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PREFACE.

IT has been Mr. LONDON's custom to preface each Volume of the *Magazine of Natural History* with an Address to the Contributors and Subscribers; and the adoption of such a course might naturally be expected from the present Conductor, upon the occasion of bringing to a close the First Volume of the New Series.

Prior, however, to the commencement of another year, it is hardly possible to form any decided estimate of the opinion which the Subscribers at large entertain of the general character of the Magazine under the existing arrangements; and, until all uncertainty upon this point is removed, it would, perhaps, be premature to discuss the present condition, or anticipate the future success, of the work.

The Editor, however, feels bound to acknowledge the support afforded to this Periodical, at a period when the attempt to carry it on promised to be attended with considerable difficulty, from the withdrawal in 1836 of a large number of the Contributors, and the establishment of a Journal devoted to Zoology and Botany, by parties in no way dependent on their literary labours.

A large proportion of the contents of the present Volume has been communicated by individuals of established reputation as Naturalists, while the entire number of writers amounts to nearly one hundred; and in no instance whatever has the slightest remuneration been given to any one Contributor, either for translations or original articles.

The circulation of the English scientific journals is so limited, that, taken in the aggregate, the sum realised by their sale falls short of the actual cost of printing and publishing; a result consequent upon their multiplicity, and perhaps still more upon the very general establishment of museums and public libraries; these institutions affording parties the means of consulting the pages of periodicals, without being obliged to have recourse to individual subscription.

The *Magazine of Natural History* is very generally admitted to have done much towards exciting an interest in the pursuits connected with the investigation of natural objects; and, so long as circumstances admit of the present Editor's carrying it on, if it con-

tinue to receive from various Contributors in future as much support as it has done during the past year, he will persevere in so doing, at least, while there is no actual loss upon its publication.

In pledging himself to this line of proceeding, the Editor feels that he may fairly call upon those who derive interest from the perusal of the work, to second his efforts, by exerting themselves to promote its circulation.

The proposed reduction to forty-eight pages, instead of fifty-six, has not been carried into effect ; but, on the contrary, small type has been introduced, so as considerably to increase the amount of matter in the present Volume.

28. *Stamford Street*, Nov. 26. 1837.

CONTENTS.

LIST OF CONTRIBUTORS,

With References to the several Articles contributed by each.

	Page
BEAN, WILLIAM.	
Notice of the Bridlington Tertiary Deposit - - -	504
BIRD, GOLDING, F.L.S., &c.	
Remarks on a particular Form of Irritability observed in the Stems of many Plants, especially Exogens, evinced on dividing them in the direction of their Axis - - -	57
Letter in Reply to some Observations published in the <i>Edinburgh Journal of Natural History</i> , upon the Cause of Vegetable Diver- gence - - -	180
Observations on the Existence of electric Currents in Vegetable Structures - - -	240, 293
BIRT, R., A.L.S.	
On the Anemomal Curves described during November, December, and January, 1836-37. - - -	211
BLYTH, EDWARD.	
On the Psychological Distinctions between Man and all other Animals; and the consequent Diversity of Human Influence over the inferior Ranks of Creation, from any mutual and reciprocal Influence exercised among the latter - - -	1. 77. 131
On the Habits and Peculiarities of the common Bottletit, or Muffin (<i>Mecistura vagans</i> Leach, <i>Parus caudatus</i> of Linnæus) -	199
On the Reconciliation of certain apparent Discrepancies observ- able in the Mode in which the seasonal and progressive Changes of Colour are effected in the Fur of Mammalians and Feathers of Birds; with various Observations on Moulting - - -	259. 300
On Woodcocks, Fieldfares, and Redwings building in the British Islands - - -	439
Confirmation of the curious Fact recorded by Capt. Manby in the Habits of the Viper - - -	441
On certain alleged Tokens of Affinity which have been held to connect the Pigeons with the Poultry - - -	442
Some Remarks on the Plumage of Birds - - -	477
Notes on the Pern, or Honey Buzzard - - -	536
Notice of a Redwing's Nest, near Godalming, in Surrey - -	555
On the Counterfeiting of Death, as a Means to escape from Danger, in the Fox and other Animals - - -	566
BOWMAN, J. E., F.L.S.	
On the Longevity of the Yew, as ascertained from actual Sections of its Trunk; and on the Origin of its frequent Occurrence in Churchyards - - -	28. 85.
BREE, Rev. W. T.	
Observations upon <i>Trochilium crabroniformis</i> , the Lunar Hornet Sphinx - - -	19

BROWN, JOHN, F.G.S.

- Observations upon the Boulders of Trap Rocks, &c., which occur
in the Diluvium of Essex - - - - - 145
Description of a Method of preserving Fossil Fruits - - - - - 336

BROWN, P. J.

- On the Preservation of Botanical Specimens from the Attacks of
Insects - - - - - 311
Short Botanical Notices - - - - - 447
Observation on a Meteorological Error in Vol. VIII. of the
Magazine of Natural History - - - - - 448

BURNELL, EDWARD H.

- List of Lepidopterous Insects, found in the Neighbourhood of
Witham, Essex - - - - - 601

CHARLESWORTH, EDWARD, F.G.S., &c.

- Notice of the Occurrence of *Volùta Lambérti* on the Suffolk
Coast; with Observations upon its Claim to rank with existing
Species - - - - - 35
Observations upon *Volùta Lambérti*, with a Description of a
gigantic Species of *Terebrátula* from the Coralline Crag - - - 90
Notice of a new Fossil Shell from the Coast of Suffolk - - - 218
Notice of the Teeth of *Carchàrias megalodon* occurring in the
Red Crag of Suffolk - - - - - 225
On the Power which the Animal of the Argonaut has of repairing
Breaches in its Shell - - - - - 526
On the recent Discovery of a Fossil Crocodile at Whitby - - - 532
On a Form of chambered cephalopodous Shells, connecting the
Genera *Nautilus* and *Ammonites* - - - - - 533

CHAMBERS, RICHARD, F.L.S., &c.

- Observations on the Phenomena termed *Ignes Fatui* - - - - - 553
Observations on the Humming-Bird - - - - - 592

CHRISTY, WILLIAM, jun., F.L.S.

- Notices of a few rare Plants collected in Jersey, in October, 1836 - 25

CLARKE, JOSEPH.

- Notes on the Crossbill - - - - - 164

CLARKE, Rev. W. B., M.A., F.G.S., &c.

- Examples of Natural Phenomena observed in 1833, and regis-
tered - - - - - 229
Notice of a singular electrical Phenomenon on the Night of
February 18, 1837. - - - - - 220
Remark respecting a Hare taking the Water - - - - - 279
Observations upon Meteorological Errors in former Numbers - 556
Illustrations of the Geology of the South-East of Dorsetshire - 461
Notes of Observations made on the Night of Nov. 12. 1837 - - 633

CLARKE, W. B., M.D.

- Notice of the Capture of some Specimens of the Genus *Hemi-
ramphus* on the Suffolk Coast - - - - - 503

COLCHESTER, WILLIAM.

- Specimen of the Tooth of *Carchàrias megalodon* - - - - - 225

COOPER, DANIEL.

- List of Plants collected in the Isle of Sheppey - - - - - 554

COUCH, JONATHAN, F.L.S.

- Observations on the luminous Meteors commonly termed Shoot-
ing Stars - - - - - 150
Notice of the *Sphínx A'tropos* crossing the Channel - - - - 224

CRADOCK, CHARLES.

- Notice respecting a young Cuckoo - - - - - 554

DALE, J. C.

- Letter respecting *Papilio Podalírius*, in Reply to Mr. Stephens - 334

DIKES, WILLIAM HEY, F.G.S.

Outlines of the Geology of Nettleton Hill, Lincolnshire - - 361

DRUMMOND, JAMES.

Offer to collect Specimens in Natural History at Swan River - 54

EDITOR.

Notice of Dr. Andrew Smith's Intention of publicly exhibiting in London the Zoological Specimens collected by the Expedition sent from the Cape, in 1833, to explore the Interior of Africa - 333

Remark relating to the Discussion between Mr. Stephens and Mr. Dale, upon the indigenous Nature of *Papilio Podalirius* - - 333

Observations upon the proposed Method of raising a Fund for the Purpose of sending a Second Exploring Expedition into Africa - - - - 433

Additions to the Menagerie of the Zoological Society - - 434

Robbery of an Armadillo at the Zoological Gardens - - 434

Notice respecting D'Orbigny's Claim to be the first Describer of the new *Rhœa* brought home by Mr. Darwin - - - 304

Mr. Murphy's Prognostications of the Weather - - - 344

Power in a Canary of imitating the human Voice - - - 548

EDMONDS, EDWIN.

Notice of the Phenomenon of Ventriloquism occurring in the Robin - - - - 279

ELLIS, F. J., F.G.S., &c.

Notice of a White Partridge shot near Birmingham - - 52

EYTON, THOMAS C., F.Z.S., &c.

Some Remarks upon the Theory of Hybridity - - - 357

FAIRHOLME, GEORGE.

Observations on Woodcocks and Fieldfares breeding in Scotland 337

FITCH, WILLIAM.

New Genus of Fossil Shells, from Suffolk - - - 218

GARDENER, WILLIAM.

Notice of *Polyommatus Artaxérxes* occurring abundantly near Dundee - - - - 275

Remarks upon the Transformations of *Cassida obsolèta* - - 276

GOULD, JOHN, F.L.S.

Observations on some Species of the Genus *Motacilla* of Linnæus 459

HARVEY, J. B., F.Z.S.

Miscellaneous Zoological Notices - - - - 473

HOOKE, Sir W. J.

Communication respecting the Plates in his *Icones Plantarum* - 385

Hoy, J. D.

A Notice of the Occurrence of Two Species of the Genus *Tringa*, new to the British Islands; with a List of the rarer Birds killed in Suffolk, and the adjoining Borders of Norfolk and Essex, from the Autumn of 1835 to December, 1836 - - - - 115

HUBBARD, GEORGE.

Notice of the Occurrence of *Helix virgata* in vast Numbers - 223

KIRTLAND, W.

Notice of the Ashmolean Museum - - - - 270

LEE, EDWARD.

Outlines of the Geology of Nettleton Hill, Lincolnshire - - 361

LEIGHTON, W. A.

On the Occurrence of *Lamium intermedium* at Shrewsbury - 438

LEWIS, E.

Objection against the proposed Genus *Cypræcassis* of Mr. Stutchbury - - - - 337

LOCH, JAMES, M.P., F.G.S.

Observations upon the Salmon in Loch Shin, in Sutherland - 308

MAIN, JAMES.

Remarks on the Variation in the Plumage of Birds - - 167

On the possible Origin of the *Ignis Fatuus* - - - 548

On the Habits of the Boat Fly - - - 558

GRAY, GEORGE ROBERT, M.E.S., &c.

Description of some singularly formed Orthopterous Insects - 141

Description of a new Subgenus, and some Remarks on Birds belonging to the Family *Laniadæ* - - - 487

GRAY, JOHN EDWARD, F.R.S., &c.

On the Enlargement of the Eggs of some Marine Molluscs during the Period of their Hatching - - - 247

A Synoptical Catalogue of the Species of certain Tribes or Genera of Shells contained in the Collection of the British Museum and the Author's Cabinet; with Descriptions of the New Species - 370

On a new Genus of Land Shells - - - 484

Description of some new, or little known, Mammalia, principally in the British Museum Collection - - - 577

GREEN, H.

Notice respecting the Transformation of *Campontia cruciformis* - 279

MANBY, GEORGE W., Capt. F.R.S.

Notice of a remarkable Fact in the Habits of the Viper - 382

MANTELL, GIDEON, LL.D., F.R.S., &c.

Communication upon Fossil Saurians - - - 341

MARTIN, WILLIAM, F.L.S.

Observations upon the Swimming of Snakes - - - 383

MITCHELL, JAMES, LL.D., F.G.S., &c.

On the Strata near Swanwich, in the Isle of Purbeck - - 587

MOORE, EDWARD, M.D., F.L.S.

Description of a new British Fish (*Peristædion Malarmat Lacep. and Cuv.*) - - - 17

On the Raptorial Birds of Devonshire - - - 113

On the Passerine Birds of Devonshire - - - 176

Climbing and Gallinaceous Birds of Devonshire - - - 227

On the Wading Birds of Devonshire - - - 319

On the Web-footed Birds of Devonshire - - - 360

On the change of Plumage in the Guillemot - - - 607

MUMBY, G.

Sketch of the Botany, &c., of the Neighbourhood of Hyères - 192

OGILBY, WILLIAM, M.A., F.L.S., &c.

Observations on the opposable Power of the Thumb in certain Mammals, considered as a zoological Character; and on the natural Affinities which subsist between the *Bimana*, *Quadrûmana*, and *Pedimana* - - - 449. 517

OWEN, RICHARD, F.R.S., &c.

Description of the Membranes of the Uterine Fœtus of the Kangaroo - - - 481

PEACOCK, J. B.

Remarks on some of the Marine Animals met with during a Sea Voyage. - - - 596

READ, R. W. H., F.Z.S.

Notice of a Woodcock shot in July - - - 52

RICHARDSON, G. F.

Translation of a Memoir on Fossil Saurians - - - 341

RICHARDSON, WILLIAM, M.A., F.G.S.

Observations upon the chronological Arrangement of fossiliferous Deposits, by a Reference to their organic Contents - 122

SALMON, S. D.

Record of a new Species of *Tringa* Shot near Yarmouth - 54

Remark on the Migration of Swifts - - - 108

SALWEY, T.	
Remarks upon the Sound produced by Snails crawling upon Glass	107
SHUCKARD, W. E.	
On Generic Nomenclature	248
Description of a new British Wasp; with an Account of its Development from the Larva to the Imago	490
Description of a new Species of <i>Sirex</i> discovered to attack and destroy the Spruce Fir	630
SIDMOUTH, Viscountess.	
Communication respecting the Discovery of a Fossil Crocodile at Whithy	531
SKAIFE, JOHN.	
Notice of a Sandpiper shot in August	555
Record of a Stormy Petrel being found dead near Blackburn	555
SMITH, ANDREW, M.D.	
Characters of a new Form in the Fringillidæ; with a Description of the only Species yet referrible to it	535
SMITH, WILLIAM, LL.D. &c.	
Notice of a Method of readily distinguishing between minute Grains of Quartz and Mica	386
Observations on Coal-finding	464
SOWERBY, GEORGE BETTINGHAM, F.L.S., &c.	
On the Form of the Crystals of Oxidulous Copper	168
On Nematūra, a new Genus of Univalve Shells	217
Some Observations on Mr. Stutchbury's proposed new Genus of Univalve Shells, <i>Cypræcassis</i>	366
Additional Remarks on Mr. Stutchbury's proposed Genus <i>Cypræcassis</i>	431
STANWAY, H.	
Notice of Aurora Borealis, as seen at Brookfield, near Manchester	635
STRICKLAND, HUGH EDWARD, F.G.S., &c.	
On the Mode of Progression observed in the Genus <i>Lima</i>	23
On the Inexpediency of altering established Terms in Natural History	127
Rules for Zoological Nomenclature	173
On the Errors which may arise in computing the relative Antiquity of Deposits from the Characters of their embedded Fossils	234
STUTCHBURY, SAMUEL, A.L.S.	
On <i>Cypræcassis</i> , a proposed new Genus of Univalve Shells, for the Reception of certain Species of Brugière's Genus <i>Cassis</i>	214
Additional Remarks upon the proposed Genus <i>Cypræcassis</i>	470
TATEM, JAMES G.	
Notice of a Singular Auroral Light seen at Wycombe	221
TEMPLETON, ROBERT.	
Irish Vertebrate Animals: selected from the Papers of the late John Templeton, Esq., Cranmore	403
WATERHOUSE, G. R., M.E.S., &c.	
Observations on the Palm Squirrel (<i>Sciurus palmærum</i> of Authors)	499
Description of a new Species of the genus <i>Manticora</i> , captured in South Africa, by Dr. Andrew Smith	595
WEBSTER, W. H.	
On the contemporaneous Deposition of Salt and Gypsum in the Island of Ascension	277
WEISSENBORN, Dr.	
Remarks on the Habits and Economy of the common Fox	507

Observations upon the Ignis Fatuus	-	-	-	554
On the alleged Transformation of <i>Avèna sativa</i> into <i>Secale cereale</i>	-	-	-	574
Observations on the Wildgeese in Germany	-	-	-	644
WESTWOOD, J. O., F.L.S., &c.				
On Generic Nomenclature	-	-	-	169
Description of a new Genus of British parasitic Hymenopterous	-	-	-	
Insects	-	-	-	275
Observations in Reply to Mr. Shuckard's Article on Generic	-	-	-	
Nomenclature	-	-	-	316
Nomenclature of the Subgenus separated from <i>Odynèrus</i>	-	-	-	554
WHETHERELL, NATHANIEL, F.G.S.				
Specimen of <i>Nautilus ziczac</i>	-	-	-	533
WHITE, W. H.				
Meteorological Observations	-	-	-	111
Meteorological Retrospect for the Year 1836	-	-	-	153
Notice of a Meteor seen on February 25. 1837	-	-	-	221
Remarks upon the possible Origin of Ignis Fatuus	-	-	-	551
WOOD, NEVILLE.				
Remarks upon the Organ of Time in Dogs	-	-	-	53
Instance of the Hedge Coalhood (<i>Pyrrhula vulgaris</i>) laying in	-	-	-	
November	-	-	-	53
Remark upon the late Singing of Birds	-	-	-	53
YARRELL, WILLIAM, F.L.S., &c.				
Observations upon the occurrence of the genus <i>Hemiramphus</i> on	-	-	-	
the Suffolk Coast	-	-	-	506

ARTICLES WHICH HAVE APPEARED ANONYMOUSLY, OR WITH INITIALS ONLY.

C.	Suggestion of Improvement in Hooker's "Icones Plantarum"	336
G. W.	Some Observations upon the supposed different Species of Viper	183
JUNIUS.	On Ventriloquism in Birds	445
KENT.	Singular Instance of Pugnacity in the Robin	222
	Notice of a Preventive against Damp in Museums	223
L. A. T.	Notice of a luminous Appearance at Birmingham	222
W. L.	Notice of the Breeding of Woodcocks in Selkirkshire; with Observations upon the Habits and Manners of the Black and Red Grouse, and Carrion Crow, in Scotland	118
	Reply to some Observations in the <i>Edinburgh Journal of Natural History</i>	443
VIATOR.	On the <i>Prôteus anguinus</i>	625
VON OSDAT.	Observations on the Oak	74
ZETETES.	On Nomenclature	421

TRANSLATIONS.

An Estimate of the probable Degrees of Temperature in Europe during the Tertiary Periods, founded upon the Study of Fossil Shells. By M. G. P. Deshayes. (From the <i>Annales des Sciences Naturelles</i>)	9
Observations upon the Tarántula (<i>Lycosa Taréntula</i>). By M. Léon Dufour. (From the <i>Annales des Sciences Naturelles</i>)	3
Passage from Raspail's Work on Vegetable Physiology, relating to the British Museum	104
On the Structure of the Fossil Saurians. (From the "Palæologica zur Geschichte der Erde und ihrer Geschöpfe;" von Hermann von Meyer. Frankfort, 1832.)	281. 341
Report of a Notice, by M. Rang, respecting the Inhabitant of the Argonaut	393
Objections to the Multiplication of Generic Synonymes (L'Hermès)	435
Observations on the Fossil Remains of Apes (L'Hermès)	437
Historical Notice of Antoine Laurent De Jussieu (From the <i>Annales des Sciences Naturelles</i>)	-

REVIEWS.

A Synopsis of the Birds of Australia. By John Gould, F.L.S., &c. author of "The Birds of Europe," "The Birds of the Himalaya Mountains," &c.	51. 270
Report of the Expedition for exploring Central Africa from the Cape of Good Hope	98
The Botanist; containing accurately coloured Figures of tender and hardy ornamented Plants; with Descriptions, scientific and popular; intended to convey both Moral and intellectual Gratification. No. I. Conducted by B. Maund, F.L.S.; assisted by the Rev. J. S. Henslow, M.A. F.L.S., &c.	163
Conchological Illustrations; or coloured figures of all the hitherto unfigured Recent Shells. By G. B. Sowerby, jun.	266
A Synopsis of the Family of Naiades. By Isaac Lee, Member of the American Philosophical Society, &c.	267
Woodland Gleanings. By the Editor of the "Sentiment of Flowers"	269
Naturalist's Library. Ornithology. Vol. VII. Birds of Western Africa. By W. Swainson, Esq.	324
Ornithological Illustrations. By Sir William Jardine and P. S. Selby, Esq.	324
Beauties of the Country; or, Descriptions of Rural Customs, Objects, and Scenery. By Thomas Miller, Author of "A Day in the Woods"	330
Zur Naturgeschichte, &c. On the Natural History of the Genus Calandra, with the Description of a new Species, Calandra Sommeri. By Dr. Hermann Burmeister	332
Histoire Naturelle des Insectes Hyménoptères. Par M. Le Compte A. Lepéletier de Saint Fargeau	377
Clavis Novi Hymenopterorum Systematis, adjecta Synopsi Larvarum ejusdem ordinis Scandinavicarum Eruciformium. A Gustavo Dahlbom	377

Prodromus Hymenopterologiæ Scandinaviæ. A Gustavo Dahlbom	377
Essay on the indigenous fossorial Hymenoptera; comprising a Description of all the British Species of burrowing Sand-Wasps contained in the Metropolitan Collections, with their Habits, as far as they have been observed. By W. E. Shuckard, M.E.S.	377
Pompilidarum Daniæ Dispositio Systematica, Scripsit Georgius Schiodte	377
An Analysis of the British Ferns and their Allies, with Copperplate Engravings of every Species and Variety. By George W. Francis, Author of a "Catalogue of British Flowering Plants and Ferns"	381
Le Règne Animal, distribué d'après son Organisation. Par George Cuvier	599
Iconographie du Règne Animal. Par E. F. Guérin	499
Dictionnaire pittoresque d'Histoire Naturelle	449
Suites à Buffon; formant, avec les Œuvres de cet Auteur, un Cours complet d'Histoire Naturelle	499
Suites à toutes les E'ditions de Buffon. Histoire Naturelle des Animaux Articulés. Par Laporte de Castelnau et M. Lucas	499

PERIODICALS.

Magazine of Zoology and Botany; conducted by Sir William Jardine, Bart., P. J. Selby, Esq., and Dr. Johnston	43. 541
Naturalist; illustrative of the Animal, Vegetable, and Mineral Kingdoms; conducted by B. Maund, F.L.S.; and W. Holl, F.G.S.	43
The American Journal of Science and Art. Conducted by Benjamin Silliman, M.D., LL.D., &c.	156
Magasin de Zoologie. Par E. F. Guérin	500
Naturalist; illustrative of the Animal, Vegetable, and Mineral Kingdoms. Edited by Neville Wood, Esq.	263. 541
Mining Journal and Commercial Gazette. Conducted by Henry English, Esq., F.G.S.	541

THE MAGAZINE

OF

NATURAL HISTORY.

JANUARY, 1837.

ORIGINAL COMMUNICATIONS.

ART. I. *On the Psychological Distinctions between Man and all other Animals; and the consequent Diversity of Human Influence over the inferior Ranks of Creation, from any mutual and reciprocal Influence exercised among the Latter.* By EDWARD BLYTH, Esq.

THERE is not, within the wide range of philosophical enquiry, a subject more intensely interesting to all who thirst for knowledge, than the precise nature of that important mental superiority which elevates the human being above the brute, and enables man alone to assume the sway where-soever he plants his dwelling; and to induce changes in the constitution and adaptions of other species, which have no parallel where his interference is unknown.

I am led to offer a few remarks on this subject, by observing continually that the instinctive actions and resource of animals are attributed, most inconsiderately, to the habitual exercise of their reflective faculties; often where it is utterly and manifestly impossible for them to have observed facts whereon to base those inferences, which alone could have led them, by an inductive process, to adopt the course we find them to pursue. I am perfectly aware that the word "instinct," by not a few, is denounced as a mere cloak for ignorance, as a sort of loophole through which to escape from a rational explanation of phenomena; but, with all deference to those who advocate this over and above refined notion, I venture to maintain that it has a very definite signification, to express which no other term could be substituted: it implies an innate knowledge, which is not, like human wisdom, derived exclusively from observation and reflection, and to assign a secondary cause for which is clearly impossible; wherefore it savours rather, I conclude, of sophistry,

to affect to be dissatisfied with any non-misleading expression, which is currently understood to denote it.

Place a juvenile chimpanzee in presence of one of its natural enemies; a python, or one of the larger Fèles; and it "instinctively" recoils with dread. But does a human infant evince the like recognition? Here, then, is a fundamental distinction at the outset.

Not only, too, do brute animals (as remarked by White of Selborne) attempt, in their own defence, to use their natural weapons before these are developed, but they intuitively understand the mode of warfare resorted to by their brute opponents. They know, also, where the latter are most vulnerable, and likewise where their concealed weapons lie. Observe the deportment of a rat that is turned into a room with a ferret: see how artfully he guards his neck against the wall, instinctively knowing that there only will his enemy fix.* Notice, on the other hand, the wondrous accuracy with which the *Mustéladæ* constantly wound the jugular vein of any bird or quadruped they attack. Witness a thrush that has captured a wasp, first squeezing out the venom from its abdomen, before it will swallow it. Or see a spider trying to shake off a wasp from its web, and, failing to do so, proceeding to cut it clean away. Can aught analogous be traced in the actions of inexperienced man? Whence, then, the acquired knowledge on which these animals could reason to act thus?

The distinction is, that, whereas the human race is compelled to derive the whole of its information through the medium of the senses, the brute is, on the contrary, supplied with an innate knowledge of whatever properties belong to all the natural objects around, which can in anywise affect its own interests or welfare†; a sort of intimation, by the way, that all the inferior races pertain to some general comprehensive system, all the components of which have a mutual reciprocal bearing, and to which man only does not intuitively conform nor constitute a part of, except in so far as his bodily frame is of necessity subject to the common laws of matter and of organisation.

In every other species, each individual comes into the world replete with "instincts," which require no education

* Even more: he will contrive so to place himself, if practicable, that the ferret's eyes shall be dazzled by the light.

† The indirect effects of human agency on this intuitive knowledge of brutes will be considered presently. In no way is the deterioration more evident, than in domesticated animals poisoning themselves by feeding on that which, in a wild state, they would instinctively reject.

for their developement. A kitten reared by hand, or a bird raised from the nest, have the same language *, the same leading habits, as the rest of their species, but little, if at all, modified by change of circumstances. A kitten watches at a mouse-hole, though it has never seen a mouse; the squirrel proceeds by the easiest possible method to get at the kernel of its first nut, by invariably scraping, with its lower incisors, at the softer end, which it instinctively turns in its fore paws to the proper position; and the wasp, crawling forth from its pupa envelope, immediately commences feeding the neighbouring larvæ. The human infant, too, applies instinctively to the breast, like the young of all other mammalians; but, unlike those, it has to attain all its after-knowledge through the medium of its external senses. It looks to its nurses, and those about it, for information; and these are capable of so communicating their attainments, as very materially to assist the infant learner in its acquisition of knowledge. It is preposterous to assert the contrary, as has been done; or to pretend that it rests on the choice of the infant whether or not it will learn.† Practically, it cannot help doing so; and it is equally monstrous to deny that human beings can so communicate the results of their experience, that, with what in addition is ever accumulating, each generation must necessarily rise in knowledge above the last. Unless the faculties were to be much deteriorated, it could not be otherwise. Who can pretend to deny the excessive influence of every generation upon that which immediately succeeds it; the influence both of precept and example? Imagine it possible for those of the present day to refuse to instruct; and what would then be the consequent condition of their offspring? Apply the same test to any other species of animal; and in what measure would the progeny be affected?

I wish not to defend the untenable doctrine, that the higher groups of animals do not individually profit by ex-

* The reader may probably be disposed to refer this to the structure of the vocal organs. But, admitting to the full extent the reasonableness of this view, it must be borne in mind that the smaller birds have great power of modulation; and it is a certain fact, that, although in most species the song is purely innate, there are many (as the song thrush and nightingale) in which it is, for the most part, acquired; as is proved by the fact of these never warbling their wild notes when reared in confinement, except they have had opportunities of listening to the proper song of their species; which latter, it may be remarked, they imitate much more readily than any other. I do not consider, however, the music of a bird to be so much the language of its species, as those various notes and calls by which different individuals commune together; and these I have never known to vary under any circumstances.

† See *Mag. Nat. Hist.* (old series), vol. ix. p. 612. l. 3., et seq.

perience; nor to deny to them the capability of observation and reflection, whereby to modify, to a considerable extent, their instinctive conduct: neither do I assert that the human race is totally devoid of intuition, when I see the infant take naturally to the breast; when I perceive the force of the maternal attachment, and the ardour of the several passions: which latter, however, are, of course, but incentives to conduct common to both man and animals. In only the human species are the actions resulting from them unguided by intuitive knowledge. All I contend for is, that the ruling principle of human actions is essentially distinct from that which mainly actuates the brute creation, whence the general influence of the two is diverse in kind; and I mistake if I cannot establish the position.

The brief period that elapses before most animals are compelled to perform the part allotted to their species, precludes the possibility of their attaining sufficient information from external sources, and renders, therefore, the possession of a substitute for knowledge so obtained absolutely requisite. We have already seen that such a substitute is not wanting; but that all the knowledge necessary to insure their general welfare is intuitively conferred on the brute creation. Their various actions, in wild nature, are consequently based on this innate knowledge; which, being the same in every individual of the same species, in a natural state (that is, as completely uncontrolled by those peculiar changes of condition which man only, the exception of all other animals, can bring about), superinduces a normal uniformity of habit throughout the members of a species, which is rarely modified to any considerable extent by individual experience. Now, this uniformity is at variance with what reasoning from observation could possibly lead to; and, as it extends even to the resource of creatures of the same species, when driven to emergency, we have herein sufficient intimation that their wiles and stratagems, however consonant with what reasoning from observation might suggest, may nevertheless be purely instinctive, perfectly unalloyed with any wisdom resulting from experience.

To ascend from illustrations the least equivocal, let me here cite the nidification of the feathered tribes. Who, that considers the wonderful fact, that not only genera, but even species, of birds are for the most part distinctly indicated by their nests, can fail to recognise in this the operation of a principle essentially distinct from that which we understand by the word *reason*? which latter, in human beings, can, of course,

be only the result of observation and reflection.* We observe a similar marked uniformity in the fabrics and operations of all animals of identical species (man only exempted), endless examples of which will instantly recur to the reader in the insect tribes; and, if we consider the beaver, and others of the higher grades of animals which join their labours for mutual advantage, or are otherwise remarkable for what has thoughtlessly been deemed *their* ingenuity, the same truth will be found still to hold just as obviously apparent, and forbids us to attribute their proceedings to aught else than the dictates of intuition.

It is most commonly, however, in the resource of brute creatures, the wisdom they display in their expedients, that unreflecting persons fancy they discern the proofs of intellect identical with human; but, even here, this does not necessarily follow; for it is sufficient to refer to the cases which I commenced by detailing, to be assured that Providence has conferred instinctive wiles on animals as a resource against contingencies; the legitimate actions resulting from which according, perhaps, with what reason might dictate in like circumstances, we are therefore apt to conclude must necessarily have been induced by reasoning. To illustrate what I mean, let me adduce the simulation of death practised by so many species, with intent to weaken the instinctive vigilance of their foes or prey. (That another animal, it may be remarked, should suffer itself to be thus duped, is most probably a result of acquired experience.) A cat has been seen to feign death, stretched on a grass-plot, over which swallows were noticed sailing to and fro; and by this ruse to succeed in capturing one which heedlessly approached too near it. The fox has been known to personate a defunct carcass, when surprised in a hen-house; and it has even suffered itself to be carried out by the brush, and thrown on a dung-heap, whereupon it instantly rose and took to its heels, to the astounding dismay of its human dupe. In like manner, this animal has submitted to be carried for more than a mile, swung over the shoulder, with its head hanging; till at length, probably getting a little weary of so uncomfortable a position, or perhaps *reasoning* that its instinctive stratagem had failed in its object, it has very speedily effected its release, by suddenly biting. The same animal has been

* Brutes appear to reason from innate knowledge, and this in proportion to the developement of the cerebrum; but the extreme promptitude of their expedients (as will be shown), in cases of emergency, often prohibits us from inferring that these can be the result of aught else than intuitive impulse.

known, when hunted, to crouch exposed upon a rock of nearly its own colour, in the midst of a river, and so to evade detection by its pursuers; and we perpetually hear such cases brought forward as decisive proofs of its extreme sagacity. However, as regards the latter instance, will not a brood of newly hatched partridges instantly cower and squat motionless at sight of a foe*? and, as concerns the former, do we not find that many beetles, though just emerged from the pupa state, will simulate death every bit as cleverly as a fox or corn-crake? Whence it surely follows that there can be no occasion to attribute the act to a reasoning process in the one animal, any more than in the other.

It would be unnecessary to enter here into any details on the obvious correlativeness of the dominant instincts of animals to the mode of life most congenial to their constitution, to remark on the mutual relations of habit and structure, and the exquisite adaptation of structure to locality. Hence, the natural habits of species of necessity bear reference to their indigenous haunts, as manifestly as their structural conformation. Thus, the elephant, which, like the other great Pachydermata, affects the vicinity of rivers and marshes, delights to relax its rigid hide in the stream; and afterwards covers it with a thick plastering of mud, probably to retard its too rapid desiccation: the which has been deemed an incontrovertible proof of its reasoning from observation. A young robin, however, the first time that it sees water, will, if it be not too deep, fearlessly plunge in and wash; and a young wren or lark will avail itself of the earliest opportunity to dust its feathers on the ground, the exact purport of which is not yet definitely understood. If, therefore, the latter be thus obviously instinctive, what reason have we to esteem the former otherwise? The uniformity of all these habits and propensities, in creatures of the same species, tends rather to intimate that in neither case are they the result of reasoning.

To infer reflection on the part of brutes, as many have not scrupled to do, as the motive for whatever in human actions could only be the result of reasoning, one would imagine to be too palpable a misapprehension to need serious consideration; yet some writers have gone so far as to attribute forethought to the dormouse, and other species which provide

* I have noticed a remarkable instance of this, on placing down a stuffed polecat before a young brood, tended by a bantam hen. A rail or gallinule will also run towards a bank approximating to their own colour; and, if no hiding-place be discoverable, will insert the head into a crevice, and, remaining motionless, suffer themselves to be taken. Of this I have known many instances.

instinctively against the winter season.* Perhaps it might be deemed a sufficient overthrow to this most shallow notion, to call in mind the migrative impulse; to enquire how the untaught cuckoo (raised by permanently resident foster-parents) could reason that in another clime it should escape the rigours of a season that it had never experienced? But herein we have an additional principle involved, which will require a separate consideration. Proceed we, then, to examine into the presumed sagacity of those provident creatures, as the ant and harvest mouse, that habitually lay up a store for future need, and even provide against all possible injury from germination, by carefully nibbling out the corcule from each grain. Can any thing be more truly wonderful as a matter of instinct? All instincts are, indeed, equally wonderful. But it would certainly be even more extraordinary, if every member of these species were to be alike induced to pursue the same course by a process of reasoning. The following anecdotes will suffice to probe the intellect of these animals:—I have a tame squirrel, which, though regularly fed all its life from day to day, nevertheless displays the intuitive habit of its race, in always hoarding the superfluities of its food. Now, in its mode of effecting this, a superficial observer might fancy that he discerned a fair share of intelligence. Carrying a nut, for instance, in its mouth, it scrapes a hole with its fore paws in the litter at the bottom of its cage; and then, after depositing its burthen, scratches together the hay, or whatever it may be, over it, and pats it down with its paws. Moreover, it never fails to remember the spot, and will occasionally, when not wishing for food, examine the place to ascertain whether it be safe. But mark the sequel. I have repeatedly seen the same animal act precisely thus on the bare carpet, and upon a smooth mahogany table; yes, upon a table I have frequently seen it deposit its nut, give it a few quick pats down, and finally thus leave it wholly unconcealed.† The tits (*Pàri*), also, evince a like propensity of hiding food, one of their many resemblances to the

* See *Mag. Nat. Hist.* (old series), vol. ix. p. 611. l. 15.

† It is no new remark, that rodents are much below the Carnivora in the scale of intelligence; a necessary consequence of their inferiorly developed brain. Yet few animals have more instinctive cunning and resource than the common rat: but this is not intellect, of which it displays scarcely any when brought up tame; a condition which, as will be shown, is sure to call forth the non-instinctive intelligence of animals. Judging from my own observation, I should say that the rat was mentally superior to the house mouse, but inferior to the squirrel; which, in its turn, must yield in intellect to the hare; and, I believe, the comparative structure of their brains will be found in accordance.

Córvidæ; and a tame marsh tit that I once possessed used habitually to drop the remainder of the almond, or piece of suet, that he had been picking, into the water-glass attached to the cage, although he never could thence reobtain it, and though his water was thus daily rendered turbid. I could narrate analogous instances without number.

Thus it plainly appears, that the instinct of each animal is adapted to its proper sphere; for the mode of life it was destined to pursue, and for that only. With this restriction (if such it can be called), it is in each case perfect. The actions of every creature uncontrolled and uninfluenced by man are invariably such as tend to the general welfare of its species; sometimes collectively, however, rather than individually * (whence we hear of what have been termed "mistakes of instinct"). They evince superhuman wisdom, because it is innate, and, therefore, instilled by an all-wise Creator. Indeed, the unpremeditated resource of animals, in cases of emergency, is oftentimes decidedly superior to that of man; and why? Because they need not experience for their guide, but are prompted to act aright by intuition.

In wild nature, this inborn knowledge of brutes thus abundantly sufficing for the attainment of all they require, there is, in consequence, but little to stimulate the exercise of their reflective faculties; and, accordingly, their general agency may be considered as passive, in effect analogous to the operation of the laws of matter. Even the "half-reasoning elephant," in the wild woods, is but a creature of unreflecting impulse, to an extent which wholly dissevers it from all community of mental attribute with the lowest grade of mankind. Witness the subdued tamed animal, which, travelling along its accustomed route, suddenly broke loose from its attendants, affrighted at the near yell of a tiger. At once its former submissiveness was forgotten: it rejoined the wild troops, and was again a free tenant of the jungle. Years rolled on, and it was retaken by the ordinary method. The sight of the stakes never sufficed to awaken its recollection; nor did the mode employed to secure it when entrapped. It was sullen and savage, and acted in nowise differently from its companions. By chance, however, its former keeper was present, who, after a while, recognised the animal. He gave the word of command, and it was instantly submissive; all traces of its wild nature suddenly dissipated; its previous habits were forgotten; it was once more a reclaimed animal,

* As in the contests of animals for the other sex; whence it follows that the breed is chiefly transmitted by the most stout and healthy.

and suffered itself to be led tractably to its place of confinement.* Would a rational being have acted like this elephant?

(*To be continued.*)

ART. II. *An Estimate of the probable Degrees of Temperature in Europe during the Tertiary Periods; founded upon the Study of Fossil Shells.* By M. G. P. DESHAYES. Read to the French Academy, May 23. 1836.

(*From the Annales des Sciences Naturelles.*)

CONCHOLOGY, studied in a logical manner in its various relations both to zoology and geology, may become a powerful means of bringing this latter science to perfection. It is even allowable, in the present day, to anticipate the time when conchology shall arrive at questions which relate to the general physics of the terrestrial globe, and furnish us with the necessary materials for their solution.

Very numerous observations, repeated upon more than eight thousand species of recent and fossil shells, and these, again, multiplied upon more than sixty thousand individuals of all regions, have enabled me to perceive important consequences with regard to an approximate estimate of the temperatures of the geological periods, concerning which man cannot cite his historical annals, since he then had no existence upon the surface of the earth.

If vegetables, as M. Arago has learnedly established in the *Annuaire du Bureau des Longitudes* for 1834, can give the mean temperatures of the historic period; if the existence in certain places of the vine, the palm, &c., are, to the skilful naturalist, equivalent to thermometrical observations; I think that animals also, and especially those which people the waters of the ocean, may by their presence determine very nearly the mean temperature of the place they inhabit.

All marine animals are not adapted to indicate temperature with the same precision: we must choose those which, possessed of but small powers of motion, cannot withdraw themselves periodically from the changes of the seasons, and are obliged to sustain all their influence in the places which have given them birth. The greatest number of the Mollusca and Zoophytes answer to this description.

To arrive at a knowledge of the temperatures of periods antecedent to human existence, there is a chain of reasoning to follow. We must first seek a starting point in existing na-

* I shall have occasion to revert to this presently.

ture, to ascertain if the life of those animals concerning, which we are about to enquire, be connected more or less intimately with circumstances among which climate may be the most essential. This induces me briefly to state some facts relating to the distribution of Mollúsca, proceeding from north to south; and, in order to shorten it, I will only speak of those which extend from Cape North to the Gulf of Guinea. If we take all together the small number of species which inhabit the north, we may divide them into two very distinct groups: first, those peculiar to the icy regions, and which never pass their limits; and, secondly, a smaller number, which exist also in the temperate seas of Germany, France, and England, with the species belonging to those seas.

In examining the Mollúsca of our temperate seas, in which there exists a greater number of species than in those of the north, it is easy to separate them into three series. In the first are comprised the species which I have just pointed out as being common to the temperate and northern seas; the species of the second series extend also as far as the south seas; those of the third are peculiar to the temperate seas.

Let us now turn to the region between the tropics, and we shall observe similar phenomena: we shall find there a greater number of species than in the two preceding regions; and, if some amongst them are also found in the temperate zones, a great many are peculiar to the equatorial seas.

These are general facts; and we may already draw from them this general inference, that each collection of species represents the mean temperature of the region it belongs to. But there are certain species more localised than others, and some more widely distributed. Thus the *Búccinum undatum*, for example, is found from the North Cape to Senegal, modifying itself according to the temperature as it advances; so that it is easy to distinguish the varieties peculiar to the three or four principal conditions of climate. This species is not the only one thus extended; but at present I am acquainted with but a small number having, like this, the property of existing in temperatures so different.

Other species, more sensible, as it appears, to the influence of climate, are much more localised, and it is these which it is most important to know. I will specify some of them:—

1. *Búccinum glaciale*. 2. *Cárdium groenlándicum*. These two species do not pass the polar circle, and are found in Norway and Greenland. 3. *Terebrátula psittácea*. It inhabits between the 65th and 75th degree. In my opinion, these species, and some others, represent the mean temperature of the north of Norway.

Tellina báltica, *Patélla Noachína*, *Nática claúsa*, *Patélla testudinális*, with many species of the genus *Astárte*, and numerous others, represent, to me, the mean temperature of the north of England, the south of Sweden, and of Denmark.

In the Channel, upon the coasts of France and England, there exist, also, many species peculiar to our climate: — 1. *Psammòbia vespertína*, 2. *Pécten irregulàris*, &c.

The shores of Spain and Portugal are more unknown than those of New Holland or South America.

The Mediterranean contains, also, a great number of species which are peculiar to itself; but, as they belong to an inland sea, I will not speak of them at present, lest their occurrence should be attributed to this particular and exceptionable circumstance.

But few observations have been made upon the coasts of Africa, from Barbary to Senegal; though for this important region we have the excellent work of Adanson; and the frequent intercourse, in the way of commerce, with Senegal and Guinea, has long enriched our collections with the marine shells of that part of the world. Among the great number of known species in the torrid zone, there are many which are peculiar to it. The list of them is too long to be given here. These species, habituated to a climate which has little variation, are not found in a recent state upon any other point on the surface of the globe; they therefore denote exactly the temperature of the seas they inhabit.

These facts demand, without doubt, to be developed in a work expressly for that purpose: they lead me to hope that zoologists will be able eventually to reply to questions such as this: — “A series of species being given, to point out the climate of the spot from which they have been procured.” It is thus that, in a period not far distant, I venture to hope that the attention of zoologists, directed towards a new end, will give to their science the means of confirming, and sometimes filling up what is deficient in, the experience of the natural philosopher.

These facts relating to the coincidence of temperature with the presence of certain species, mentioned with the greatest possible conciseness, ought to precede what I have to say upon the temperature of the geological epochs of the tertiary strata. I should add, that, to arrive at this interesting question, it is necessary to compare, with care and patient minuteness, all the known species of recent shells with all those which are brought from the tertiary strata of Europe. The

following are the principal results, obtained by the aid of considerable labour, which has occupied a great length of time : —

1. The tertiary strata of Europe contain no species which can be identified with the secondary strata lying beneath them.

2. The tertiary strata are the only ones which contain fossil specimens of existing species.

3. The fossil shells which can be identified with living species are more numerous in proportion as the strata are more recent, and *vice versa*.

4. Constant proportions (3 per cent, 19 per cent, 52 per cent) in the number of recent species determine the age of the tertiary strata.

5. The tertiary strata are superposed one upon another, and not parallel, as was at first imagined.

6. The tertiary strata, according to their zoology, ought to be divided into three groups, or stages.* The last of the tertiary strata, those which lie nearest the surface, have been deposited when the temperature of Europe was very nearly similar to that which we experience; as the following observations prove. The tertiary strata of that age, of Norway, Sweden, Denmark, of St. Hospice near Nice, and of a part of Sicily, contain in a fossil state all the identical species of the adjacent seas, and, among others, those of which we have already spoken, which, being more localised, serve best to represent to us the temperature.

In these fossils we remark the same series of varieties as in the recent species, which indicates very decidedly an equable state of temperature, or very slight modifications, from the period when the fossils were buried there, until the present day.

These same strata, in France bordering upon the Mediterranean, Spain, Piedmont, Italy, Sicily, the Morea, and Barbary, contain a great part of the species which live in the Mediterranean; but contain, also, others of which the analogous species either no longer exist, or are distributed in small number through the torrid regions of the Atlantic Ocean, and through the Indian seas. To form a just idea of the tertiary period upon the borders of the Mediterranean, we must remark three kinds of fossil species : —

1. Those of which the analogous species still exist in the Mediterranean.

* Since the month of August, 1831, when I proved the existence of these groups, pointing out the places where they might be observed, geologists have confirmed their separation.

2. Those few of which the corresponding species do not exist in the Mediterranean; but are found in the Atlantic, in the Red Sea, and in the Indian Ocean.

3. Those of which the analogous species do not exist at all.

These observations led me to think that the Mediterranean had undergone a slight lowering of temperature, since the chain of Mount Atlas on one side, and that of the Apennines on the other, had acquired their present elevation. These changes in the elevation of strata, and consequently of temperature, would explain the extinction of the recent species analogous to those of the third series, and the particular distribution of species of the second series, in warmer seas than the Mediterranean. This occasions me to consider it as very probable, that, before the latest changes in the borders of this sea, it had a wide communication with the Atlantic, by the Great Desert of Africa; and another with the Indian Ocean, either by the Red Sea, or by the low lands of Arabia, which separate the Mediterranean from the Persian Gulf.

Belonging to the second tertiary period are a great number of small basins, scattered particularly about the centre of Europe. La Superga, near Turin, the basin of the Gironde, the crag of Touraine, the little basin of Angers, the basin of Vienna in Austria, Podolia, Wolhynia, and some other traces upon the southern frontier of Russia in Europe, of which some remains show themselves not far from Moscow. The lacustrine strata of Mayence, and on the borders of the Rhine, belong, probably, also to this period.

During this epoch, the temperature was very different from what it is at present in the places we have just mentioned. Indeed, the species peculiar to Senegal and the Gulf of Guinea, those which best indicate the temperature of that part of the equatorial zone, are found in a fossil state in beds belonging to this second period.

Now, if, reckoning from the number of species, and the great quantity of individuals belonging to each of them, we calculate where their largest assemblage is to be found, it would be along the basin of the Gironde that we should make the line of the greatest intensity of heat to pass; and we should say, an equatorial temperature has formerly reigned there during a long succession of ages.

There must have been this temperature, for the species now fossil, to have lived formerly in our seas; for they inhabit there no longer, and could not do so at the present time. As they once lived there, why should they not live there now, if the temperature had remained the same?

This temperature must have continued during a long course

14 *Estimate of Temperature during the Tertiary Period,*

of ages, for accumulated generations to have formed of their remains a soil of vast extent and considerable thickness.

If, as I firmly believe, the basin of the Gironde has been deposited under an equatorial temperature, a glance at the map will suffice to convince us, that the influence of this temperature must have been felt as far as Poland and the south of Russia in Europe.

To determine the temperature of my second tertiary period, I have proved the analogy of nearly two hundred species of the torrid zone with the fossil species distributed more particularly at Bordeaux and at Dax, but found in all the other basins belonging to this second period.

An equally conclusive mode is, unfortunately, wanting to determine the temperature of the first stage of tertiary strata. This first group, represented particularly by the Paris basin, occupies, also, that of London and that of Valognes, almost all Belgium and Holland, many points of the Alps, Castel Gonbereo, the Val de Ronca, some small basins of Hungary and Moldavia, the lower part of the basin of the Gironde (Blaye, &c.), and, finally, but with some uncertainties, all the lower tertiary strata of North America.

Among more than 1400 known species in the Parisian strata, 38 only are analogous to recent ones. It is true, that the greater part of these 38 species live solely in the equatorial zone; nevertheless, there are some found among them which are not only distributed through this zone, and found also in our temperate seas, but even are seen to have passed into the North Sea.

We must abandon, then, in calculating the temperature of the most important tertiary period, the means that I have employed for the two preceding ones. I can, however, supply its place by many other means, though of less value than that which fails me in this instance.

In the Icy Seas, there exist only a very small number of Mollúsca; but other species are added to these in proportion as we advance towards warmer regions; and thus we see them augment from 8 or 10 which subsist near the 80th degree, to nearly 900, which live in the tropical region of Senegal and Guinea. This increase of species with an increase of temperature points out, also, the influence which is exercised by an agent so powerful as heat upon the creation of living beings. But these phenomena do not show themselves only in that part of the terrestrial globe which I have chosen for an example; they are produced, also, from the Sea of Behring to the Isles of Sunda, on each side of North

America, and, in an inverse manner, on each side of South America.

An important fact has just given a new *point d'appui* to the estimate of the temperature of the two latest tertiary periods: it is the agreement in the number of fossil and recent species. Thus, in the north, there are few recent species, few in a fossil state; in the region of the Mediterranean, about 700 fossil species, nearly 600 recent. We must call to our recollection, that this difference arises from the circumstance, that among the fossil species, there are a certain number belonging to races now extinct. In fine, the high temperature of my second period will be placed beyond dispute, when, to the thousand fossil species of this epoch are opposed the nine hundred recent ones in the African seas lying between the tropics.

Since the number of species increases with the temperature, since on a fixed point of the torrid region we find 900 species, it appears to me that, by a natural induction, we may attribute to my first tertiary period a temperature at least equatorial; for we recognise there, as we have already said, 1400 species, of which above 1200 were accumulated within the limits of the Paris basin; that is to say, in an extent of 40 leagues in diameter one way, and 55 the other. There no longer exists, in any of our seas, any single point exhibiting an equal number of species in as small a space.

If we now examine these species, we shall find them particularly large and numerous in the families and genera whose species multiply in the warmest regions of the earth. forty species of *Cerithia*, a great number of *Pleurótomæ*, of *Fusi*, of *Mitræ*, of *Volûtæ*, of *Mùrices*, of *Véneres*, of *Cárdia*, of *A'rcæ*, &c., found, in a fossil state, in the environs of Paris; the absence in this basin of the forms peculiar to the North Seas; all these facts relative to the number and nature of the species, unite to attest strongly that the great Parisian period took place under an equatorial temperature, probably higher than that of the equator at present.

In borrowing from other parts of Parisian palæontology documents comparable to those which conchology furnishes, I find in the great number of *Pachydérmata*, and their sometimes gigantic size, another proof of the high temperature of the Paris basin. Where do we find, in the present day, animals analogous to these, if it be not in the equatorial parts of the old and new continents, in the Isles of Sunda, and in the Asiatic islands? By adding to these considerations those furnished by a small number of fossil vegetables, particularly

by some palms, we shall have acquired the means of forming a sufficient number of inductions, all tending to prove the high temperature of the first period of the tertiary strata. I shall give, perhaps, a greater degree of certainty to my inductions, if I bring before our consideration the ancient state of the Paris basin, as compared with its present one. I find there, in effect, on one side, a great number of animals whose races are annihilated; and, on the other, the soil occupied by new races, and the nearest seas peopled by species of which ninety-nine hundredths did not formerly exist. I find also, in this comparison, the proofs of profound changes which have taken place in the circumstances of existence of living creatures: but I will not pursue this interesting subject; it would demand more space for developement than I can give it here.

From what I have just shown, it appears to me that we may draw the following conclusions:—

1. The first tertiary period took place under an equatorial temperature; and, according to all probability, one many degrees hotter than the present temperature of the equator.

2. During the second period, the beds of which occupy the centre of Europe, the temperature has been similar to that of Senegal and of Guinea.

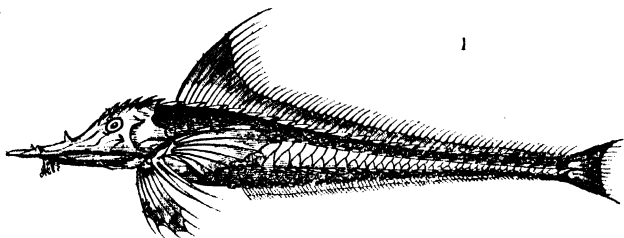
3. The temperature of the third period, at first a little more elevated than ours in the basin of the Mediterranean, has become similar to that which we experience. In the north, the species of the north are fossil; in the south, those of the south.

Thus, since the commencement of the tertiary strata, the temperature has been constantly diminishing. Passing, in our climates, from the equatorial to that which we now enjoy, it is easy to measure the difference.

Without doubt, naturalists, supporting themselves upon theories concerning heat, have been able to conjecture, *a priori*, the changes of temperature of which I have just spoken: it is curious, nevertheless, to see their conjectures confirmed by a long-neglected science, which no one had yet thought of directing towards this entirely novel end.

This question respecting temperatures might be resumed for the secondary strata; but observations and materials are wanting. This is not the only one in the domain of conchology; many others are of no less importance: biology, for example, destined to make us acquainted with the laws of the developement of life on the surface of the earth within time and space, will draw from conchology numerous materials. But biology is a science yet to be formed. Lamarck has discovered it: who shall lay its foundations?—E. S. C.

ART. III. *Description of a new British Fish.* By EDWARD MOORE, M.D. F.L.S., Secretary to the Plymouth Institution.

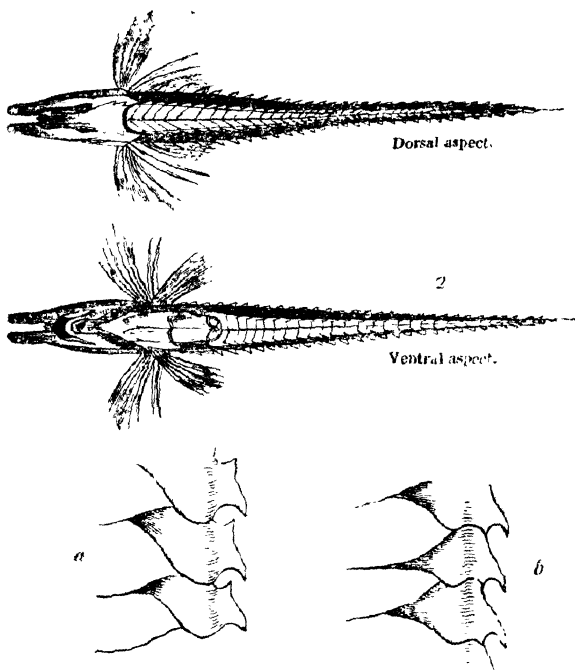


I TRANSMIT, for insertion in your Magazine, a description and rough sketch of a fish caught on the usual fishing-ground between Plymouth and the Eddystone, by the crew of a trawl sloop belonging to Mr. Bulley of this town, and brought fresh to me by Mr. W. Snow Harris, F.R.S.; in which state it was also seen by Lieut.-Col. C. Hamilton Smith. It has since been inspected by Mr. Couch of Polperro and Mr. Yarrell, both of whom pronounce it new to Britain. The characters are as follows:— It is the *Peristèdion Malármat* of Lacepède and Cuvier, *Trigla cataphracts* Lin., Mailed Gurnard. Its length is 11 in.; from the nose projects a forked snout 1 in. long, the divisions being half an inch apart at the base, where there are three small mammillary projections. From the snout to the base of the pectoral fin, it measures $3\frac{1}{2}$ in.; the head is armed with numerous tooth-like processes, of which three are placed triangularly on the nose, six over the eye, three larger on the forehead, and thence they extend in a serrated manner, down the back to the tail. The orbit of the eye is oval; iris silvery; a projecting bony ridge extends across the cheek-plate, from the nose to the base of the pectoral fin; the jaws are cartilaginous and toothless; the chin is furnished with several cirri; at the under side of each division of the snout are three openings, covered with a delicate membrane, through which a pin can be easily passed down to the nose.

The body is octagonal, covered with bony scales, laid over each other like a coat of mail; from the centre of each scale, forming the edge of the octagon, there projects a sharp hook-like process, together forming eight serrated ridges from head to tail; the hooks are all shaped as in *fig. 2. b*, except on the last twelve scales of the superior lateral ridge, where they assume the character exemplified in *fig. 2. a*. Their number is as follows:— Dorsal ridge, twenty-nine scales; supe-

rior lateral, thirty; inferior lateral and abdominal, each twenty-three: the small number of the latter is owing to the three pectoral scales, where the fins play, being much enlarged; they are, also, free from points, and united with the abdominal plates, three of which, of different dimensions, extend on each side from the neck to the vent.

The formula for the fin rays will be as follows: — Dorsal, twenty-six; the first twelve or fourteen extending much beyond the others. Pectoral, eight, 2 in. long, with only two free rays below it. Ventral, six, $1\frac{1}{2}$ in. long. Anal, sixteen. Caudal, fourteen, $1\frac{1}{2}$ in. long, slightly forked. The chief flexible points appear to be at the neck and the junctions of



the gill-plates: the motion of the other parts of the body is much impeded by the firmness of the imbrications with which the whole of the fish is surrounded. Its colour, when fresh, was of a uniform scarlet, like the red gurnard, gradually softening to pale flesh-colour towards the abdomen; the anal and dorsal fins were crimson; but the others pale and greyish. The *Peristædion* coloured in the *Naturalist's Miscellany* is from a dried specimen.

This is, probably, a young fish, as it is said to be found,

sometimes, in the Mediterranean, 2 ft. long. (*Dict. d'Hist. Nat.*, t. 25.) It has been long separated from the gurnards by the French naturalists, and should have a different English name, as it is totally distinct from that family.

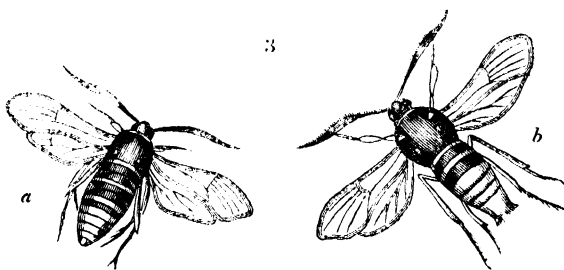
Plymouth, Sept. 5. 1836.

ART. IV. *Observations upon Trochilium crabronifórmis, the Lunar Hornet Sphinx.* By the Rev. W. T. BREE.

MANY insects, I believe, are reputed to be rare only because, from our ignorance of their habits and mode of life, we know not how to search for them. There are insects, too, which are commonly met with in one state of their existence, and but seldom seen in another. Some are more frequently found in the imago, or perfect, state; others in that of larva. Not that they may not, in fact, be equally abundant in each state; but they are *obvious* in the one, and less so in the other. The caterpillars, e. g., of nearly all the British species of the genus *Hipparchia* (and, probably, the remark might be extended to the foreign species also) are seldom met with, although several of the species are among our most common butterflies. For instance, *Hipparchia Janira* swarms, in its season, in every meadow and field of grass; and, if we except the garden whites (*Pontia brassicæ* and *rappæ*), is perhaps the most abundant butterfly we have; and yet I never met with the caterpillar of this species but once, and then by mere accident: I was walking through a meadow of grass; and, feeling something in my shoe, on examination I found it to be a green caterpillar, which in due time changed to a chrysalis, and produced *Hipparchia Janira*. How abundant, again (to take another instance), are several species of the little blue butterflies (*Polyommatus*) on our downs and chalk-hills! yet these, as caterpillars, are quite unknown to me; nor are they depicted in any entomological work to which I happen to have access. Of course, these caterpillars must, at any rate, be as numerous as the butterflies which are produced from them: we may safely say, *more* numerous; for all do not come to perfection: some will be accidentally destroyed. No doubt, they feed on the short herbage which grows in the situations where the butterflies are found; for the latter, for the most part, do not stray far from the spot where they are bred. Probably they keep close to the surface; and, perhaps, like some other larvæ, they may feed by night: at all events, they are not obvious, and, I believe, are very rarely found. The above are instances of insects frequent in the winged state, but seldom found in that

of larva. There are others, on the contrary, which are more frequently met with in the larva than in the perfect state; e. g. *Smerínthus pópli* (poplar hawk), *Cerùra vínula* (puss moth), *Episèma cæruleocéphala* (figure of 8), *Clisiocámpa Neústria* (lackey), *Eriogáster lanéstris* (small egger), *Odonéstis potatòria* (drinker), *Maméstra pìsi* (broom), &c. I do not say that all these are rare in the winged state, but merely that they are far more frequently met with in the state of caterpillars. Possibly, many may be devoured by birds, or preyed on by parasitic Hymenóptera, and so do not come to perfection; but I think that their comparative infrequency in the winged state arises chiefly from their habits. A person may walk through a wood which abounds with the little brilliant purple hairstreak (*Thècla quércus*), and yet not see a single individual, unless his attention is directed to the right quarter. These insects keep hovering about, and settling upon the summits of oak trees; in which situation they sometimes absolutely swarm. They rarely approach the ground; and, even in a cloudy day, if disturbed by your shaking the trees, they settle again in the same place. This insect then, though common and abundant, is not obvious.

But I am straying sadly from the particular subject which suggested these remarks; viz. *Trochilium crabroniförmis*. (*fig. 3.*) The larva of this insect feeds upon the living wood

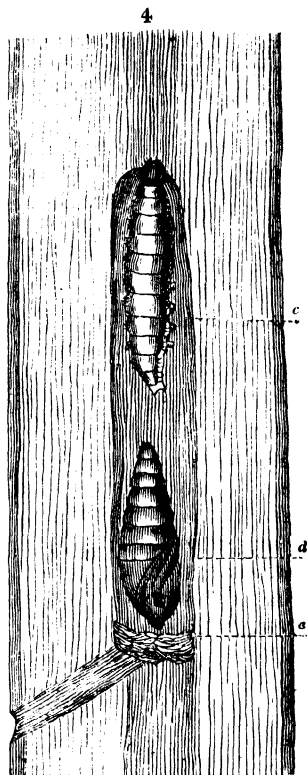


a, Female. *b*, Male.

of the broad-leaved willow (*Sàlix càprea*), the stems of which it perforates, entering them near the root, and eating its way upwards for several inches, sometimes to the length of a foot or more (*fig. 4. c.*)* (See the specimens sent: *fig. 5.*)

See *Transactions of Linnæan Society*, vol. iii. tab. i., for a figure of the insect in its three stages [from which our figures are copied]. Lewin, the writer of the article, gives it as his opinion that "the caterpillar does not enter the wood till the second year of its own age;" and he states as a reason, that, "among all the numerous larvæ he has found from June to

Being an internal feeder, the caterpillar, of course, is only to be found by cutting into and opening the stems of the willow, in which it is enclosed, finding there both food and lodging. *Sàlix càprea* abounds in our coppices, and forms a useful and rapid-growing underwood. When the periodical falls take place, I have observed that scarcely a single willow wand is cut down that does not exhibit proofs of the ravages of this insect: sometimes three or four, or even five, separate perforations occur in the same stem.* We may fairly infer, therefore, that *Trochílum crabronifórmis* is here a common species; and yet, strange to say, I have never met with an example of the winged insect at large in this county. I have bred it from the caterpillar; and once I took a single pair in an osier bed near Dudley, which at the time were considered as great rarities.† Doubtless, this in-

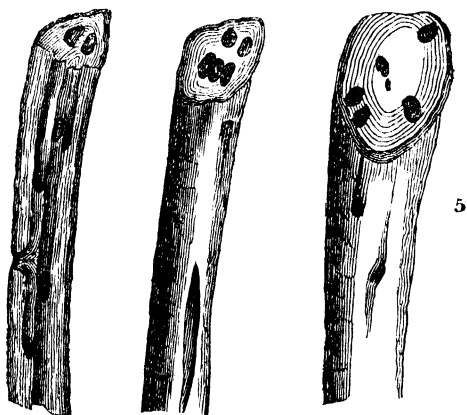


c, Larva; d, pupa; e, web closing the orifice by which the animal had entered.

November, he could perceive but a slight difference in size. Probably, therefore, they may feed on the tender bark of the willow root the first year after they are hatched." This, I think, is very probably the case; for I have not observed in the wood any perforations of a very small size, or such as have the appearance of having been made by caterpillars newly hatched. As the caterpillar eats its way upwards through the solid wood, a question may arise, How is the sphinx, when it bursts from the chrysalis, to make its escape out of the wood without injury? To obviate this difficulty, instinct directs the caterpillar, before it changes to chrysalis, to turn its head downwards, so as to be opposite to the orifice, which affords a ready exit for the winged insect. (A portion of the plate in *Lin. Trans.*, above referred to, is copied in fig. 4.)

* I do not find that the caterpillar confines itself to the pith, as stated by Lewin to be generally the case. Sometimes the pith is untouched, all the perforations being in the solid wood, between the pith and the bark.

† Mr. Stephens states that, during the month of July, 1817, he "saw it in profusion, flying heavily along, on the south-west border of Darent Wood." (*Illustrations, Haustellata*, vol. i. p. 138.)



sect might be met with in sufficient plenty in this part of the country, if one were acquainted with its habits, and knew how to look for it. To the woodman our elegant sphinx must be regarded as in some degree an injurious insect. The wood of *Sàlix càprea* is, with us, usually either sold to the rake-maker, for the purpose of being worked up into rake-teeth, &c., or converted into what are here called flakes, i. e. hurdles made of split stuff nailed together, in contradistinction to the common hurdle, which is formed of round wood, twisted and plaited together without the help of nails. The lower, and consequently the thickest, portion of each willow rod, to the length of five or six inches, or occasionally a foot or more, is spoiled by the perforations of the larva, and rendered unavailable to the above purposes. It may seem an odd complaint to make: but *Sàlix càprea* appears to be a tree of rather too rapid a growth; that is to say, it outruns its neighbours, and comes to maturity before the rest of the underwood with which it is intermixed. If, indeed, the entire underwood consisted of this species only, the coppice would make a quick return, and might be cut at the end of every seven or eight years, or in little more than half the time usually allowed for the growth of coppice-wood. My own practice is, to cut wood at about ten or eleven years' growth. Long before the time comes round for the periodical fall, I observe that on every stool of the broad-leaved willow most of the rods have ceased to thrive, and many have even died; and I cannot help suspecting that this premature decay may, in part at least, be owing to the injury inflicted at the base of the stems by the larvæ of *Trochilium crabronifórmis*.

Allesley Rectory, Nov. 7. 1836.

ART. V. *On the Mode of Progression observed in the Genus Lìma Brug.* By H. E. STRICKLAND, Esq., F.G.S.

IN May, 1836, I was detained at Malta to perform quarantine; the accustomed penance to which all must submit who visit the Levant. I used to beguile this tedious imprisonment with watching the amphibious occupations of the Maltese fishermen, in the harbour fronting the Lazzaretto. The barren island of Malta teems with a vast population, who live in the greatest poverty, and can with difficulty procure subsistence. Land produce failing them, they take to the sea, and devour indiscriminately all that they can find, whether vertebrated, crustaceous, molluscous, or radiated. Among others of these *frutti di mare*, as they are called, the Maltese are particularly fond of the *Lithódomus dáctylus Cuv.*, a shell which perforates the limestone rocks in the same manner as the *Phòlas*. When these shells occur in detached blocks of limestone, the latter are fished up by means of a large pair of iron forceps, attached to ropes. The fisherman sprinkles a few drops of oil on the water, and renders its surface as smooth as glass. He is then enabled, by the clearness of the water, to detect every object in a depth even of six fathoms, and to raise the blocks of stone to the surface by means of his grappling-irons. He then breaks them to pieces, and extracts the *sea-dates*, as these perforating *Lithódomi* are termed. Not content with those which are obtained by this means, the Maltese will dive to great depths, armed with hammers and chisels, and extract the *dates* from the solid rock.

While watching these operations, and examining the miscellaneous productions obtained by the fishermen, I was struck by the lively motions of some specimens of a *Lìma*, about $1\frac{1}{2}$ in. in length. On placing them in a glass of sea water, I found that this bivalve possesses the power of swimming in great perfection. The shell opens to a much greater width than any other bivalve that I am acquainted with; and, when thus filled with water, the valves are suddenly closed by a rapid contraction of the adductor muscle. The water is thus ejected with violence from the front margin, and causes the shell to move with considerable speed in an opposite direction. By repeating these contractions and expansions, the animal is enabled to swim in a straight course, and to an indefinite distance. So great is the force with which the valves are brought together, that their collision produces a snapping noise, which is distinctly audible.

I have not observed any other molluscous bivalve which

possesses this singular mode of progression.* If I mistake not, however, the genus *Cypris* (a crustaceous animal with a bivalve shell) swims in a manner somewhat analogous.

The animal of the *Lima* which I noticed at Malta is of a delicate pink colour; the margin of the mantle fringed with numerous slender filaments. It is described, in some works on Mollusca, as provided with a byssus; but of this I could see no traces; nor is it probable that an animal possessed of such great locomotive powers should have one. Cuvier, indeed, though aware of its power of natation, assigns it a small byssus. He further asserts that some species of *Pecten* are able to swim, while others are permanently attached by their byssus.

Now, it appears to me, that the great locomotive powers of the *Lima* betoken an organisation so different from that of those *Pectines* which remain constantly rooted to one spot by their byssus, as to make a wide interval between these two genera. It is desirable, therefore, to learn whether this interval really exists, or whether a passage may be traced between the locomotive and the attached species of *Pectinidæ*. I have, therefore, drawn up the following queries for the consideration of your conchological readers:—

1. What are the *natatory* species of *Pecten* to which Cuvier alludes?

2. Do they possess a byssus? If so, can they attach themselves spontaneously? or are they attached at any definite period of their existence?

3. Do these *natatory* *Pectines* exhibit any generic or sub-generic difference from the *attached* species?

4. Do the *attached* species become *detached* at certain periods of life, or can they detach themselves spontaneously?

5. Are there any species of other *byssiferous* genera, such as *Arca*, *Pinna*, &c., which are constantly or occasionally detached and locomotive?

6. Do any species of *Lima* possess a byssus? If so, are they either permanently or occasionally attached?

Lastly. If it should appear that the whole genus *Lima* is destitute of a byssus, and is permanently locomotive; and that all the other genera with which it has been hitherto classed possess a byssus, and are permanently attached; what other organic differences characterise the genus *Lima*? and where ought it to be placed in a systematic classification?

* This singular locomotive property is not peculiar to the genus *Lima*. — Ed.

ART. VI. *Notices of a few rare Plants collected in Jersey in October, 1836.* By WM. CHRISTY, jun., Esq., F.L.S., &c.

THE results of a fortnight's botanising, in the end of autumn, and in very unfavourable weather, would not be worth communicating to your pages, were it not that I thought it might interest some of your readers, who, like myself, might pay a hasty visit to Jersey, to know where they may at once lay their hand on some of the rarer plants of our flora.

And here I would remark that I cannot but object to the admission into the British flora of the plants of the Channel Islands. In point of geographical situation, they are decidedly *French*; and, if we reject from our fauna the shells, insects, and birds, why is our flora entitled to the plants? However, as it is universally agreed that they are to be admitted, I must submit, and even go farther, and give my contribution to the increase of the list of plants reputed as *British*, from the circumstance of their being found in Jersey. I have no doubt that, until the island is fully explored, it will be continually affording us additions to our flora; for, I believe, there is no resident botanist; and the few who visit it from England have not time for a very close investigation.

That this is the case, is evident from the discovery, in 1834, by Mr. Trevelyan, of *Státice plantaginea*; a plant so abundant in one part of the island, so conspicuous, and so much larger than *S. Armèria*, that no *botanist* could have passed it over unobserved.

Then, again, *E'chium violaceum*, found by that gentleman, is so different from *E. vulgàre*, as well as from *E. italicum*, which was supposed to be the plant intended by Ray as "*Lycopsis*," that any one finding the plant would, as he did, immediately detect the mistake. I am therefore led to believe that few, if any, botanists have explored Jersey of late years. From its diversity of surface, we might expect a rich harvest; and I have no doubt any assiduous botanist, who would sit down there for three or four months, and patiently explore the different districts of the island, would find his labours rewarded. Having only remained here about three weeks, at an advanced period of the year, and not having seen half the island, I do not pretend to guess at its flora.

All I propose to do is, to give a list of some of the plants which, in England, are rare or local, with the stations in which I found them.

Before doing this, I will, however, briefly glance at the various situations which afford the different plants.

The greater part of the coast is composed of perpendicular granite cliffs, too much washed by the sea to admit of much vegetation, except a few lichens. In some sheltered bays, however, they are clothed with vegetation, including some rare maritime species. The grassy slopes above them also afford several very rare plants, which, with us, usually affect similar situations. Jersey is remarkably deficient in streams or pools, in which we might look for marsh plants. In the marshes of St. Ouen's Bay is a large piece of water, called St. Ouen's Pond. I only saw it from a distance; but it appeared to have no plants on its margin.

The principal streams (and these, too, are very small) are in the valleys of St. Laurence and St. Peter, especially the latter. They form a number of boggy meadows, which would probably afford some rare Cárices.

I am not aware of the existence of any salt marshes, unless they exist in Granville and St. Ouen's Bays.

There are not many inland rocks, except on the hills called coties, which occur in most parts of the island. They are principally covered with furze, with points of rock peeping up through the turf. In a few places, there are, however, faces of rock; but they do not afford any very rare plants.

The deep lanes which intersect the country in every direction, especially those whose banks are rocky, seem well adapted for ferns; though the number of these is more limited than I should have expected. The sandy shores of St. Aubyn's, St. Brelade's, and St. Ouen's Bays afford, perhaps, the greatest number of rare plants. But the most curious spot is the extraordinary inland sandy district of Les Quenvais, which is situated in the parish of St. Brelade. It is an immense deposit of drift sand, nearly a mile from the sea, which is there bordered by high cliffs. How it got there, it is difficult to imagine. It is now pretty firmly fixed by an abundance of *Ammóphila arundinacea*, and affords a rich harvest of plants generally peculiar to sea-shore sands.

I have only one plant in my list which I believe new to the British flora; and this I give with some hesitation, as I only saw it in a very decayed state; but, from the description given to me by those who saw it in perfection, I cannot find that it agrees with any described British species. Several of the plants mentioned are not properly *rare*, but, in England, are generally local.

Papaveracæ.

Glaucium flavum. Quenvais, St. Ouen's, Brelade's, and St. Aubyn's Bays.

Cruciferae.

Mathiola sinuata. St. Ouen's Bay, Petit Port, St. Aubyn's Bay, near Milbrook; also on the Quenvais.
Senebiera didyma Banks and road sides at St. Helier's and St. Aubyn's.

Cistaceæ.

Heliánthemum guttatum. Abundant on the sloping ground above the cliffs between La Corbière and Noirmont Point.

Caryophyllacæ.

Dianthus prolifer. Near St. Ouen's; also on the Quenvais.

Silene conica. On the Quenvais, *anglica.* Sandy places, very common.

nitans. Near St. Ouen's; rocks by road side from St. Brelade's towards St. Aubyn's.

Linacæ.

Linum angustifolium. Fields and Coties, common; Quenvais, &c.

Geraniacæ.

Erodium cicutarium flore albo. St. Aubyn's Bay and Quenvais.
maritimum. Grève de Lecq.
moschatum. St. Aubyn's Bay, near Beaumont; also on the bastions of Fort Regent.

Lotus angustissimus. Banks of a lane leading from La Haule to the Quenvais.

Pomacæ.

Méspilus germanica. Abundant in the hedges between Roselle Manor House and Gorey.

Paronychiæ.

Polycarpon tetraphyllum. A common weed in gardens, hedge banks, &c.; Quenvais, La Haule, St. Aubyn's, &c.

Crassulacæ.

Cotylèdon Umbilicus. Roofs, walls, banks, and rocks, everywhere.
Sedum anglicum. Rocks, walls, and coties, common.

Umbelliferae.

Petroselinum sativum. Naturalised on the walls of Mont Orgueil Castle.

Crithmum maritimum. Cliffs at La Corbière, and Plemont Point.

Fœniculum vulgare. Rocks and banks near the sea; not rare.

Valerianæ.

Centranthus ruber. ? Naturalised on the rocks and walls of Fort Regent.

Compositæ.

Hypochaeris glabra. Sands at Grève de Lecq.

Carlina acaulis. Common.

Gnaphalium luteo-album. Road side near Petit Port.

Convolvulacæ.

Calystegia Soldanella. Sands at Grève de Lecq.

Boraginæ.

Echium violaceum. Road sides on the Quenvais, Mont le Veau, and elsewhere.

Borago officinalis. Road sides and orchards, apparently wild.

Solanæ.

Solanum nigrum fructu rubro. Quenvais, Petit Port, &c.

Scrophularinæ.

Scrophularia Scorodonia. Hedge banks and moist places all over the island.

Sibthorpia europæa. Banks of shady lanes above La Haule Manor House.

Labiatae.

Méntha rotundifolia. Road side a little above La Haule, towards the Quenvais.

Marrubium vulgare. St. Brelade's churchyard, waste places; not rare.

Phumbaginæ.

Státice plantaginæa. In very great profusion on the Quenvais, also on the sand-hills of St. Brelade's Bay; sparingly.

Euphorbiacæ.

Euphorbia portlandica. Sea shore, all round the island.

Paralias. Sands of St. Aubyn's Bay, near Milbrook.

Orchidæ.

Neottia spiralis. On the Quenvais.

Iridæ.

Iris foetidissima. Sea banks near La Haule.

Asphodèleæ.

Scilla autumnalis. On the sand-hills and coties, very common.

**Allium* (?*sphærocéphalum*). Banks on both sides of the road between Beaumont and La Haule. I only saw dead stalks of this plant; but, from the description of it when in flower, it appears to agree with specimens of *A. sphærocéphalum* which I possess, gathered at Fontainebleau.

Júnceæ.

Juncus acútus. On the Quenvais, St. Ouen's Bay, Petit Port.

Cyperàcææ.

Cyperus longus. Common in many
La Haule, St. Aubyn's, Oct. 20. 1836.

places in St. Peter's Valley; also in a marshy field near St. Brelade's church.

Scirpus Sàvii. By the road side between the Quenvais and St. Brelade's Bay.

Gramíneæ.

Elymus arenarius.

Fílices.

Asplénium marinum. Cliffs at Plemont Point and Havre Giffard. lanceolatum. Rocks, walls, and hedge-banks, common; particularly fine in shady lanes between Grève de Lecq and Plemont Point.

ART. VII. *On the Longevity of the Yew, as ascertained from actual Sections of its Trunk; and on the Origin of its frequent Occurrence in Churchyards.* By J. E. BOWMAN, Esq., F.L.S.

THOUGH it has long been known that all exogenous or dicotyledonous trees form a new ring or layer of wood annually, and that their age may be very nearly ascertained by the number of these concentric circles in a transverse section, the fact seems to have been made little use of, till the publication of Professor De Candolle's interesting paper "On the Longevity of Trees, and the Means of ascertaining it." This method had, indeed, been employed to estimate the age of the huge baobab, or *adansonia*, of Senegal, and of the *taxodium* of Mexico; but it had given them an antiquity so enormous, that our reason paused, and a wish was felt that new and careful examinations should be made by competent persons to ascertain the fact. Our faith, however, will be strengthened, if we bear in mind that the laws of vegetable life are totally different from those of the animal kingdom. Animals attain their full size at an early period of their existence, the original bones, arteries, &c., continuing to perform the several functions of the body until death, though the actual particles of which they are composed constantly pass off and are replaced by others: so that in an old animal we have more the sem-

* Since writing the above, I have heard that my friend Mr. Joseph Woods, during a short visit to Jersey last summer, has gathered *Allium sphærocéphalum*; so that I think I may safely conclude my plant to have been rightly named. I was also told that Mr. Woods had discovered several other plants new to the British flora; but have only heard the name of one, *Eruca sativa* D. C. (*Brassica sativa* Lin.) — *Nº 4.*

blance than the reality of age, the first components of its bones and flesh having long since been resolved into their original elements, and, perhaps, assimilated into other bodies. A tree, on the contrary, during life, is always, at least for a portion of every year, in a state of growth; the wood first deposited soon ceases to minister to the purposes of vitality; but its fibre remains, and is surrounded and enveloped by other rings, composed of new fibres and vessels, elaborated through the medium of new leaves and spongioles annually produced: so that, in an old tree, its earliest wood remains, though concealed within, and we see only the parts created within the last few years; and these, possessing the vigour of youth, a natural capacity exists of carrying on the process to an indefinite period, so long as the exterior of the trunk, the leaves, and rootlets escape the accidents to which they are exposed.

The wood of the yew has long been known to be of slower growth, and greater durability, than that of any other European tree; but I am not aware that, except by Professor Henslow, any attempt has been made to ascertain the age of the venerable specimens scattered here and there throughout our island by an actual examination of their annual woody deposits.

De Candolle says that measurements of the layers of three yews, one of 71, another of 150, and a third of 280 years old, agreed in proving that this tree grows a little more than one line annually in diameter in the first 150 years, and a little less from 150 to 250 years. He adds, "If we admit an average of a line annually for very old yews, it is probably within the truth; and in reckoning the number of their years as equal to that of the lines of their diameter, we shall make them to be younger than they actually are." I have a section taken near the base of a trunk, whose average annual increase of diameter, for the first 40 years, was $2\frac{1}{2}$ lines. The average diameter of eighteen yews now growing in the churchyard of Gresford, near Wrexham, North Wales, which it is on record in the parish register were planted out in 1726, is 20 in., or 240 lines, which gives a mean annual increase of 2 lines in the diameter, allowing the trees to be ten years old when planted out. A talented friend of mine*, and an enthusiast in trees, has a beautiful yew in his grounds at West Felton, Shropshire, which was planted out about 60 years since. Its diameter, below the divarication of the branches, is now 20 in., showing a mean annual increase of 4 lines, or perhaps of $3\frac{1}{2}$, allowing it to be 10 years old when planted out. This extraordinary growth may be owing to its warm

* J. F. M. Dovaston, Esq.

sheltered situation. I may pause to add that this graceful tree has its lower branches declining towards the ground in all directions, and all its foliage of a pensile character; but, besides its beauty, it has another interesting peculiarity: though a male and profuse in pollen, it has one entire branch female, that produces and ripens berries plentifully, from which my friend has raised several plants for his friends, all partaking markedly of their parents' *pensility*.

The above are all the data I have hitherto obtained of yews whose ages are known; and they all concur in showing a larger increase than De Candolle's standard, which is "a little more than a line annually for the first 150 years." It must, however, be borne in mind, that his average extends 30 or 40 years beyond mine; the oldest of the trees I have named being only 110, or at most 120, years.

In the volume on botany in Lardner's *Cabinet Cyclopædia*, Professor Henslow states the mean annual growth of two fine healthy yews in the churchyard at Basildon, in Berkshire, (which, by a singular coincidence, were planted out in the same year as the eighteen at Gresford,) to be equal to four lines. He also found that the layers varied considerably in a yew at Cholsey, in Berkshire, whose trunk was between 14 ft. and 15 ft. in circumference, some of those recently deposited being $2\frac{1}{2}$ lines, while others, a century older, were only half a line in thickness. It will be seen that this inequality accords with my own observations. From these data he arrived at the conclusion that De Candolle's calculations should be reduced by one third; but he does not appear to have examined any very large yews, or to have met with sections containing 40, 50, or even 60 rings within the inch; and it follows that, if a deduction is made on account of the wider rings, we should, on the other hand, add something to De Candolle's average for the closer and thinner ones.

I shall now give the result of my own examination of two yews of extraordinary dimensions, of whose age no other evidence exists beyond that supplied by their internal structure. The first (*fig. 6.*) stands in the churchyard of Gresford, among the eighteen young ones already mentioned. It is a male tree, its trunk sound to the very core, its numerous gigantic boughs spreading widely, full of foliage, and partially concealing the splintered bases of others which have yielded to the storms of past centuries. Its circumference at the base is 22 ft.; at 2 ft. high, it is 23 ft.; at 4 ft. 5 in., 26 ft. 6 in.; and at 5 ft. 3 in., being just below the main boughs, 29 ft. very nearly, thus gradually thickening upwards. I have selected the greatest and least of these admeasurements, as the best

6



and fairest elements for the mean dimensions of its trunk, and the base of the calculations of its age. They give an average circumference of 25 ft. 6 in., and a diameter of 8 ft. 6 in., or 1224 lines. By De Candolle's method, its age is therefore now 1224 years; and the mass of concentric zones of wood which compose its trunk, when taken in the aggregate, ought to have an average thickness of half a line, or 24 in each inch, counted on a line drawn from the circumference to the centre; because, in measuring the diameter of the trunk, we take in the two opposite sides of the same circle.

To ascertain how far this rule might be relied on, I took

three horizontal sections from different sides of the trunk *, the average number of rings in each of which is as follows:—

<i>Section on the North Side.</i>		<i>Section on the South Side.</i>	
Rings in 1 in. of the diameter	- 44	Rings in $2\frac{1}{2}$ in. of the diameter	118
Ditto - ditto	- 36	Ditto on opposite side of the	
Ditto in $\frac{7}{8}$ in. 45, say in 1 in.	50	same section - - -	113
	3) 130		5) 231
Average number per inch	- 43	Average number per inch	- 46

A section taken on the s.w. side, from a projecting portion of the trunk, where the rings were swollen beyond their ordinary thickness, contained only 15 within the inch, and were so uniform as not to require an average to be taken.

Average number of rings per inch on the north side	-	-	43
Ditto ditto on the south side	-	-	46
Ditto ditto on the south-west side	-	-	15
			3) 104

General average number per inch of diameter - $34\frac{2}{3}$

Therefore, a yew whose diameter is 8 ft. 6 in., supposing each inch of the radius to contain $34\frac{2}{3}$ rings, would consist of 1734 such annual rings, and be, at least, that number of years old. But this would exceed the truth; because I have shown that young yews deposit thicker layers than older ones, and a corresponding allowance must be made. Now, as there are eighteen yews growing in the same churchyard, whose ages are known†, and whose average diameter, at 120 years old, is 20 in., we cannot do better than to assume that the great yew now under consideration had a similar diameter at that age, and, farther, that it continued to increase in the same ratio up to 150 years, the date assigned by De Candolle for the diminution of its rings. I would also make an additional allowance for a probable intermediate rate of increase between the age

* Some of my sections have been taken with a frame saw, and others with a circular one, similar to the trephine, made for me by Mr. Salt, surgical instrument maker, Birmingham. The latter is worked horizontally, with a carpenter's brace, and is decidedly the best, as it takes out a clean cylinder of wood 3 in. deep, which, when divided longitudinally, shows the annual rings throughout its whole length, and the hole may be plugged up. The greatest difficulty is to detach the base of the cylinder, and extract it; it has, besides, too much friction, and, in its present state, is only applicable to very hard wood, though I hope to adapt it to all.

† I have caused the situation and present dimensions of each of these trees to be inserted in the parish register, to form data whereby their future increase may be ascertained.

of 150 and 250 years, rather than pass at once from the vigorous growth of youth to the slower progress of more advanced periods. I have had no opportunity to obtain satisfactory evidence on this point, though sections from the north and south sides of a yew at least 250 years old, but whose diameter could not be fixed, owing to great inequalities and excrescences, showed an increase of 2 in. diameter in $21\frac{1}{2}$ years, or rather more than one line annually. De Candolle says that, between 150 and 250 years old, the yew grows rather less than one line annually. I will therefore take the mean, and allow 100 lines, or, to avoid fractions, 96 lines, or 8 in. for its growth between 150 and 246 years, only employing the reduced rate obtained from actual sections for its subsequent periods. Then, at 150 years old, its diameter would be 25 in., or 300 lines; and at 246 years, 33 in., or 396 lines; and, deducting this from its present diameter of 8 ft. 6 in., the subsequent increase will have been 5 ft. 9 in. Now, a diameter of 5 ft. 9 in., at 34 rings for each inch of the radius, will contain 1173 rings or years' growth; to which add 246, its assumed age when 2 ft. 9 in. diameter, and we find its present age, by the nearest approximation at which we can arrive, to be 1419 years. I have not made any deduction for the bark, because in the yew it is too thin sensibly to affect the general result.

The other aged yew which I have examined is of still greater dimensions than the last, and is growing in the churchyard of Darley in the Dale, Derbyshire. This is a female, with a solid trunk, forking, at 7 ft. above the ground, into two nearly upright boughs, which reach a height of about 55 ft.; but its head has not the breadth or luxuriance of the Gresford yew. Its circumference at the base is 27 ft.; at 2 ft. 4 in. above the ground, 27 ft. 7 in.; at 4 ft., 31 ft. 8 in.; and at 6 ft., 30 ft. 7 in. At 4 ft. high, there are excrescences which swell the trunk beyond its natural size; I would therefore omit that measurement, and take the mean of the three others, which will be, circumference 28 ft. 4 in., diameter 9 ft. 5 in., disregarding fractional parts. Its mean diameter is therefore 1356 lines, which, according to De Candolle's method, would also be the number of its years.

Let us now endeavour to find its age by the number and thickness of its annual rings.

A horizontal section on the north side contained, in different parts of its surface respectively, 57 rings in 1 in.; 71 rings in 2 in.; 62 rings in 1 in.; 66 rings in 1 in.; giving an average number of 51 rings per inch. A similar section, from the south side, contained 53 rings in 1 in.; 68 rings in 2 in.; 67 rings in 2 in.; 66 rings in 2 in.; and 39 rings in 1 in.; giving an

average of $36\frac{1}{2}$ rings per inch ; the average of both being 44 rings per inch, very nearly. Therefore this yew, with a mean diameter of 9 ft. 5 in., or radius of 4 ft. $8\frac{1}{2}$ in., would consist of 2486 concentric rings or annual zones. Making the same deductions I have done in the Gresford yew for more rapid growth during the first 246 years, its present age will be about 2006 years.

The result of this examination of the sections shows the Gresford tree to be about 200 years, and the Darley one about 650 years, older than the method of allowing a year for each line of the diameter would indicate. It also shows that the latter, with a mean diameter of only 11 in. more than the former, is 587 years older, the difference arising from the greater thinness of its annual rings. This discrepancy could never have been detected without resorting to actual sections ; and in this instance it may be owing to the Darley yew having fewer branches and less luxuriant foliage, in consequence, possibly, of its roots having been constantly mutilated by new-made graves ; a custom that ought not to be allowed. A thinner circle may also be caused by poverty of soil, lack of moisture, coldness of climate, or partial exclusion from air and light ; for, where any of these operate, I suspect we shall always find a corresponding diminution of woody deposit. Even the plan of taking horizontal sections is liable, in the yew at least, to lead to great errors unless caution be used, and several sections be obtained. This arises from the great and constantly recurring inequality in the thickness and parallelism of the rings, both individually and collectively. This general character of the wood is probably the cause of the many prominences and recesses in the boles of old yews. The same ring is often two or three times thicker or thinner in a given point of the circle than in a neighbouring part ; and a series or fascicle of rings will often alternately swell or diminish together, while other series, both older and younger, will be thickest where the first were thinnest, and *vice versa*. This arrangement gives to their cross section an undulatory appearance, so beautiful in the polished wood, especially where the zones are deposited irregularly by the protrusion of branchlets from the trunk. It also causes a line drawn across the section in the direction of the radius, to facilitate the counting of the rings, to pass so obliquely through some of them, that they appear to have two or three times their real thickness ; and makes it dangerous, where calculations are to be founded upon it, to trust to a single section. It is also necessary to count the number contained in an inch, in as many portions of the same section as possible, and then to strike a general

average. There is also a great inequality in the width of some zones over others on the same side of the tree; and those on the south are sometimes narrower than on the north: the former inequality is generally thought to be owing to a favourable or unfavourable season; but my own observations tend to discountenance such an opinion. I have several times fixed on a given ring, say the fifth, tenth, or twentieth, counting inwards from the one in contact with the inner bark; and, on comparing it with that of the same year's growth in sections from other trees, have found considerable discrepancies. The alburnum also passes very unequally into the duramen, or heart-wood; different portions of the same or of many contiguous rings being often found in each of these states.

My experiments tend to show that, while De Candolle's average makes old yews to be younger than they are, it gives too great an age to those of more recent growth. For the latter, I think, we should not allow less than 2 lines of their diameter for annual increase, where the trunk has a less circumference than 6 ft.; and even 3 lines or more, if the tree is in a warm situation and a moist luxuriant soil.

I have thought it desirable, at the risk of being tedious, to point out the several sources of error which attend the examination of the yew, that others may avoid them; though I strongly fear that no standard, either for old or young trees of this species, will ever be found generally applicable, where the nearest approach to truth is required. Actual sections must be resorted to, before we can place any confidence in the result.*

(*To be continued.*)

ART. VIII. *Notice of the Occurrence of Volûta Lamberti on the Suffolk Coast; with Observations upon its Claim to rank with existing Species.* By EDWARD CHARLESWORTH, F.G.S.

IT is in the study of fossil organisms, and in the cautious observance of the conditions under which they are presented

* In taking the circumference of any old trees, and especially of the yew, whose trunk is often concealed by innumerable little shoots, and is subject to excrescences and inequalities, care should be taken to select that portion which has a medium thickness, and to pass the tape close to the bark; otherwise very erroneous results will be obtained. I had read somewhere that a yew in Llanfoist churchyard, Monmouthshire, had been measured by the writer, and was 33 ft. in circumference; I was therefore disappointed to find that this measurement must have included a great arm or bough that proceeds from the very base of the trunk on the south side, and therefore formed no part of it. Even with this bough, the circumference, at 3 ft. high, is only 27 ft. 6 in.; without it, the circumference of the real trunk, at the same height, is only 21 ft. 6 in.

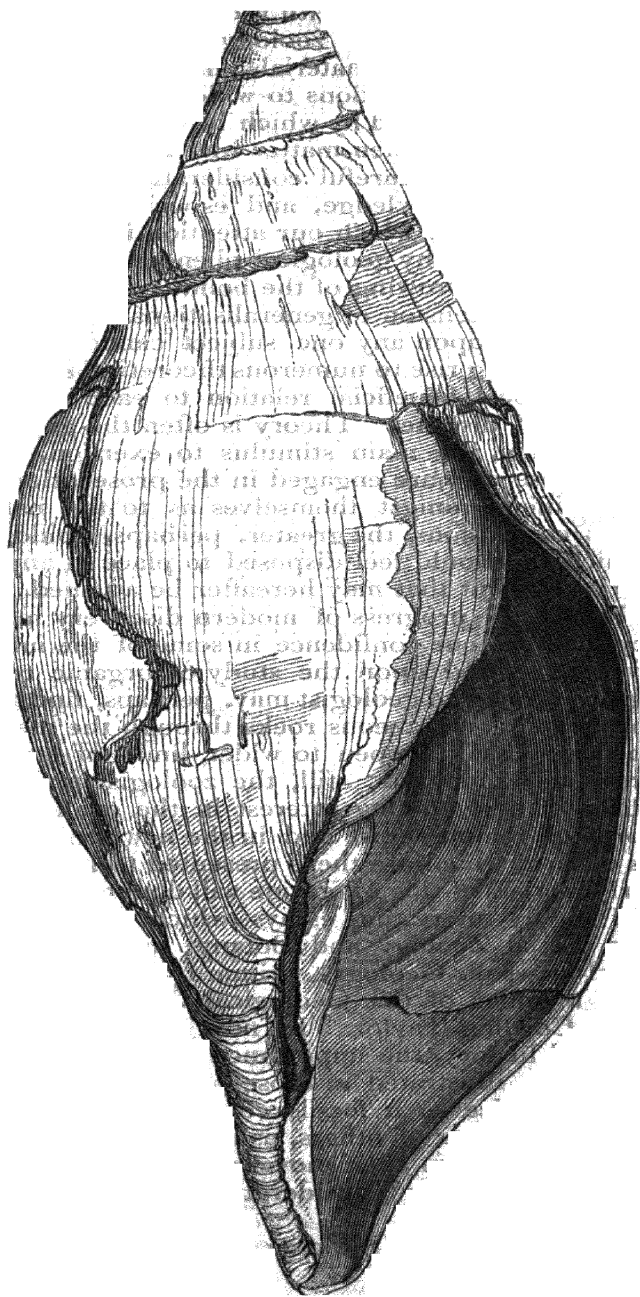
to examination, in conjunction with those inferences which we draw from our knowledge of zoology and general physics, that the geologist finds the materials on which he speculates as to the changes and revolutions to which the surface of this planet has been exposed, and by which he chronicles the lapse of ages since the period when matter was first endowed with the principle of life. A careful consideration of the present condition of human knowledge, and especially of those departments of research to which our attention is directed, with a view of elucidating many geological phenomena, would seem rather to indicate a narrowing of the boundaries of legitimate induction than an extension of generalisations.

Facts which bear upon any one subject cannot long accumulate without giving rise to numerous theoretical suggestions, and their reciprocal beneficial relation to each other is no longer a matter of dispute. Theory is often the great incentive to observation, the main stimulus to exertion, and the more widely those who are engaged in the prosecution of the same object differ amongst themselves as to the nature of their present conclusions, the greater, perhaps, would be the reliance which we should feel disposed to place in any points of common agreement that may hereafter be attained.

But, although the progress of modern discovery may have a tendency to shake our confidence in some of the inferences which have been based upon the study of organic remains; and though the practical geologist may, perhaps, find that the recognition of contemporaneous rocks through the medium of their embedded fossils is open to wider limits of error than he had previously supposed; still, the zoologist must always find a source of never failing interest in the examination of these records of remote eras, and in the new structures and new types of form which are there presented to his view.

The early readers of this Magazine will doubtless remember a series of highly interesting essays which appeared in its pages upon Fossil Zoology and Botany, in connexion with some general views on Geology, written by a most active and enterprising member of the Geological Society of London, Mr. Richard Cowling Taylor. In now taking up a department in natural history, the importance and interest of which have been so ably illustrated in those papers, my intention is occasionally to notice such fossils contained in my own collection, or the cabinets of others, as appear to me worthy of observation, either from their novelty as specimens, or from their suggesting any new considerations in a geological or zoological point of view.

The *Volùta Lambérta* of the crag (fig. 7.), one of the most



elegant British tertiary fossils, must be familiar to those who are acquainted with the works of Parkinson and Sowerby; and it therefore possesses no interest on the score of novelty; but there are some very curious points connected with its history which are not generally known, and to which I am particularly anxious attention should be directed. Specimens of this shell are not uncommon in the cabinets of collectors, but I believe that few of the possessors are aware of the sources from which they are generally derived. Nine tenths, or, perhaps, a still larger proportion of the whole number that I have seen, instead of coming, as is usually thought, from the crag, have been taken from the beach along the Suffolk coast, and principally at Walton and Felixtow, two adjoining localities (a few miles east of Harwich), where they are generally found at the time of very low tides.

The mere occurrence of this fossil under the circumstances above mentioned would not in itself excite our surprise, since it is known that rivers in their course carry down to the sea such species of land shells as inhabit their banks; and where the crag is intersected by estuaries, the fossil shells would, from similar causes, be liable to be swept down into the German Ocean, and we should then naturally expect to find some of them washed on shore in common with the shells of recent Mollusca. But, as the case really stands, there are two difficulties to be explained: first, the great number of these littoral volutes; and, secondly, the different state of preservation which they exhibit, when contrasted with such specimens as are actually taken from the crag deposit. Speaking of this volute, Parkinson says, "the most rare shell of this genus found in this island is the fossil volute of Harwich" (*Organic Remains*, vol. iii. p. 56.); and certainly it is not by any means a shell of very common occurrence in the deposit to which it is always referred; and, when found there, it is generally in so fragile a state, that tolerably perfect specimens are hardly ever obtained. But from one of the soldiers' wives at the Fort, on the Suffolk side of Harwich harbour, I have obtained more of these littoral volutes, than all the specimens put together that I have seen from the whole extent of the crag formation; and the shells thus found are not only often much larger than those in the crag, but many of them appear to have undergone scarcely any change, save the loss of colour; in fact, were they not almost as strong as recent shells, they would stand but little chance of reaching the shore, unless in fragments, which is, of course, the case with a great many of them.

In a succeeding paragraph to that which I have already

quoted, Parkinson observes, "A very fine fossil shell, bearing much the form of this volute, is found in some parts of Yorkshire; I believe in the neighbourhood of Whitby. This shell is so perfect, and its colours are so well preserved, that a specimen of it having fallen some years since into the hands of Mr. George Humphries, he was deceived into the opinion of its being a dead shell; and being satisfied that it was of a species which was entirely unknown, he cleaned and polished it as a recent shell, and was not undeceived, until, at a subsequent period, he saw another specimen, by which he was enabled to ascertain its being really a fossil."

So long a time has elapsed since the above was written, that I have not been able to gain any more information respecting the shell here spoken of; but I can only conjecture, from Mr. Parkinson's account, that it was one of these fine volutes thrown on shore at Whitby. The fact is certainly highly interesting, considering the great distance between the two localities, unless we suppose that the shell was transported from the Suffolk to the Yorkshire coast. Mr. Humphries is not the only individual who has been misled in this way; a similar instance has come under my own observation; and, indeed, some of these shells have such a recent character about them, that a naturalist totally ignorant of the species indigenous to the British seas might perambulate our eastern coast and meet with a specimen of the *Volùta Lamberti* without suspecting it to be other than a dead shell of a living mollusc.

Now, it is very possible that those shells, which have undergone so little alteration in character, may have been removed from the crag before the process of mineralisation had taken place to any considerable extent; or we may imagine that there existed a comparatively recent fossiliferous stratum in which this particular species was abundant, and of which all traces are now entirely destroyed. Without entering largely into details to show the plausibility of the latter suggestion, I may remark that, from a careful examination of the deposits upon our eastern coast, I anticipate a considerable change in the opinions which geologists have usually entertained respecting them, when their history shall have been more fully investigated.

The tertiary shells brought from Suffolk and the neighbouring counties have so invariably gone under the appellation of "crag fossils," that it is no very easy matter for a geologist who has not personally examined the numerous localities in which they occur, to divest himself of the impression that they all belong to one definite deposit.

The shells figured in Sowerby's *Mineral Conchology* were

principally forwarded to him by local collectors, who were unacquainted with geology; and it could not, therefore, be expected that they would pay much attention to the position or general characters of different beds. Allusion is, however, made, once or twice, to "native beds of crag;" and Dr. William Smith, in his *Strata Identified*, speaks of "stony" and "sandy" crag as distinct.

It is well known that some extremely recent deposits, containing existing species of marine Testacea, occur either above the crag, or in not very distant localities; and, were it not for the extensive denudation to which our eastern coast has been subjected, I firmly believe that in those tertiary strata, of which now only a remnant is left, we should find a series of fossiliferous beds connecting the oldest members of the tertiary group with those in which all the shells can be identified with existing species. Mr. Bean has announced the discovery of a marine deposit at Burlington*, the fossils of which seem to indicate a geological position between the London clay and crag; while, at the same time, I have also endeavoured to show that a distinct age should be assigned to those beds of the crag formation in which we meet with existing species of Mammifera; if, therefore, the premises in these two instances are correct, a considerable approximation towards a series of successive deposits, without any wide hiatus, is established. The original extent of these formations cannot possibly be determined; but elephants' bones have been dredged up 20 miles from the shore, and, within that distance of the coast line, a dozen deposits of different ages may have been swallowed up by the encroachments of the ocean. Under these circumstances, it is highly probable that fossil shells may be taken up at sea, or washed on shore, which have no connexion with any existing deposits. Nor is the evidence of specific agreement of any use as a guide to our conclusions, since so large a proportion of Mollusca are common to beds of different geological ages.

In Mr. Lyell's *Geology*, the *Volùta Lambérti* is regarded as a still existing species, upon the authority of M. Deshayes, who states that, among a large proportion of crag shells which he was enabled to identify with recent Testacea, this species was the only one not inhabiting the German Ocean.

Being totally unacquainted with any recent analogue of this fossil, I applied to Mr. John Edward Gray and to Mr. George Sowerby for information upon the subject. From both these distinguished conchologists I learned that there

* Mag. Nat. Hist. (old series), vol. viii. p. 355.; also, British Association, 5th Report, p. 62.

was no existing volute which could be confounded with the one from the crag, even if the widest limits were allowed for specific variations. It is true that Sowerby, in the *Mineral Conchology*, speaks of having seen drawings of recent shells from the Fejee Islands resembling the *Volùta Lambérti*, and names Mr. Hall and Mr. Jennings as parties possessing the original specimens.* From enquiries that I have made, I have not been able to learn that the late Mr. Sowerby ever personally inspected the volutes to which he refers; and, if such rarities were really extant, it is not likely that conchologists would be unacquainted with the circumstance.

On two occasions lately, when writing to M. Deshayes, I have particularly requested him to inform me whether he really is acquainted with any recent shell resembling *Volùta Lambérti*, but as yet he has been silent upon the subject. That a solitary crag species should inhabit a remote region, when all the rest of the supposed living forms are still existing in our own seas, is a circumstance both interesting and important, and the truth or incorrectness of which it would be very desirable to establish. At the present time too, it is particularly to be wished that this point should be settled, as the general correctness of M. Deshayes's identifications of fossil with recent species has been so lately called in question by Dr. Beck and other conchologists.

The paper by M. Deshayes on the European climate during the tertiary periods will be perused with great interest, both by the cultivators of geology and conchology; but there is one circumstance connected with the views which are there brought forward certainly requiring explanation. In Mr. Lyell's address to the fellows of the Geological Society, the following passage occurs:—"Dr. Beck has lately seen 260 species of crag shells in Mr. Charlesworth's cabinet in London, and informs me that although a large proportion of the species approach very near to others which now live in our northern seas, he regards them as almost all of distinct species, and unknown as living. Both he and M. Deshayes have declared the shells to be those of a *northern climate*, and according to Dr. Beck, the climate may even have resembled that of our *arctic regions*."† Mr. Lyell's address was delivered in February, 1836; and, on the 26th of the May following, we find M. Deshayes laying a paper before the French Academy, in which he seems to have arrived at the most opposite conclusions, for he sums up his observations with

* Sowerby's Min. Con. tab. 129.

† See London and Edinburgh Philosophical Magazine, third series, vol. viii. p. 327.; and Proceedings of the Geological Society.

remarking that, "since the commencement of the tertiary strata, the temperature has been constantly diminishing; passing in our climates from the equatorial to that which we now enjoy." * Two statements could not well be more diametrically opposed to each other; and to increase the difficulty, M. Deshayes has left out all reference to the crag, although he alludes to nearly every well known European tertiary deposit. To say the least of it, this omission looks singular, especially when M. Deshayes had so recently been engaged in the examination of the crag fossils.

In whatever light we regard the crag, it appears to be a most mysterious deposit, and the present investigation of its history seems likely to be attended in one sense with most unfortunate results. Professor Agassiz has declared the fish to be those of tropical climates, whilst the Mollusca, by equally eminent naturalists, are said to indicate a temperature approaching that of the polar regions; and, to complete the anomaly, we have associated with them the mammiferous species which now inhabit this island. These are facts of the highest importance in reference to such geological deductions as may have been based upon individual opinion, or upon the examination of only one class of fossil organisms. I am, however, sanguine enough to hope that the discrepancies will be in some measure reconciled, when the tertiary formations in Norfolk and Suffolk are no longer referred to by geologists as "the crag," and when the nature of the separate deposits, and their relation to one another, are more clearly established.

The circumstance of meeting with these volutes upon the coast, along with the shells of living Mollusca, illustrates in a most forcible manner how fallacious may be the conclusions founded upon association, and upon the assumption that all the organic remains embedded in one deposit must have existed contemporaneously. The most casual observers of the causes now in operation upon the earth's surface must perceive that the formations at this time in progress necessarily contain the remains of beings which belong to different periods, and yet, day after day, are inferences based upon the supposition, that, in whatever stratum a fossil is found, at that particular period it must have existed. In this respect the examination of the crag has demonstrated the fallacy of the percentage test, as a general rule for determining the age of the supra-cretaceous rocks, since it has been clearly shown that one formation may derive a large proportion of its fossils from deposits

* See Art. II. in our present Number, p. 16.

which are no longer in existence. This subject is one abounding with materials for speculation, but, as I have treated of it at some length in other quarters, I will not enter further upon it on the present occasion.

The *Volùta Lambérti* is found in the coral rocks of Aldborough and Orford, and in the red crag along the southern coast of Suffolk and Essex, but it has not yet been discovered in that part of the upper deposit which extends from Thorp (near Aldborough) into the county of Norfolk, and in which are deposited the remains of mammiferous animals. The woodcut at p. 37. is engraved from a drawing made by Mr. James de C. Sowerby, of a particularly fine specimen in my possession, and which was procured from the beach at Felixtow. This individual, in common with several others from the same locality, exhibits, upon those portions of the shell not exposed to attrition, numerous well defined sharp transverse striæ, a character which has not hitherto been noticed, and which I have been unable to detect in those specimens which occur in the crag, although I have examined them in all stages of growth.

I know of only one fossil species which in its general aspect resembles this volute, and that is a shell found at Touraine, and in some other Continental tertiary deposits, and which is probably the one figured by Brocchi. This latter may be readily distinguished from *Lambérti*, by the thickness of its shell, and the different position of the folds of the columella, and from the outer lip being slightly everted.

Mr. Gray is of opinion that there are some characters about *Volùta Lambérti* so nearly allied to the genus *Fasciolaria* as to induce him to separate it from the true volutes. The occurrence of a tropical form among so many species of cold or temperate climates had led Dr. Beck to doubt the existence of the fact, until he saw the specimens of this fossil in my collection; and, therefore, Mr. Gray's conjecture is one of considerable importance; for, if correct, we are consequently unacquainted with its inhabitant.

REVIEWS.

ART. I. 1. *Magazine of Zoology and Botany*: conducted by Sir William Jardine, Bart.; P. J. Selby, Esq.; and Dr. Johnston. Edinburgh, W. H. Lizars; London, S. Highly.

2. *The Naturalist; illustrative of the Animal, Vegetable, and Mineral Kingdoms*: conducted by B. Maund, F.L.S.; and W. Holl, F.G.S. London, Groombridge.

1. *MAGAZINE of Zoology and Botany*.—We are in ignorance as to the degree of success which has attended the publication

of this periodical, but it is undoubtedly a work possessing strong claims to the support of those who are desirous for the advancement of the two departments of science to which its pages are devoted. The names of Selby, Jardine, and Johnston, so well known to all the cultivators of science, are associated with those of Swainson, Jenyns, Gould, Westwood, Henslow, and other eminent naturalists, in the establishment of this addition to our scientific literature. Four numbers have already issued from the press, containing much interesting and valuable matter, whilst the general character of the work fully bears out the favourable anticipations which at the period of its announcement we were led to form respecting it.

2. *Naturalist*. — We are induced to give this publication a more extended notice than we might otherwise have done, from the general silence on the part of other scientific periodicals respecting it; and also because the object it has in view, and the plan upon which it is conducted, appear very much to accord with our own; namely, that of communicating to the public information upon various subjects in different branches of natural history, divested, in some measure, of the technical details of science, but, at the same time, without our excluding such articles as are worthy the attention of the experienced naturalist. This association of matters comparatively abstruse, with those which are calculated to produce a more general degree of interest, is a combination perfectly legitimate, and which, if judiciously carried into effect, may be attended with highly advantageous results. Much caution is, however, requisite in the selection of appropriate materials; for a journal conducted upon this principle must necessarily embrace a wide range of subjects; and it not unfrequently becomes a nice point to determine the particular class of contributions which are, or are not, admissible to its pages. In deciding upon the degree of latitude which in this respect should be given to the observations of all those who are seeking after knowledge, circumstances of a very opposite character often require consideration, and difficulties present themselves which do not arise in the case of a periodical that aims exclusively at the higher departments of natural science, or in one which is solely elementary.

When the above work was first announced, we certainly were disposed to think that, if well conducted, it might succeed, more especially as the prospectus contained (as future contributors) rather a numerous list of "eminent scientific men," the majority of whom being quite unknown to us in that capacity,

we concluded that their pretensions to rank as such would date from the commencement of the *Naturalist*. The late proceedings at Bristol have furnished a striking example of an individual who must long have had just claims to the title of an eminent scientific man, although he was, comparatively speaking, quite unknown to the world at large. Hence we flattered ourselves that so many persons coming forward for the first time in that character, through the medium of a new periodical, its publication would stamp a new epoch in the present condition of our knowledge of natural history.

Would that we could say our hopes and expectations have not been disappointed ! The *Naturalist* has appeared ; but the scientific men — *where* are they ?

On glancing over the first numbers, we do not see much to arrest the attention of the man of real science, or to captivate the mere lover of nature. The articles, generally speaking, are extremely tame, and written in a style which unavoidably forces upon the reader's recollection the idea of their being "got up" for the occasion, instead of being the spontaneous productions of those who are engaged hand and heart in the advancement of that science of which they profess to treat.

There is, however, one feature in the present work upon which we cannot help expressing ourselves in terms of the most unqualified approbation, the fair sex having come forward as contributors to its pages ; and we blush to observe that the only original facts connected with natural history, recorded in the columns of the first number of the *Naturalist*, are to be found in the communications of *two ladies*.

In geology, and some other branches of physical science, there are among our countrywomen names that will shine bright in the history of the progress of human knowledge, and which can never be referred to without exciting our feelings of pride, and calling forth our admiration. Considering the numerous matters of every day occurrence which still furnish ample materials for investigation, we cannot but feel that there are abundance of subjects to which the attention of the other sex might be advantageously directed. If they would take up the study of zoology, even with reference only to our domestic animals, we feel convinced, from the facts now before us, that we should soon be in possession of a series of valuable and original observations.

Miss Dobson's communication, though, perhaps, the less important of the two, stands first in order. This lady, whilst studying the habits and peculiarities of gold and silver fish, has remarked, among other particulars, that, after catching the worms thrown to them in the water, they shake them in

the same way as cats do mice. (p. 29.) This observation is not only exceedingly valuable as an addition to our knowledge of the economy of the gold fish, but it possesses a far higher importance considered with reference to certain theoretical opinions of some distinguished zoologists. How Mr. Swainson will pounce upon this new illustration of his views of the representative system : *Felis maniculata* among *Mammalia*, represented by *Cyprinus auratus* among fishes ! The points of correspondence are so striking, and established upon such clear evidence, that we think the most confirmed opponent of the views of Mr. Swainson may now waver in his scepticism.

Both animals, it should be observed, are *carnivorous*; both *shake* their prey after catching it, and both *swallow* it after shaking it. We must not, however, enter upon the considerations which here naturally present themselves, as our limits would not allow us to do justice to the merits of the other young lady's observations, which exceed in interest, if possible, those of Miss Dobson's.

This very modest unassuming contribution may truly be said to contain *multum in parvo*. It is headed, "Music of Snails." We give it *verbatim et literatim* :—

"One evening, I kneeled upon the window-seat when it was nearly dusk, and heard a soft musical sound : not a humming or murmuring, but a truly musical tone. I saw a snail, and, having a desire to annihilate those destroyers of fruit and flowers, took it from the window. I had silenced the music ! I recollected what I had heard, and felt a sort of pang." (p. 38.)

That a young lady, kneeling at her window in the dusk of the evening, should hear a soft musical sound, will, we presume, be regarded by those who are at all versed in matters of natural history as an occurrence quite within the limits of possibility : but the sounds heard on these occasions are not usually attributed to *cold-blooded animals*. We cannot help half suspecting the presence of some creature possessing a higher degree of organisation than a *mollusc*. Let it not, however, for one moment be imagined that we intend to cast a shadow of an imputation upon the young lady's veracity or powers of correct discrimination. There is the strongest *primâ facie* evidence to justify her in concluding that the dulcet airs proceeded from the snail ; and it is only our profound acquaintance with *zoology* that has enabled us to imagine the possibility of her having made a mistake. The lady and the snail being at the window together, soft musical sounds were heard : upon the young lady's annihilating the snail, the music ceased : *ergo*, the music proceeded from the snail. The sole evidence, therefore, of the musical powers of the snail rests

upon a negative fact—that of the sounds not being repeated after the snail was dead. Now, the circumstance that appears to us as rather suspicious is this, that the young lady's attention should be directed towards the snail while the music was going on, and yet that she should not perceive the sounds proceeded from the direction in which the snail was crawling. But it may be asked, How, then, can you account for the music ceasing after the death of the snail? Here, we must admit, there is a difficulty; and the only solution we can suggest is, that, for the purpose of annihilating the snail, the young lady retired from the window.

We have thought it right to dwell minutely upon this relation, and sift the evidence rather closely; for, if it really be the case that the snail possesses musical organs, the fact is one of the highest physiological importance; and we do not know anything that would give the *Naturalist* so high a reputation, both here and on the Continent, as its being the first scientific journal to announce and demonstrate their existence.

If, on the other hand, subsequent investigations should at all confirm the conjectures which we have ventured to throw out, as to the way in which a mistake might have originated, we think our contemporary is bound to rectify the error which his fair correspondent has innocently fallen into; for, should the *Naturalist* ever have an extensive circulation, it is not by any means desirable, considering the present state of society, that mammas and guardians of young ladies should imbibe a notion that the soft musical sounds sometimes heard in the dusk of the *evening* originate with snails.

We have remarked that the above articles contain the only original information upon natural *history* in the first number; though we cannot deny but that there are some bold excursive ideas, startling conceptions, &c., possessing undisputed claims to originality. The following may serve as an illustration:—

“ Besides, those ‘stars’ of genius follow the law of all other stars, by being conspicuous only in the dark, and more conspicuous the more profound the obscurity is, and the more vacant the space athwart which they are seen. In the mighty darkness of those ages, during which the combined mischief of reckless war, and senseless superstition, had well-nigh banished science from the earth, a single scintillation, and that too of some false light—of some *ignis fatuus* of the polluted air—was sufficient to constitute a star of the first magnitude, after which the benighted children of men wondered and worshipped; and this they were prone to endow with ‘airs from heaven’ or ‘blasts from hell,’ upon as slender grounds as those which called forth their wonder and their worship. But as the dawn of true knowledge broke, and the sun of science neared the horizon, the stars in that part waxed dim and disappeared; and when this glorious morning to the human mind had so far advanced as to show, as it were, to the great body of the people upon the earth the objects immediately around them, in their true colours, so that each man might observe with his own

senses, and judge with his own understanding, those stars of the darkness of intellectual night vanished away, as is the case with their namesakes of the natural sky." (p. 5.)

If, gentle reader, your faculties are not so bewildered by the perusal of this passage, that you are unable to collect your ideas, you will probably ask, Is *this* written by a "lady," or by an "eminent scientific man?" Now, we would not, for the world, be guilty of imputing it to either. There is only one step from the sublime to the ridiculous, and to which —. But we will not criticise *unfairly*: here is another specimen of the same writer's, exhibiting rather more consideration for ordinary capacities: —

"For in those warm and stilly days, when not a breath of wind rustles the foliage, or breaks the glassy surface of the brook, the kingfisher may be observed sitting for hours together upon some withered branch or water-encircled stone, until a fish comes within the range of his vision. Then off it darts with the rapidity of an arrow and the radiance of a meteor, and seldom misses its aim. If the fish is small, it is swallowed during the flight; but if it is too large for that purpose, then the bird betakes itself to some rock, stone, or firm portion of the bank, where it speedily kills the fish by hewing into its skull with its strong and powerful beak: after this, the trenchant edges of the same instrument may soon divide the fish into such portions as can be swallowed; and the feast is then over." (p. 195.)

Now, without presuming in the slightest degree to place our own experience in these matters in competition with Mr. Mudie's, we cannot quite understand the policy which induces the kingfisher to hammer away at the skull of the unfortunate fish that has come within its clutches, when slicing it up with its trenchant bill would appear to answer the purpose in a much more effectual manner. Were it known to walk off with a jack of six or eight pounds' weight, we might, on such occasions, give it credit for adopting some extra precautions to prevent anything unpleasant *occurring*. Here we would remark, *en passant*, that, from what is known respecting the general habits and disposition of the kingfisher, we should be greatly inclined to doubt whether it ever really considers its repast finished until, besides *cutting* up its fish, it has also *swallowed* the pieces.

Mr. Mudie's imagination is rather fertile; and, in some of his ornithological descriptions, he is apt to confound his own poetical feelings with the habits of the feathered race. Poetical license, however, ought not to exceed reasonable limits. Hundreds of times have we watched the kingfishers in spots where there was no lack of withered branches, no scarcity of water-encircled stones; yet the usual resting-place of these classic birds was some bare stump, or, perhaps, the square top of an oaken pile, jutting a foot or two above the water.

Contrast the silvery mellifluous descriptions of Mr. Mudie, with the straightforward but spirited sketches of Mr. Waterton. Mr. Waterton tells us of what he has really seen and heard: Mr. Mudie fancies himself the bird he is describing, and looks only at the bright side of the picture: for, after all, what is a kingfisher, but a fish-guzzling animal, with a short tail, gaudy breast, a huge beak, and a hungry belly; squatting all day long upon some stump or ashen rail, and, as though utterly insensible to all sentimental ideas and poetical associations, choosing, probably, the very one which only three days before was planed smooth and round by the hands of some clod-hopping carpenter, who, in sticking it bolt across the stream in any but a romantic position, knew and cared as little of the poets of old, who sang of the "halcyon" bird, as the shoal of tiny sticklebacks besporting themselves in the brook beneath? But not thus sees Mr. Mudie: in picturing himself as a kingfisher, his imagination only dwells upon a form that flits about with the radiance of a meteor and the rapidity of an arrow; betaking himself, on warm stilly days, to some withered branch or water-encircled stone: no matter his catching cold on the one, and no fish off the other. Gratifying his appetite would be quite a secondary consideration, compared with having a romantic situation; and, if even a fish did by chance fall in his way, he would consider his repast finished when he had only divided it in such pieces as might be swallowed.

Zoological details clothed in the language of *poetry* should always be received with caution, and perhaps even some degree of distrust. Water-encircled stone chimes in with a vast deal prettier effect than rail or stump; but the instances must be very rare, comparatively speaking, where a stone thus encircled affords the bird that elevated position which it generally selects for its watchtower.

Some anonymous correspondent thought fit to send a critique of Mr. Neville Wood's book on British song birds to the *Magazine of Natural History*.* Mr. Wood has, however, found an able champion in the reviewer to the *Naturalist*, who, in speaking of this work, remarks, —

"Of the two productions of Mr. Neville Wood, both highly valuable and instructive, we greatly prefer the last. It is a delightful volume; full of living portraits of our native song birds, evidently traced by the hand of a man of genius and an enthusiast, — an original and an indefatigable observer; and truly refreshing to the spirit of the thorough-bred ornithologist, whom the stale and vapid performances of the hiring compiler have too frequently served only to nauseate and disgust. Deeply do we marvel how an individual, so little advanced in years as Mr. Neville Wood

* Vol. IX. p. 515, old series. We are quite ignorant of the author's name.

VOL. I. — NO. I. N. S.

really is, could have produced a work of which any naturalist, however aged or experienced, might well be proud; and which all, who aspire to the character of a British ornithologist, must possess; and, once possessing, will frequently peruse."

As Mr. Neville Wood is one of the "eminent scientific men" under whose auspices the *Naturalist* is conducted, we think it would have looked quite as well if the reviewer had measured out to him a more moderate dose of adulation. We are not sufficiently acquainted with Mr. N. Wood's production to judge of its merits as an ornithological work; but, in the December Number of this Magazine, p. 640., Mr. T. C. Wood remarks that his brother's book "contains little that is new, but it puts us in possession of what was previously known, in a portable form."

Upon the whole, the *Naturalist* does more credit to the printer than to its conductors; but there certainly are symptoms of improvement in the last two numbers; and some of the extracts from foreign journals are well selected. Each number has, for a frontispiece, a coloured plate of some animal, which is accompanied by a description. Here, we think, the editors have shown bad taste: there is no novelty in the execution of the plates, or in the subject which they are intended to illustrate; and they are, consequently, devoid of interest to the naturalist, and cannot be very attractive to general readers. No. 3. contains a plate of the duck-billed platypus; and the describer, Mr. Frederick Ryland, gravely informs his readers that the name *Ornithorhynchus* was assigned to this animal because there was "some doubt as to whether it could properly be arranged under any of the existing classes of *Vertebrata*" (p. 97.), instead of confining this explanation to the specific term *paradóxus*. Nor does he, in any part of his observations, hint at the real meaning of the generic appellation, although he remarks that, besides the name of *Ornithorhynchus*, it is more frequently called the "duck-billed animal," from the peculiar form of its beak. (p. 101.) No. 5., for December, was to have contained a figure of the kingfisher; but the editors observe that the plates were so *inaccurately and badly coloured*, that they did not like to disfigure the work by their insertion. Now, we had rather see the commonest woodcut that illustrates some new fact in zoology, than five hundred such plates as those which have appeared in the *Naturalist*. Even looking at it as a mere matter of business, we think that a change of system would prove advantageous; for the number of purchasers who are attracted by showy figures must be very few compared with those who support a publication upon the ground of its intrinsic merit. We know, however, that the conductors of

this work have in their possession, at any rate, *one* highly interesting drawing, and the publication of which has only been delayed from the difficulty of finding a person competent to describe the subject which it illustrates.

In venturing to offer the above observations with reference to a contemporary periodical, we by no means flatter ourselves with the expectation that this Magazine will not be equally open to criticism, or even censure. We wish, however, to remark, that on all occasions we shall be most glad to avail ourselves of any improvements which may be suggested to us by the *Naturalist*, or by any other scientific Journal.*

ART. II. *A Synopsis of the Birds of Australasia.* By John Gould, F.L.S., &c., Author of "The Birds of Europe," "The Birds of the Himalaya Mountains," &c. London, 1837.

WE have hastily looked over the plates of Mr. Gould's new work, which is announced for publication on the 2d of this month. The illustrations are executed in a style which certainly will not lessen the author's high reputation as an artist and practical ornithologist. On a future occasion, we shall probably give this work a more detailed notice. In the mean time, an extract from the prospectus will convey a better idea of Mr. Gould's object in undertaking the above publication, than any remarks of our own.

"The Author therefore conceives that a work on the Birds of these countries cannot fail to be of the greatest interest, not only to the naturalist and scientific men of our own country, but to those of Europe and America, as well as to the inhabitants themselves of these distant colonies; and he is further induced to commence such an undertaking having at this moment in his possession an exceedingly rich collection, perhaps the finest extant, of the productions of these countries, among which are a large number of undescribed species; and having also relatives resident there devoted to this branch of science.

"The object of the present publication is, in the first instance, to make known and record in an eligible form the vast accessions which science has latterly acquired from this portion of the globe; and, in order to render it of real value and utility to the men of science of all countries, the Author has determined upon giving, besides a Latin and English description, measurements, synonyms, &c., a figure of the head of the natural size of every species, a feature not to be found in preceding works of a similar nature, and by which each bird may at once be distinguished, hitherto a matter of some difficulty, particularly in those that are nearly allied. The work will be published in Parts, each of which will contain 18 Plates, with letter-press

* Our animadversions upon the *Naturalist* will not be attributed to unjust motives, as our opinion of that work was known to its conductors before there was any prospect of a contemporaneous publication being placed in our hands.

descriptions. The First Part will be published on the 2d of January, 1837, and will comprise Illustrations and Descriptions of Forty-four Species.

"The size, Imperial 8vo; and the price of each Part, 1*l.* 5*s.* coloured, 15*s.* uncoloured: to appear at intervals of Three Months.

"It is impossible to state the precise number of parts to which the work may extend; the species now known to the Author, of which more than a third will be characterised for the first time in the present work, may be comprised in from 6 to 8 parts; any extension, therefore, beyond that number will contain still greater novelties, and will of course, be still more interesting. An arrangement with remarks on the different genera and the peculiarities of their forms, will be given either at the close or in the course of the publication, so that the work may be formed into volumes.

"Should the present publication meet that degree of support to which the Author trusts its merits will entitle it, he may be induced to undertake a still larger work on the same subject, similar in every respect to the "*Birds of Europe*," in which case he contemplates visiting Australia, New Zealand, &c., for the space of two years, in order to investigate and study the natural history of those countries, and endeavour, as far as practicable, to make himself acquainted with their natural habits and economy, of which at present but little is known."

MISCELLANEOUS INTELLIGENCE.

ART. I. *Short Communications.*

WOODCOCK shot in July.—On the 16th of July, Mr. Joshua Crompton shot in a spruce fir plantation near to his house, Sion Hill, near Thirsk, a male woodcock: it was in good condition, and weighed, when first killed, 10½ oz. He examined carefully the spot where he flushed it, but could find no traces of its having frequented the place previously. — *W. H. Rudston Read. Temple, Nov. 18. 1836.*

White Partridge shot. — A curious specimen of the common partridge was shot on Thursday, Oct. 27., in the neighbourhood of Birmingham, the plumage of which was almost entirely white. It rose among a covey of thirteen; and, after five unsuccessful attempts to get a shot at it (two of which times it would have escaped had not the plumage betrayed it as it was running), a single shot struck it in the wing, and pinioned it. The bird has since been stuffed by Mr. Gould.

On my way to town, Archer, the coachman of the Buckingham coach informed me that two or three times this autumn he has seen, in the neighbourhood of Chalfont St. Peters, a rook flying and feeding among a flock of others, the wings of which were white, while the body appeared of the usual colour. I have since heard of one with a similar plumage having been seen in the neighbourhood of Upwell, Cambridgeshire, by a friend of mine, who followed it with his gun, but was unable to get a shot at it. This was also among a flock of others. Is it probable that this was the same bird?

or have either of these specimens been killed or noticed by any any of your correspondents?

Colonel Montagu, in his *Ornithological Dictionary*, mentions four white partridges in one covey at Powderham, in Devonshire. None of the other birds in the covey from which my specimen was shot had any apparent peculiarity in their plumage, while on the wing. We did not, however, succeed in killing any of them. — *F. J. Ellis. Temple, Nov. 4. 1836.*

The Organ of Time in Dogs. — In Mr. Bell's admirable *History of British Quadrupeds*, p. 244., the following passage occurs: — "The power of dogs to mark distinct periods of time cannot be denied: there are many instances on record in proof of it; but the following is detailed as having fallen under my own knowledge: — A fine Newfoundland dog, which was kept at an inn in Dorsetshire, was accustomed every morning, as the clock struck eight, to take in his mouth a certain basket, placed for the purpose, and containing a few pence, and to carry it across the street to a baker's, who took out the money, and replaced it by a certain number of rolls. With these Neptune hastened back to the kitchen, and safely deposited his trust; but, what was well worthy of remark, he never attempted to take the basket, or even to approach it, on Sunday mornings." Now, though I do not intend to deny that the lower animals are possessed of an innate organ of time, yet, possibly, the faculty of time may have had nothing to do in the above instance. Indeed, probably, the dog was rather apprised of the return of the Sunday by the different dress of the inmates of the house, or by various other circumstances which might tend to point out to the intelligent animal the difference of the days. It would, at all events, be interesting to ascertain if quadrupeds have the power of marking distinct periods in so decided a manner as supposed by Mr. Bell. — *Neville Wood. Campsall Hall, near Doncaster, Dec. 5. 1836.*

The Hedge Coalhood (Pyrrhula vulgaris) laying in November. — On Nov. 15. a friend showed me a fresh-laid egg of the hedge coalhood, which he had found the day before on the road side near this place. The shell was quite perfect, and the egg differed in no respect from those deposited in the ordinary course. I never knew any egg laid by birds in a state of nature so long after the usual breeding season; and those which I have found on the ground early in spring have generally been minus the shell. They are probably the production of young birds of the former year. (*Id.*)

Late Singing of Birds. — The fact of birds being occasionally heard to sing, in mild seasons, throughout the winter, proves that the state of the weather has much influence in

causing them to exert their vocal powers. Thus, I have known the sky-lark and yellow bunting sing with considerable spirit at the end of November. I have more than once heard the lively notes of the common goldwing (or "goldfinch") on Dec. 21.; and those of the hedge coalhood (or "bulfinch") in the middle of November. The ivy wren and robin redbreast will sing throughout the winter in fine weather; and the song of the whin linnet, green grosbeak, and various other choristers, may be heard considerably after the period when the greater part of the feathered songsters have become comparatively mute. I might fill pages with facts and speculations on this interesting topic, but have neither the time nor the space for enlarging on it in this place. (*Id.*)

Swan River Colony. — Our botanic garden here having been given up, I have determined, with the assistance of my sons, who are practical naturalists, to make collections of skins of quadrupeds, birds, &c., insects of all descriptions, seeds, and specimens of plants. Your inserting a notice to that effect in the *Magazine of Natural History* would much oblige me. Our flora here is of the most varied and beautiful description, the plants at King George's Sound being almost all different from those at Swan River. Persons requiring specimens of plants would be required to send paper to pack and dry them in, at least until we can get a sufficient supply of that article from London. To nurserymen who will favour us with any orders for seeds or bulbs of Orchideæ, or other plants, we will be particular to send only such as will repay them for their trouble. Any orders addressed to James Drummond and Sons, Swan River Colony, will be carefully attended to. — *James Drummond. Swan River, Dec. 1835.*

New Tringa, shot near Yarmouth. — "On May 24. a new Tringa to this country was shot near Yarmouth, and is now in the collection of J. D. Hoy, Esq., from whom I received this information. The sex was noted at the time: it is the flat-billed sandpiper (*Tringa platyrhyncha* of Temminck); it is rather less than the dunlin, and appears intermediate between that bird and the *Tringa pusilla*."

There was also shot, during the past summer, a fine specimen of the rose-coloured pastor (*Pástor ròseus Temm.*) at Yarmouth, on some trees out of the North Gates. On Aug. 10. was shot, at Elvedon, near Thetford, a very beautiful specimen of the dusky sandpiper (*Tótanus fúscus Leisler*), or spotted redshank of Bewick. It was mounted by J. Reynolds of this town, and presented to the Norwich Museum by W. Newton, Esq., on whose estate it was killed. — *J. D. Salmon. Thetford,*

ART. II. *Proceedings of Scientific Societies.*

METEOROLOGICAL Society.—Dec. 13. Dr. Birkbeck, President, in the chair. Several highly interesting communications were read on the tremendous gale that visited this island on Nov. 29. last: the most important were from the Rev. W. B. Clarke of Poole; Captain W. H. Smyth, R.N., of the Observatory, Bedford; the Rev. W. T. Bree of Allesley Rectory, near Coventry; Mr. W. H. Campbell, Secretary to the Botanical Society of Edinburgh; and Mr. J. G. Tatem of High Wycombe.

From the manner in which the wind was observed to change its direction at various places during the gale, it was considered to belong to that class of hurricanes which traverse the western basin of the Atlantic. These hurricanes consist of a large body of air moving with considerable velocity round an axis which progresses in such a direction as to describe an elliptic or parabolic curve, the apex of the curve being situated about the parallel of the thirtieth degree of north latitude. It was requested that, on future occasions, observers would be careful to note particularly the phases of the storms, and the time when any change in the direction of the wind takes place.

The following extract from a letter from the Rev. W. T. Bree was then read:—“On Oct. 11. last, between eight and nine, P.M., a bright band of light appeared in the sky, extending over the entire vault of the heavens, in the direction of s.w. by w. to N.E. by E. It was about as broad as a rainbow, and brightest at the south-western extremity near the horizon. In a quarter of an hour, or less, it had entirely, but gradually, disappeared.” This phenomenon was seen by other gentlemen present; and Mr. Birt stated that he observed it at London. It appeared to him as an arch or band of light, similar to the auroral arches, much broader than a rainbow, and extending from one side of the horizon to the opposite. The stars it passed over were Capella, the Pole Star, β Draconis, and μ Herculis. The position of these stars on the evening in question would give s.w. by w. to N.E. by E. as its direction as seen from London. It had a perceptible motion towards the south, and was visible about a quarter of an hour.

An interesting paper from the pen of Mr. Patrick Murphy (author of an excellent work on meteorology), anticipating the state of the weather during the approaching month of January, 1837, was next read. The author observed that the tendency of the weather throughout the month will be to *drought*, about

the 5th, if not earlier, frost may be expected to set in; and the greatest cold may be expected to occur in the night of the 13th, or morning of the 14th, succeeded by a thaw. From this period to the 22d, the weather will be squally, with rain; and this will be followed with frosty, dry, and harsh weather, till the end of the month.

It was suggested that meteorologists should rigorously observe the phenomena during the month, and accurately record their observations, and also report them to the Society, with a view to determine how far Mr. Murphy's "anticipations" may be proved to have been correct. At the next meeting, to be held on Jan. 10. 1837, Mr. Murphy will explain to the Society the courses of the late gales, their periodicity, and the method by which he prognosticates the changes of the weather for a period of twelve months in advance.

Mr. Birt (author of *Tabulæ Anemologicæ*) explained the principles of his method of registering the direction of the wind, and other meteorological phenomena, by which the curves of variation are delineated in a manner that is calculated to facilitate the comparison of the courses of the aerial current, either at distant points, or at periods long past. In the tables with which this method was illustrated, Mr. Birt directed the attention of the members to the circumstances that the curves presented similar portions, and that the same curves frequently reoccurred; thus indicating that the phenomena are of a periodical nature. As a remarkable instance of this, he observed that the same curve was described in June, 1833, and June, 1836, the weather on both occasions being similar.*

[Communications on subjects connected with meteorological phenomena, journals, &c., are requested to be addressed to the secretary, Mr. W. H. White, 4. Worship Square, London. — ED.]

ART. III. *Literary Notices.*

IN immediate preparation, a *History of British Birds*, in 2 vols., by Mr. Yarrell; and a *History of British Reptiles*, in 1 vol., by Mr. Bell. These works, with the *British Fishes* now finished, and *British Quadrupeds* now in course of publication, will complete a uniform series of the vertebrate animals of Great Britain, in 6 vols.

In the press, and will shortly appear, in one vol. 12mo, with numerous engravings, *The Wonders of Geology*, by Dr. Mantell, F.R.S. F.G.S., &c.

* We are indebted to Mr. White and Mr. Birt for the above report.

THE MAGAZINE OF NATURAL HISTORY.

FEBRUARY, 1837.

ORIGINAL COMMUNICATIONS.

ART. I. *Remarks on a particular Form of Irritability observed in the Stems of many Plants, especially Exogens, evinced on dividing them in the Direction of their Axis.* By GOLDING BIRD, F.L.S. F.G.S., Lecturer on Experimental Philosophy at Guy's Hospital, &c.

WE are indebted to Dr. H. Johnson of Shrewsbury for the first notice of the very curious and interesting fact of the peculiar kind of vegetable irritability on which I am about to offer a few remarks. This gentleman observed that, "on dividing the stem of almost any herbaceous plant, a singular separation of the divided segments uniformly occurs; and that this separation continues until the stem withers and dies from the loss of its moisture." This discovery was made known by Dr. Johnson, in a memoir read before the Ashmolean Society of Oxford, and subsequently published in the *Philosophical Magazine* for March, 1835.

If a portion of the stem of an herbaceous exogenous plant, but especially those with fistulous stems, as any of the Labiatae, be divided longitudinally, in the direction of the axis of the plant, the division extending to the length of about 2 in., the divided portions will instantly separate from each other to the distance of 1 in., or even more; this separation constantly occurring, in whatever direction the plant may be held. The same thing occurs if the young shoots of woody stems are substituted for those more strictly herbaceous; the young branches of the common privet (*Ligustrum vulgare*), as well as of the jasmine, and many others, possessing this property of diverging on being divided, in a remarkable manner.

From a consideration of the facts thus briefly enumerated, Dr. Johnson was induced to attribute the cause of this di-

vergence to the *vital irritability* of the plants, in consequence of its absence in some which are very elastic, as in the rattan cane, and the dry and very elastic ligneous portions of the stems of plants. He appears to have been led to this conclusion from the apparent necessity of attributing this phenomenon either to the physical elasticity, or to the vital "*contractility*" (? irritability) of the plant itself; and, certainly, the fact of poisons preventing the developement of this divergent property appears to countenance this conclusion. But I think that the observations I am about to offer will be sufficient to show that this peculiarity may be explained on purely *physical* principles, independent of the necessary presence of vital agency; for I apprehend that, in vegetable as well as in animal physiology, it too often happens, that calling in the aid of vitality to explain secondary effects (independent of ultimate causes) is little else than, in other words, a confession of our ignorance.

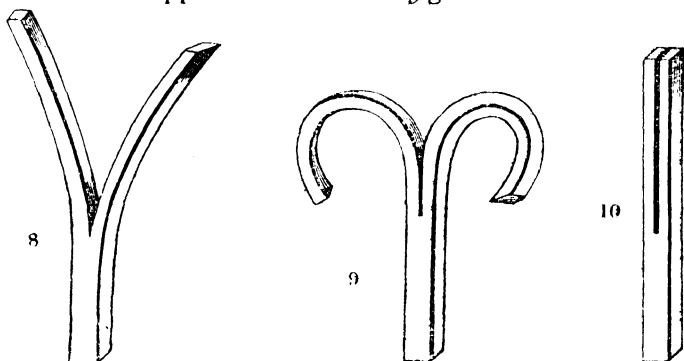
I conceive that the separation of the divided portions of a stem may be explained on the same physical principles which Dutrochet has had recourse to, in his explanation of the irritability evinced by the valves of the seed-vessel of the *Impatiens Balsamina*, and the pericarps of *Momordica Elatèrium*. And here I may be excused a momentary digression, for the purpose of giving a very brief outline of Dutrochet's discovery. This philosopher has shown that, when a fluid, as water, or a weak saline solution, is enclosed in an organised membrane, as a piece of bladder, or placed in a glass tube over which a piece of membrane is firmly tied, and immersed in a solution of sugar, the bladder or glass tube becomes rapidly emptied; but if, on the contrary, the bladder or tube, be filled with syrup, and immersed in distilled water, the reverse takes place, the bladder becoming completely injected and turgid, and the tube filled with fluid; which, at last (if the tube be not too long), runs over. From these facts, amongst many others, M. Dutrochet was inclined to draw the following deductions:—1. That, when a fluid of low specific gravity, enclosed in an organic membrane, is immersed in one of greater density, the membrane becomes rapidly emptied, in consequence of a current being set up from the lighter to the denser fluid (from within and without); and, 2., that, when a dense fluid is enclosed in a membranous reservoir, and immersed in a fluid of a lower specific gravity, a current is set up, whereby the membrane becomes distended by a supply of fluid from without. The exceptions to these two rules are very few, and may at present be set out of the question. For the sake of convenience and conciseness of expression,

Dutrochet applied the term "endosmosis" to the current when established from within to without, and "exosmosis" when from without to within.

Having premised these remarks explanatory of the nature of endosmotic action, I shall proceed to apply them to the explanation of the phenomena of divergence, commencing with a very brief account of some experiments which I performed with the hope of eliciting more information on this point.

1. A piece of the fresh stem of *Làmium álbum* was divided longitudinally, in the manner already described, to the extent of three quarters of an inch: divergence immediately ensued, the upper portions of the segments separating to half an inch.

2. Another piece of a similar stem was treated in the same manner, and its utmost extent of divergence ascertained. It assumed the appearance shown in *fig. 8*. It was then im-



mersed in distilled water: the divergence almost immediately increased; and in half an hour the segments had curved in opposite directions, like the zodiacal sign of Aries (*fig. 9*.)

3. The piece of stem used in the last experiment was removed from the water, and plunged into a weak solution of sugar: in the course of an hour the segments had lost their curvature, and soon after their divergence, approaching so closely as to touch each other. (*fig. 10*.) By replacing the piece of stem in water, divergence again took place; and so on repeatedly.

4. A young plant of *Làmium álbum* was placed in a vessel containing water mixed with hydrocyanic acid, so that the roots and lower part of the stem were immersed in the poisonous mixture. In twenty-four hours the leaves appeared drooping, and even yellowish at their tips, and the stem flaccid; symptoms sufficiently indicative of the poisonous influence exerted by the hydrocyanic acid on the plant. The upper part of

the stem was removed, and a longitudinal section made in the truncated portion : *no perceptible divergence* ensued.

5. The piece of stem used in the last experiment was placed in distilled water. In six hours *the divided portions had separated to the extent of half an inch*. On being removed, and immersed in syrup, the divergence gradually decreased, precisely as in the case of the stem which had not been submitted to the deleterious influence of a poisonous agent.

6. Above 2 in. of the stem of *Stachys palustris*, removed at about 3 in. from its root, was left for some days on a glass plate exposed to the air. From the evaporation of its moisture, it withered, and, in a short time, became nearly dry. In this state, no one would hesitate to pronounce the portion of stem to be quite dead, or, at least, pretty well deprived of any thing approaching to vital irritability. A small piece of this dead stem was removed, and a longitudinal section made in its upper portion ; *but not the slightest appearance of divergence ensued*.

7. The remaining portion of the dried stem of the *Stachys* was placed in a weak syrup. In twelve hours it had absorbed a considerable quantity (? by capillary influence), and nearly regained its natural state of turgescence. A longitudinal incision was then made in its upper portion : *divergence immediately ensued* ; and, on being immersed in water, the segments separated, and became curved as in experiment 2.

The above experiments were repeated with the stems and petioles of different herbaceous plants, and with similar results. Let us now see what deductions can be fairly drawn from them. That the property of divergence does not depend upon "vital irritability," as assumed by its discoverer, is shown by experiments 5. and 7., in which the property was restored, by artificial means, to stems deprived of vital influence, by being isolated from the plants bearing them, and submitted to the deleterious influence of a poison, or to desiccation. Finding that vital influence alone is insufficient to explain the cause of the phenomenon under consideration, we are compelled to have recourse to some physical agent. That this agent cannot be "*elasticity*," the observations of Dr. H. Johnson (op. sup. citat.) are more than sufficient to demonstrate, seeing that the property of divergence is absent in the most elastic parts of plants, as true woody fibre, rattan cane, &c. ; and present in the most delicate herbaceous plants, as well as in the most inelastic ; as in the individuals of the family *Thymelæacæ*. As, then, physical elasticity fails to explain the nature of divergence, we must seek for another more satisfactory cause ; and this, I think, we shall find in

the discoveries of Dutrochet. This acute investigator has shown that the valves of the pericarp of *Impatiens Balsamina* (which, when mature, are well known to separate from each other, and become considerably *curved*, in such a manner that the *convexity* of the curve is on the epidermic, or *external*, surface of the valve) are composed of a vesicular tissue, so arranged, that the vesicles, or cells, nearest the external are considerably larger than those nearest the internal face of the valves; and, consequently, that each individual portion of the vesicular tissue, thus arranged, becomes injected from an accumulation of sap: all the cells, of course, become turgid, and the larger ones occupy, in consequence, a greater space than before. Their complete distention being, however, prevented by the more compact tissue formed by the aggregation of the minuter cells, the whole valve assumes a tendency to curve in such a manner, that the *external* portion, or that composed of the larger cells, may occupy the *convex* part of the curve; and this tendency to curve is obeyed as soon as the resistance of the opposite valve is removed by a slight touch or otherwise. For a minute and elaborate account of this and other instances of irritability depending upon a similar vesicular structure, I must refer to the essay of M. Dutrochet. (*Nouvelles Recherches sur l'Endosmose*, &c., 1828, p. 57. et seq.)

This explanation of Dutrochet, for the separation of the valves of the pericarps of the balsam, may be applied, with but a slight modification, to the phenomena before us. If we make a thin transverse section of the stems or petioles of any plants possessing the property of divergence, as of a lamium, or of the common garden celery, and place it in a drop of water under a good microscope, we shall see a considerable quantity of vesicular tissue mixed with vessels. The vesicular tissue itself we shall find to be very *compact*, and composed of *very minute cells*, nearest the circumference, or external part, and of much *looser tissue*, made up of *larger cells*, nearest the axis, or central part, of the stem, or petiole; presenting a similar anatomical structure to that of the pericarps of the balsam, although arranged in an inverted direction. When, therefore, a stem possessing this structure is in perfect vigour, its vesicular tissue is injected with sap; the larger cells nearest the axis of the plant become considerably distended, and, in consequence, press upon the neighbouring smaller cells; which, resisting this pressure, give to the larger cells a tendency to separate, and occupy a greater space in consequence of this distention; their separation being, however, prevented by their intimate lateral

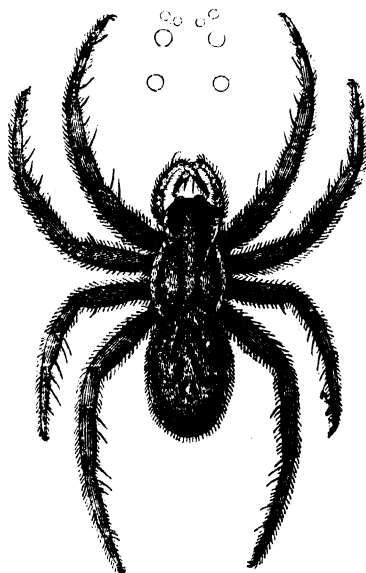
organic connexion. But when this bond of union is severed, by an incision or otherwise, the segments instantly separate, and curve in such a manner, that the *internal portions*, or those made up of the looser vesicular tissue (i. e. cells of larger diameter), form the *convex part* of the curve, and thus have more room for their distention; whilst the *external portions*, formed of more compact tissue, occupy the *concave parts* of the curve, in consequence of their not becoming distended so early or readily as the tissue nearest the axis of the plant.

This explanation is in perfect accordance with the result of experiment; for, on immersing the piece of stem, when the segments have separated to a certain extent, in water, which is a fluid of lower specific gravity than the sap in the cells, endosmosis ensues, whereby a quantity of water is forced into the already turgid cells, which, consequently, become more distended, and the curvature increases; and, on removing the piece of stem into syrup, a much denser fluid than sap, exosmosis, for reasons already explained, ensues; the cells become emptied, and the separated portions recover their former rectitude; the elasticity of the woody fibre present, also, probably assisting. Why, then, it may be asked, should poisons prevent the development of divergence, if it depends upon *purely physical principles*? To this question a very ready answer may be given; for, as poisons diminish or destroy the vital energy of the plant, they prevent the cells becoming distended with sap to an extent sufficient to cause their separation (and, consequently, that of the segments) on making a longitudinal incision; but, on placing the piece of stem in water, *endosmosis* occurs; the cells become completely injected, and the divergent property, consequently, developed. But when (as in experiment 7.) the piece of stem used had been previously desiccated, the cells, by evaporation, were nearly, if not completely, emptied of their sap; and it was necessary to fill them artificially with a tolerably dense fluid, as syrup, before they became sufficiently injected to cause the separation of the segments, on making a longitudinal incision.

From a careful review of the phenomena connected with divergence, as well as of the experiments related by Dr. Johnson (op. sup. cit.) and myself, I think that the conclusion I have arrived at, in considering divergence to be the result of a *purely physical action, independent of vitality*, is fully justified and borne out by the results of reasoning and experiment.

ART. II. *Observations upon the Tarantula (Lycosa Taréntula).*
By M. LEON DUFOUR.

(From the *Annales des Sciences Naturelles*, 1835.)



EVERY one is aware that the name of tarantula has been given to a large spider observed, at first, more especially in the neighbourhood of Tarentum, in Italy, and which has become celebrated because it was supposed that the maladies arising from its reputed venomous bite might be cured by music and dancing. It is not my intention to write the history of this spider, and still less to retrace the fabulous stories related concerning it. With respect to these, we may have recourse to the works of Kircher, Müller, Grube, Valetta, Mouffet, Aldrovandus, Bellon, Jonston, and, above all, the special dissertation of Baglivi, published about the middle of the last century.

In resolving, on the present occasion, to speak of the tarantula, I have no other end than to offer to science some positive facts arising from direct personal observation. It is, without doubt, a tardy homage; for it is more than 20 years ago that, during my stay in Spain, I commenced collecting materials for this task; but these facts, notwithstanding their ancient date, have appeared to me worthy of being brought to light; and, in setting myself to prepare them for publica-

tion, I have been unavoidably led to give them at greater length, in order that they might accord with the present condition of science.

Let us, at first, turn our attention to the determination of the species of the true tarantula. This spider belongs to the genus *Lycosa*, founded by Latreille. The southern countries of Europe are the abode of a considerable number of species of this genus, which have never yet been studied sufficiently. But it must be confessed that this study is accompanied with considerable difficulty, both because the species vary with respect to their size and the shades of their colours, according to their age, and even according to their locality; and because it is necessary, on account of the softness and changeableness of their texture, to observe them alive.

Considered with regard to their habits (and these are a result, a consequence of their organisation), the *Lycosæ* may be divided into two sections. Those of the first section, which are generally larger, more robust, and more industrious, inhabit subterranean intrenchments, regular burrows, which they dig for themselves. We might call these cunicular, or mining, *Lycosæ*. Those of the second remain more habitually upon the surface of the soil, and merely seek a refuge either in fissures in the earth, or among stones and tangled fragments. They would deserve the name of wandering, or vagrant, *Lycosæ*.

The *Lycosa* which makes the principal subject of my observations belongs to the first section. I have studied it in the different countries of Spain; that is to say, in the centre of the Peninsula, at Madrid, at Tudela; in Navarre, which is to the north; in Valencia, situated to the east; and I have received it from Cadiz, which is the southern point of Spain. The specimens of these last-mentioned places have not presented to me any traits which might constitute, in the eyes of a scrupulous entomologist, I will not say species, but even remarkable varieties. There existed between them only some slight differences in the size of the body, or in the shades of the covering; and often these variations are to be observed even in those of the same territory. From the comparison of different specimens of this *Lycosa*, the conviction has arisen in my mind that it is the true tarantula of the ancients; that of all the authors who have written upon Tarentismus, that of Baglivi, Linnæus, Fabricius, Olivier, &c. I hope shortly to impress the same conviction upon the minds of my readers. But, before I enter upon this critical examination, I will attempt a description and specific designation of the *Lycosa* in question.

LYCO'SA TARE'NTULA (Tarantula), fig. 11.

Supra grisea nunc nigrescens nunc lutescens, marginibus pallidioribus; cephalothorace plus minusve obscurius nebuloso; mandibulis nigris basi antica grisescente; abdominis dorso maculis geminis 2—3 semi-sagittatis lineolisque posticis transversis nigris; subtus nigra, ventre atro-velutino marginibus anoque late intensive ochraceis; trochanteribus, femorum basi tibiarumque maculis duabus nigris.

Aranea Tarantula Lin. *Syst. Nat.*, 1035. 25.; *Fabr. Entom. Syst.*, vol. ii. p. 423.; *Oliv. Encycl. Méth.*, No. *Lycosa melanogaster*, Latr. *Nouv. Dict. d'Hist. Nat.*, 2e édit.

Hab. in aridis Europæ australioris. Long. 10—14 lin.

The cephalothorax, in specimens that are recently adult and very fresh, that is to say, not injured by friction, has on the upper side a bed of greyish hair, sometimes uniform, sometimes displaying on each side of the central line a large longitudinal spot, which is more obscure, and which often appears only a dusky stain. Older specimens, or those which have been carelessly handled, have often the back of the cephalothorax stripped of its bed of hair; and we see then the naked tegument, which is of a brownish colour. In every instance the edges of the trunk have a more decided tint of an ochreous or clayey grey. The part surrounding the eyes is bristled with a few upright hairs. The eyes, which, during life, have sometimes the colour of rubies, are either brown or inclining to black in dead specimens, with a pale circle at their base. The strong huge mandibles are of a shining black, except at their anterior base, which is covered with a down, more or less grey or ochreous in colour. The other parts of the mouth are black. The feelers have a tint of ochre, which is often vivid; but they are always black at the extremity.

The abdomen has a very obtusely oval form; but it is more or less developed according to the sex of the individual, and to some accidental circumstances relating either to gestation or alimentary repletion. As in other spiders, that of the male is much the smaller, and in some wasted or feeble individuals it is often so reduced as to be disproportioned to the cephalothorax. The colour of its covering, as seen on the upper side, presents some variations. In old individuals, it is of a deep grey, bordering upon black: in recent adults, a yellowish grey, more or less spotted with black, predominates; but the circumference is of a clearer ochreous grey. The two anterior thirds of the central part display two, rarely three, pair of half-arrowhead-shaped black spots, of which the point is directed backward. The hinder third is marked with transverse blackish lines, slightly curved. The under side of the body of the tarantula is black, which constitutes one of the

most striking of its specific marks. The abdomen is occupied by a large black spot, of a rounded oval shape, of a deep velvet-like black, bordered upon the sides by an ochreous tint, sometimes vivid, but never inclining to yellow. The region of the anus, that is to say, that which surrounds for a considerable space the brown disk from which the threads proceed, is also of an intense ochreous colour.

The legs, which are strong and stout, are on the upper side of a uniform blackish or yellowish grey; but below there are, always upon the second joint of the tibia, two black spots, more decidedly marked, from the clearness of the ground of yellowish grey which surrounds them. One of these spots occupies the base, and the other the extremity, of the joint just mentioned. The first encroaches upon the first joint of the tibia, or the knee-pan. The two joints which form the trochanter, as well as a great spot at the base of the thigh, and a small one at the extremity, are also black. The second joint of the tibia, and the first of the tarsi, are armed with rather long small spines, rigid, and movable upon their bases, which are of great use to the tarantula in seizing and retaining its prey. The knee-pan and the last joint of the tarsus are without these spines; but we find some upon the thighs. The tarsi of the two pair of anterior legs are supplied on the under side with a thick bed of hair, disposed like a brush, which is not observed upon any of the others. This brush is of use to the tarantula chiefly in performing its toilet, and to fasten itself when climbing up smooth surfaces. The two claws which terminate the tarsi are tolerably stout, black, pectinated; that is to say, furnished within so as to spring from their bending, with a single row of five teeth, distinctly separated when viewed with a microscope.

Let us see whether the spider which I have just described is the true tarantula, or, in other words, and without entangling ourselves in the labyrinth of an antiquated erudition, let us enquire if it be the *Arànea Tarántula* of Linnæus, for the nomenclature of natural history goes back no further. Here are the exact words of the Swedish Pliny:—“*Aranea subtus atra, pedibus subtus atro fasciatis.*” This description applies exactly to our *Lycôsa*: the marks spoken of are the first which strike our eyes, especially when we are not able to observe this spider in a living state, and can consult only dead specimens, more or less deformed, or figures roughly executed. Now, Linnæus must have found himself precisely in this latter case, when he collected the materials of his immense and monumental work, the *Systema Naturæ*. There was no occasion for the colour of a lighter or darker grey, as

belonging to the back of the tarantula, to be defined by this author, because it is common to almost all spiders. As to the triangular spots which are observed on the hinder part of the abdomen, when the specimen under examination is fresh, they become so far effaced by the contraction of the dried integuments, that it is necessary to be aware of their existence to recognise any trace of them. I have at this moment before me many large specimens of our *Lycosa*; and, if I had not formerly proved beyond doubt the shape and large size of these spots, I should have found it impossible to include them in the description of the species. Thus, in looking back to the time and the circumstances in which Linnæus lived, we must pass over his silence with regard to the colour of the tarantula just described.

Let us now examine the body of this *Lycosa* in its lower parts. The blackness of its mouth, of its breast, of the upper part of its legs, of the spots upon the front of its legs, and especially upon its abdomen, form a striking contrast with the grey of its upper part. The importance of this well-marked specific character has been appreciated by the eagle eye of the legislator of natural history; and he has rightly made it the foundation of his laconic description. The ochreous colour which, in fresh specimens, is observed around the abdomen, and more particularly near the anus, grows faint, and ceases to become a striking mark of the species, when the skin is shriveled by drying. Finally, I shall add, to account for the circumstance of Linnæus's having only described the characteristics furnished by the lower part of the spider, that, very probably, he supports himself by the figure of Olearius, which he cites. Now, following the testimony of M. Walckenaer, who is an authority of considerable weight in this matter, this figure of Olearius represents only the lower side of the tarantula; and it is, according to him, very easily to be recognised, although but a rough sketch. As to the detestable figure of Baglivi, which, in the time of Linnæus, had its value, and which, as M. Walckenaer relates, has been copied and recopied by a crowd of authors, even by Boccone and Albin, referred to also by Linnæus, the tarantula there is sketched only on the upper side; and it is impossible to observe any of the spots I have spoken of.

The specific account of Fabricius, in his *Entomologia Systematica*, as well as in his *Species*, published twelve years before, is expressed in these terms, relatively to the *Aranea Tarantula*: — “*Abdominis dorso maculis trigonis nigris, pedibus nigro maculatis.*” In the same manner, the entomologist of Kiel, in explaining the most striking characteristic fur-

nished by the dorsal parts of the abdomen, seems to have had nothing in view but to complete the description of his master Linnæus, which he quotes, word for word, at the end of his own. We must take particular notice, that these two founders of the science of entomology have said nothing which can lead us to presume the existence in the tarantula of a black stripe upon the abdomen. The species which they have mentioned is, without doubt, that which I have met with in ten places in Spain, and of which I here produce a figure. (*fig. 11.*)

The detailed description of the Arànea Taréntula which Olivier has given in his *Encyclopédie Méthodique*, and which appears to have been taken from specimens he had himself observed in Provence, is adapted, in all points, to the one which is the subject of my paper. It is also the Linnæan species, the fundamental one.

Latreille had at first (I know not upon what evidence, for he does not cite any authority), advanced, in the *Histoire des Araignées*, making part of Sonnini's *Buffon*, that the tarantula of Linnæus and Fabricius had the lower surface of the abdomen of a clear vermilion, with a black stripe crossing the centre. In his *Genera*, as well as in the second edition of the *Nouveau Dict. d'Hist. Nat.*; in that of the *Règne Animal* of Cuvier (1829); and, finally, in his *Cours d'Entomologie* (1831), Latreille has confined his description to the Linnæan species, excluding the synonyme of Olivier. I think I have more than proved that Linnæus, Fabricius, and Olivier had all three mentioned or described one and the same tarantula, and that this is, in all respects, similar to the species which is the object of my present essay. Now, I repeat, the abdomen of the tarantula of these authors, and of mine, displays neither any red or saffron colour, nor any stripe across the centre.

Without disputing the existence of a species of *Lycôsa* which shall be characterised by these last traits, I conclude merely that it is not the tarantula of Linnæus. I regret very much my not being able to consult the recent figure in the *Iconographie du Règne Animal*, cited by Latreille, in his course of entomology, with reference to the species.*

* I met with a species of *Lycôsa*, in December, 1831, under the stones on the barren mountains of Murviedro, in Valencia, which I find thus described in my notes: — "*Lycôsa fascii-véntris* *Nob.* — *Cinereo-grisea*, abdominis dorso maculis triangularibus nigris coadunatis; ventre ochraceo fascia in medio transversa atra lateribus unidentata. This species is smaller than the true tarantula, which it very much resembles. However, I have

This author has described, in the second edition of the dictionary before referred to, under the new name of *Lycòsa melanogàster*, a species to which he refers both the *Araignée Tarentule* of Olivier, and the *Lycose narbonaise* of M. Walckenaer, and, I should almost say, my *tarentula* also; since, as he has been so good as to inform me, he devotes an article of some length to the description of some specimens of it which I had transmitted to him during my stay in Spain. The correspondence admitted by Latreille between these species is correct; but I think that we must add to them those of Linnaeus and Fabricius, and, finally, substitute the name of *Taréntula* for the epithet *melanogàster*. For the same reason, the *Lycòsa* described by Latreille under the name of *Taréntula*, and which has a black stripe in the centre of the abdomen, ought to receive another name, and, perhaps, will not differ from that which I have called, in the preceding note, *fàscii-véntris*.

I think I have made all which relates to the describing, the determining the species, and the recognising, of the *tarantula*, sufficiently clear. It now remains for me to bring forward facts relative to its habits and mode of life, arising from my own observations; facts which may be depended upon as positive and authentic, because I have been careful to preserve them in writing at the time. These are the materials which may serve to complete the history of this celebrated spider.

The *Lycòsa* inhabits, from preference, exposed places; dry, barren, uncultivated, and open to the sun. It hides itself, generally, at least when it is full grown, in underground passages, complete burrows, which it digs for itself. These burrows, though noticed by many authors, have been imperfectly apprehended and studied. Cylindrical, and often 1 in. in diameter, they are sunk more than 1 ft. in the soil. But they are not simply perpendicular, as has been advanced. The inhabitant of the trench proves that he is, at the same time, a skilful hunter and an able engineer. It was necessary, not only that he should construct a deep intrenchment, which might hide him from the pursuit of his enemies; he must also establish there a place of observation, from which he could spy out his prey, and dart, like an arrow, upon it. The *tarantula* has foreseen all. The subterranean passage has, in effect, at first, a vertical direction; but, at 4 in. or

seen specimens which were ten lines in length. The black stripe which crosses the centre of the abdomen presents, on each side, at its lower end, a little tooth-shaped projection.

5 in. from the surface, it turns in an obtuse angle, forms a horizontal bend, and then reassumes the perpendicular. It is at the commencement of this bend that the *Lycòsa*, established as a vigilant sentinel, never for a moment loses sight of the door of his dwelling; and it was there that, at the time I was seeking him, as I shall proceed to relate, I perceived his eyes, glittering like diamonds, rendered bright, like those of a cat, by the darkness. The exterior orifice of the tarantula's burrow is ordinarily surmounted by a funnel constructed altogether by itself, and which no author has mentioned. This funnel, a true piece of architecture, rises about 1 in. above the surface of the soil, and is sometimes 2 in. in diameter; so that it is larger than the burrow itself.

This last circumstance, which looks like a piece of forethought in the industrious spider, is of wonderful use, in the necessary extension of its legs, at the moment when it is about to seize its prey. This funnel is principally composed of fragments of dry wood united by a little clay, and disposed one upon another, in such an artist-like manner, that they form a scaffolding in the shape of an upright column, of which the interior is a hollow cylinder. What establishes most firmly the solidity of this tubular edifice, of this advanced bastion, is, that it is lined, tapestried within by a tissue formed of the threads of the *Lycòsa*, and which is continued through the whole interior. It is easy to conceive how useful this skilfully fabricated drapery must be, both in preventing the crumbling in of the earth, or any such accident to the structure, and for the maintenance of its order, and, also, to assist the tarantula in scaling his fortress.

I have admitted that this outer fortification of the burrow does not always exist: indeed, I have often met with the holes of tarantulas where no traces of it could be seen. Possibly, in these instances, it might have been accidentally destroyed by unfavourable weather; or the *Lycòsa* might not always meet with materials for its construction; or, perhaps, the talent for architecture only declares itself in individuals arrived at the last stage of physical and intellectual developement. Nevertheless, it is very certain that I have had numerous opportunities of proving the existence of these funnels, these outworks of the tarantula's abode. They illustrated to me, on a larger scale, the cases of some of the *Phryganeæ*. This spider has had many purposes to answer in its construction. It not only protects its intrenchment from inundations, and fortifies it against the falling of external bodies, which, swept by the winds, would be likely to close it up, but it also serves as an ambush, by offering to flies, and other

insects upon which the tarantula feeds, an enticing resting-place. Who shall tell us all the stratagems employed by this adroit and intrepid hunter?

The tarantula is not the only species of *Lycosa* which raises an edifice of masonry above the entrance of its subterranean dwelling. The *Lycosa habile* (*Lycosa perita Latr.*), discovered by Latreille in the environs of Paris, has also, according to this author, the habit of constructing a little conical and taffetied funnel of extraneous materials, earth, &c. (*Latr., Cours d'Entom.*, tom. i. p. 537.)

We will now give some account of the search after the tarantula, which is amusing enough. The months of May and June are the most favourable season for making it. The first time that I discovered the holes of this spider, and had satisfied myself that they were inhabited, by perceiving him stationed at the first stage of his dwelling, which is the bend that I have already described, I thought the best way to obtain possession of him would be to attack him by open force, and follow him to the termination of his burrow. I passed whole hours opening the intrenchment with my knife, in order to sack his domicile. I dug to the depth of more than 1 ft., over a space 2 ft. in width, without meeting with the tarantula. I recommenced my operation in other holes, and always with as little success. I ought to have had a pick-axe to attain my end; but I was far from any house, and in Spain. I was then obliged to change my plan of attack; and I had recourse to stratagem. Necessity, they say, is the mother of invention. It occurred to me to take, by way of bait, a stalk surmounted by a spikelet, and to shake it and rub it gently against the opening of the hole. I was not long in perceiving that the attention and desire of the *Lycosa* was awakened. Tempted by this lure, he advanced, with a slow and irresolute step, towards the spikelet; and, upon my drawing it back a little out of the hole, in order to leave him no time for reflection, he frequently used to throw himself, at one spring, out of his dwelling, the entrance of which I instantly closed. In this case, the tarantula, greatly disconcerted to find himself unable to regain his domicile, was very awkward in his attempts to elude my pursuit; and I obliged him to take up his quarters in a piece of paper, in which I instantly shut him up.

It sometimes happened that, suspecting the snare, or, perhaps, less pressed by hunger, he held back, immovable, at a little distance from his door, which he did not judge it advisable to pass, until my patience was completely exhausted. When this occurred, these are the tactics I made use of:—

After having well observed the direction of the hole and the position of the spider, I drove in with force, and in an oblique direction, the blade of my knife, in such a manner as to surprise the creature behind, and cut off his retreat by stopping up his hole. I seldom missed my stroke, especially in soil which was not stony. In this critical situation, either the tarantula, terrified, quitted his covert to make his escape, or he persisted obstinately in remaining driven up against the blade of the knife. Upon this, causing the knife to make a sudden sweep, I threw out both the earth and the *Lycôsa*, and seized upon the latter. By employing this method of capture, I sometimes took as many as fifteen tarantulas in an hour.

In some circumstances, when the tarantula was quite aware of the deceit which I was practising, I have been not a little surprised, on my pushing in the spikelet so as to even touch him in his den, to see him play with it with a sort of contempt, and push it back with his claws, without giving himself the trouble to seek the farther end of his retreat.

The Apulian peasants, from Baglivi's account, also hunt the tarantula, imitating, at the mouth of the hole, the humming of an insect, by means of an oaten stalk. "*Ruricolæ nostri*," he says, "*quando eas captare volunt, ad illarum latibula accedunt, tenuisque avenacæ fistulæ sonum, apum murmuri non absimilem modulantur, quo audito foras exit tarantula ut muscas vel alia hujusmodi insecta, quorum murmur esse putat, captat; captatur tamen ista a rustico insidiatore.*" (Baglivi, *Opera Omnia*, p. 356.)

The tarantula, frightful as it is at first sight, especially when one is impressed with the idea of danger from its bite, and shy as it appears, is yet very capable of being tamed, as I have many times found by experience. Here, perhaps, I may be allowed to recount, in few words, the history of one of these *Lycôsæ*, which I kept alive for more than five months.

On May 7. 1812, during my stay at Valencia, in Spain, I took, without hurting him, a tarantula of tolerable size, which I imprisoned in a glass covered over with paper, in which I had made a square opening. In the bottom of the glass I had fixed the roll of paper in which I had carried him, and which was to serve him for a dwelling. I placed the glass upon a table in my sleeping-room, that I might have frequent opportunities of watching him. He quickly accustomed himself to his cell, and ended by becoming so familiar, that he would come to eat out of my fingers the living fly that I brought him. After having given his victim its death wound with his jaws, he did not content himself, like most spiders, with sucking the head, but bruised all its body by plunging it

successively into his mouth with his feelers. He then threw away the triturated remains, and swept them to a distance from his hiding-place. After his repast, he seldom omitted attending to his toilet, which consisted in brushing, with the tarsi of his anterior legs, his feelers and mandibles, without as well as within; and, having done this, he resumed his attitude of immovable gravity. The evening and night were his times of walking and attempting to escape. I often heard him scratching against the paper of his prison. These nocturnal habits confirmed the opinion I have already advanced, that the greater number of spiders have, like cats, the faculty of seeing by night as well as by day.

The 28th of June, my tarantula changed his skin; and this moult, which was the last, did not alter, in any perceptible manner, either the colour of his covering or the size of his body.

The 14th of July, I was obliged to leave Valencia; and I remained absent till the 23d. During this time the tarantula fasted. I found him quite well upon my return. The 20th of August, I was again absent for a period of nine days, which my prisoner supported without food, and without any alteration in his health. The 1st of October, I again left the tarantula without any provision. The 21st of this month, being twenty leagues from Valencia, where I was about to remain, I sent a servant to bring him to me. I had the regret of finding that the vase which contained him was nowhere to be met with; and I could not learn his fate.

I shall terminate my remarks upon the tarantula by a short description of a singular combat between these creatures. In the month of June, 1810, one day, when I had been successful in my search after the *Lycosæ*, I chose two full-grown and very vigorous males, which I put together into a large vase, that I might witness the spectacle of a mortal combat. After having many times made the circuit of their arena, in the endeavour to shun each other, they hastened, as at a given signal, to set themselves in a warlike attitude. I saw them, with surprise, taking their distance, and gravely rising upon their hind legs, so as to present to each other the buckler formed by their chests. After having looked each other in the face for about two minutes, and, without doubt, provoked each other by glances which I could not discern, I saw them throw themselves upon one another, entwine their legs, and endeavour, in an obstinate struggle, to wound each other with the hooks of their mandibles. Either from fatigue, or by mutual consent, the combat was for a while suspended: there was a truce for some seconds; and each wrestler, retiring to a

little distance, resumed his menacing posture. This circumstance reminded me that in the single encounters of cats there were also suspensions of arms. But the struggle was not long in recommencing, with more fury than before, between our two tarantulas. One of them, after victory had been a long time doubtful, was at length overthrown, and mortally wounded in the head; he became the prey of the vanquisher, who tore open his skull, and devoured him. After this murderous combat, I kept the victorious tarantula alive for many weeks.

I have been forestalled by Baglivi in the description of this arachnomachy; and, though he does not enter into any detail, his suffrage upholds my observations. Here are the words of this author:—“*Si duæ solummodo tarantulæ in aliquo vase claudantur, altera alteram interficit et comedit brevi temporis intervallo.*” (*Baglivi*, l. c., p. 356.)

ART. III. *Some Observations on the Oak.* By VON OSDAT.

Behold the forest, and th' expansive verdure
Of yonder level lawn, whose smooth shorn sod
No object interrupts, unless the oak
His lordly head uprears, and branching arms
Extends. Behold, in regal solitude
And pastoral magnificence he stands:
So simple! and so great! the underwoods
Of meaner rank an awful distance keep.

If any pleasure can be called bright, beautiful, and lasting, it surely is a love of nature, particularly of the green things that clothe the earth's surface: the contemplation of them gives a tone of health and freshness to the mind, and the cultivation of them vigour to the body. They afford occupation in our youth, and a delightful source of calm enjoyment in our after years. They serve as living and lasting memoranda of our pleasures and our sorrows; and, when the silent hand of Time has “wede away” the companions of our youth and the friends of our manhood, the trees we have planted remain to us in all their increased and increasing loveliness and beauty. It is an absolute duty, that every one should till his paternal patch of ground: the size makes little difference in the pleasure; and the interest taken in this rational and active enjoyment has a greater tendency to lead the feelings to real and permanent happiness than many persons may imagine. I have taken a fancy to three of our native plants: a tree, a shrub, and a flower: although all the others are either beautiful or interesting, still, more particularly (in part,

perhaps, from association), I love these three; the oak, the ivy, and the hare-bell. The two latter being only ornamental, it is of the oak I intend to make some few observations. Of all our forest trees, not one so much deserves the attention of the naturalist and planter as the oak. In every state, from the seedling plant to the last stage of decay, this beautiful and majestic tree solicits admiration from the eye of taste, as well as the less refined calculations of the speculator of profit. Botanists have given two species of the oak, *Quercus Ròbur* (common British oak), and *Quercus sessiliflòra* (sessile-fruited oak); but both species sport in infinite varieties. It has been the opinion of some planters, that the wood of the *sessiliflòra* is inferior in quality to the *Ròbur*; and I am inclined to favour that opinion myself. I think it will be found, on examination, that the wood of the *Ròbur* is more dense and compact than the *sessiliflòra*, and grows into a more noble and majestic tree. Among the mountainous parts of the Welsh borders, the *sessiliflòra* grows very plentifully; but I am not aware that I ever saw one grown to a very great size, although I have seen some, to all appearance, of great age. The beauty and utility of the oak appears to have been appreciated by the Druids, from which their appellation is taken: *derw* (oak), Welsh; *darach*, Gaelic; and of which the *llan*, or sacred grove, was chiefly composed. On its branches grew the mystic mistletoe, used at their solemn rites; and, as now, no doubt the mistletoe was more abundant on the crab and hawthorn than on the oak, some peculiar virtue was attributed to the one rather than the other, from the beauty or utility of the tree upon which the parasite grew. This, probably, I may be allowed to infer, as, under the patched investiture of ancient mythological rites, we may easily trace a veneration for certain plants and animals that were of service to, or that held an influence over, the moral and physical condition of man. Its utility to our British ancestors must have been very great; for the fruit (however astringent and unpalatable it may be to a modern appetite) formed a portion of their food, and the rifted logs their chief article of firing. It seems to be lord of the soil; and more adapted to our clime than any other denizen of the forest. Unless in the neighbourhood of the sea (a most unhappy situation for any tree), it never shows a "weather side to the storm." When the acorn begins to germinate, the radicle, or what planters term the taproot, very deeply strikes into the earth, and anchors itself safely in its place; and this is done long before the stem has risen from the cotyledons but a comparatively short length, perhaps not one

fourth as long as the radicle; as though instinctively aware, in embryo, of the howling storms and beating blasts which, in after-life, its massy arms are doomed to contend with. Planters are aware of this circumstance; and, when the acorns are dibbled in beds, they are generally transplanted after the second year's growth; for, should they remain longer, it is next to impossible to get them up without injury to the taproot; and, if this be done, the plant rarely afterwards thrives well. This is the reason why self-sown trees, particularly the oak, grow better and more freely than those which have been removed. The acorns form the food of some of the gallinaceous birds; and I have commonly observed rooks fly away with them in their bills, and more frequently drop them in their flight, than any other sort of food I have seen them carry, owing, no doubt, to the polished smoothness of the outside capsule; and I have often observed fields freely planted by this means. About the middle of the merry month of May, generally, the gradual expanding of the crimped yellowish foliage of the oak presents a most refreshing and beautiful feature in our landscape, and gives a richness and mellow relief to the vivid and more dazzling green of the woods; while its extended and twisted arms, thickly curled and matted branchlets, form a dark and harmonious contrast beneath. It does not, as the sycamore and many other trees of rank and lush foliage, burst suddenly into leaf; but, as the season advances, expands to the blessed and balmy gales, deepened in its tint, and more mature in its aspect. The wood, formerly, when much more plentiful, was applied to almost all purposes where wood was wanting for durability and strength, particularly of household furniture and building. Few persons, I think, can look without feelings of admiration and pleasure on the now blackened, but beautifully carved, wainscoting in some of the ancient halls of our baronial ancestors; or see the heavy old oak table, with its massive carved legs and framework, without conjuring up in fancy the great wassail bowl circulating round it, amid the boisterous mirth and happy hearts of the rude and merry wassailers. The contrast is very great indeed between this sort of furniture and the flimsy and luxurious kickshaws of a modern hall or drawingroom; where every thing of *native* growth, worth, or beauty, is kicked out, to make room for *foreign* tinsel, or *something worse*. In some of our old churches may be seen fine specimens of the durability of the oak in the great beams and rafters: they, untouched by the tooth of Time, or the burrowing of the worm, have stood for ages; have seen creeds change and dynasties alter, and, pro-

bably, may see them again and again. But there is one purpose for which the British oak stands alone, unrivalled in the world, the purpose of ship-building. As adapted to this, it has been the boast of our country, and the terror of our foes; lauded in lyric strains, from the inglenook side of the humble mud cabin to the princely halls of the noble; and well indeed is it merited.

“Britannia needs no bulwarks,
No castles on the steep;
Her march is o’er the mountain waves,
Her home is on the deep.”

The bark of the oak is of very great value as an article of commerce, from the astringent principle called *tannin*, which it contains in much larger proportion than the bark of any other tree. This ingredient, as is well known, it is, with which the raw hide is saturated in the process of tanning, preserved, and fitted for sale and use. The value of the bark, for the purposes of trade, depends very much on the age; as that which is peeled from the full-grown and healthy tree contains much more of the requisite principle, than either the sapling, or that which is old, gnarled, or decaying. The bark on the healthy growing tree, although rough, rugous, and seamed, is by no means unsightly to look upon; but has a fitness and adaptation, as the external covering of the majestic bulk which it envelopes. And, oh, what a grapple it affords for the ivy, with its smooth, bright, and glinting leaves (for ever green), to creep up the trunk, and enringing itself round the barky fingers, and, grateful for the protection it receives, deck it in garlands of beauty in the last stage of decay!

ART. IV. *On the Psychological Distinctions between Man and all other Animals; and the consequent Diversity of Human Influence over the inferior Ranks of Creation, from any mutual and reciprocal Influence exercised among the Latter.* By EDWARD BLYTH, Esq.

(Continued from p. 9.)

MAN only, by the habitual exercise of his reasoning powers, appears to be competent to trace effects to their remote causes; and is thereby enabled to recognise the existence of abstract laws, by assuming the guidance of which he can intentionally modify their operation, or, from observation, convert them to a means of accomplishing his various ends. It is thus he wields the principle of gravitation; and it is thus, from studying the inherent propensities

and consequent habits of other animals, that, by judicious management, he contrives to subdue their instincts (as in the case of the elephant just mentioned), or to direct their force towards effecting other purposes than those for which they were more legitimately designed. But a more remarkable sequence of human interference is, that, by removing animals from their proper place in nature, and training them to novel modes of life, wherein the field for the exercise of their original instincts becomes much limited, their faculties of observation and reflection are, in consequence, brought more into play, in proportion as the former are rendered inefficient; till, at length, experience not unfrequently supersedes innate impulse as the main spring of their actions; more especially where they have become attached to a human master, and pass much of their time in his society. Yet even here the difference between man and brute is still manifest, in the transmission of acquired knowledge by generation, in the offspring inheriting as innate instincts the experience of their parents*; so that the tendency of brutes is ever to become slaves to a certain amount of intuition, rather than beings dependent on their own intelligence.

And here we recognise a fundamental principle of domestication, which is only gradually induced to any extent through a series of generations. Thus the elephant, though tamed, is not domesticated, for every individual is separately captured in a wild state; and we have seen that, when one of these returns to its proper haunts, its natural instincts having been only for a time subdued and rendered subservient (not eradicated), these have again become the incentives to its conduct, to the exclusion of those reasoning faculties which had only been excited into action under circumstances adverse to the efficient operation of the former. Far otherwise is what we observe in animals truly domesticated: witness the opposite conduct of even the newly hatched progeny of a wild and domestic duck, though

* Propensities are similarly transmitted in the human race, but certainly not the knowledge of how these are to be gratified. It is true, however, that our observation in these matters is too much confined to cultivated, domesticated man, who is, consequently, farthest removed from the brute creation. The Australian savages are known to have a great *penchant* for snails and caterpillars; and I have somewhere read of one of these who had been brought up in a town, and carefully kept away from all communion with others of his race, who, nevertheless, exhibited the same fondness for these dainties, despite the abhorrence with which all his companions regarded them. His *gout* for them must thus unquestionably have been hereditary; though it is probable he may have learned the fact of their being eaten by his race, which, likely enough, induced him to taste and try them.

incubated by the same bird. But here a question arises, that, as numerous instincts in domestic animals, which are now hereditary, are known to have been originally habits superinduced by man's agency, to what extent may not all the innate propensities and consequent habits of animals have originated in the acquired experience of their predecessors?

As with all other subjects, we must trace the series upward from its more simple phases. In the insect world, we discern the most complicated instincts; modes of procedure of which the consummate wisdom excites our admiration and amazement, and bearing reference to a future generation, in beings which are but creatures of an hour. Can it be supposed possible that the progenitors of these derived their habits from acquired experience, and transmitted them as innate instincts to their posterity? Here we must ascend to a higher source, which, being admitted, the marked uniformity, also, of the instinctive habits of all wild animals, before commented on, warrant us in concluding that these were from the first imprinted in their constitution, and may, therefore, be legitimately esteemed as forming part of the specific character.*

The tendency of human influence is every where to destroy whatever conduces not to man's enjoyment, as superfluous, and only cumbering the ground; but to secure, by every means the reasoning faculties can suggest, a due continuance and never-failing supply of all that tends to the gratification of our species. Brutes, on the contrary, evince indifference to whatever does not immediately concern them; and although, practically, their influence upon their prey is for the most part decidedly conservative, yet they individually continue to destroy without reflection, and endeavour not, by any forbearance, or plan resulting from reasoning, to insure the perpetuity of their provision. That the squirrel or jay should instinctively plant acorns is, of course, nothing whatever to the purpose: we have already tested the sagacity of the former animal; and we know that the latter, removed from its proper office in wild nature, will bury a bit of glass or clipping of tin as carefully as it does a seed.

It may be worth while to devote a few remarks to the consideration of the unintentional agency of brutes, towards not only preventing the over-increase of their prey, which would only lead to too much consumption of the food of the latter, and so bring about famine and consequent degeneration from

* The reader will observe that the doctrine here controverted is but an application of the exploded hypothesis of M. Lamarck.

insufficiency of nutriment, but likewise towards preserving the typical character of their prey in a more direct manner, by removing all that deviate from their normal or healthy condition, or which occur away from their proper and suitable locality, rather than those engaged in performing the office for which Providence designed them. In illustration, it will be sufficient to call attention to the principle on which many birds of prey are enabled to discern their quarry. When the tyrant of the air appears on wing, his dreaded form is instantly recognised by all whose ranks are thinned for his subsistence; and instinct prompts them to crouch motionless, like a portion of the surface, the tint of which all animals that inhabit open places ever resemble; so that he passes over, and fails to discriminate them, and seeks perchance in vain for a meal in the very midst of abundance; but, should there happen to be an individual incapacitated by debility or sickness to maintain its wonted vigilance, or should its colours not accord sufficiently with that of the surface, as in the case of a variety, or of an animal pertaining to other and diverse haunts, that creature becomes, in consequence, a marked victim, and is sacrificed to appease the appetite of the destroyer: so profoundly wise are even the minor workings of the grand system; and thus do we perceive one of an endless multiplicity of causes which alike tend to limit the geographical range of species, and to maintain their pristine characters without blemish or decay to their remotest posterity.

Thus it is that, however great may be the tendency of varieties to perpetuate themselves by generation, we do not find that they can maintain themselves in wild nature; nor do the causes which induce variation, beyond the occasional and very rare occurrence of an albino, prevail in those natural haunts of species to which their structural adaptations bind them. We have already noticed the anomalous influence of human interference in altering the innate instincts of the lower animals, thereby unfitting them to pursue the mode of life followed by their wild progenitors. It would be needless to amplify on the concomitant effects produced by domestication on the changes in the physical constitution and adaptations of the corporeal frame of animals, which oftentimes render them dependent on human assistance for continuous support, in the degree of their domesticity. Such changes are equally imposed on the vegetable world by cultivation; and they every where mark the progress of man, and exhibit in indisputable characters the diversity of his influence over the inferior ranks of creation, from any mutual and reciprocal influence observable among these latter.

I may cursorily allude to hybridism also, as a phenomenon,

so far as can yet be shown, at least in animals, where fecundation cannot happen fortuitously, in every instance referable to human interference. As yet, I have failed to meet with a single satisfactory instance, wherein commixture of species could not be directly traced to man's agency, in superimposing a change on the constitution of the female parent. This is a subject of exceeding interest; and I am glad to avail myself of every occasion to endeavour to incite some to undertake its further investigation. There can be little doubt that certain of our domestic races, as the common fowl, are derived from a plurality of species, which, however, do not blend in wild nature; so that their union (assuming the hypothesis to be correct) may here, at least, be fairly ascribed to domestication. Still, when we consider that separate species (i. e. races not descended from a common stock) exhibit, as is well known, every grade of approximation, from obviously distinct to doubtfully identical, there appears, I think, sufficient reason at least to suspect that circumstances may sometimes combine to induce those nearest allied to commingle. That the mixed progeny, too, would in some instances be mutually fertile, I know in the case of the hybrid offspring of the *Anser cygnoides*, and the common goose; but, in birds generally, the converse nevertheless obtains, as is particularly instanced, I have learned, by the hybrid *Fringillidæ* reared in confinement; and also the mule betwixt the common fowl and pheasant; the males of all which appear (from a variety of instances I have been fortunate in collecting) to have been incompetent to fecundate the eggs produced.* Perhaps the superior size, too, of these hybrids generally to that of either of their parent species may be explicable on the principle which occasions the large growth of capons. However, none of the species here alluded to are by any means so closely allied as many that are known to exist; and, therefore, as in the vegetable world the degree of fertility in hybrids is in the ratio of that of affinity between the parents, those derived from very approximate species being, apparently, quite as prolific as the pure race, analogy would lead us to infer that the same law holds in the animal creation. At present, we have no proof of it: and I may conclude the subject by observing that the cases of supposed union (apart from human influence) betwixt the carrion and hooded crows, so often insisted on, are inconclusive, inasmuch as it does not appear that the individuals were ever examined and compared, although black varieties of *Corvus Cornix* have been several times known to occur. Indeed, I have myself examined a female specimen,

* Since writing this, I have been informed of a solitary instance of a

on which were several black feathers intermingled with the ordinary ash colour on the back.*

The agency of the human race has been likened to that of brutes, in the particular that, as man effects the destruction of one species, he necessarily advances the interests of another.† How far he may permanently benefit the latter, might be discussed on principles that have been already expounded. More able writers, however, have put the enquiry whether man, by taking certain plants, for instance, under his protection, and greatly extending their natural range by cultivation, does not thereby unintentionally promote the welfare of the various species which subsist upon them. But, will it be argued that man, by vastly increasing the breed of sheep, is unconsciously labouring for the advantage of the wolves? As little can it be concluded, regarding the human race as progressive (in which it differs from all other species), that any race hostile to man's interests can be permanently benefited by his agency. The question, in short, resolves itself into one of time.

It has already been intimated, that man is the only species that habitually destroys for other purposes than those of food. This leads me to a few remarks on the extinction of species. Without alluding, however, to the more direct agency of the human race, towards accomplishing the destruction of every terrene species which conduces not in some way to our enjoyment, we will merely consider the natural causes which suffice to extirpate all other races, but are inadequate to effect the extinction of the human species. We have already seen that brute animals, in a state of nature, are merely beings of locality, whose agency tends to perpetuate the surrounding system of which they are members. It tends to do so, but is insufficient to effect this permanently; because, in the immensity of time important changes are brought about in every locality, by causes ever in operation, to which the faculties of the inferior animals are blind. They must, therefore, perish with their locality, unless distributed beyond the influence of the change; for their adaptations unfit them to contend for existence with the more legitimate habitants of diverse haunts, in proportion as they were suited to their former abode: and it

* A friend informs me that he has repeatedly noticed, in Aberdeenshire, the pairing of a black crow with an ordinary individual of *C. Cornix*; and he further assures me that, to judge from its most commonly sitting, the former was in every instance the female bird. (Are not the black individuals noticed in Ireland, and assumed to be *C. Corone*, in reality varieties of *C. Cornix*?) It may be added, that the circumstances occasioning the alleged union, stated by Temminck, betwixt the *Motacilla lugubris* and *M. alba* require much additional investigation.

† Vide IX. p. 613.

must be necessary for creatures of instinct to be thus expressly organised in relation to their specific haunts, even to all the minutiae we perceive, in order to enable them to perform efficiently their destined office; which exquisite adaptation, however, cannot but of course disqualify them for maintaining their existence elsewhere. In man only we discover none of these partial adaptations, further than that he is intended to exist upon the ground; and the human race alone, in opposition to all other animals, takes cognisance of the progressive changes adverted to, and, from reflection, intentionally opposes obstacles to their course, or systematically endeavours to divert their energy. Man's agency, indeed, tends everywhere to alter, rather than to preserve, the indigenous features of a country; those features which natural causes combine to produce: in short, he strives against the united efforts of all other agents, insomuch that, wherever he appears, with his faculties at all developed, the aspect of the surface becomes changed: forests yield to his persevering labours; the marshes are drained, and converted into fertile lands; the very climate, accordingly, changes under his influence, which every way inclines to extirpate the indigenous products of the soil, or to reduce them, by domestication, to a condition subservient to the promotion of human interests. Does not, then, all this intimate that, even as a mundane being, man is no component of that reciprocal system to which all other species appertain? a system which for countless epochs prevailed ere the human race was summoned into being. His anomalous interference, therefore (for this word most aptly expresses the bearings of human influence upon that system), essentially differing from the uniform agency of all the rest, in not conducing to the *general* welfare, is thus shown to be in no way requisite to fill a gap in the vast system alluded to. All rather tends alike to indicate him a being of diverse, of higher destiny; designed, in the course of time, with the aid of physical causes ever in operation, and the presumed cessation of the creative energy, to revolutionise the entire surface of our planet. I will presently recur to this subject as regards marine productions. It is sufficiently evident, that, as the human species is bound to no description of locality, but alike inhabits the mountain and the plain, and is, by self-contrivance, enabled to endure the fervid heats of tropical climes, equally with the withering blasts of a polar winter, it is consequently proof against the undermining effects of those surface changes which suffice to effect the extermination of every other.* Its future removal, then, from this

* There is no occasion, here, to follow out all the causes which combine to bring about the extirpation of species; but I will mention one which

scene of existence, whenever that shall happen, will probably be brought about on another principle : how, it would be most

appears not to have been duly considered by those who have written on the subject. We have every reason to believe that the original germ of an animal may be developed into either male or female ; and it is certain, that external circumstances exercise a very considerable influence in determining the sex of the future being. Now, the results of experiments instituted on sheep by the Agricultural Society of Séverac fully warrant the conclusion, that, where species exist under circumstances favourable for their increase, a greater number of that sex is produced, which, in polygamous animals is most effectual for their multiplication ; whereas the contrary obtains, probably, in proportion to the difficulty of obtaining a livelihood. The relative age and constitutional vigour of the parents is likewise an important element in this problem ; and, combined with the former, will enable us to calculate an average with tolerable precision. I have collected some very curious facts bearing upon this subject, some of which are extremely difficult of explanation. Mr. Knapp, in his *Journal of a Naturalist*, has the following, which is worthy of close attention :—" The most remarkable instance," he observes, of variation in the relative proportion of the sexes, " that I remember of late, happened in 1825. How far it extended I do not know ; but, for many miles round us, we had in that year scarcely any female calves born. Dairies of forty or fifty cows produced not more than five or six ; those of inferior numbers in the same proportion ; and the price of female calves for rearing was greatly augmented. In a wild state," he justly observes, " an event like this would have considerable influence upon the usual product of some future herd." (Note to p. 138.) This occurred in Gloucestershire. The character of the preceding season is not stated ; but, most probably, it was one of scarcity to the parent animals. The following list exhibits the proportion of the sexes in the annual produce of generally six cows, of the Ayrshire breed (four being the same individuals throughout, the remainder their produce), kept in a park in this neighbourhood. It commences with the year in which the present superintendent took charge of the stock ; and there is no question but that, if the stock-books of other persons who have the care of cattle were to be duly looked over for a series of years, many similar and equally interesting facts would be brought to light :—

In 1826, from 6 cows, were born 6 male calves, 0 females.

1827	-	6	-	-	6	-	-	0
1828	-	6	-	-	6	-	-	0
1829	-	5	-	-	4	-	-	1
1830	-	6	-	-	3	-	-	3
1831	-	5	-	-	0	-	-	5
1832	-	5	-	-	0	-	-	5
1833	-	6	-	-	0	-	-	6
1834	-	6	-	-	0	-	-	6
1835	-	6	-	-	3	-	-	3
1836	-	6	-	-	2	-	-	4

Thus it appears that, for the first four years, but one female calf was produced out of twenty-three births ; that in the succeeding year the proportions were equal ; that in the next four years, out of twenty-two births, there was not a single male ; and that in the following year, again, the sexes were in like proportions. The present season, alone, has formed an exception to this remarkable regularity, which I have in vain endeavoured to solve by making every enquiry concerning the male parents. There is some reason, also, to suspect that the same phenomenon will be found to obtain

useless to enquire. There is no reason, however, hence to anticipate that supernatural means must *necessarily* be resorted to, as a malignant disease might suffice to level all ranks in the dust. It is enough for my present purpose, to indicate in this the diversity of the human from all other species.

Some have argued the connexion of man with the reciprocal system to which the inferior animals pertain, because, forsooth, he sometimes is annoyed by parasites. Without dwelling upon this topic, I may be allowed to say that it remains to be shown that any are peculiar to the human species. The certain fact, that different races of mankind are infested by distinct species, rather points to the conclusion, that, as the bed cimex can subsist and thrive away from human habitations, so also may even those species which abide on the person.*

(To be continued.)

ART. V. *On the Longevity of the Yew, as ascertained from actual Sections of its Trunk; and on the Origin of its frequent Occurrence in Churchyards.* By J. E. BOWMAN, Esq., F.L.S.

(Continued from p. 35.)

MANY reasons have been assigned for the frequent occurrence of the yew in our churchyards: to me, it always seemed most natural and simple to believe that, being indisputably indigenous, and, from its perennial verdure †, its longevity, and

among wild birds. The Hon. and Rev. W. Herbert remarks, incidentally, that he has found in the nests of whitethroats (*Currûca cinerea*) a great predominance of males, and the contrary in those of whinchats and stonechats; which latter I have also noticed myself; but cannot say that I have remarked it in a sufficient number of instances, nor over a sufficient extent of ground, nor for a sufficiently protracted period, to be enabled to deduce any general or satisfactory conclusion: the fact can, in most instances, be only ascertained (without slaughtering a great number) by raising them to maturity in confinement. But the young stonechat may be readily distinguished even in the nest: the immature males having a large pure white spot above their wings, which in the females is pale brown. The subject is extremely worthy of further investigation, and it is needless to point out its important bearings in wild nature.

* It is amusing to observe how gravely the loss of these parasites is commented on in Vol. IX. p. 612. as a necessary consequence of the extermination of human beings. Let us suppose they were to perish; what then? Have not myriads upon myriads of every class of beings become extinct, as species, without affecting at all the workings of the mighty system? Why, then, should the dreaded loss of a few parasites, the sphere of whose influence cannot be supposed to extend beyond that of the species to which their adaptations link them?

† Its very name seems to be derived from the Celtic, *iw*, signifying *verdure*.

the durability of its wood, at once an emblem and a specimen of immortality, it would be employed by our pagan ancestors, on their first arrival here, as the best substitute for the cypress, to deck the graves of the dead, and for other sacred purposes.* As it is the policy of innovators in religion to avoid unnecessary interference with matters not essential, these, with many other customs of heathen origin, would be retained and engrafted on Christianity on its first introduction. It would indeed be surprising, if one so innocent and so congenial to their best feelings were not allowed, as a tribute to departed worth or friendship, under that new and purer system, which confirmed to them the cheering prospect of a reunion after death with those who had shared their pleasures and affections here. History and tradition concur in telling us that this was the case, and that the yew was also closely connected in the superstitions of our simple forefathers with ghosts and fairies.

In a very ancient Welsh bard, we are told of two churches eminent for their prodigious yew trees : —

“ Bangor Esgor, a Bangeibyr Hênllan
Yssid er clodvan er clyd Ywyz ;”

which Dr. Owen Pugh thus translates : — “ The Minster of Esgor, and that of Hênllan, of celebrity for sheltering yews.” Hênllan signifies an *old grove* ; thus proving that its church stood where druid worship had been performed. Can we, then, longer doubt the real origin of planting it in our churchyards? And, if it be said that this, its usual, though not natural, situation rather proves the venerable trees we find there not to be older, at most, than the introduction of Christianity, I reply, that our earliest Christian churches were generally erected on the site of a previous heathen temple, and that at least one motive for placing them there would be their proximity to trees so sacred, already venerable for size, and indispensable in their religious rites. That these rites were performed, and altars erected, in groves, from the highest antiquity, we know from the Pentateuch. The devotions and sacrifices of Baal among the Moabites, and the idolatrous rites of the Canaanites and other gentile tribes, were performed in groves and high places. The druids chose for their places of worship the tops of wooded hills, where, as they allowed no *covered* temples, they cleared out a circular space, and erected their circles of stone.† Many of the first Christian

* I am told that in some parts of Hampshire it is still the custom to sponge the bodies of the dead with an infusion of yew leaves, under the idea that it retards or prevents putrefaction.

† It worthy of remark, that many of the remote Welsh churches are on little eminences among the wooded hills. Mr. Rootsey of Bristol sug-

churches were built, and intertwined with green boughs, on the sites of druidical groves. When Augustine was sent by Gregory the Great to preach Christianity in Britain, he was particularly enjoined *not to destroy the heathen temples*, but only to remove the images, to wash the walls with holy water, to erect altars, &c., and so *convert them into Christian churches*. These were the *designata loca Gentilium*, in which our converted ancestors performed their first Christian worship. *Llan*, so general a name for towns and villages in Wales, is a corruption of the British *llwyn*, a grove; and, strictly, means an enclosure, rather than a church, the places so designated being, probably, the earliest inhabited spots, and also those where religious rites would be celebrated. *Eglwys* means a Christian church (ecclesia); and, probably, those were so called which were first erected after the introduction of Christianity, and not on the site of a heathen temple.

But this is not the place to pursue this curious subject; nor am I competent to discuss it. I am satisfied with having brought forward sufficient proofs, from the laws of nature examined upon scientific principles, of the great longevity of the yew; and, as history and tradition give their concurrent testimony that it was held sacred by our remotest ancestors, I think we cannot avoid the conclusion, that many of the specimens which still survive must have been planted long before the first promulgation of Christianity.* Nay, some yews, still standing, are probably above 3000 years old. Who, without emotion, can look upon one of these primeval giants, the oldest of living forms; which, after braving the storms and accidents

gested to me whether our words kirk and church might not originate in *cerrig*, a stone or circle of stones, the first churches having been placed within these circular stone enclosures. Hence also, perhaps, *caer*, a camp, which word is also used in some parts of Wales for the wall round a churchyard. Dr. Stukeley believes that *round churches* are the most ancient in England; though others, I know not why, do not agree with him. A circle was the most sacred symbol among the Eastern nations of antiquity; and it would be interesting to know whether the raised platform within a circle of stones, which is sometimes found round our old yews, as in Darley and Llanfoist churchyards, is not a remnant of this superstition.

* If the superannuated yew in Braburn churchyard, Kent, mentioned by Evelyn in his *Sylva*, as being then (in 1660) 58 ft. 11 in. in circumference; or that at Crowhurst, in Surrey, which was then 30 ft.; be still standing, it would be well if some competent person would fix their age by examination of actual sections: also that of the great Fortingal Yew, near Loch Tay, named by Pennant, and which is still standing, or was in 1833. It is also desirable that any fine old tree, of whatever kind, should be measured and placed on record, with the date and any other particulars, which would hereafter form valuable standards whereby to estimate their future increase, and establish a general average rule.

of so many centuries ; after being the contemporary of successive dynasties and governments now swept away, and surviving various changes in the customs, nay even in the language and religion, of the country ; still enjoys a green old age, and promises to remain, for centuries to come, the living, though unconscious, witness of other unforeseen events and changes, when we shall have joined our fathers beneath its shade ?

Since writing the above, I have had an opportunity of seeing many venerable yews in Monmouthshire ; and have been informed that one or more such may be found in most of the retired country churchyards among the hills in that county and in Breconshire. Though I was not provided with the means of taking sections, the extraordinary dimensions and singular growth of two of these yews deserve to be recorded. The first (*fig. 12.*) is in the churchyard of Mamhilad, a few miles north



of Pontypool : it is a female ; and, 2 ft. 6 in. from the ground, where the trunk has a fair medium thickness, it measures 29 ft. 4 in. in circumference. At about 4 ft. high, it divides into six main boughs, one of which is quite decayed. The trunk is quite hollow from natural decay ; and on the north side it has an opening down to the ground, which is gradually contracting on both sides by annual deposits of new wood. Within this opening, and in the centre of the original tree, is seen another, and apparently detached, yew, several feet in diameter, covered with bark, and in a state of vigorous growth : it is, in fact, of itself a great tree, and overtops the old one. On examination, however, it is found to be united behind, and also at some distance from the ground, by two great contorted arms, one on each side, to the inner wall of its decaying parent ; being a singular example of natural inarching, and having altogether a very striking and singular appearance. The accompanying portrait of the trunk and main boughs will, I hope, make my

description more intelligible. Another yew, a male, in Llanthewy Vach churchyard, near Caerleon, measures 30 ft. 4 in. in circumference at 3 ft. from the ground; and, like the last, has a stunted and hollow trunk, and a lateral opening, and will hold five or six persons. It has also in the centre a still more remarkable inner trunk covered with bark, *quite detached* and distinct from the old one below, but united with it above by a great branch running into, or, more probably, proceeding from, it. I will explain how I conceive these inner trees have been produced, after stating the fact which has suggested the idea; for, without such evidence, it would not have been easy to understand them. On the excursion of the botanical section of the British Association from Bristol to Portishead, Mr. Bright of Ham Green, after regaling our party with a sumptuous *déjeûné à la fourchette*, courteously took us to the churchyard of Portbury to see two very lofty yews, much longer in the bole than usual. One of the company, Mr. Ball of Dublin, ascended the oldest of these, and announced *that a small branch from the base of a bough had shot downwards into the decayed top of the trunk; and which, on being pulled up, proved to be a perfect root, upwards of 3 ft. in length.* This singular circumstance, which, I dare say, many of the eminent naturalists then present will recollect, will, I think, fully explain the origin of the inner trunks above described. When the top of the trunk became cracked by the action of storms upon the boughs, the rain would find access, and, in time, cause decay; and the dead leaves and dung of bats, birds, &c., falling in, would combine with the rotten wood to form a soft rich mould, into which a bud shooting out from a neighbouring part (if not actually covered by the mould) would naturally be drawn by the moisture and surrounding shade, and transformed into a root. As the fissure widened and deepened by the slow but sure progress of decay, this root would descend and thicken, and ultimately fix itself in the soil below. After a lapse of, perhaps, several centuries, decay would approach the circumference of the trunk, and produce a rift on one side: through this the rotten mould would fall out, and gradually expose the root it had conducted downwards; and, the combined influence of light and air acting upon its juices, it would soon deposit annual layers of true wood, and be covered with a true bark. Meanwhile it would have shot up a stem near its point of union, and have formed for itself an independent head and branches. All this is in strict conformity with the known laws of vegetable physiology; and some similar process has produced the peculiarities I have described in the Mamhilad and Llanthewy Vach yews. We have detected it,

in its earlier stage, in the Portbury tree; and the three instances occurring so near together make it probable that, under favourable circumstances, the yew has the power of thus perpetuating itself. If so, it may be said to have a new claim to be considered the emblem of immortality. There is no doubt that, barring accidents, the inner trunks of the two old ones just named, will survive as independent trees, when, centuries hence, the surrounding walls of their original boles shall have completely disappeared; and, should no record of its true history exist, an observer then will be quite unconscious that it is but a portion of a former tree, whose germ existed, perhaps, three thousand years ago; for the lateral scar, which would for a while mark its point of union, would, in time, be closed up, and buried beneath new deposits.*

ART. VI. *Observations upon Volùta Lamberti, with a Description of a gigantic Species of Terebrátula from the Coralline Crag.*
By EDWARD CHARLESWORTH, F.G.S.

PRIOR to the publication of my remarks in the last Number of the *Magazine of Natural History*, upon the *Volùta Lamberti*, I communicated my intention to M. Deshayes, informing him at the same time of the opinion entertained by British conchologists, as to his having erroneously placed that fossil on the list of existing species. Having, in the course of my former paper, mentioned the silence of M. Deshayes upon this subject, it is now only just for me to state that within the last few days a letter has reached me, dated 15th of the present month (January), in which it appears that illness and other causes prevented his replying to mine at an earlier period. He thus explains the grounds which led him to class the *crag Volùta* with those fossil species which have living analogues.

“Vous me demandez, Monsieur, des renseignements sur le *Voluta Lamberti* de Mr. Sowerby. Vous savez mieux que moi ce que M. Sowerby dit de cette coquille dans son *Mineral Conchology*: il dit en avoir vu l’analogue vivant pêché dans les mers du sud: il en décrit les couleurs; et c’est à cette description que je me suis confié pour mentionner cette espèce parmi les analogues vivants et fossiles. Plusieurs personnes sur le témoignage des quelles je pouvais compter m’ont dit avoir vu à Londres l’analogue vivant du *Voluta Lamberti*. Ce sont là les seuls renseignements que je possède à ce sujet, et ils ne vous apprendront rien que vous ne sachiez mieux que moi. Quant aux fossiles, je puis vous

* The greater part of this Paper was read at the meeting of the British Association at Bristol, where it excited very great interest. — Ed.

affirmer après un très-minutieux examen, que l'analogue identique du *Volùta Lamberti* se trouve aux environs d'Angers, dans les fallons de la Touraine, et aux environs de Bordeaux et de Dax, dans mon second étage tertiaire.

"Les individus que vous m'avez envoyés de cette espèce sont plus beaux que ceux que je possédais dans ma collection. Il est évident que ces coquilles étaient déjà fossiles lorsqu'elles ont été reprises par la mer et roulées sur les côtes. Je vous ferai observer que les couleurs qu'elles ont acquises, ne ressemblent point à celles décrites par Sowerby; et il faudrait avoir bien peu l'habitude de comparer des coquilles vivantes et fossiles pour croire que celles-ci sont vivantes parce qu'elles ont été trouvées dans la mer." *

Sowerby's observations respecting this fossil have evidently been quite misinterpreted by M. Deshayes, as will be seen on perusing the passage referred to, which occurs at p. 65. of vol. ii. tab. 129. "I retain this as a *Volute*, although the base is, perhaps, scarcely emarginate, and is more taper than usual. It is rather curious that about five specimens have been found in a recent state much resembling this, which are in the hands of different cognoscenti; Mr. Hall is said to have two, Mr. Jennings one, of which I have seen drawings, some of which indicate an emarginate base; the shape, in other respects, is so near that it might be considered the same; the colour also corresponds; the recent one is, however, finely marked with zig zag or lightning-like stripes, of the colour of the warmest or darkest line of our figure, and is altogether to be admired, so that it has got the appellation of *elegans*. It is said to be a native of the *Feejee Islands* in the *South Seas*. I have seen a recent specimen approaching it with a

* "You ask for information respecting *Volùta Lamberti*. You are fully aware that Mr. Sowerby, in his *Mineral Conchology*, speaks of having seen the living analogue of this fossil, taken in the *South Seas*. He describes its colours, and it is upon this description that I have depended in placing this species among living analogues. Several persons, upon whose testimony I can rely, have told me that they have seen in London the living analogue of *Volùta Lamberti*. This is all the information which I possess on this subject, and it will teach you nothing that you do not know better than myself.

"With regard to the fossils, I can assure you, after a very minute examination, that the identical analogue of *Volùta Lamberti* is found in the neighbourhood of Angers, in the marl pits of Touraine, and in the environs of Bordeaux and of Dax, which belong to my second tertiary period. The individuals which you have sent me are finer than any specimens in my collection. It is evident that these shells were already fossil when taken up by the sea, and cast upon the beach. You will observe that the colours which they have acquired do not resemble those described by Sowerby; and one must be little in the habit of comparing living and fossil shells, to believe that these are living because they have been found in the sea."

broad expansion of the outer lip, and emarginate base, without coloured markings."

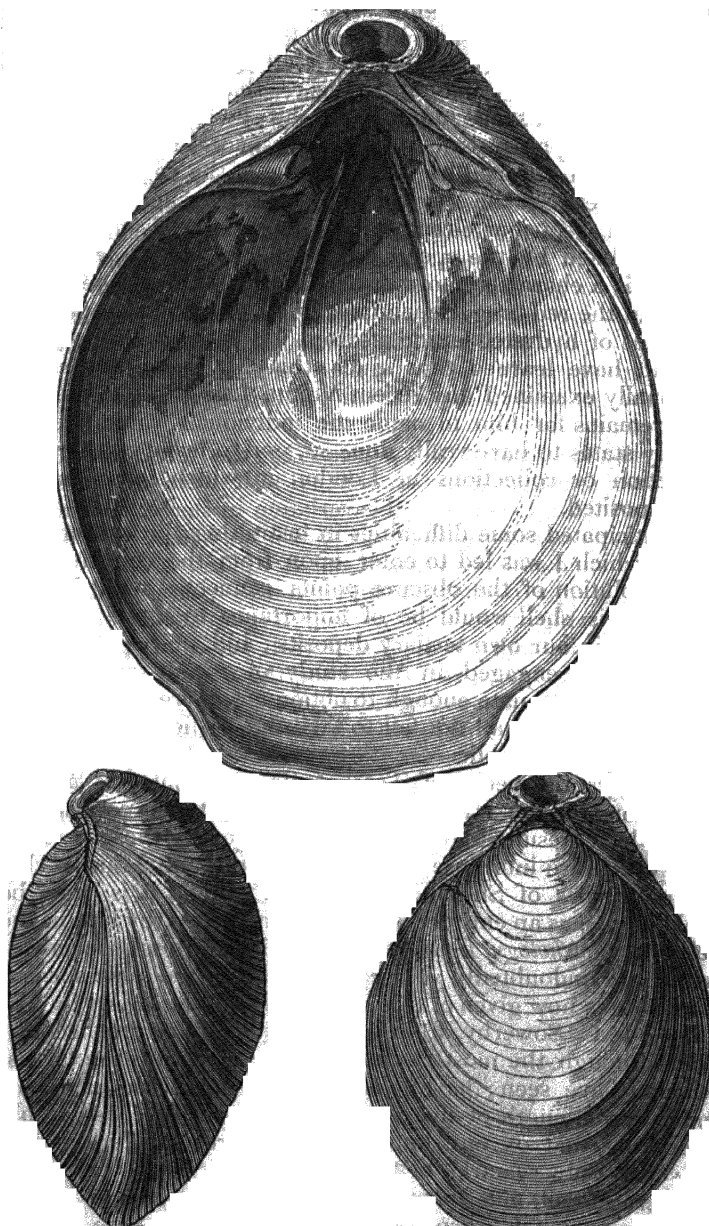
It appears, therefore, that the statement upon which M. Deshayes depended amounts to this:—that Mr. Sowerby had seen *drawings* of shells *said* to be in the possession of Mr. Hall and Mr. Jennings, resembling in *some* respects *Volùta Lambérti*.

The fact mentioned by Mr. Sowerby of the correspondence in colour between the crag volete and the drawings to which he refers is a suspicious circumstance, because the deep ochreous tint exhibited by the specimen figured in the *Mineral Conchology* is a character more or less common to all the fossils found in the red crag, depending, in all probability, upon the presence of hydrated oxide of iron. It is, however, satisfactory to have learned thus much, that M. Deshayes has not personally examined any recent *Volùta Lambérti*, and it now only remains for him to name the individuals whom he explicitly states to have really done so, and to learn of them the collection or collections in London in which these rarities are deposited.

I anticipated some difficulties in instituting the present enquiry, which I was led to enter upon from the consideration that a solution of the obscure points connected with the history of this shell would be of importance to those who are interested in our own tertiary deposits; and, perhaps, not less so to those engaged in the study of recent conchology. Should I be fortunate enough to obtain any more facts relating to the subject, I shall not fail to take the earliest opportunity of making them public.

The gigantic species of *Terebrátula* represented at *fig. 13*. forms one of the numerous additions to fossil conchology which have resulted from the examination of those tertiary beds which are interposed between the crag and London clay in some parts of Suffolk. This shell cannot, it is true, be looked upon as an entirely new fossil, since Sowerby has, in the *Mineral Conchology*, figured and described several specimens, which are undoubtedly young individuals of the same species. The figures now given of this singular fossil are drawn by Mr. James de C. Sowerby, from specimens in my own collection; and, although the most perfect, are by no means the largest which I have seen; having occasionally met with fragments indicating a length of five or six inches, a size considerably exceeding that of any known fossil or recent *Terebrátula*. Sowerby only remarks of this shell that it is a very abundant crag fossil, and that the valves are never found joined, and always much worn.* In the red crag, whence Sower-

* Sowerby's Min. Con., vol. vi. p. 148.

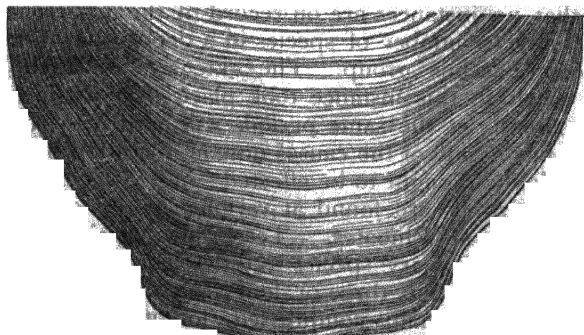


a, *Terebratula* (natural size) from the coralline crag of Sudburn, Suffolk : *b* and *c*, a smaller specimen of the same species, with the valves in contact.

by's specimens were obtained (by Mrs. Murchison), this is certainly by no means an abundant fossil; the other observation with respect to it is perfectly correct, as I have never met with it there but as a solitary valve. I believe, however, that this shell, in common with many others, known as "crag species," has been introduced into that deposit at the expense of an *older* formation, by the operation of causes analogous to those which are now indiscriminately mingling the Mollúsca of the crag with those of the German Ocean. It is only in the beds *beneath* the crag that this *Terebrátula* occurs naturally grouped, and, when found there, the valves are most commonly in contact, but we should naturally expect to find them dislocated when washed out of their original matrix, either by the encroachments of the sea, or by the action of a river upon the bed in which they may have been deposited.

Sowerby designated this species by the term *variábilis*, from observing that many specimens of it were much more orbicular than others; now, this variation in shape, constantly exhibited by immature shells, is shown only in a very slight degree by such as have attained the size of *fig. 13. a.*

There is one distinction between the young and adult shells deserving particular notice; it consists in the production of the margin of the dorsal valve of the latter. During the early stages of growth, the edges of the valves do not encroach upon one another, there being only a simple adaptation of the margins in an even line, sometimes accidentally distorted, from the excessive thinness of the shells at the line of junction. When, however, the shell has attained the length of 3 in. or more, the front edge is rather suddenly produced,



External view of *fig. 13. a.*, showing the production of the front margin.

with an abrupt termination as at *fig. 14.* which is received into a notch in the opposite valve. This locking together of the

valves is not, as in most instances, attended with a depression of the produced portion in the one, and a corresponding elevation in the other, interrupting the regularity of the oval form exhibited by the two shells when in contact. The dorsal, or perforated, valve is the more convex, and its apex, or beak, is produced, and in young specimens considerably incurved. The foramen for the passage of the byssus is always circular, and sometimes large enough to admit the tip of the little finger. In adult shells the length, measuring from the perforation to the opposite margin, is about one fourth greater than the width. The lines of growth are very clearly defined, the shell being in other respects perfectly smooth. The interior of the dorsal valve is thickened towards the apex in a most remarkable manner, and to an extent which sometimes diminishes the capacity of a considerable portion of it by one third or even more. The singular appendages attached to the ventral, or lower, valve of this genus, are often preserved unbroken; but, from their extreme delicacy, it is almost impossible to remove the substance which has filled the cavity of the shell, without effecting their destruction.

The *Terebrátula* is a particularly interesting genus to the geologist, from the vast numbers in which it is universally found throughout nearly all the secondary formations, and in the more ancient fossiliferous strata; while a considerable number of species are still in existence, though these latter bear but a small numerical proportion to the amount known only in the fossil state.

So far as the researches of geologists have at present extended, it would seem that this genus ceased to be abundant at or prior to the commencement of the tertiary epoch. I believe that no instances are on record of the occurrence of any considerable number of species in a deposit belonging to the supra-cretaceous group. The extensive destruction of species which in this instance took place over an immense area, apparently at the same period, will hardly be referred to the agency of any of the causes now in operation by which extermination is thought to be effected; more especially, too, as the living shells are found at various depths, and in the seas of nearly all climates. *Terebrátula variabilis* is, I think, the only tertiary species yet described as occurring in this country, though three or four are said to exist in the British seas. A small, compressed, longitudinally striated species is abundant in the London clay of the Isle of Sheppy; and, besides the one now figured, Mr. Scarles Wood possesses two others from the coralline crag, neither of which is known in the living state.

Another genus of Brachiopodous Mollúsca, *Lingula*, now only found in the seas of hot climates, is associated with the *Terebrátula* in the coralline crag. No legitimate inferences, respecting the temperature of the period when this formation was deposited, can be drawn from the latter of these two genera, since, as I have already mentioned, it is one capable of supporting various temperatures.

The cliffs of Norfolk and Suffolk have suffered an amount of degradation, within the historic period, which would lead us to suppose that some hundred square miles, along this line of coast, may have been swallowed up by the encroachments of the sea, since our eastern tertiary deposits have occupied their present level. Now, when we consider that the crag is often little else than a mass of shells, having an average thickness of perhaps 18 ft. or 20 ft., and that some thousand individuals must often be contained in the space of a cubic yard, it is easy to conceive that, could we only have access to the deposits now forming in the neighbouring ocean, a difficulty would sometimes arise, in endeavouring to distinguish between those fossil and recent shells which may there have been embedded during any very long period. In all probability we should meet with new forms, derived from the extensive destruction of tertiary deposits, while we should also expect to find some species of *recent* Mollúsca with which we are as yet unacquainted. In this investigation, an attention to specific distinctions would avail us nothing, and the shells of both periods might have been so acted upon by external agents as to have removed those adventitious characters which each of them formerly possessed. Even now specimens of *Túrbo littóreus* are sometimes found in the crag of Norfolk which exhibit scarcely any appreciable difference, when placed beside dead shells of their existing analogue. I admit, however, that the instances I have supposed would be exceptions to the general rule, but it is otherwise with the *Testácea* which we find thus associated in the red crag. Here the organic remains have indiscriminately acquired one common ferruginous aspect, which has superseded all other characters; and it is utterly out of our power to determine whether the animal belonging to these worn and solitary valves of the *Terebrátula* existed during the formation of both deposits, or only during that of the coralliferous beds.

Here, perhaps, it will not be irrelevant to notice the means by which the age of the upper crag has been determined. 111 species taken from it, collected at different times and by different individuals, upon being examined by M. Deshayes, were found to include 66 extinct forms; and the crag was

therefore called an older pliocene deposit, and presumed to be contemporaneous with all other formations exhibiting the same proportion of extinct Testacea ! *Terebrátula variabilis* would, of course, be one among the number ; and it was not for M. Deshayes to enquire into the conditions attending its occurrence. He had simply to decide upon the number of recent species in the shells submitted to his examination from a given deposit, and then to assign its geological position by the new principles of chronological classification.

In this instance, however, the result obtained from the application of the per-centage test has been completely invalidated, by the discovery of facts which indicate an association of the fossils of different periods over one deposit ; clearly pointing out the extreme caution with which those general conclusions should be received which are based upon the numerical calculations of the conchologist. Had the crag occupied some very distant locality, and our acquaintance with its history been limited to the examination of its fossils, hastily gathered by some geological explorer, as is the case with many tertiary deposits, it would have been called an older pliocene deposit, and the accuracy of this conclusion would never have been questioned.

The facts which have been brought forward respecting the history of the Suffolk crag, and which indicate such wide limits of error in the application of the per-centage test, have only been elicited in consequence of long continued and careful investigation. No one source of fallacy connected with numerical calculations has there been pointed out, which may not also exist to a greater or less extent in all other tertiary formations.

To return, however, from this digression to the immediate object of my paper, I may observe that the *Terebrátula variabilis*, like the *Volùta Lamberti*, is unknown in that part of the crag which contains mammalian remains. The specimens figured are from a quarry at Sudburn, upon the estate of the Marquess of Hertford : I have also found it in the large quarry by the side of the road leading from Aldborough to Leiston, and it is of frequent occurrence at Ramsholt. Could Mr. Sowerby have seen this fossil in the state in which it is procured at these localities, I do not think he would have distinguished it by the term *variabilis*. *Máxima* would seem a more appropriate designation ; particularly too, if, as I have some reason to imagine, the variations in form are principally confined to the early periods of growth.

REVIEWS.

ART. I. *Report of the Expedition for exploring Central Africa, from the Cape of Good Hope.* (Published for the Subscribers only.)

IN the year 1834, some spirited individuals resident at the Cape, from a desire to promote the objects of science and likewise to benefit the commercial interests of the colonists, raised a fund for the purpose of fitting out an expedition to explore a portion of Central Africa. With these ends in view, rather a numerous party equipped in a very efficient manner, were dispatched from the Cape, the arrangements and whole superintendence of the expedition being committed to the care of Dr. Andrew Smith; and, among the instructions placed in his hands, particular directions were given for collecting all the materials in his power, relating to the natural history of the districts which he was about to explore.

After an absence of about eighteen months, the party have returned; and a report, containing a description of the route which they pursued, a list of the various specimens collected, and a general summary of their whole proceedings, is now laid before the subscribers.

The undertaking appears to have been very judiciously and ably conducted by Dr. Smith, who seems to have met with the most zealous cooperation on the part of the missionaries; he thus concludes his narrative —

“The importance of the services which were rendered by the various missionaries we visited will, ere this, have been apparent; yet, comparatively speaking, but a small proportion of their real utility has been noticed, from the necessity of abstaining, on the present occasion, from particular details. To all of them I consider the Association to be deeply indebted for whatever degree of success has attended the exertions of the expedition; and to the Rev. Mr. Moffat especially, for the friendly reception and kind treatment which we experienced from Umsiligas.* To the general activity and good feeling of the majority of the members of the party itself, I am bound to attribute, in a great measure, the fortunate result of the enterprise; and, should it ever be my good fortune to obtain leave to proceed on another journey of the kind, I should be delighted to have with me nearly all of the individuals of the late party, and more than delighted to have those gentlemen the fruits of whose talents† are this day conspicuous before you.

“Having now given a general outline of the proceedings of the expedition, I shall sum up concisely what appears to me to have been some of the principal results:—

“1st. It has put us in possession of much information respecting many tribes even hitherto unknown to us by name; and has enabled us also to extend very considerably our knowledge of those which had previously

* An African chief.

† 497 drawings.

been visited, by having brought us in immediate connexion either with them, or with persons who could furnish information regarding them.

"2dly. It has enabled us to ascertain the geographical position of many places previously doubtful; to lay down the sources and courses of various rivers which run to the eastward; and otherwise obtain what will considerably add to the utility of our maps of South Africa.

"3dly. It has enabled us to extend considerably our knowledge of natural history, not only by the discovery of many new and interesting forms in the animal kingdom, but also by additional information in regard to several previously known; and has put us in possession of a splendid collection, which, if disposed of, will, in all probability, realise a sum more than equal to the expenses which have been incurred.

"4thly. It has enabled us to ascertain that the Hottentot race is much more extended than has been hitherto believed; and that parties or communities belonging to it inhabit the interior as far, at least, as the inland lake, which we were told is not less than three weeks' journey to the north of the Tropic of Capricorn.

"5thly. It has made us aware of the existence of an infinity of misery in the interior with which we were previously unacquainted; a circumstance which, in all probability, will lead, eventually, to the benefit of thousands, who, without some such opportunity of making known their sufferings, might have lived and died even without commiseration.

"6thly. It has enabled us to establish a good understanding with Umsiligas, and insure his services and support in the farther attempts which may be made to extend our knowledge of South Africa, which, without his concurrence, could never be well effected from the Cape of Good Hope; and,

"Lastly. It has furnished a proof that the plan upon which the Association proceeded was calculated to accomplish the objects it had in view; and has given reason to believe that a party, similarly equipped, when assisted by the knowledge we now possess, may, with proper regard to the seasons, penetrate far beyond the latitude of 23. 28. (our southern limit), and with a termination equally fortunate as that of the late undertaking."

An appendix attached to the report is principally occupied with specific descriptions of the new animals brought home by Dr. Smith, accompanied by some general observations respecting them, which latter we extract.

"As some time must necessarily elapse before the objects of the natural history department collected by the expedition can be examined and described in England, it may be expected that some account of those esteemed new to science should at present be produced. Had there been proper books of reference for such an undertaking to be consulted here, a detail of the kind might have been furnished with some satisfaction; but as that is not the case, what I now submit is offered with diffidence, and not without a belief that it will be discovered to abound in inaccuracies. Independent of which, it must of necessity be very limited, and will include only such quadrupeds and birds as are not distinctly noticed in Griffith's *Translation of the Animal Kingdom*, or Latham's *General History of Birds*. As neither of those works contains the many species which have lately been discovered, and are characterised in more recent publications, it will only be necessary to reject the name which I have given, if the subject of it have been already described.

"During the journey, we traversed or visited three distinct zoological provinces, each supplying certain animal forms, which, if not restricted to

itself, certainly occurred in that relative proportion which warranted its being regarded as their favourite, if not their prescribed, resort.

"The first district includes within its limits, Africa south of the Ky Gariep; the second, the country between the latter and Kurrichaine; and the third, the tract between Kurrichaine and the Tropic of Capricorn. Each of those provinces, again, would admit of being subdivided into smaller ones, which, individually, would establish paramount claims to the possession of certain forms, and at the same time furnish members of others, whose head quarters would be readily traced to other localities. Thus, most of the species we met with appeared to have each a natural or chosen domicile, where an evident congregation of its members existed; and, by discovering some of these, I was obliged to discard opinions which had been formed during our early movements, as to the paucity of members in certain species, and their very limited range. The country in the vicinity of the Ky Gariep supplied us with a few specimens of several species, certain of which must at least have been wanderers, as their more common habitats were eventually discovered either immediately beyond Latakoo, or between Kurrichaine and the Tropic. But of three of the species obtained near that river, no additional specimens were afterwards discovered: it may therefore be expected, that of these the *partridge* will be found in abundance on the grassy plains which skirt the range of mountains that extends towards the remote sources of the Ky Gariep; the thrush, in numbers, either on the banks of the various streamlets to the eastward, or in the district interior to Delagoa Bay; and the Falco chiquera may also have its African metropolis in the same direction.

"Scarcely had we passed the northern limit of the first district, when objects foreign to it presented themselves to our notice; and by the time we reached the latitude of Latakoo, which may be regarded as the centre or head quarters of the second province, we found many novelties to engage attention, at the same time that we were kept in remembrance of the *first* district, by the occasional appearance of species common even in the vicinity of Cape Town.

"In advancing towards the third province we lost several species, particularly of birds, common near Latakoo; and we occasionally met with new ones, but the individuals were in number so limited, that they might be regarded as emigrants, rather than fixed inhabitants of the district. On reaching the vicinity of the third province, objects hitherto unseen were immediately procured; and before we had penetrated it to any extent, the number of those was considerably increased, and some species known to inhabit Northern Africa were obtained, such as *Merops Minulus*, *Psittacus Meyerii*, *Anser gambensis*, &c.

"Certain species of quadrupeds and birds were found common to the three districts; namely, *Cercocebus pygerythraeus*, *Mephitis Zorilla*, *Cynictis Ogilbyii*, *Canis mesomelas*, *Hyæna crocuta*, *Leo Malaniceps*, *Bathergus hottentotus*, *Elephas africanus*, *Gazella euchore*, *Boselaphus Oreas*, *Strepsiceros Koodoo*, *Vultur fulvus*, *Neophron ægyptiacus*, *Helotarsus typicus*, *Elanus melanopterus*, *Accipiter musicus*, *Accipiter Gabar*, *Milvus parasiticus*, *Nilaus (Lanius capensis Shaw)*, *Bucorvus (Corvus albicollis)*, *Picus biarmicus*, *Columba capensis*, &c.

"Others to the second and third, such as *Macroscelides brachyrhynchus*, *Ichneumon ratlamuchi*, *Rhinoceros simus*, *Rhinoceros Keitloa*, *Equus Burchellii*, *Camelopardalis australis Sw.*, *Aigoceras equina*, *Antilope melampus*, *Cephalopus Burchellii*, *Vultur occipitalis*, *Neophron carunculatus*, *Cratopus bicolor (Loxia maculosa Burch)*, *Estrela Granatina*, *Pterocles variegata*, *Pterocles semitorquata*, &c.

"And to the third only, *Galago Moholi*, *Macroscelides Intufi*, *Sciurus Cipapi*, *Aigoceras ellipsiprymnus*, *Prionops Talacoma*, *Cratopus Jardine*, *Euplectes Taha*, *Estrela Lipiniani*, *Estrela bengala*, *Polystictice*,

Quopopa, *Perdix sephæna*, *Perdix Coqui*, *Perdix Swainsonii*, *Perdix Lechoha*, &c.

"In the second district some few species were obtained which did not present themselves to our observation either in the first or third; but the members of nearly all of those were so limited that we may, without hesitation, conclude they were proper to provinces which were not reached by the expedition.

"The range of species, generally speaking, appeared to vary considerably as to extent; and in no case was it possible to discover any cause or causes, depending upon external circumstances, which could enable us to account, in a satisfactory manner, for such a diversity. There is, doubtless, a something besides either food or temperature which influences, nay, regulates, the distribution of animal forms; but what that may be, will appear more and more evident only as we get divested of the opinion that we already know sufficient of the scheme of the Creator to enable us to explain the manifold difficulties which it offers to our enquiry, by the assumed aid of certain external agencies, which, in all probability, will eventually be found to have not even the most remote share in the occurrences.

"When countries shall have been carefully traversed, and the animal productions inhabiting them exclusively, or in common with other countries, minutely examined, both as relates to their physical characters and their habits, then the naturalist may be able to indicate principles which the great book of nature, and not simply the books of men, will maintain and extend. If persons could spring into existence, and enter upon the course which one of the first observers of the day is following, could study as he is studying, and enquire as he is enquiring, then might Mr. Swainson yet aspire to see the day when mind and matter would alike proclaim the accuracy of his views, and when African travellers, at least, would declare they found little to gather which was not in corroboration of the contents of his interesting volumes.

"The facts which we have collected are in direct support of the opinions maintained by Mr. Swainson; and the observations we have had occasion to make will be of interest only, provided naturalists feel satisfied to proceed, by endeavouring to discover what are not, instead of what are, the ways, means, and ends of Omnipotence, in the regulation of man and the animal world." *

In deviating from a plain narration of facts to touch upon the ground of speculative enquiry, and in doing homage to the opinions advanced by a talented writer of the present day, Dr. Smith appears to us not to have evolved his own ideas with that clearness and precision which, from the general tenor of his observations, we might have expected. If persons could spring into existence, and enter at once upon the course which Mr. Swainson is pursuing, would it hasten, in the smallest degree, the time when mind and matter shall declare the accuracy of his views, unless those views be the result of sound philosophical induction, originating in the cautious observance of facts, and in the unbiassed investigation of zoological phenomena? If we may venture to throw out a hint to Dr. Smith, judging from the decided sentiments

* We do not quite see the author's meaning here, after what he has remarked in the preceding sentence. — *Ed.*

which he has expressed, we would suggest to him the expediency of making public the facts which he has collected, apart from any theoretical indications which they may appear to present. If as an African traveller he has really gathered nothing, save what is in corroboration of the conclusions arrived at by Mr. Swainson, we should say, — Record your observations, but leave their theoretical application to others. Not that we mean to convey the slightest expression of hostile feeling towards these views of which Dr. Smith avows himself so staunch an advocate; but, if it be desirable that the observations made during the progress of the present expedition should be received with perfect confidence by all parties, we think it would be the safest course to avoid giving the impression, that they are about to be put forward with some ulterior object, rather than with a view of simply extending our present positive information with respect to the innumerable forms of animated existence, their varied attributes, and their adaptation to their respective localities.

The supposed new forms described in the appendix to the report, consist of about sixty birds, and thirteen quadrupeds, among which is a new species of rhinoceros, of which the following are given as the characters.

“Rhinoceros Keitloa. — Colour, a rusty greenish yellow, clouded with pale olive brown; horns of equal length, the anterior one curved and rounded, the posterior straight, and laterally compressed; size of the *Rhinoceros africanus*. Inhabits the country north and south of Kurrichaine.”

The following is a general statement of the number of specimens collected relating to natural history: —

“180 skins of new or rare quadrupeds; 3379 skins of new or rare birds; 3 barrels containing snakes, lizards, &c.; 1 box containing insects; 1 box containing skeletons, &c.; 3 crocodiles; 2 skeletons of crocodiles; 23 tortoises, new or rare; 799 geological specimens; 1 package of dried plants; 457 drawings.”

“Reptiles, Lizards, Tortoises, and Insects. — From what has already been stated, it will have been understood that the classification and description of the objects belonging to the above divisions of the animal kingdom cannot here be attempted with advantage; the remarks, therefore, which are offered in regard to them must deal in generalities. Generic forms, unknown in the colony, and even yet in the records of science, are contained in the collections; and the species belonging to genera already indicated are, generally speaking, different from those which occur to the southward of the Orange River. Among the snakes obtained, two of the most beautiful belong to the genera *Bucephalus* and *Chrysopelea*. The first measured nearly 6ft. in length, and is of an uniform, fine grass-green colour: it forms the sixth species of this genus, which, as far as I know, is peculiar to South Africa. The second is smaller in size, but also marked by lively colours, and is the second species of the genus which I have found in this country. Soon after passing Kurrichaine, we came in communication with the haunts of the larger

forms of this class, and procured specimens of a species of Python, which I had formerly obtained near Port Natal. The poisonous snakes have been found to bear nearly the same proportion to innocuous ones which they do in the colony.

"Crocodiles, of moderate size, were found inhabiting the principal rivers beyond Kurrichaine in considerable numbers, and are much dreaded by the natives, who, like their cattle, dogs, &c., often suffer from their voracity. One which we shot had just swallowed a Rooye-bok (Antelope Melampus), which had been caught in the act of drinking, and it was extracted entire from its stomach. Besides crocodiles, we found in the same river a new species of box tortoise, belonging to the genus *Sternotherus*, and which has been provisionally designated *Sternotherus africanus*. The shell of this species sometimes measures 2 ft. in length. But few specimens were procured; a circumstance not arising out of the scarcity of individuals, but from the difficulty of catching them, the deepest pools being their exclusive abodes.

"As regards the collection of insects, it is (and that from necessity) but small; yet, nevertheless, it will furnish some interesting species. The interior does not appear to present that rich field for the entomologist which is done by the districts nearer the coast. It is true a portion of the most favourable season for the collection of insects passed when we were in situations where but few trees or little underwood existed, and where, at certain seasons, the country is densely covered with grass.

"*Botany*. — From there having been no person attached to the party for the specific purpose of collecting and drying plants, little of interest has been obtained in this department. That beauty and variety which characterise the productions of the vegetable kingdom within the colony were not observed at any great distance beyond the Orange River; and though numerous forms of the smaller and less showy plants in all probability exist in the different districts we visited, yet the means and the time for detecting them were wanting. Few trees were observed, and the *Acacia Giraffe* had but few rivals, as far as regarded size. Shrubs, from 1 ft. to 6 ft. in height, prevail in abundance, from Vaal River to some distance north of Latakoo, and to a great distance north-west and west of it; also upon the granite and limestone formations, over which we principally travelled, beyond Kurrichaine. Indeed, in the latter district, they, associated with dwarf trees, formed almost a continuous coating to the surface of the country, which coating became denser and denser as the Tropic was approached. The few seeds which were collected have, by direction of the committee, been planted in the botanical garden of Baron Von Ludwig; and the dried specimens of plants have, by a like order, been reserved to form a portion of the general collection destined for Europe.

"*Mineralogy and Geology*. — An extensive collection of geological specimens has been formed, which will enable the Association to dispose of four series, and, at the same time, reserve one, the finest and most complete, for the Association. The specimens possessed are calculated to furnish a correct knowledge of the prevailing geological groups which occur between Graaff-Reinet and the Tropic, and show what a great share the trap and granitic series possess in the structure of South Africa. No organic remains were detected, though extensive limestone formations, with a distinct stratification, and abounding in caverns, were examined in three different positions, the last in about latitude 25°. The notes possessed in relation to those points will admit of ample illustration when the subject can be treated in detail."

Naturalists in this country will eagerly anticipate the arrival of so extensive a series of zoological specimens, and we ob-

serve, that it is intended to retain for a time the most valuable part of the collection, for exhibition in Europe, with a view of raising funds for enabling the Association to pursue its original object, by sending out other expeditions. Looking at the thing as a matter of pecuniary advantage to the Association, we would strongly urge the committee to reconsider the policy of the course which they propose to adopt. Unless some particularly advantageous plan can be devised, with reference to the manner in which the collection is to be shown; we doubt whether the sum raised by its exhibition in England would amount to one tenth of the expenses which must unavoidably be incurred in making the necessary arrangements.

[At a general meeting of the members of the Association, held March 19. 1836, immediately after the return of the expedition, it was resolved, unanimously, — That the only adequate thanks which can be rendered to Dr. Smith are, that he be requested to undertake the next expedition.]

MISCELLANEOUS INTELLIGENCE.

ART. I. *Short Communications.*

[A correspondent has put into our hands the following translation of a passage which has just appeared in the second volume of Raspail's work upon vegetable physiology (p. 624.). As the evidence laid before the parliamentary committee relative to the British Museum, has been published in the course of the past month, in which allusions are repeatedly made to the public Continental museums, the opinion entertained by a French naturalist, with respect to the one at Paris, is certainly deserving attention. — *Ed.*]

MUSEUM of Natural History at Paris. — Here reform should penetrate with its pitiless hammer; for here long established customs have become abuses scarcely susceptible of correction by other means. The Museum of Natural History is a kind of oligarchical republic, independent of the power which protects and supports without controlling it. This republic is governed by irremovable professors; and the rank is in some measure hereditary, since these professors constitute a self-electing body. Their number is limited to ten, and they have the power of proposing their own sons and sons-in-law. It is thus easy to imagine that the museum may one day be ruled by a single family of professors. This would undoubtedly be the result if one professor should have only sons, and the rest daughters :

at each vacancy two parents would then be accommodated.* The professors have the final nomination of the officers (employés) of the establishment, and the regulation of their salaries; an effectual guarantee against the grievous evil of sinecures, and the scandal of enormous emoluments, amongst these officers; and yet many of these latter have rendered greater service to science than certain of the professors. We shall one day have no reason to thank that institution, which imposed on Cuvier the burthen of sinecures to the amount of 60,000 fr., and condemned Laurillard, his preparator, to a stipend of 2000 fr. The state supported Cuvier; the voice of Cuvier in the conclave fixed the remuneration of Laurillard.

The building is occupied by collections from the three kingdoms of natural history, and the mansions of the professors. It is divided into the galleries of zoology, anatomy, and mineralogy; a menagerie, a botanic garden, and enclosures appropriated to *botanical and, as they say, agricultural demonstrations*; green-houses and orangeries, where exotics are cultivated at great expense; and, lastly, a library.

The allowance for this establishment is 360,000 fr. (about 14,000*l.*) per annum. Such an establishment, supported by such an allowance, should doubtless be a nursery, so to speak, of discoveries and their applications; but for more than six years the legislature has had ample opportunity of learning that it can but serve as the grave of all the discoveries forwarded to it from the four quarters of the globe.

There is no catalogue to define the value of this national property, and guide the researches of the student. The bales are opened at the pleasure of the professors, who select from them such objects as come under their department, and take charge of forwarding them to their destination, without taking the precaution of cataloguing them, and thereby covering their own responsibility and that of their officers. A professor has the right of carrying home, and even of lending, a specimen of the greatest importance, and of returning it to the collection at his convenience. He is not at all bound to place the collection under his care within the reach of students; he may even, under pretences of which he alone is judge, refuse them the use of it altogether. He is granting them a particular favour in opening the drawers of the cases to them, and he grants it only, as may be imagined, to those who will thank him for it. Most of the collections are unclassified, and, so far, useless to the student; others are so incomplete, that it

* At this very time one father has united the votes for his son and two sons-in-law: his grandchildren are not yet adult; but their place is marked in the museum.

has been asked often, and anxiously, how a mere inferior officer (*employé*), economising on his slender salary, contrived to make a collection which at his death sold for 60,000 fr., whilst the corresponding collection in the museum, with the advantage of its superior reputation, is not valued at 10,000 fr. Still the state is so generous as to allow this establishment the sums required; and we have heard, in the Chamber, the amount and the unhappy expenditure of these grants made with a readiness deserving a better use. It has been there noticed that the new gallery of mineralogy had been built in such a manner, that half the specimens will be hidden from public view. We have before remarked in what spirit the plan of the green-houses was drawn. Now, the tenth of this sum would have been enough to enrich and class each collection in the most ample manner.

The garden has a professor of agriculture, who neither does nor can profess agriculture; and a division of agriculture, which could not serve for demonstrations; for I doubt if a plough or a drill could turn at the end of a furrow without breaking the trelliswork. More especially it has a school of botany, and green-houses where the tyranny of the professors grudges more and more to independent study the small advantages which custom and the indefatigable complaisance of the inferior officers had hitherto secured to authors. Hitherto, the gate of the green-houses had been open to us, as well as that of the enclosures: this has all been changed this year, at the will of a man whom, we grant, our work had not flattered. Presenting ourselves, as usual, at a time when a plant was in flower which it was needful in the course of our work to analyse, an attendant ran to request our immediate departure, as we were not in possession of a ticket of admission, such as had been voted necessary by the professors, at the request of the official owner of the green-houses. Some days after, three of these tickets were procured for us, signed by the professor himself, with a request that we would not visit the beds unaccompanied by a gardener. We cast back these impertinences to the administration, and had recourse to other complaisance than that which the state fancies it is paying in the interests of students.

Now, it has been decided that a mere gardener has the right of gathering whole bouquets in these green-houses: the professor covers his chimney-piece with them. It has been decided, also, that a student has the right to examine a flower on the spot, and even to carry home a certain number of specimens for his private study; so that the condition annexed to this permission was a gratuitous insult, and a mode of shut-

ting the door to us whilst pretending to open it. The author of it had rightly counted upon our self-respect.

Each professor, in his own particular department, enjoys the same privileges as the professor of the orangeries. When Cuvier was at work upon ichthyology, it was forbidden to deliver a bottle of fishes to any one whatever: Cuvier ~~was~~ at work upon the fishes, and at the garden of plants Cuviers are become rare. Note that appeal would be useless: these gentlemen are responsible only to their conscience; a tribunal which, for our parts, we know not the means of reaching.

The herbarium, that library of dried specimens of native and exotic plants, was not long ago in rich disorder: the adepts alone had the key of these buried treasures. The professors have the right of lending, as seems good to them, the fasciculi, to be consulted on the spot and at home. Students not thus protected must carry their desk into the common hall, and work under these gentlemen's inspection.

In short, the collections of the museum belong, in all strictness, to the professors: the public has nothing of its own but the right of walking there; students have no right to any thing but certain favours, which they must repay by an ample gratitude.

The immediate consequence is, that science, up to this time, has not received a hundredth part of the advantages it had a right to expect from an institution so well furnished, and so liberally endowed. There the plants are warmed in winter, watered and aired in summer, and thrown away when they have degenerated: but, as to experimental physiology and theoretical or practical agriculture, private individuals, labourers, and provincial gardeners are allowed to devote themselves to the study of these at their own expense.

"*Music of Snails.*" — At p. 46. of your last Number, you remark upon a short communication under the above title, which appears to have been sent by a lady to the editor of the *Naturalist*; and, as you seem to think the subject deserving of some consideration, I have ventured to send you a few observations upon it. Three or four years ago, whilst sitting in my room reading late at night, my attention was attracted, for several nights in succession, to a sort of low musical note, which seemed to proceed from one of the windows. It occurred at short intervals, and was sometimes silent for a quarter or half an hour, and then returned again. I thought, at first, it proceeded from something in the room, or arose from some accidental vibration of one of the strings of a pianoforte which stood near the window; but, being satisfied at length that it proceeded from the window itself, I drew up

the blind, and discovered one of the common large garden snails crawling upon one of the panes. Immediately upon my drawing up the blind, and the light of the candle being strongly thrown upon the window, the sound ceased, and the snail partly withdrew itself under its shell; nor were its motions resumed so long as the light continued to be thrown upon the window. Being now satisfied, however, that the sound was caused by the motions of the snail on the pane of glass, I carefully noticed the exact position of the animal; and, putting the candle in such a situation that no light should be thrown upon the window, I returned to it, and sat down close to the place where the snail was. In a few minutes the sound returned, and I had now no farther doubt of its being caused by the snail; for, bringing the candle back again so as just to throw light enough upon the window to enable me to perceive his motions, I observed that it was now moving on again across the pane, and the sound evidently accompanied it. Upon stopping its motion again as before, the sound ceased; but always returned when it moved on. I suspected at the time, with the correspondent of the *Naturalist*, that the sound proceeded from the *snail* itself, as I was not able to ascertain whether the shell actually was in any part in contact with the glass; but I concluded that this *must* be the case, and that the sound was merely caused by the slow scraping of the shell on the moistened surface of the glass, producing a phenomenon somewhat similar to that which children amuse themselves in producing by passing a wet finger over the edge of a glass containing water. As far as I recollect, it was always in wet weather when the phenomenon occurred, and when the whole surface of the glass would be overspread with moisture. The above phenomenon has been one of frequent occurrence since the time I first noticed it; and, if it be traceable to the same cause as in the other instance to which I have alluded, perhaps the *body* of the animal might cause a sufficient vibration in the glass to produce the sound, even if the shell were not in contact with it. If you think the above observations calculated to throw any light upon the subject, they are much at your service. — *T. Salwey. Vicarage, Oswestry, Jan. 5. 1837.*

Migration of Swifts. — I beg to offer, for insertion in your Magazine, a few remarks relative to the autumnal migration, &c., of the swifts (*Cypselus murarius Temm.*), in the years 1834, 1835, and 1836, in this vicinity.

The excessively hot weather we experienced during the summer of 1834, and, more particularly, about the time the swifts usually leave this country, might naturally have been

expected to have had some influence in retarding their migration. That this was not the case was very evident; for, although the month of August came in very hot, yet by the 9th they, apparently, had all taken their departure; and for several succeeding days I did not observe a single individual of this species; consequently, I was rather surprised on seeing a pair of these birds, on the morning of the 17th, winging their rapid flight along the eaves of a house, where a colony of those birds had taken up their residence, for the purpose of nidification, during several seasons. I found, from observation, this pair of birds continued to frequent this locality for a few days, when they disappeared. Their detention in this country, I judged at the time, was owing to their having a brood of young ones, which were unable to follow their congeners in the early part of the month. With this conjecture I was obliged to rest satisfied, as I could not conveniently ascertain the fact at the time. After an interval of a week, a solitary individual made its appearance on the 28th, about noon, the thermometer at the time standing at 60°. After coursing round the same situation a few times, it disappeared; and none were seen afterwards.

Although the summer of 1835 exceeded in heat that of the preceding, yet, apparently, it had no visible effect whatever upon the migratory movements of the swifts. Up to August 3., there appeared to be a daily increase to their numbers, as they assembled, towards the evenings, in joyous conclaves, high over the town. The severe drought experienced at that time compelled the great majority of our Hirúndines to seek for food along the meadows adjoining the river; consequently, but few were to be seen during the middle of the day. From the 3d to the 18th, each assemblage gradually decreased in numbers, when I only saw a few pairs, which, in a few days, were reduced to a single pair; and they continued to resort to their nesting-place throughout the month; and, as they still lingered in its vicinity, I was induced, on September 3., to examine the situation; when, to my utter astonishment, I found a nest containing a pair of *squabs*, probably only a week old. The parent birds were unremitting in their exertions, throughout the remainder of the month, in bringing food for their progeny; apparently more so than at the usual period of nidification, by their constant and repeated visits during the middle of the day, which was evidently the fact; for, when I examined the nest again on October 1., I found the pair of young birds very *fat*, and ready to wing their flight to distant climes, which, I suspect, took place on the 4th, that being the last day that I observed their parents

visiting them ; for on the following day I ascertained the young birds had taken their departure from the nest.

The coolness of the past season, as compared with the two preceding, apparently, had more effect (if the weather has any influence) upon the migration of the swifts ; for, up to August 19., there did not appear to be any very great diminution of their numbers, being ten days or a fortnight later than the two former years before they began to disappear. The following day (20th), being very wet, evidently hastened their departure ; for on the 22d only a few pairs were to be seen ; and on the 27th I saw only a solitary pair, being the last that came under my notice for this season.

The procrastinated period of nidification of the pair of swifts in the year 1835 naturally calls forth some few remarks on such an unusual occurrence. Probably the delay arose in consequence of their nest, with several others containing eggs, being unavoidably destroyed about June 1., owing to some necessary repairs at the place they unfortunately had selected for nidification. Several pairs of the old birds, after this disaster, still pertinaciously adhered to the same situation ; and I have no doubt the majority succeeded in rearing their broods in sufficient time to take their departure with the main body, at which time the pair previously noted could scarcely have commenced the task of incubation ; for it will be observed that on September 3. their young were, apparently, only a week old, which would give rather an unusual time for so small a bird, a period of *three weeks for incubation*, from the time their companions commenced leaving this district. And we find so great was the instinctive propensity of these poor birds to increase their species, that they actually deferred their usual period of migration, and remained nearly *seven weeks* in this country after all their associates had departed. — *J. D. Salmon. Thetford, Dec. 3. 1836.*

Two Mermaids caught in the river Gabon, Africa. (Extracted from Mr. Herapath's Railway Magazine.) — It appears that this is not the first fish of the kind taken in the river Gabon. The natives had informed Captain Herapath of such things in a former voyage ; and his treating the information lightly was their reason now of sending for him to see it. He has not spoken of the tail ; but, from what I learned in conversation with him, it appears that the fan of the tail is one undivided fin ; and the plane of it, when the fish is swimming, horizontal, not vertical, like that of other fish.

“*Gabon, August 16. 1835, P. M.* I received intelligence that a native residing at Sam's Town had taken a singularly

shaped fish, which, from the description given, I imagined to be a mermaid. On reaching the hut, I found two, both females: the largest was cut up; the natives in the act of preparing it for a meal. Of the other, the following is a brief description: — Length, about 5 ft.; breadth across the shoulders, about 14 in.; the head something like that of a porpoise, and without hair, united with the body by a short neck. From the shoulders downwards the shape was exactly the same as represented in the engravings of the mermaid, with the exception of the arms. Instead of hands, they terminate the same as a turtle's fin, and have no joints except at the shoulders. The breasts were perfectly feminine, and the arms folded across as if to protect them. The skin was thick, of a dun colour, and the surface of it quite smooth.

“The natives inform me that this animal, when seen, always appears erect, with the head and shoulders above water, and the arms in the same position as when I saw them.* — *Brig Tom Cod, A. N. Herapath, Commander.*”

Mr. Murphy's Predictions of the Weather. — Having, in the report of the proceedings of the Meteorological Society for December, 1836, stated Mr. Murphy's anticipated state of the weather for the present month (January, 1837), which will appear to most, or all, of your readers to have been a complete failure, and thereby calculated to reflect discredit on meteorologists, I think it but justice to Mr. Murphy to state that he has sent another paper to the Meteorological Society, prior to the last meeting on the 9th inst., explaining the error into which he had fallen with regard to the dates not coinciding with the meteorological facts. He accounts for his error in anticipating the first interval of frost to have set in about fifteen days, or *half a lunar circle*, sooner than he had expected; or that the frost commenced at the *full moon*, or on the night of December 23., instead of the period of new moon, or the night of January 5. The greatest cold, therefore, occurred in the night of the 1st January † (the second quadrature of the moon being only the day preceding, viz. Dec. 31.), immediately preceding the thaw, which commenced January 2. Whereas, if these predictions had been made to correspond with the facts so accurately as they have done, dates and all, then all would have been ready to have pronounced Mr. Murphy's a *lucky hit*. But, seeing that he is out in dates only, and not in facts, I take it for granted that

* This animal is evidently the *Manatus senegalensis Desm.*, which was well described by Adanson under the name of *Lamantin*. — *Ed.*

† The minimum cold for the year 1836 occurred in the night of Jan. 1.; a remarkable coincidence.

meteorologists ought to take courage from this error in calculation, and rather encourage than censure the attempt made to bring meteorology within demonstrable limits.

Mr. Murphy still feels a confidence that the second period of frost indicated by him (p. 56.) will still be borne out; viz. Jan. 22. and following days.

The science of meteorology is at present but in its infancy, compared with astronomy, chemistry, &c.; and, therefore, it becomes imperative on observers to be very minute in registering facts in connexion with lunar influence, in order that the lunar action on the weather may be fully developed, not through the quadratures of a single lunation only, but through every lunar period during the year. It will then be seen whether periods of heat and cold, drought or humidity, constantly refer to the periods of new or full moon, or the quadratures, or whether their changes are not referable to some other agency.

I ought, in conclusion, to observe that Mr. Murphy still believes that the calculation he made for *this hemisphere* will be borne out, both as to dates and circumstances, in the *western hemisphere*; from which he wishes to demonstrate that "lunar action is an active agency in the production of *atmospheric cold* equally as of *heat*." Time alone can put us in possession of the fulfilment of these as well as other prophecies.—*W. H. White. London, Jan. 16. 1837.*

[We do not apprehend, with Mr. White, that any great sensation will be excited among meteorologists in consequence of Mr. Patrick Murphy's "unlucky hit." If it be the wish of the present members that the Meteorological Society should have any pretension to the character of a scientific body, they will have nothing to do with such foolish twaddle as (judging from the above letter) Mr. Murphy's "anticipations of the weather twelve months in advance" appear to consist of. — *Ed.*]

ART. II. *Literary Notice.*

THE second and concluding volume of H. C. Watson's *New Botanist's Guide*, containing Scotland and the adjacent Isles, with a copious Supplement to England and Wales, will be published in March.

THE MAGAZINE

OF

NATURAL HISTORY.

MARCH, 1837.

ORIGINAL COMMUNICATIONS.

ART. I. *On the Birds of Devonshire.* By EDWARD MOORE, M.D., F.L.S., Secretary of the Plymouth Institution.

HAVING observed that a work on British birds is shortly to be published by Mr. Yarrell, I beg the favour of a portion of your pages, in order to give a list of the birds of Devonshire. In the year 1830, I published a paper on the subject in the *Transactions of the Plymouth Institution*; but since that period I have been able greatly to enlarge that catalogue; and am therefore desirous of thus offering the information I have obtained regarding several very rare specimens. I shall, however, confine myself to as brief a notice as possible; and, should any of your correspondents require farther observations on particular species, I shall be ready to accede to their wishes on a future occasion. The subject of ornithology has long been pursued here; and, besides my own collection, I have access to those of Lord Boringdon, at Saltram; of Sir G. Magrath, Plymouth; of Dr. Isbell; of C. Tripe, Esq.; of Mr. Drew, collector, of Stonehouse; and Pincombe and Bolitho, collectors, at Devonport.

The list of British birds lately published by Mr. Eyton being an approximation to the arrangement of Cuvier, I shall take that for my guide in making the following observations; and, in order not to occupy too much space at once, I propose to divide my communication into sections corresponding to the different orders.

ORDER I. ACCIPITRES.

Division i. *Diurnæ.*

Gen. FA'LCO. — Subgen. 1. *Fálco.*

1. *Fálco peregrinus*, Peregrine falcon. This bird, termed the cliff hawk in Cornwall, is frequent on our coasts, where it breeds, and

frequently pounces on the young gulls. Specimens are found in every collection.

2. *Fálcó Subbúteo*, Hobby. Visits us in summer; breeds in Warleigh woods, whence a specimen was sent me by the Rev. Walter Radcliffe.
3. *Fálcó rufipes*, Red-legged falcon. A specimen of the male is in the possession of Pincombe, Chapel Street, Devonport, who obtained it *fresh* from a sailor. It might have been caught in the Channel; but I am not quite certain of its being a Devon bird.
4. *Fálcó Æ'salon*, Merlin. Found here in winter. Not numerous.
5. *Fálcó Tinnúnculus*, Kestrel. Frequent. Breeds on our coasts.

Subgen. 2. *Hierofálcó*.

1. *Hierofálcó Gyrfálcó*, the Gyrfalcon. Mentioned as a Devon bird in Polwhele's *History of Devonshire*, which is confirmed by the capture of a beautiful specimen on the banks of the Lynher, a branch of the Tamar, February 7. 1834. It had been wounded in the wing, and was kept alive for some days by Pincombe, in whose possession the bird now is. The whole of the plumage is white, barred with brown on the back; wings and tail, head and neck, and sides of the body, with brown streaks; breast, belly, and under tail coverts, white; thighs white; feathers extending below the knee; cere bluish; bill pale blue, become white by drying; legs blue; iris hazel; tips of the wings brownish black, extending about half the length of the tail. Length about 1 ft. 9 in.

Gen. A'QUILA. — Subgen. *A'quila*.

1. *A'quila Chrysætos*, Golden eagle. Said to have been occasionally seen on Dartmoor; and Mr. Gosling informs me that formerly a nest was known on Dewerstone Rock, near Plymouth.

Subgen. 2. *Haliæ'tus*.

1. *Haliæ'tus Pygárgus*, Sea eagle, or Cinereous eagle. A specimen caught near the Eddystone was kept alive some years by the late Addis Archer, Esq., at Leigham, near Plymouth. In the summer of 1832, one was frequently seen by the gentlemen of the hunt, hovering over Dartmoor; and, in October of that year, a fine specimen (probably the same) was shot near Kingsbridge, by W. Elliott, Esq., in whose possession it still remains. It is mottled all over with brown and white; legs yellow; bill and claws black; feathers extending very little below the knee.

Subgen. 3. *Pándion*.

1. *Pándion Haliæ'tus*, Osprey, or Bald buzzard. Several have been shot in our neighbourhood. I have accounts of their being killed or seen in April, May, July, September, October, and November. R. Julian, Esq., of Estover, has one; and another is in the collection of Lord Boringdon, at Saltram.

Gen. A'STUR.

1. *A'stur Palumbàrius*, Goshawk. Found on Dartmoor. Vide Carrington's poem *Dartmoor*. A nest was seen by Bolitho of Devonport at South Tawton; and one of the old birds was wounded, but escaped.

Gen. ACCI'PITER.

1. *Accipiter fringillàrius*, Sparrowhawk. Common.

Gen. MÍLVUS.

1. *Mílvus regàlis*, the Kite. This bird is nearly as scarce as in the time of Montagu, who only saw one in Devonshire in twelve years. A fine specimen is now, however, in Mr. Drew's collection at Stonehouse; another, caught in Trowlsworthy rabbit

warren, in May, 1831, is in the possession of Capt. Morshead of Widey; and another belongs to Sydenham, a dyer, in Plymouth.

Gen. *PERNIS*.

1. *Pernis apivorus*, Honey buzzard. (See Montagu's *Dictionary*.)

Gen. *BUCEO*.

1. *Buteo Lagopus*, Rough-legged falcon. Scarce. A specimen is at Pincombe's; another, shot at Egg-Buckland, near Plymouth, November, 1836, is in Mr. Drew's collection.
2. *Buteo vulgaris*, Common buzzard. Frequent.

Gen. *CIRCUS*.

1. *Circus cinerarius*, Ash-coloured falcon. Scarce. A specimen at Bolitho's; another, sent to Pincombe for stuffing, is at Trelaske House, Cornwall.
2. *Circus Pygargus*, Hen-harrier. Not uncommon. Mr. Drew has a specimen, which appears to me a variety of the male: it is similar in size and shape; but *the whole* of the plumage is of the "pitch or brownish black" of Syme's nomenclature of colours. This bird was shot by the gamekeeper of G. Leach, Esq., who declared that the female, which he afterwards killed on a nest with two young, was of the same colour.
3. *Circus rufus*, Moor buzzard. Frequent.

Division ii. *Nocturnæ*.

Gen. *STRIX*. — Subgen. 1. *Otus*.

1. *Otus vulgaris*, Long-horned owl. Specimens at Drew's, Bolitho's, and Pincombe's.
2. *Otus brachyotus*, Short-eared owl. I have a specimen, shot in March, 1829, on Exe Moor.

Subgen. 2. *Strix*.

1. *Strix flammea*, White owl. Common.

Subgen. 3. *Syrnium*.

1. *Syrnium stridulum*, Brown owl. Common.

Subgen. 4. *Bubo*.

1. *Bubo maximus*, Great-eared owl. I have only seen one specimen in Devonshire, and that in a living state, near Honiton, in 1820.

Subgen. 5. *Noctua*.

1. *Noctua passerina*, Little owl. Very rare: one specimen was shot by Mr. Comyns of Dawlish; another was sent to Mr. Drew for preparation.

11. *Athenæum Terrace, Plymouth, January 7. 1837.*

ART. II. *A Notice of the Occurrence of Two Species of the Genus Tringa, new to the British Islands; with a List of the rarer Birds killed in Suffolk, and the adjoining Borders of Norfolk and Essex, from the Autumn of 1835 to December, 1836.* By J. D. HOY, Esq.

ALTHOUGH the number of birds which are constant residents in, or periodical visitants to, this country may now be considered well known, still scarcely a year passes in which our list of accidental stragglers is not augmented; nor is this at all surprising, when we consider the powers of flight which some species possess, and which, from various causes, may be

driven out of their usual line of flight during their migratory movements. The occurrence of the pectoral sandpiper *Tringa pectoralis* near Yarmouth, is noticed and a plate given, by Eyton, in his continuation of Bewick's *Birds*. I am not aware of a more recent instance of its occurrence, and have thought it might be interesting to some of your readers to know something more respecting the capture of the above-named specimen. This tringa seems allied both to *T. variabilis* and *T. subarquata*; and in the form of the bill shows some affinity with the knot (*T. Canutus*). In size, it is superior to the curlew tringa, (*T. subarquata*). It was killed on Oct. 17. 1830, on the borders of Breydon Broad, an extensive sheet of water near Yarmouth, rather celebrated for the numerous rare birds which have, at different times, been observed and shot on its banks and waters. The person who killed it remarked that it was solitary, and its note was new to him, which induced him to shoot it. It proved a female on dissection. It was preserved by the late Mr. J. Harvey of Yarmouth, as a curious variety of *T. variabilis*, with some doubts as to whether it might not be a new species. I detected the bird in Mr. Harvey's collection, and felt convinced it was an undescribed species of *Tringa*. I also received from him the particulars above stated.

This specimen has been examined by M. Audubon, and identified by him with the *Tringa pectoralis* of North America. During the last summer, another bird of the *Tringa* family, new to this country, has been obtained from the same locality; the flat-billed sandpiper (*Tringa platyrhynchos*; the Bécasseau platyrhinque of Temminck's *Manuel*); it was shot on the 25th of May, 1836, on the muddy flats of Breydon Broad. It was in company with some dunlins and ring plovers. From the season of the year, it had probably acquired its summer plumage; and it very closely agrees with the nuptial garb of the species as given by Temminck. This bird is rather inferior in size to the dunlin, but may be always readily distinguished from that species by the peculiar form of the bill, as well as by considerable difference in plumage. This specimen was preserved by a friend of mine, who did not notice the sex. It is probable that this sandpiper may occasionally be found on our eastern coasts during the time of its periodical flights, but, from its similarity to one or two closely allied species, has hitherto escaped detection.

A fine specimen of the honey buzzard (*Pernis apivorus*) was shot in the parish of Stratford St. Mary, Suffolk, in the end of September, 1835; and, some time in the month of November of the same year, a purple-crested heron (*Ardea pur-*

pùrea) was obtained on the borders of a large water, known by the name of King's Fleet, near the mouth of the Woodbridge river. The bird rose from the thick reeds which skirt the water, and was at first supposed to have been a bittern by the person who shot it. From the redness of the plumage, it may be easily mistaken for the bittern when first seen; and it has much of the habits of that bird in keeping much concealed in reeds and rushy swamps. I have known two other instances of this species of heron occurring in this county; and I have also known two or three individuals to have been met with in Norfolk, within a few years. This bird was in the plumage of the first year. Two great shrikes (*L. excubitor*) have been killed; one shot in this parish, December, 1835; the other was caught in a common trap-cage set for small birds, in a garden on the outskirts of Colchester, in February, 1836. Another was seen about the same time in this neighbourhood. Wood sandpiper (*Tótanus Glarèola*): a specimen of this bird, shot in the vicinity of Yarmouth, September, 1835; also, about the same time, two specimens of Temminck's tringa (*T. Temminckii*), both birds of the year; and in May last an adult bird of the same species was obtained on Breydon Broad. Spotted snipe (*Tótanus fúscus*): one shot on Breydon, September, 1836. Curlew tringa (*T. subarquàta*): several occurred in summer plumage, near Yarmouth, in May last. Fork-tailed petrel: one found dead near Ipswich in December last. Skua gull (*L. Cataráctes*): on the coast, near Yarmouth, October, 1836. Several great snipes (*Scólopax mājor*) have been shot, during the last autumn, on the Suffolk and Essex coasts. Hawfinch (*Coccothraústes vulgàris*): six or seven specimens of this bird were shot near Woodbridge, in the latter end of November, 1836. The dipper (*Cínelus aquáticus*): one shot early in the autumn of 1835, on the borders of a large fishpond, St. Osyth, Essex. The occurrence of the dipper in this part of the island is extremely rare. The common crossbill was rather numerous, in some localities in this district, during the last year. I first observed them about the 20th of July, 1835; and in the month of August we had a large flock in some fir plantations in this neighbourhood. When I first discovered them, many of the young birds were in the nestling feathers, they fed principally on the larch cones; but they also attacked the spruce and other kinds. They remained with us through the autumn and winter months. I did not observe any after March; but, in the beginning of the month of June following, a flock of fifteen or twenty were noticed in the same plantations which they had frequented during the winter months.

Whether these birds were a fresh flight from the northern parts of Europe, or remains of the flocks which had wintered with us, it is difficult to determine; but I am inclined to the latter opinion, and consider it highly probable that the cross-bills which visited this country in the summer of 1835 had continued with us during the whole time, in flocks, and had not felt any incitement to pair and breed. I am the more induced to believe it to be the case, as I recollect, in the year 1821, when this island was visited by such numerous flights, they continued in this neighbourhood during the winter and spring months of 1822; and were noticed in different parts of this county, in flocks, until the end of May of that year.

Stoke Nayland, Suffolk, Jan. 12. 1837.

ART. III. *Notice of the Breeding of Woodcocks in Selkirkshire; with Observations upon the Habits and Manners of the Black and Red Grouse, and Carrion Crow, in Scotland.* By W. L.*

THE carrion, or black, crow (Vol. IX. p. 547.) is not unknown in the low country of the north of Scotland; but it is by no means plentiful, although I never saw it except in pairs. It would be strange indeed if it had not arrived where the hare, rabbit, polecat, weasel, stoat, wild cat, mole, badger, &c., have found their way. Some of these, doubtless, may have been brought. There are no perch north of Perth, and no minnows, but plenty of sticklebacks. No pike are to be found in streams that fall into the West Sea, nor in the lochs from which they flow.

But to return to the crows. In former times, the grey, *Royston*, or hooded, crow, had, as I think, been the more common species, even in the border counties where it is now almost unknown; for the carrion crow is called every where the *hoody crow*, and seems to have gradually banished the other, which, although almost as subtle and cautious, has somewhat more of a sylvan or wild character. These two nearly connected species do not generally incline to associate; for I have twice seen them paired in Selkirkshire, but never a black and a grey crow together.

I am not aware that the black carrion crow is at all common on the north-west coast, or on any of the Western Islands.

I once saw a flock of the grey hooded crows feeding on shell-fish, on the east coast of Jura, after a violent storm, which I could not estimate at less than 500; and I did not observe one black crow amongst them.

* An old correspondent of this Magazine.

Although both the black and grey hooded crows make their nests on trees*, I am inclined to suppose that the emigration of the grey sort from the south of Scotland took place along with the destruction of the woods, during the early part of the seventeenth century, which was caused by the demand for charcoal for the smelting of iron.

The changes that birds sometimes evince in their preference for certain districts is often curious enough, and by no means easy to be accounted for: the subject, in general, would be well worth the attention of such a person as your correspondent Mr. E. Blyth.

Not many years ago, the eagle was often seen taking a view of the lower mountains of Selkirkshire, and was a native of the neighbouring county of Dumfries, or, rather, of the alpine boundary between the two districts; and had its nest annually in two places. One of these was on a precipice in a wild glen in Eskdale, called the Garwald Grains; the other situation was chosen with much of that touch of reflection that we sometimes observe among birds, as well as others of the lower animals. There is a small rocky islet, almost even with the water, in Loch Skene, which is surrounded with the highest mountains south of the Forth; and, although the side of one of these mountains, that overhangs the lake, is rocky and seemingly inaccessible, the eagles chose to have their nest on the islet in the loch, because, forsooth, the loch craig could be approached by ropes from above, while it is almost impossible to convey a boat to the loch, and there never was one there.

About forty years ago, people spoke of the starling as being in former times a constant companion of the ruined towers, but which had so completely forsaken the southern counties, that the first I ever saw were flying about the tower of the old monastery of Roudell, in the Island of Harris, in 1804. † The old people likewise spoke of having in their youth seen the black cock and grey hen, as the old Highlanders now do of the capercaillie. Now, the black grouse (*Tétrao Tètrix*) are nearly as plentiful in Selkirkshire as the common grouse. The starlings returned by a pair in a season, and built, some in hollow trees, and some in the few old towers that still remain, and are become even less nice of a breeding-place.

* I have once known the carrion crow make her nest on steep ground amongst heath; and another time on the point of a rock in a ravine.

† Some years afterwards, a bird-fancier in Edinburgh told me that the only starlings he knew of made their nest down the shaft of an old draw-well at Priestfield, whence he procured the young ones, by getting boys to go down for them.

A circumstance worth recording occurred in Selkirkshire, when the black grouse became plentiful. It was formerly believed that the muirhen, as the female of the red grouse was called, had in her wild and muirland nature somewhat of the spirit of the "sons of Jonathan the son of Rechab;" and, as she kept her young aloof from the haunts of man and from all human cultivation, so neither would she approach his dwelling, nor eat grain herself. That of old this had been the case I make no doubt, because I well recollect when such a thing was unknown in that district; and this belief was corroborated by a proverb in ancient rhyme, viz. : —

"The muirhen has sworn by her tough shin,
She sal never eat of the carl's win;"

and, doubtless, she long, and most unaccountably, kept her oath.

The first time I ever saw the muirfowl feeding on grain, was six and twenty years ago, while passing the Kingside-edge, the high lands between Peebles and Edinburgh; when, to my astonishment (for the fact was not at that time a fact in Yarrow), I saw part of a covey spring from a stubble, and others seated upon the stooks.

When the black grouse became numerous in Selkirkshire, they soon became also a great annoyance to the crops of oats; at first in late seasons, and afterwards as soon as the oats began to ripen.

For some years they got no countenance in this practice from their congeners, the red grouse, or *muirfowl*, as they are still called there: but "evil communication corrupts good morals;" and sorry I am to report, that now the muirhen makes as light of the oath of her ancestors as the descendants of Jonathan the Rechabite now do; and any day in October may be seen coveys of them, mixed with the black grouse, on the stubbles, seated on the stooks, and ranged in lines on the top of the stone walls that bound the fields; greatly to the offence of the older shepherds, who speak of their corruption by the greyfowl, and repeat the proverbial rhyme.

It would be well could we obtain any account of the habits of the swans that, in former times, annually resorted to Loch Spynie, in Morayshire; but the cause of their forsaking it was compulsory, for the lake was drained. A like disaster is not soon to be apprehended, we trust, to the wild geese which breed around Loch Naver, in Sutherland, where they waddle out of the traveller's way with little more fear than the domestic goose, being especially protected by the noble proprietress.

The woodcock, twenty years ago, was a migratory visitor

of our wild woods and copses: any surmise, at that time, of its breeding in the country would have been held as visionary and ridiculous; but, for some years past, the woodcock is as well known annually to bring out her young as the curlew or green plover. In various parts of Ross-shire, its nests are frequent. It hatches early, often in the latter end of March, but generally by the first week of April. On the 10th of April, 1835, the gamekeeper at Brahan Castle, a seat of the Hon. Mrs. Stewart Mackenzie, offered to show the writer of this two nests upon which the birds (woodcocks) were still sitting. We found one of these by the side of a road used for driving timber, but which was not much frequented. It was in withered grass, and partially screened by spray and brambles. Although the gamekeeper pointed to the place, and we were within a few feet of the bird, yet, like an unpractised person endeavouring to see a hare in her *form*, it was sometime before our eyes were able to find her. To me the sight was new, greatly interesting, and beautiful; and the woodcock in her nest would have made a delightful study for Bewick, or a theme for Wordsworth.* She sat with her head thrown as if far back between her wings, and the end of her long bill a very little over her mottled breast. The dark brown streaks of her wing coverts, and the markings on her wings and her head, were so delicate, and, withal, so clear and distinct, as to be, on the whole, "beautiful exceedingly."

We left her there, after looking at her attentively, and greatly delighted, for several minutes; and, about 250 paces off, we were shown another, amongst pruned branches at the root of a large larch tree. I was eager to see the nest and eggs of this; and the gamekeeper allowed his terrier to put her off. She fluttered away in a zig-zag direction, hanging her head and her legs as if severely wounded, on purpose to decoy us from her nest, as many other birds do. We found there had been five eggs of the colour of those of the red grouse. Two of the birds were free of the shell; but one of these we thought was dead, and the other tried to run away. We caught it, and put it in the nest again, which it again left; and in the mean time, the other, that we thought was dead, got up, and tried to run off likewise. We quitted the nest as quickly as we could, afraid that the dam, who had once or twice appeared on the wing among the underwood, might, between her young that had run from their eggs, and those that still were confined there, have more to do in her

* See his Sonnet to a Wild Duck's Nest. The gamekeeper told us that, in March, 1834, he found a woodcock's nest, the young of which ran off on the 29th of that month.

household than she could well manage. The nest was constructed carelessly, like all of the tribe, and chiefly of a little of the dried grass from the immediate neighbourhood.

I was surprised at the large size of the eggs, which, as I said, were of the colour of those of the red grouse (*Tétrao scôtica*), and similarly speckled; but they were also nearly of the same size. The gamekeeper assured us that he had seen them carrying them in their claws; and Sir George Mackenzie of Coul's gamekeeper was likewise convinced that they did so, and that he had, besides, seen them carrying their young: and a friend, residing near Coul, where many woodcocks breed, tells me that he has more than once observed woodcocks carrying something in their claws, while flying low, and which he could not consider as any thing else than one of their young. If it be not a mistake, it is, like many others, a startling fact; for, as the young leave the nest, like partridges, immediately on being hatched, there seems little occasion for it. That they may convey their eggs to another situation I am the more inclined to believe, because I have been assured by shepherds that they have known the ring-tailed glade (female of *Fálco cyàneus*) remove her eggs more than once when she was aware that her nest was discovered. I am likewise inclined to believe that the *F. cyàneus* lays only two eggs.

I beg to leave some farther notices, relating to the habits of the scolopax, to another time.

ART. IV. *Observations upon the chronological Arrangement of fossiliferous Deposits, by a Reference to their organic Contents.*
By WILLIAM RICHARDSON, Esq., M.D. F.G.S.

THE announcement by M. Deshayes of the principles of the per-centage system, and the subsequent confirmation by Mr. Lyell of the views advanced by this eminent conchologist, were welcomed by the scientific public with marked satisfaction. I was one of those who rejoiced in this accession of knowledge to the fund of natural science, and felt strongly assured that, by the aid which it proffered, diligence and accuracy were alone requisite for establishing upon a sure basis the relative succession of our tertiary deposits; nay more, the system, when fortified by new facts, appeared applicable, also, to the secondary formations; and I saw no good reason for excluding from its legitimate influences the earliest of the fossiliferous deposits.

My confidence, however, in the truth of the system was not destined to remain long unshaken. The proceedings in the geological section of the British Association, held at Bristol, first created distrust in my mind; the papers of Mr. Charlesworth in the *London and Edinburgh Phil. Mag.*, and recently in *London's Mag. Nat. Hist.*, strengthened this feeling; and my own observations on the eastern coast of England, especially on that part of it which forms the northern boundary of the Thames estuary, have, I may say, almost demonstrated that the principles of M. Deshayes are not only not sure conductors to truth, but must, unless modified to a degree that will affect their practical utility, lead inevitably to error. In endeavouring to determine the age of one tertiary deposit (the crag), the application of the system has already involved its propounder and a celebrated naturalist in a dilemma from which it is quite clear both cannot escape with credit. Dr. Beck and M. Deshayes are directly at issue on this point; nor does any authority exist, but that of time, to which the difference between them can be referred; and that stern and uncompromising arbitrator may ultimately determine that to neither can be tender a favourable award.

But, disregarding the facts stated, and the arguments advanced, by Mr. Charlesworth, I shall confine my attention exclusively to the evidence in corroboration of his views, derived from an examination of the causes now in operation on the Kentish coast. From the time of the venerable Bede to the present day, the degradation of the land, and the encroachment of the sea, on this coast, have been repeatedly the subjects of observation. The site of the devastation extends from the westernmost point of the Isle of Sheppey to the ruinous towers of the Reculver Church, comprising a distance of more than twenty miles. It is difficult to mark with accuracy the progress of the encroachment; but an approximation to the truth may be obtained by consulting a map of Kent published in the reign of Henry VIII., and in which a space of more than a mile is assigned to the land which then existed between the Roman wall bounding the village of Reculver and the low-water mark. At the present time, the village can hardly be said to exist; and the towers of its once celebrated church now stand within 5 ft. of the perpendicular cliffs. The same map discloses the existence of an inlet of the sea, between Whitstable and Reculver, capable of affording shelter to small vessels, but of which not the slightest trace now remains.

The testimony of living witnesses sustains the fact of rapid

encroachment within the last quarter of a century ; and my personal knowledge, not reaching backward more than ten years, enables me to state that the features of the whole coast line are annually changing.

The cliffs which skirt this coast from Whitstable to Reculver display beautiful sections of the London and plastic clays, with their associated sands ; and are richly stored with their characteristic fossils. The whole line is capped with a thick bed of diluvial gravel, which abounds with mammalian remains.

The result of the degradation which is thus uninterruptedly taking place is, to scatter in profusion, on a line of coast more than twenty miles in extent, the mammalian spoils of the diluvial gravel, and the organic treasures of two rich tertiary deposits. The action of the tides, which, on the Kentish coast, run nearly parallel to the land, gradually convey the lighter and fragile portions of the bones and shells into the comparatively deeper water, and there quietly deposit their burthen. The larger bones, and the weightier fossils, retain the stations which their gravity has assigned to them, and are gradually circumvented by, and involved in, the advancing waters.

That I am not indebted to my imagination for these facts, I may state, and some of the readers of this Magazine may remember, that, about two years since, I crowded the table of the Geological Society of London with fossil mammalian remains dredged up by the fishermen of Whitstable and Herne Bay, in their daily avocations. The greater part were derived from the outlying oyster beds, which extend more than a mile and a half from the shore ; others from a much greater distance ; so that little doubt can exist that these animal reliquæ were embedded in the diluvial detritus which capped the cliffs of this coast, and which have fallen beneath the undermining action of the tides and waves. Similar remains are found in the gravel bed extending inland, whenever it is extensively explored : but what renders their identity unquestionable is, the fact that the larger bones have their interior still filled with the yellow loam and the small flints of the gravel bed. They are, moreover, in a good state of preservation, and appear to have suffered no violence since their displacement : their condition may be ascribed to the soft and tenacious nature of the blue, or London, clay, on the surface of which they repose. With the exception of the external discoloration, arising from their long contact with the clay, they are not to be distinguished from their undisturbed brethren of the superficial

gravel. To avert all suspicion as to these remains being due to the destruction of recent animals, it may be observed, that they consist principally of the bones of the elephant, the rhinoceros, the stag, and the bear. Those of the horse, the ox, and the dog are not unfrequent. The same character, however, pervades the whole; viz. the total absence of all albuminous matter.

With these bones, and acquired by the same means, dredging, are obtained the Naútili and Crustacea of the Sheppey beds, to which, as well as to the bones, are attached, in considerable numbers, the living Bálani, O'streæ, and Scrpulæ, and also the recent A'lgæ, Fùci, and Flústræ.

From Herne Bay to the Reculvers, the bed of the sea presents different, but analogous, results. On this line, the mud and sand exposed by the retreat of the tides is stored with the fossil molluscs of the sands and clays of the adjoining cliffs; comprising, at the lowest estimate, twelve species, some of which are extinct, and others are entire strangers to the European seas. The shore affords to the collector a larger quantity, and a better choice, than the cliffs themselves. With these are largely associated the living Testacea of the German Ocean.

From the preceding statement it results, then, on a line of coast more than twenty miles in length, and two or three in breadth, and within the historic period, there have been, and still continue to be, deposited the animal products of three distinct periods; viz. the eocene, the last diluvial, and the recent. The process of exhumation is slowly, but steadily, advancing; and, without calling in the aid of cycle and epicycle, it may safely be inferred that a formation, of no inconsiderable extent, is in rapid progress throughout the estuary of the Thames, involving anachronisms, as to its organic contents, of the most obvious and violent characters. With equal force and fairness, the observation may be applied to the whole eastern coast of England, to the shores of Europe generally, and to those of America. It would be gratuitous and unphilosophical, and totally opposed to the leading principle of Mr. Lyell's work, not to assume that the causes now in action must have prevailed under similar circumstances in former ages: but it is not left to assumption; the secondary fossils in the crag attest the destruction of the chalk during the period when that comparatively recent deposit was in progress; and, indeed, it may be asked, what are all the vast conglomerates of geology, but witnesses trumpet-tongued of the antagonist forces of destruction and reconstruction which have ever been contending on the surface of this earth.

With this statement of facts, an excursion into the region of speculation may now be permitted, with the view of testing, more closely than can otherwise be done, the force and truth of that system announced by M. Deshayes, and which professes to determine the age of deposits by a proportional estimate of their recent and extinct organic contents. I will suppose, then, that one of those indefinite periods of time, with which the mind of the geologist is so familiar, has been completed; during which the estuary of the Thames shall have been consolidated and elevated, and a section of it exposed to the observation of some future Deshayes, or to a disciple of his school. The investigator proceeds to ascertain the number and proportion of the recent and extinct genera and species, and to assign, upon the strength of this calculation, the rank which the deposit is entitled to assume in the chronological scale of nature's works. The sedimentary and tranquil character of the formation, consisting of alternating bands of sand and clay, and the total absence of extraneous materials, give assurance to his conclusions; and the synchronous existence of the organic contents is instanced with unhesitating confidence. He meets with no fact that can excite suspicion, or create distrust: the intrusive and extinct fossils are linked with the recent by the closest of all ties, the attachment by growth of the latter upon the former: they lie in peaceful juxtaposition, and upon undisturbed beds of oysters. But, notwithstanding this concurring and apparently conclusive testimony, it is at once obvious that such conclusions and inferences must be directly at variance with truth, and replete with the elements of error.

The presence of mammalian remains will not avail to disturb the confidence of the enquirer: in his view, they are the representatives of the fauna of the same period to which the formation itself is to be ascribed; and their presence is to be explained upon the same principles which account for the shallow seas of the present age becoming receptacles for similar remains.

Thus all is harmonious, but untrue; all philosophical, but false; and the geologist who looked for safe guidance through the difficulties of his way by means of this talisman ultimately finds himself involved, by its employment, in "confusion worse confounded."

ART. V. *On the Inexpediency of altering established Terms in Natural History.* By HUGH EDWARD STRICKLAND, Esq., F.G.S.

IT is now about two years since I published some remarks on this subject in this Magazine (Vol. VIII. p. 36.), and in the *Analyst* (vol. ii. p. 317.). Those remarks were directed against a practice which certain naturalists (?) had commenced, of altering at their own good will and pleasure numerous scientific terms, many of which had been current in the republic of science for near a century. Absence from England has since prevented me from recurring to the subject until now. On looking over this Magazine, and the *Analyst*, for the last year and half, I find that the lovers of confusion have been hard at work, and that corresponding efforts are required on the part of the true friends of science to counteract this evil tendency. Among other papers on this subject, is one in this Magazine (Vol. IX. p. 139. and 337.), by a Mr. C. T. Wood, in which he attacks, in not the most courteous terms, my former communications of Vol. VIII. p. 36. Having a great dislike to the personalities of ordinary paper warfare, it is not my intention, at present, to expose the fallacies and misstatements in Mr. Wood's paper.* I will merely remark that, in his zeal for improved nomenclature, he might have found a more appropriate epithet for me than *anti-reformer*. No one is more desirous of the improvement of science than myself; but *reform* implies something more than *change*; and it is precisely because I do not consider that the proposed changes are *for the better*, that I enter my protest against them. On a superficial view of the case, it may certainly appear, that to change a less appropriate scientific name for one that is more so *is* a change for the better: but what is the result? If, to take the most favourable view of the case, the scientific world should agree to adopt an "improved" nomenclature, yet, even then, all our standard works on natural history would become, in great measure, a dead letter; every museum in the world would require to be re-labeled; and the disentanglement of synonymes (already a sufficiently laborious, though necessary, duty) would become almost hopeless. But if, as would most certainly be the case, these "improved nomenclatures" should be only partially adopted, the disentanglement of synonymes would

* Not content with "improving" nomenclature, Mr. C. T. Wood and an anonymous colleague of his (S. D. W.) try their hand at orthography also, and insist upon writing Fasiànus, Faláropus, níctea, Cípselus, &c., in defiance of all the laws of etymology which have been acknowledged these 2000 years. Such puerilities do not require further comment.

then become *quite* hopeless, and the curse of Babel would be entailed on the scientific world. Natural history would become divided into nations and languages; each country would remain in happy ignorance of the state of the science among its neighbours; and we should have genera and species described as new which had been known for twenty years in France or Germany. Surely there are at present sufficient impediments to scientific intercourse (such as loss of time and money, passports, quarantine, duties on books, and the like), without further obliging the traveller to learn a new scientific nomenclature in each country previously to visiting its museums, or conversing with its professors.

This "improving" system has already gone far enough to afford a fair specimen of its merits. Any one who will take the trouble to examine the various papers on ornithological nomenclature in the *Analyst*, will find that specific names are as variable as the London fashions. Every new number of that work contains some fresh change in the nomenclature; and sage reasons are given why the names invented, three months before, by A. B., are not satisfactory to C. D. When the golden rule of *priority* is once laid aside, there seems to be no limit to these alterations; for, however appropriate a nomenclature may be, dabblers in science will always be found who will prefer terms of their own coinage to those which are already established. The result will be, that, after these obscure individuals have involved the science in an inextricable maze of confusion, the real cultivators of zoology will cut the Gordian knot, and fall back upon the names originally established by the fathers of the science; names recognised in all standard works, and current among naturalists in all parts of the world. Then will the nomenclature of Linnæus, Cuvier, and Temminck triumph over the crude inventions of a host of anonymous scribblers.*

That these proposed innovations will never be adopted by the highest class of naturalists is my firm belief. If I am mistaken in this point; if three fourths of the terms now current in science *must* and *will* be called in, and a new coinage issued; then, at least, let that coinage proceed from a duly authorised mint. Let a committee be appointed; not from the "Constant Readers" of a provincial magazine, but from the most eminent naturalists of every country where the

* Sir James E. Smith, quoted by Swainson (*Birds*, vol. i. p. 245.), says, "Those who alter names, often for the worse, according to arbitrary rules of their own, or in order to aim at consequence which they cannot otherwise attain, are best treated with silent neglect. The system should not be encumbered with such names, even as synonymses."

science is cultivated, to take the subject of nomenclature into consideration. The number of persons selected from each country should be proportionate to the degree in which it encourages science, in such ratio as the following:—Germany, including Austria, 6; France, 5; Prussia, 4; England, 4; Holland, Switzerland, and Italy, 3 each; America and Russia, 2 each; Sweden, Denmark, and Spain, 1 each; total, 35. Let a list be prepared of such names of classes, orders, families, genera, and species as are considered objectionable, and let the committee have full power to retain or condemn as they should think best. By this means, whatever changes were once made would be unalterably established, and uniformly adopted, in all parts of the world. Such a plan might not gratify the vanity of those individuals who, by altering names, “aim at consequence which they cannot otherwise attain;” but it would be the most beneficial method of reforming the language of science, if reformed it must be.

In my former paper of Vol. VIII. p. 36., I showed that it is of much more importance that a name should be universally adopted, than that its *meaning* should exclusively apply to the object. This, indeed, it very rarely can do; for nothing short of a whole sentence will, in general, express that aggregate of characters which distinguishes a species or group from its congeners.* Nay, a name will even answer its purpose if it has no meaning at all; a doctrine admitted by some of my opponents with respect to genera, though, for some inexplicable reason, they deny it in the case of species. The *meaning* of a name is, therefore, a point of less importance than its *universality*; and, when the latter object has been once gained, I would never sacrifice it to the former. Yet it must not be supposed that I consider the meaning of a name a point of *no* importance. As a general principle, the meaning of an epithet may be made of great use in recalling to the mind many facts connected with the object which it represents; and, therefore, in bestowing names upon species discovered, or groups defined, *for the first time*, it is desirable to make those names as expressive as possible. I therefore fully approve of many of the rules laid down by my opponent Mr. Wood in Vol. IX. p. 341.; and by Mr. Swainson, in his *Birds*, part ii. ch. 2., to which I gladly refer for support to my own views. I would not, however, go so far as Mr. Swainson in erasing

* Mr. Wood denies that any one maintains this. Then why, let me ask, do the innovators continually change names which are already appropriate, in the vain hope of finding others which shall be exclusively so? (See the *Analyst*, passim.)

many of the generic names to which he objects. Thus *Týnamus*, *Catarrháctes*, *Dendrocoláptes*, &c., having *once become established*, may, in my opinion, be advantageously retained, though they are not to be imitated in future.

As a proof that a name may answer the purpose of suggesting an object to the mind, even when its *meaning* implies something actually false and erroneous, I may instance the names *Caprimúlgus* and *Paradísea ápada*. The mention of these names immediately suggests the idea of certain birds to the ornithologist; but there are surely none so ignorant as to be led by the etymology of these terms into a belief that the one sucks goats, and that the other has no feet. All that is *now* implied by the term *Caprimúlgus* is, that "these are the birds once accused of sucking goats;" and by *ápada*, that "this is the bird anciently supposed to be destitute of feet, and which to this day is so rarely obtained with those organs perfect." Now, though these facts are of no great importance, they are at least amusing and harmless associations connected with the birds in question. Therefore, names whose very meaning is erroneous do not necessarily mislead: hence the term *Caprimúlgus*, which has been established for 2000 years, ought, and I trust will, triumph over its ephemeral rivals *Nyctichélidon*, *Vociferátor*, and *Phalænívora*.

Yet, in general, it cannot be denied that, in the rare cases when the derivation of a name, whether generic or specific, is likely to propagate a really false opinion, such a name should be erased. When such changes are made, some plan should be adopted to consult the opinions of foreign as well as English naturalists, and to insure a universal adoption throughout the whole scientific world.

In what has been said above I have had in view only the Latin and Græco-Latin names for natural objects. These, being recognised by naturalists of all nations, form the only legitimate language of science. English names, therefore, are not wanted in scientific discourse; for, when one name for a thing is sufficient, two are superfluous. There are, however, certain persons who find the Latin names too learned for them, and will not be satisfied without English names for genera and species. Not being able to make the vernacular names in use among our peasantry square with their ideas of systematic nomenclature, they set to work to coin terms out of their mother-tongue; and thus we are beset with a host of such names as *kinglet*, *treeling*, *mufflin*, &c. Such puerilities may be very well for country bird-stuffers, and for idle boys, who, instead of going to school, spend their time in birdnesting, and call themselves "field-naturalists;" but they

are beneath the notice of men of science, whom I would gladly see discarding the superfluous English names altogether. Some concession must, however, be made to the vulgar cry; for, if science be not put in a "popular" form, the labours of its real cultivators will not be repaid. If, then, English terms must be superadded to the Latin, I would suggest that the old terms, such as warbler, finch, &c., be as much as possible retained, and that, where a genus has no peculiar English name already, the Latin one should be used in preference to coining a new term. Thus, I would rather say, "hedge accentor, fire-crested regulus, bearded calamophilus, yellow budytes, &c., than burden science with such clumsy appellations as dunnoek, kinglet, longtail, and willet (*alias* oatear); to say nothing of abern, surn, popin, sprigtail, and the like.

But I would strongly protest against extending the system of English nomenclature beyond the English fauna. What possible benefit can accrue from coining new substantives, of Saxon derivation, for the countless genera of exotic zoology? I trust we may never see the forms of New Holland or of South America burdened with such uncouth appellations as have been invented for the birds of England.

ART. VI. *On the Psychological Distinctions between Man and all other Animals; and the consequent Diversity of Human Influence over the inferior Ranks of Creation, from any mutual and reciprocal Influence exercised among the Latter.* By EDWARD BLYTH, Esq.

(Concluded from p. 85.)

I WILL now proceed to notice, and follow to its bearings, that mysterious impulse (if possible, even more incomprehensible than ordinary instinct) which guides a migrant animal to its destined haven; which also propels a bee towards its hive, and a pigeon homeward from one extremity of Europe to another; a principle, as will be shown, not wholly absent from the human constitution. The migrative restlessness displayed so forcibly by birds of passage, even when raised in confinement, and plentifully supplied with the nourishment they have been accustomed to (thus showing that insufficiency of food is not the predisposing cause, as is also intimated by the early departure of certain species from their summer haunts, after performing the duties of the season), is merely on a par with all other instinctive manifestations: and I may cursorily remark that, from much careful and attentive observation, I have determined, at least

to my own satisfaction, that, as a general rule, it is in autumn mainly influenced by decline of temperature, and in spring by the breeding stimulus: the period of the incidence of which latter (though, undoubtedly, somewhat affected by temperature) is primarily dependent on specific peculiarity, and, secondarily, on constitutional vigour.* It is not the erratic impulse, however, so much as the guiding principle, that we have here to do with; that wonderful, most inexplicable principle, on which a diurnal migratory bird is not only, and by

* The direct influence of decline of temperature in prompting the equatorial movements of the feathered race, may be observed in the fluctuations in intensity of the erratic impulse, throughout the greater part of winter, exhibited by migrant birds in a state of confinement; such variations being constantly found to accord with thermometrical changes. It may be added, that the degree of temperature which incites them to migrate varies considerably in different species; and in some instances, also, it must not be concealed, that the impulse to quit the breeding station is entirely independent of decrease of temperature; as is exemplified by the swift and adult cuckoo retiring southward at the hottest period of the year: so powerful, too, is this impetus in the first-named species, and others of the *Hirundinidae*, that these have been many times known to leave a brood of half-fledged nestlings to perish. As regards the polar movement, the proximate cause will appear on consideration of the following facts:—It is known that, in the feathered race, the enlargement of particular organs in spring superinduces, in most groups, some considerable change in the external aspect; frequently altering, for instance, the colour of the bill, and occasioning (in single-moulting species) the rapid disappearance of those deciduous edgings to the feathers, which oftentimes conceal, for a while, the brighter tints of summer; which latter, also, are, in addition, commonly more or less heightened at this period. Now, all these changes are observable in two nearly allied species, the chaffinch and bramble finch, both of which pass the winter in the same localities; but it uniformly happens that the vernal change takes place in the former species several weeks earlier than in the latter. In the beginning of March, every chaffinch is found to exhibit its complete summer aspect; whereas, late in April, I have watched, with a glass, a flock of bramble finches feeding on elm blossoms, in none of which had the bill acquired its blue colour; coincident with which change this species always leaves the country. The fact is equally noticeable when they are kept in confinement. Fieldfares and redwings, also, linger in our fields till long after their resident congeners have been engaged in breeding; and it is found, on dissecting these, at this period, that they are comparatively very backward in their seasonal developments, the attainment of which immediately prompts the migrative impulse. Of course, the breeding station is the proper home of a species, and thereto do all its adaptations directly refer; and thus we find that even the genial influence of a more equatorial abode fails to excite the breeding energies of migrant birds, until such time as their distant summer haunts become fitted for their reception. To conclude this subject, it may be added, that the migratory restlessness in caged birds does not dissipate in spring, at the time of the reappearance of their wild brethren, but is occasionally evinced throughout the summer, till its cessation follows the decrease of those organs which had all along stimulated its manifestation; a constitutional change which likewise puts a stop to song, and brings about the autumnal renovation of plumage.

night, enabled to soar for even thousands of miles, over seas and continents, surmounting every obstacle, even lofty mountain ridges, in its course, impelled always in one unvarying direction, till it arrives at the proper winter quarters of its species; but, at the ensuing season, is also led back to its former abode, to the precise locality that it had previously set out from, having been known even to return to confinement. I conceive it unnecessary to detail observed instances of this astonishing fact, because, in the feathered race, it is well known to every student of natural history. It will be enough to mention, that I have an instance, on indisputable authority, of a lame redstart returning regularly for sixteen summers to the same garden.

Among mammalians, numerous instances have been recorded, resting on unexceptionable testimony, of animals returning straight to their accustomed haunts, over pastures and across streams they could not possibly have ever traversed before, and by a nearer and very different route from that by which they had been driven or carried. To these I will add the following, which occurred to the personal knowledge of my informant. A cat, from the centre of an intricate and populous seaport town*, was shipped on board of a vessel bound for the Brazils; and, after performing the voyage to and fro, contrived to escape, on returning to its native port, and found its way, through several streets, to its former domicile.

Mr. Jesse, in the third series of his *Gleanings*, has related a like anecdote of a reptile. Of a number of turtles, captured on Ascension Island, chanced to be an individual which, to use the technical phrase, had lost one of its *fins*. It was marked in the ordinary manner on the under shell, which marks are well known to be indelible. The vessel, on arriving in the Channel, was long detained by contrary winds, during which time a great mortality took place among the turtles; these dying one after another so fast, that it was at length resolved to cast what few remained of them, including the lame one, into the sea, to give them, as was said, a chance for their lives. Three years afterwards, this same turtle, with its three fins, and the marks of the hot iron beneath, was found again upon Ascension Island.

It is sufficient to refer to the results of numerous experiments which have been instituted on the fry of the *Salmonidæ*, to be convinced of the prevalence of the same surprising impulse also among fishes.

* St. Helier's, Jersey.

In the invertebrate animals, we have, apparently, proof of the existence of this principle, in the fact of the great distances to which many hymenopterous insects are known to range for food. A decisive experiment, however, is still needed to render the inference conclusive; and I venture to suggest, to whoever may have the opportunity and inclination, that of marking a number of bees from the same hive, and suffering them to fly from, say, a hundred miles' distance. There is hardly a doubt that they would be found to regain their abode; and it would be interesting to ascertain the time they would require to do so.

Some migratory birds are observed to resort annually to the exact same winter quarters; for illustrative proof of which, refer to Bewick's description of the woodcock. Other species would seem to wander through the winter, of which the waxwing may be cited as an example. They all, however, appear to return to their former breeding haunts, where dispersion is effected, in those species which do not nidificate in society, by the older individuals (which are always the first to return) driving away their young of a former year; which latter, however, do not commonly retire farther than they can help, as I have had occasion to notice in some instances.

The bearings of this law on the geographical distribution of species do not appear to have been sufficiently taken into consideration. For instance, Mr. Selby remarks, as an extraordinary circumstance, tending to show within what abrupt boundaries the natural range of particular species is confined, the abundance of the white stork in Holland, and its excessive rarity on the opposite English coast. In Holland, be it remembered, it meets with encouragement; whereas, in this country, no sooner does an individual make its appearance, than it is immediately shot down. Once allowed to settle, it would doubtless soon colonise our fenny counties.

Some years ago, a considerable flock of spoonbills settled in a part of Aberdeenshire; whereupon the whole neighbourhood uprose in arms, till every bird of them was killed. Here, probably, we have an instance of another phenomenon in the animal world, which should not be overlooked in this treatise. When a species increases numerically in any habitat beyond what the latter is adequate to sustain (a circumstance which, in the higher groups, can hardly happen, except in those of social habits), either their ranks are mysteriously thinned by what is termed *epizooty*, or an erratic impulse (unrestrained by the localising principle we have been considering) instinctively prompts a portion of them to seek fresh quarters. This is observed more in mammals than in

birds, but is particularly noticeable in the insect tribes; various species of which, though solitary in their usual habit, have been known to assemble at times in prodigious multitudes, prompted by a general impulse, which, however, appears to be less conferred with intent to extend the previous range of their distribution, than to preserve the species within due bounds in its native locality; for the numerous dangers with which these wanderers are necessarily every where beset absolutely appear to suffice, in most instances, to prevent their permanently establishing themselves in other places; a remarkable fact, notorious to all who have attended to the subject. So many causes are there in operation which combine to circumscribe the geographic range of species.

A variety of important considerations here crowd upon the mind; foremost of which is the enquiry, that, as man, by removing species from their appropriate haunts, superinduces changes on their physical constitution and adaptations, to what extent may not the same take place in wild nature, so that, in a few generations, distinctive characters may be acquired, such as are recognised as indicative of specific diversity? It is a positive fact, for example, that the nestling plumage of larks, hatched in a red gravelly locality, is of a paler and more rufous tint than in those bred upon a dark soil.* May not, then, a large proportion of what are considered species have descended from a common parentage?

I would briefly despatch this interrogatory, as abler writers have often taken the subject in hand. It is, moreover, foreign to the professed object of this paper. There are many phenomena which tend, in no small degree, to favour the supposition, and none more so than what I have termed the localising principle, which must occasion, to a great extent, what is called "breeding in and in," and, therefore, the transmission of individual peculiarities. We have seen, however, the extreme difficulties which most species have

* Such is, at least, the uniform result of my experience; though I could never discern a corresponding difference in the adults. This curious fact was first intimated to me by a person who had a number of young larks for sale, among which were two nests of very rufous birds, and three of a much darker colour: the former, he assured me, were found in a gravelly situation; the others on a dark soil. Some cases I have since noticed have verified the observation. On another occasion, I may probably bring together a number of analogous facts, in the form of a paper; but it would occupy too much space to do so here. It may, however, be added, that the agency of many species confers a reciprocity of adaptation; thus, the mode in which sheep graze has a decided tendency to reduce a country to that bare and bleak state which suits best with their healthy condition. Hence would accrue a necessary return of varieties to their normal characters.

to encounter when occurring beyond the sphere of their adaptations; difficulties which must require human aid, in general, to render surmountable. But, without re-entering into the details of this subject, it will be sufficiently clear to all who consider the matter, that, were this self-adapting system to prevail to any extent, we should in vain seek for those constant and invariable distinctions which are found to obtain. Instead of a species becoming gradually less numerous where its haunts grade imperceptibly away, we should discover a corresponding gradation in its adaptations; and, as the most dissimilar varieties of one species (those of the dog, for instance) propagate as readily together as individuals of the same variety, producing offspring of blended characters*, so much so, that human interference is requisite to preserve a breed unadulterated, the unbending permanency of the distinguishing characteristics of all wild animals becomes of double import. Moreover, the characters in which these differ are of a diverse kind from those observable in any but the most distant of mere varieties; for they rarely agree in the relative proportions of parts, which are the most fixed of all specific distinctions. It is, therefore, advisedly that we are enabled to state that the raven of the Cape is distinct from the raven of South America; that both are again different from that of the South Sea Islands and from that of Europe. The common jay is diffused over a wide range of latitude, but is the same in Italy as in Sweden: this would not be were it affected by locality or climate; the very trivial distinctions, therefore, which characterise it apart from that of Japan, and from that of Asia Minor, we are warranted in esteeming of specific value. Until the jays of intervening localities present inosculant characters†, or until precisely analogous diversities are, in wild nature, observed to be produced by locality or climate, the above conclusion is as irresistible as it is incontrovertible.

When, too, we perceive that species so very general in their adaptations as the typical *Córvidae* are limited in their range, it behoves us to be most cautious in assuming the specific identity of the most similar animals from widely separated localities. Let it be remembered that no reason can be assigned why those originally distinct should not

* Individuals of very diverse breeds mostly do so: where the parents more nearly approximate, the young often entirely resemble one or the other.

† Here the very remarkable fact, however, is not to be overlooked, that the solitary African species of trogon presents a combination of those colours and markings which uniformly distinguish apart its numerous congeners in the Oriental isles from those of South America.

exactly resemble. Human agency apart, I do not think there is a single species which even approximates to universal distribution. Of course, we can only judge from probability and analogy. Great locomotive power, even the maximum, by no means necessarily implies an extensive distribution: witness the common swift, and its American analogue*, neither of which have been known to straggle across the Atlantic, like many birds of far less power of wing, but are bound by the localising principle. It is true, this principle can apply only to such species as are locomotive; but it is equally true, that other causes analogously restrain the undue diffusion of those which are individually fixed. Thus we hear of the agency of sea currents in transporting seeds, which must abundantly be carried out into the ocean by the action of rivers; but it appears not to have been remembered that steeping in sea water destroys the vital principle; that moisture induces germination, which, once excited, can only be checked by the final cessation of the vital functions.† Analogy would lead us to infer that such antagonist principles obtain throughout creation, whether or not human observation may have yet detected their existence. It would be easy to point out additional hindrances to the more extensive spread of species of fixed habit, by treating on the fraction which are allowed to attain maturity, even in their normal habitat, of the multitude of germs which are annually produced; and in what ratio the causes which prevent the numerical increase of a species in its indigenous locality would act where its adaptations are not in strict accordance will sufficiently appear, on considering the exquisite perfection of those of the races with which it would have to contend. If there is a probability that any species has become naturally of general distribution, it is in the case of two lepidopterous insects, *Acherontia A'tropos* and *Cynthia cardui*, both of which are of peculiarly erratic habits; and it is said that these are found throughout the world: yet the differences which exist in specimens from diverse localities are hard to reconcile with specific variation, at least to judge from what tropical specimens I have seen of the former; and an eminent entomological friend has remarked to me, in conversation, that he is equally sceptical, judging from his

* *Chætura pelagica*.

† This observation is, however, intended to apply merely to those of inland plants; for some maritime species, as the *Pandaneæ* and cocoa palms, have their seeds encased in sea-proof coverings, especially adapted for floating uninjured on the waves: the restricted distribution of such vegetables is provided for on another principle.

own experience, of many *Cýnthiæ* assumed to be *cárdui*. It will be borne in mind, however, that man has unintentionally carried with him the seeds of the very prolific plants on which the painted-lady butterfly feeds, wherever he has introduced the *Cereàlia*.

But to return to that mysterious guiding principle, so important, as we have seen, in regulating the distribution of species; and which I have asserted to be not wholly absent from the human constitution. It has been stated of many savages, and more particularly of the aborigines of Australia, that they are enabled to return for even hundreds of miles to their homes, though totally unacquainted with the route, being led by an intuitive impulse that they cannot explain. This seems incredible: but we know that diurnal birds will return by night from the heart of Africa to their former abode, marked individuals having done so; and we also know that a pigeon, carried from Paris to Constantinople, has flown back to the former city: these facts will tend to diminish our scepticism. I have two instances, however, of the manifestation of this principle by Europeans, when in a state of insensibility; for both of which I am indebted to the parties themselves, gentlemen of unimpeachable veracity: both of them returned, in this condition, to their temporary homes (one in the dark, and for upwards of a mile, having been thrown from his horse, which remained on the spot till found next morning), by routes with which they were quite unacquainted. I am not disposed to enlarge at present on this subject, by enquiring to what extent numerous phenomena recorded of somnambulists may be explicable on this obscure principle. We hear continually of surprising instances of blind men finding their way, with a degree of accuracy very difficult to comprehend; and, also, of drunkards stumbling home, when apparently unobservant of external objects. It will be sufficient if these hints serve to awaken the reader's attention, and so, peradventure, elicit some additional facts.

We have now traced to their ultimate results certain of the bearings of the intuitive information conferred on brutes, which, in wild nature, mainly influences their actions. We have seen that man is denied innate knowledge of the properties of objects, and is, therefore, necessitated to observe and reflect; in a word, to learn. Hence the necessity of a long infancy and superior intelligence; hence that progressiveness which so eminently distinguishes him from all other races. I have nowhere denied that other animals are capable of reflection; but I assert that, unrestrained by human influence, their inherent instincts sufficing to insure

their weal and maintenance, these, in consequence, supersede the necessity of habitual observation; whence their reasoning even may be independent of experience. Indeed, it is hard to instance a case wherein the conduct of truly wild animals may not be satisfactorily referred to instinctive motives; but that such cases do occur is shown by eaves swallows (*Hirundo úrbica*) having been known to immure a sitting sparrow that had usurped their nest*; which fact is proved sufficiently to be in nowise referable to instinct, inasmuch as it is contrary to the ordinary habit of the species upon such occasions. It will be readily admitted, however, that such instances are extremely rare exceptions to the general rule; and I imagine there are few who will be disposed to refer the ordinary habits of any species of the lower animals to aught else than original intuition.

I have yet another phenomenon, which is now, I believe, for the first time introduced to notice. It is the occurrence, in domesticated animals, of what is analogous to idiocy in the human race. Of this I have several instances in poultry, and one in a sheep. It consists in the privation of more or less of that intuitive knowledge which is needed to enable an animal to maintain its existence amid the numerous dangers with which it is naturally surrounded; dangers against which no experience could suffice to fortify it. The creatures I allude to evinced a listlessness in their deportment strikingly similar to what is commonly observed in human idiots: they sought not the society of their companions; and one of them, a hen (of which only I can speak from personal observation), would heedlessly wander close before the kennel of a fierce dog, which the other fowls constantly avoided. Whether the dog would have attacked another fowl, I cannot say; very likely not: but it is a well known fact, that the most savage of the canine race will never attack a human idiot, nor a child, nor a person stupified by intoxication: of the truth of which latter, a most remarkable exemplification lately happened in this neighbourhood; a drunken stranger having been absolutely permitted to share the straw of a very fierce watch-dog, which those it knows can hardly approach with safety.

In the foregoing pages, I have all along been considering the diversity of human influence from that of all other organised races, rather in its effects towards these latter, than by

* Even here it might be objected that man's influence could alone have brought these species into contact; so hard is it to disentangle ourselves entirely from the meshes of human interference. Such an objection would, however, in this instance, be frivolous.

taking the higher ground of natural theology in reference to human kind, and recognising, in the grand aggregate of all that has been effected in past ages by the joint influence of every cause that has been in operation, not only a gradual prospective adaptation to the welfare of each succeeding race, but an ulterior object in capacitating the globe for the residence of human beings. A new era commenced with the introduction of man upon this world: a secondary intelligence was permitted to assume the dominion over matter, in so far as, by experimenting upon its properties, it can elucidate the unvarying laws which regulate these, a knowledge of which is indispensable to empower intellect to direct their operation.* To man it was given to "conquer the whole earth and subdue it;" and who can venture to aver the ultimate limits of those changes which he every where superinduces; changes which, in conjunction with the physical laws which wear away the land and uplift the bed of the ocean, may, in time, be gradually fatal to the normal condition of every other race, and to the existence even of by far the greater number? that is, assuming, what there is every reason to infer, that the human species was the last act of creation upon this world, and that it will continue to be so until its removal. It is needless to add, that a prodigious lapse of time is here required; and, to judge from data which the past history of the globe abundantly furnishes, in legible records, wherever we turn our eyes; to judge from the progressiveness of human intellect, and the long, long while that must yet transpire ere man can hope to assume that rank, as a consistent being, for which his faculties clearly show that he was intended, the duration of his existence upon this planet would appear likely to bear proportion to that immense period that the globe will continue fitted for his reception; a period, it may be presumed, that will abundantly suffice to alternate the land and sea, as we know has repeatedly happened heretofore, and which may sweep from existence the inhabitants of the present ocean, as those of which the *exuviae* occur in the chalk have become extinct before them.† The past affording the only record from which we are competent to judge rationally of the future, this inverse analogy would argue a continuance of the refrigeration of our planet, till it shall be again unfitted for the existence of or-

* "*Homo, naturæ minister et interpres, tantum facit et intelligit quantum de naturæ ordine re vel mente observaverit; nec amplius scit aut potest.*"—*Lord Bacon.*

† Except man shall have domesticated some of these, and artificially transferred them to new localities.

ganic beings. As by a catenation of obvious and palpable facts we can trace the history of this world to a state of fusion, if not of general nebulosity, so are we warranted in anticipating its future congelation, when old age shall have come over it as barrenness, and the gases shall have solidified by intensity of cold; when, it may be, the sun himself shall have grown dim, and nature, in so far as this system is concerned, have sunk in years; when the stupendous cycle shall have been accomplished. Then, and with humble reverence let the mighty acts of Supreme Omnipotence be spoken of, it may be that the eternal and ever-glorious Being which willed matter into existence shall pronounce on it the final doom of annihilation; and

— “the great globe itself
shall dissolve,
And, like the baseless fabric of a vision,
Leave not a rack behind.”

Or, what is far more probable, to judge from the universal analogies of all that is within our grasp, its elements shall again be called forth into light and life, and blaze forth the recommencement of the same system.

It is inconsistent with our notions of divine benevolence, to suppose that the human race shall be suffered to linger here upon earth, till such secondary causes as we have been considering should suffice to gather the last man to his fathers.

Tooting, Surrey, Dec. 1. 1836.

ART. VII. *Description of some singularly formed Orthopterous Insects.* By GEORGE ROBERT GRAY, Esq.

CYLINDRO'DES *G. R. Gray.*

HEAD small, of a long triangular shape, with the angles rounded. *Antennæ* (only a few basal joints remained in the specimen) apparently moniliform. *Labrum* small, shaped like a horseshoe. *Mandibles* small, strongly dentated. *Eyes* very small. *Palpi* with the last joint truncated, somewhat rounded, and slightly enlarging towards the tip. *Body* very long, cylindrical; the thorax occupying more than a third of its whole length, distinctly dividing into prothorax, mesothorax, and metathorax. The first is the longest, and cylindrical; the last two are nearly equal. *Abdomen* of eight joints, the last the largest, with the apex rounded, depressed and margined above, and without any caudal appendages. *Anterior legs* moderately strong, compressed and dentated in front; the *tarsi*

composed of two long slender joints without a claw. *Posterior legs* very short, and received in cavities on each side of the body. The cavities which receive the second pair of legs occupy the spaces between the mesothorax and metathorax; while the third pair are contained in the interval between the metathorax and the first joint of the abdomen. The legs are much compressed. *Femora* broad and armed at the apex, with a blunt spine, serving as a guide to the tibia, when in the act of being drawn beneath them. *Tibiae* broad, compressed, and strongly armed with a short spine at the tip. *Tarsi* biarticulated, ciliated beneath, and furnished with a very small claw.

C. CAMPBELLII G. R. Gray.* (fig. 15.)

Smooth; head, forelegs, and last joint of the abdomen dark brown; thorax reddish brown; abdomen (except the last joint), and the two posterior pairs of legs, yellowish brown, with a tinge of darker colour.

Brought from Melville Island, on the north coast of New Holland, by Major Campbell; who informed me that he was unable to keep a single plant in his green-house on account of the ravages of this insect. It bores in their stems; and the withering of the plants alone betrays the secret work of the spoiler. Its form is admirably adapted for its mode of life. The power which it has of drawing its legs at pleasure into the cavities at the sides of the body enables it to assume a shape almost perfectly cylindrical; while the short blunt spine at the end of the tibia, being protruded, keeps the insect fast when it is engaged in boring. The name given by the colonists to this insect was the wireworm.

I may here mention that a species of the genus *Grylloblatta* is also found in New Holland, but of a small size. Specimens have also been brought from Brazil, India, China, and Egypt.

The group to which I am now desirous of directing attention has been sadly neglected by entomologists, although it contains, as is here exemplified, some very singularly formed species, which are well worthy of notice. Those to which I am about to refer are included under my subgeneric name of

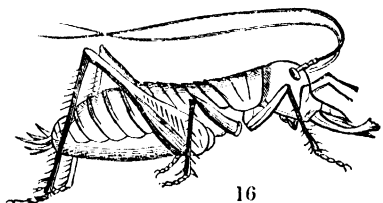


* Figured, but not described, in *Griffith's Translation of Cuvier*, pl. 131.

ANOSTO'STOMA.

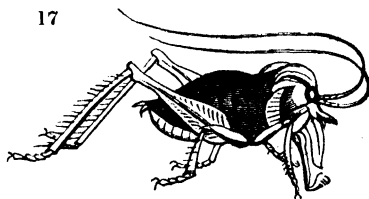
Antennæ much longer than the body, multi-articulate, setaceous. *Labrum* large, crescent-shaped. *Head* very large, globose above, somewhat elevated into a ridge between the antennæ, with three ocelli at the base; the eye prominent, and somewhat crescent-shaped. *Mandibles* long, porrected in some, horizontal, strong, dilated and dentated at the tip. *Trophi* much exposed. *Mentum* long, somewhat narrow, but rather dilated near the tip. *Labial palpi* slender, basal joint short, second shorter than the third, which is much more slender than the others, with the tip membranaceous and dilated. *Maxillary palpi* very slender, long, with the tip ending in an acute spine; first and second joints equal to one another, the third and fourth also equal, the fifth rather longer than the fourth, with the tip membranaceous and slightly dilated. *Prothorax* as long as broad, with the margin somewhat rounded. *Abdomen* long, broad, with short caudal appendages, which are hirsute. *Legs* long, especially the hind ones; the *tibiæ* of all strong, spinous. *Tarsi* four-jointed. Apterous in both sexes.

A. AUSTRALÆSIÆ G. R. Gray. (fig. 16.) Ferruginous; abdomen variegated with yellow; legs yellow; tip of the mandibles black; those of the male porrect; of the female horizontal.



The two specimens examined were brought from the interior of Australia, about 300 miles up the country. I can give no information about its habits, as no remarks were sent with them. The species is allied to *Locusta spinósula* and *L. pùpa*; which form the genus *Bradýporus* of Latreille. Both are inhabitants of Africa. From the great length of the antennæ, and in possessing anal appendages, it appears to be allied to the crickets; but, as the insect has four joints in all its tarsi, I have placed it with the locusts.

In the same subgenus must be placed a species somewhat similarly formed, long since figured by Herbst (*Nat. freun. Berl. Neue Schriften*, vol. iv.), under the name of *Locusta monstrosa*. (fig. 17.) This has never been referred to by any



entomologist since its publication. Its peculiarities are, that the mandibles (of the male) are horizontal and long, with the apex dentated and curved, so that the two ends meet; and the head is peculiar from having a wing-like projection on each side, with the margins dentated. This insect is supposed to come from Surinam; and I would propose to call it *A. Hérbstii*, in honour of its first describer.

Another very singular insect will be found in Stoll's work on *Cigales*, under the name of *Gryllon aquatique cornu*, which appears to come near the foregoing, though the form of the head is totally distinct. It is very long, truncate, with two long acute curved horns, projecting forwards over the lip: the latter is very large, pyriform, covering the mandibles: the palpi are filiform. For further characters, I must refer to the figure of this curious insect, with the name of *Hénicus Stóllii*. (*fig. 18.*)



18

Before closing the remarks on orthopterous insects, I would add some notes regarding the *Phásmidæ*, which have occurred to me since my *Synopsis* was published.

In that work, I have stated (note, p. 5, 6.) that I could not adopt M. Serville's arrangement of the *Plerophasmàta* into those with distinct or indistinct ocelli; but, as I then gave no reason for my rejection of it, I avail myself of this opportunity of doing so, as it might be satisfactory to M. Serville. I will take a few examples: those with distinct ocelli, in which division would come *Phásma Tithònus*, *acanthópterum*, *variegàtum*, and *Hòpei*; whilst amongst those which have none, and yet must be placed with the former, are *Phásma córniceps*, *aràntum*, and *acuticórne*. I may also observe that several of those which would not be considered by M. Serville to belong to the restricted genus *Phásma* also possess distinct ocelli: thus *Podocánthus Týphon*, *Xeróderus Kírbyi*, *Acrophýlla Titan* and *Encéladus*; also all the species of *Ctenomórpha*; while, on the other hand, *Acrophýlla chròmus* and *Phibalosòma Lepelletèrii* do not possess this character. I trust, therefore, that the above statement may justify my offering another arrangement of the family in my *Synopsis*.

I established the genus *Heteronèmia* (p. 19.) for the reception of an insect of this family, peculiar for the shortness of

its hind legs. But it has since occurred to me that that shortness may be owing to some accident; for the late Lansdown Guilding, in the *Linnæan Transactions*, has informed us that, "if it loses a leg by violence, this is reproduced, but of a smaller size, at the next change of skin" (my *Synopsis*, p. 11.); hence it is not improbable that this accident might have happened to the specimen which I examined. This reproduction is well known to occur with crabs and lobsters, and also with spiders.

An example of this phenomenon is well shown by a specimen of *Diapherodes*, contained in the Linnæan Society's collection; which has one of its hind legs short, while the other is of the natural size; proving, in this case, that one leg only was injured, and renewed on change of skin.

Acanthoderus scabrösus (p. 14.) I now believe (from a specimen kindly lent me by Mr. Templeton, brought from the Isle of France) to be the larva of a winged species, which has not yet been discovered in its perfect state. *Acanthoderus Dumerilii*, and even *A. spinösus* (p. 14.), with *Bactèria fragilis*, *acænösa* (p. 18.), and *spinösa* (p. 43.), may probably prove to be only larvæ.

I have offered these suggestions for the purpose of calling the attention of entomologists to an examination of the doubtful points, and, at the same time, to correct these supposed errors in my *Synopsis* of the family.

ART. VIII. *Observations upon the Boulders of Trap Rocks, &c., which occur in the Diluvium of Essex.* By J. BROWN, Esq., F.G.S.

IN the *Magazine of Natural History*, Vol. VIII. p. 349, 350., there is a synoptical table of the boulders of trap rocks, porphyries, granite, &c., which have been found in the gravel at Stanway, and other places within a radius of fifteen miles, in the county of Essex.

It is well known, that all rocks recognised by the above terms, from possessing characters peculiarly their own, and which are found, in some parts of the world, occupying extensive tracts of country, are of an igneous, or volcanic, origin.

But, although this fact is familiar to those who make this subject their study, it is not commonly known to persons in general, that the gravel which is used every day in repairing our common roads, and which is spread over a large portion of this and the adjoining counties of Suffolk and Norfolk, to a considerable depth, is in part, and in some localities largely,

composed of ancient lavas. In that part of our island now under review, the surface being unbroken save by the partial sinkings for water and gravel, there does not appear such excitement to the study of geology as in the mining and quarrying districts, or where the surface is broken by natural causes, displaying the rocks to the discerning spectator in the most inviting manner. Still, to enquiring individuals, the deposits, even in these localities, become deeply interesting when their mineral characters are investigated and made known.

Numerous other rocks in the series have contributed towards the great accumulation of detritus which forms our deposits of gravel: but the chief object of the present communication is a confirmation, by a series of experiments, that the boulders of basalt, porphyry, &c., belong to that class of rocks termed trap, and to which an igneous origin is attributed by our most eminent geologists.

To prove, as far as artificial heat on a small scale can accomplish it, the igneous nature of the basalts, porphyries, greenstone, and even granite, which I have found in our neighbourhood, I have recently submitted fragments of each of those rocks to the action of heat produced by the oxy-hydrogen blow-pipe on Hemming's principle; and I have much pleasure in stating that they were all completely fused by this means, without the aid of any additional flux. While under this process, some melted much more readily than others: the basalts, for instance, melted comparatively easily to what the porphyries did: this difference in fusion appears easily to be accounted for, by the basalts containing iron, soda, or potash (perhaps all three), more or less, in larger quantities than is found in the porphyries.

The compact felspar, which forms the matrix of the porphyries, containing potash, may be the means of facilitating its fusion; but its not containing so much iron as the basalts, may be the reason of its fusing more slowly than the latter.

All the basalts which I submitted to this test, in this series of experiments, melted with less than half the heat that was employed to fuse the porphyries.

The following are the particulars observed as the fusion of each specimen mentioned in Vol. VIII. took place. The fragments submitted were about the size of peas, and are now attached to their respective specimens.

1. Hornblende rock. This is merely basalt accompanied by minerals frequently found in this kind of rock. This readily fused into a black glass, with effervescence.

2. Hornblende basalt. This fused with rather more difficulty, and with effervescence.

3. Compact felspar, with crystals of common felspar (porphyries). This fused with difficulty, and with effervescence. The colour of the stone is blue; but it fused into a light-coloured mass of irregular forms. This porphyry is common in our gravel pits.

4—6. These three specimens are porphyries; compact felspar with crystals of the same mineral: they are distinct in structure, and their composition is various; but the fusion was nearly alike in all three. They fused with difficulty, and with effervescence.

7—14. These eight specimens are basalts, being composed mainly of hornblende, or augite, in crystals of various forms and sizes: they are all of a black colour. They all fused into perfectly vitreous globules, with a comparatively small degree of heat. It is worthy of remark, that No. 8. was perfectly melted before the flame of the blow-pipe had attained its full size and degree of heat. It has been before observed of this specimen, that, in external form and appearance, this is like the Rowley rag, a stone which the town of Birmingham is paved with; and, if fusion is a good test, they are alike in composition; for a fragment of the Rowley basalt, from one of my cabinet specimens, fused in the same time, and with the same low degree of heat, as No. 8. from the gravel. This result is in accordance with the experiment made some years ago, by Mr. Gregory Watt of Birmingham, upon this very stone. He fused seven hundred weight of the Rowley basalt at one time; and it is stated that it melted with less heat than was necessary to melt the same quantity of pig-iron. Basalt is not scarce in our gravel.

More than twenty other specimens found in the gravel, consisting of basalt and porphyries, and distinct from those above-noticed, with several kinds of granite, sienite, and greenstone, were in the series of experiments submitted to the action of heat by this blow-pipe. The whole of them were fused, at least fragments of them of about the size of peas; some with much less trouble than others: but fusion was attained in all the instances. The basalts fused the most readily in these instances, as well as in the former.

I then endeavoured to ascertain, by the same test, what analogy existed between the porphyries and basalts found in boulders in our gravel, and the same kind of rocks *in situ*, in different localities in England and Scotland; specimens of which I had myself collected, at various times, from the rocks themselves.

The porphyries selected for these experiments were those from the Calton Hill, Edinburgh, and two varieties of red porphyry from distinct dykes which cross the river Garry; and are

seen cutting through stratified rocks, near the Blair of Athol. Another specimen of porphyry, from the Pass of Killiekrankie; and one from Ben Awe, near Inverary; and one from near Inverness. There was almost a uniform appearance in all these porphyries while under the heat of the blow-pipe. The same was observed in the porphyries from the gravel. The specimens from the Calton Hill fused with difficulty, and effervescence. The porphyry from the dykes near Blair is of a red colour: it fused under the blow-pipe to a snowy-white enamel, with effervescence. The porphyry from near Inverary is as red as that from the Blair of Athol; but it fused into a black glass.

The porphyry of the Wrekin Hill, near Colebrook Dale, in Shropshire, showed the same reluctance to complete fusion as those from the gravel, and those from Scotland.

The porphyry of the Wrekin appears to be composed of portions of clinkstone of various sizes, united in a paste, which may be termed a felspathic breccia. It is a hard and beautiful rock, of a dark colour: in some places, it approaches to a reddish hue; it ultimately was fused into an irregular mass, with effervescence.

Some compact felspars, with small portions of crystalline quartz, from Charnwood Forest, fused with great difficulty. These rocks have no crystals of felspar, like many of the porphyries, but are of a dull uniform texture and colour, with scarcely any mineral embedded in them to relieve the sameness, but the few portions of quartz.

Several varieties of porphyry, of compact felspar with irregularly formed crystals of that mineral, fused slowly by directing the whole of the heat, for some considerable time, upon the fragment. These were taken from a different part of the forest whence the former specimens were obtained.

The greenstone, or sienite of some authors, from Markfield Knoll, fused quickly, with brisk effervescence, into a perfect globule of a glassy black colour. This stone has a large portion of hornblende in its mass, probably the cause of its easy fusion.

The sienite of Mount Sorrel fused very slowly into an irregular shapeless mass. In this the felspar fused into a perfect white enamel, as in the instance above-noticed in the porphyry of Scotland.

A specimen of compact felspar from Mount Sorrel fused instantly into a black glass globule; while a fragment from a vein of felspar in the neighbouring sienite could only be superficially vitrified, without altering its angular form.

A small portion of crystalline felspar, from the great mass

which is to be seen in contact with limestone in Glen Tilt, Scotland, fused with effervescence, and swelled up into twice its natural size whilst under its greatest heat. A greater degree of intumescence was observed in this felspar than in all the trials made. It fused into a perfectly white globule, a transparent glassy enamel.

A small portion of the red granite, also, from Glen Tilt, fused into a white enamel.

Basalt. — A black basalt from a dyke, which cuts through the porphyry on the north-eastern side of the Calton Hill, about 14 ft. in thickness.

Another specimen of basalt, from the overlying mass which forms the summit of Salisbury Crags. A finer-grained basalt, from another part of this hill. A specimen from Arthur's Seat. Another basalt, part of the rock on which Edinburgh Castle is elevated. Two specimens of amygdaloidal trap, from separate and distinct dykes, seen at St. Bernard's and St. George's Wells, cutting through the coal-measures, and crossing the Water of Leith river at Edinburgh.

Greenstone from the Hill of Kinnoul, near Perth. A specimen of basalt from a quarry near Perth. Basalt from a dyke which underlies the slate rocks at Dunkeld, and from the rock on which stands Dumbarton Castle; also several specimens of basalt from the vicinity of this latter town, of various mineral composition, but principally hornblende; with several varieties of basalt from the Island of Mull.

All the above basalts, with the exception of those two from the dykes crossing the river called the Water of Leith, fused with the greatest ease, with a comparatively low degree of heat, and with a brisk effervescence, into black glass globules. The two specimens which form the exception to this easy melting appear to be of a different composition to the others: they are of a coarse granular structure, blue, and not of a deep black colour, which distinguishes the other basalts from Scotland. These two basalts fused, with more difficulty, into irregular vitreous masses. The absence of hornblende probably makes the difference.

From the conclusions drawn from the observations made during the time these operations were proceeding, there is evident a general feature with regard to basalt, those broken from the rocks *in situ*, and also those from the gravel; in both instances the fusion was almost uniformly complete: but all the basalts were fused, even the most stubborn of them (so to speak), with much less time and heat than was necessary for the porphyries. The porphyries collected from the gravel, and those which were broken from the same kind of rocks *in*

situ, showed the same reluctance to fuse in one instance as in the other. Although the porphyries were fused ultimately, and with effervescence, they required three times the heat which was necessary to melt the basalts. This result is just what might be expected, when we know, by means of this instrument, that hornblende, or augite, is the principal mineral constituent of basalt, because either is so much easier melted than felspar, which latter is the principal mineral substance in the composition of the porphyries.

Those substances which contain the smallest proportion of silex are the most ductile under heat. We find that hornblende has a less quantity of silex, by nearly twenty per cent, in its composition, than most of the felspars; and this is the reason that basalt, which is mainly composed of hornblende, fuses so much quicker than porphyry.

Having some modern basaltic lavas by me from Vesuvius, I submitted portions of them to this blow-pipe. I found that some of the basalts from the gravel, and some of those from Scotland, fused as easily as the lava of 1805.

The blow-pipe would not, perhaps, be worthy of confidence, as a test for making us acquainted with some of the characters of rocks, if the same results were obtained in the trap, the mechanical, and fossiliferous limestone rocks. But different results were effected, as specimens of the latter were submitted to its heat. Several varieties of oolite, mountain limestone, calcareous spar, millstone grit, and several siliceous sandstones were tried with the same degree of heat as that which fused the trap, &c.; but fusion could not be effected in any of them: the grit and sandstones vitrified only. A specimen of old red sandstone, from its having felspar in its composition, was more altered than any of the others; while, at the same time, a fragment of green porphyry, with the same degree of heat, fused instantly into a dark glass globule.

Stanway, Jan. 2. 1837.

ART. IX. *Observations on the luminous Meteors commonly termed Shooting Stars.* By JONATHAN COUCH, Esq., F.L.S.

THE meteorological constitution of the atmosphere is, perhaps, less understood than any other department of science; of which we have a remarkable proof in the insufficient, not to say absurd, explanations that have been hazarded in reference to the phenomena of the luminous meteors commonly termed falling, or shooting, stars, concerning which what has been advanced is scarcely more pro-

bable than the opinion of the ancients, that they were the very things expressed by their common English name.

It is something, however, that attention is now directed to the subject; and the following observations are communicated with the view as well of inviting further enquiry, as of recording what materials I have been able to collect, from personal observation, for the use of those who may be better able to give the desired explanation.

The most common and abundant of these meteors are those which simply become visible, apparently from inflammation; which fall from their altitude, usually, in an oblique course; and, after the lapse of a few seconds, cease to be visible. These are commonly of a pale yellowish tint; often pass in a waved, or serpentine, course, not unfrequently in a nearly horizontal line; and appear to be influenced by the resistance of the air; which, however, does not guide them, unless we are to suppose that there is a different current in the place where they appeared, for their slope is in every direction, as compared with the wind blowing at the time. I once, about the end of the month of September, but in what year I have not recorded, had an opportunity of seeing as many of these meteors in one night, as, during the lapse of many years, with excellent opportunities, I have ever witnessed, if the whole were added together. They were incessant during a ride of many miles; but I could not count more than four visible at once. This meteor never appears in thick and misty weather; but, if clear, they are seen in the coldest, as well as the warmest, seasons. Sometimes they make a great blaze in their course; and, in one instance, I observed one which, in its progress, parted into two, of about equal size; one of the portions keeping on its course, while the other dropped off more perpendicularly, as if of greater specific gravity. I have known it to show a tendency to ascend towards the end of its course, to undulate four or five times in its progress, and, when the time of its duration is five or six seconds, to suffer an evident declension of size before extinction.

A shooting star, very different from the former, is that which is accompanied with a luminous train, and which always proceeds in a straight line, as if projected by force. It differs from the former, also, in colour, being of a fine white; and, from careful and repeated observation, it appears that the train is not formed, or kindled, from the body of the meteor, but consists of an immense assemblage of fine grains, that appear, or are kindled, at the same time as the body, and from the same cause, but of particles that were at the time in

the region through which it passed. In one instance (in November, 1836), the train, as it is termed, was projected without the appearance of any concentrated body; and the origin had not become extinct by the time that it had reached its termination. In all these instances of a star with a train, the projection has been rapid and horizontal.

The distinctness of form, as well as of colour and motion, with which these meteors are seen; their change of direction, often within a small space; the apparent obstruction they meet with from the air; and their evidently occasionally low position; are proofs that they exist at no great distance from the earth. But, although I have seen them fall so low as only to be hidden from me by a rather lofty hedge, I never yet saw one that actually reached the ground; a circumstance, however, that has been reported to me by an authority which I cannot doubt. Two ladies, of veracity and intelligence, assured me that they witnessed together the fall of a star-shoot, from a considerable elevation in the air, to the gravel walk on which they stood, the place of descent being at the distance of but a few yards; and from this spot the meteor ran along for some distance before it disappeared, leaving no impression or mark of its existence.

The following, which occurred to myself, is equally incapable of explanation on any principles "of our philosophy," though, perhaps, of a different kind from either of the preceding phenomena: — On July 1. 1832, riding homeward in the evening, whilst the lightning was vivid, and thunder loud and frequent, a ball of light, of about the size of a large orange, met my view on the right, towards the north-west, distant about 20 yards. As if projected from a cannon, it passed straight and rapidly across the lane, close before me, and was instantly lost sight of on the other side. The whole was the work of an instant; the ball, of a steel blue, passing but at the elevation of my head, unattended by any noise or explosion, and evidently unconnected with the lightning that glared around.

The following may, perhaps, have still less connexion with the phenomena of a star-shoot, but deserves to be recorded, as being combined with a sudden developement of light, and, at least in some of the particulars, of more frequent occurrence than, from the paucity of observations connected with it, might be supposed. The particulars of the instance now given I derive from some intelligent fishermen, who were thrown into great danger by the occurrence: — Aug. 10. 1835. The weather fine, rather calm, warm and cloudy. In the evening, at a few miles from land, a light was first seen to fall from the clouds

on the water, but without a sound; a violent and sudden wind immediately followed it, by which the sea, within the limited space, was thrown into great commotion. The wind blew from every point of the compass, the vessels within its range being obliged to let all their sheets fly, and the boats striking their sails for safety. The fury of the gust lasted for about an hour, and was confined to about a couple of square miles: at its termination, all was again quiet. The subsequent direction of the wind was between north and east, and the barometer fell, but without a change of weather.

ART. X. *Meteorological Retrospect for the Year 1836.*
By W. H. WHITE, Esq.

THIS year commenced with a very sharp frost. The minimum temperature of the night of the 1st was 12° of Fahrenheit, which was also the minimum for the whole year. Thaw commenced on the 4th; and on the 5th, at noon, the thermometer stood, in the shade, at 50° . Frost returned on the 8th; a slight fall of snow took place on the 11th. The remainder of the month was dry and mild.

At $6\frac{1}{2}$ A. M. on the 13th, a very beautiful meteor appeared in the E., and took a S. W. direction. It was visible about 3 seconds with a short train of sparks.

February was, upon the whole, a rough tempestuous month; N. and N. W. winds prevailing, particularly on the 17th and 18th, which were two very stormy days. The latter part of the month was cold and wet; nights slightly frosty.

March exhibited an unusual range of the barometer; and more than an average quantity of rain fell. There were only four fine days. Prevailing winds, W. and S. W., with a few frosty nights towards the close of the month.

April was the coldest corresponding month known in England for many years, especially at the close, which was characterised by severe frosts and snow, and strong northerly winds. On the last day of the month, the thermometer was 29° at 8 A. M.; which cold was very injurious to fruit trees and tender vegetation.

May was particularly noted for a continued series, for twenty-eight days, of dry cold N. and N. E. winds: the only interruption was a S. W. wind on the 11th, 12th, and 13th. Grass became parched with drought, and vegetation was scanty and unhealthy.

June was also a dry month, and not hot, with prevailing

s. w. winds. Vegetation recovered its healthy appearance, but remained very scanty.

July commenced with great heat, especially during the first ten days. Thunder on the 5th and 6th. The 20th and 21st were remarkable for being tempestuous, with strong gales, accompanied with thunder, lightning, and heavy rain, which greatly reduced the temperature. On the 20th, so great was the change, that the thermometer, which at noon stood at 75° , at 3 p. m. was only 50° . One of the most perfect solar halos I ever witnessed, exhibiting the prismatic colours in high perfection, with a parheliion below the sun, appeared at 8 a. m., and continued visible till 11 a. m. The barometer was sinking at the time the halo appeared, and rain followed in twenty hours.

August was decidedly the finest month in the year, notwithstanding the great prevalence of N. E. winds. A violent thunder storm passed over on the 14th, accompanied with heavy rain. This storm was very violent, between 8 and 9 p. m., at Liverpool, and did much damage to the shipping in the harbour. A violent thunder storm, on the same day, did much damage in Austria, destroying houses, barns, and even life.

September. The cold northerly winds, and constantly cloudy sky, for the first twenty days of this month, reduced the temperature of the month much *below* the mean.

October was wet, cold, and stormy, especially the 1st, 6th, 11th, and 12th. Auroræ boreales were visible on the 5th, 15th, and 18th. On the 29th, snow fell to the depth of $4\frac{1}{2}$ in. in the metropolis. In the country it was considerably deeper, and did not entirely disappear till the 1st of

November, the first week of which was wet and cold, with frosty nights. From the 8th there was an almost uninterrupted succession of s. w. winds, accompanied with light showers, till the memorable hurricane on the 29th, which was one of the most terrible known in England for many years. The violent gusts of wind, chiefly from the N. w., did much damage, leaving many a sad memento behind both by land and sea. From the most authentic accounts of this gale which have reached me, it appears that it commenced on the 23d, on the eastern shores of North America, off St. Lawrence. A ship from Poole fell in with it on the 26th, in lat. 47° N., long. $32^{\circ} 20'$ W., and was thrown on her beam ends. It continued its progress across the Atlantic, and reached the Land's End about $7\frac{3}{4}$ a. m.; Plymouth, $8\frac{1}{2}$ a. m.; Exeter, $9\frac{1}{2}$ a. m.; Weymouth, 10 a. m.; Poole, $10\frac{1}{2}$ a. m.; Farnham, 12 noon.; London, $1\frac{1}{2}$ p. m.; Suffolk coast, $2\frac{1}{2}$ p. m.; and Hamburg, at 6 p. m. Thus the storm travelled at the rate of about 50 miles per hour; but the circular motion of the

wind had a velocity of from 120 to 150 miles per hour. The fury of the gale was most felt on the coasts of France and Belgium. At Ostend there was scarcely a house which was not unroofed; and so great was the demand for tiles, that they rose from 16 to 30 florins per 1000. The motion of the mercury in the barometer, during the most violent part of the hurricane, attracted great attention. On the morning of the 29th, at 9, the mercury stood at 29.30 in.: it soon afterwards began to sink very rapidly, exhibiting much agitation during the violent gusts of wind, for which this hurricane was particularly remarkable; till 12 at noon, when it stood at 28.82 in. At 2 p. m. the barometer had risen to 29.35, soon after which the wind lulled into almost a calm.

December came in with an unusually high temperature. The thermometer ranging between 50° and 56°. The min. during the nights of the 4th, 5th, and 6th, was above 50°. The great prevalence of s. w. winds during the first three weeks may account for the very high temperature; and, indeed, the very high winter temperature during the last three years may be attributed to the same cause. On the 23d *, the wind shifted suddenly to the n., with a sinking barometer, and decreasing temperature, which was introductory to the memorable snow storm on Christmas day, which will be long remembered by the Londoners. Communication with the metropolis, for one whole week, was greatly retarded by land, the effects of which were seriously felt by the commercial houses. The drifted snow, in many places, measured from 12 ft. to 16 ft. in depth, but the average depth, as nearly as could be calculated, was about 4 ft. In London, the principal streets, during the whole of the Christmas week, resembled ploughed lands. The snow, having become mingled with the dirt in the streets, had lost its whiteness, and had very much the appearance of black mould; so that carriages passed along the streets as silently as they would have done along a ploughed field. The gale on Christmas day from n. and n. e., independently of drifting the snow, did much damage to the shipping on the east coast. This gale, I believe, was general all over England; but the direction in which the wind blew varied at different places to almost every point of the compass. There was a considerable fall of snow in Spain, with an unusual decrease of temperature. — *W. H. White. London, Feb. 13. 1837.*

* At New York, Dec. 21st, at 11 a. m., the thermometer stood at 50° Fahrenheit above zero. In twenty minutes, it fell 32°; and at 9 p. m. it stood at 16°. This sudden change was succeeded by a fall of snow, which was carried away by heavy rain, and a s. w. wind, on the 27th inst., to the overflowing of several rivers. On the 28th, a n. w. wind blew, with hard frost.

REVIEWS.

ART. I. *The American Journal of Science and Art.* Conducted by Benjamin Silliman, M.D. LL.D., &c. Vol. xxxi. No. 1. October, 1836.

THE *American Quarterly Journal of Science and Art*, conducted by Professor Silliman, has now reached its sixty-third number, having been carried through the difficulties which have attended its publication, by determined perseverance and unflinching exertions on the part of its editor, under circumstances which do not redound greatly to the credit of our transatlantic friends, considering that the periodical in question is the only one of the kind which can be said to have any direct claim upon them for support. The fault, however, may not rest entirely with the public; for it must be admitted that some departments of scientific research are not put forward in so correct or careful a manner as might fairly be expected in a publication which, from standing almost alone, holds so prominent a station as the one under notice. But, granting this, still the merits of the work are such as most assuredly have entitled it to more general countenance than it appears to have received; nor is it improbable that, had it met with more extensive support, the deficiencies which, in some particulars, are now observed, in that case might not have existed.

The *American Journal of Geology and general Science*, undertaken by Mr. Featherstonhaugh, although conducted with considerable talent and energy, was relinquished after a vigorous but unsuccessful attempt to establish it. We trust, however, that Professor Silliman, having so long weathered the storm, will now have his meritorious exertions in the cause of science rewarded, as the real importance of the objects to which his journal is devoted are at this time rapidly becoming generally acknowledged, and there must necessarily be a corresponding increase in the number of those who are engaged in pursuits of a scientific nature.

The last number which has reached us is partly occupied by a collection of miscellaneous notes, extracted from the *Diary of a Naturalist*, during a tour, in 1835, to the Falls of the Cuyahoga, near Lake Erie. These are penned in a free and pleasing style; and the writer is evidently one who has had his eyes about him, although, like many other indiscriminate observers, he evidently possesses no definite acquaintance with the details of science; and his deficiency in this respect is so manifest, as to destroy, in a great measure, the interest which would otherwise have attended some of his remarks upon various points in natural history.

"Sun-fish Creek. — At nine o'clock this morning, the boat passed the south of Sun-fish Creek, a small stream falling into the Ohio from the right bank. The hills here are nearly 300 ft. high, much broken, and divided by deep ravines into isolated masses. They are now clothed, to their very summits, with the richest verdure of the forest, and at this season are displaying the various tints of the different species that cluster around their sides; the pure white of the *Cornus florida*, and the rich pink of the *Celtis ohioensis*, now in full bloom, appear beautifully contrasted with the rich green of the woodlands. For the painter, this spot affords some of the finest views that are to be found on the Ohio. The river makes an abrupt bend opposite the mouth of the creek, and opens an extensive perspective of the richest scenery, both up and down the stream. The creek itself is lined with beautiful hills and shady ravines, some of which have given employment to the pencil of Mr. Sullivan, who has produced several masterly pieces taken from this vicinity. He is almost the only painter who has taken living views from the enchanting landscapes of the Ohio. This summer he proposes visiting the cliffs of New River and the valley of the Greenbrier, where some of the most sublime and grand scenery has rested for ages unnoticed and unknown, except to the passing traveller, or the hunter, while chasing the deer amidst these lovely solitudes. No country possesses more rich or varied scenery than the mountain regions on the tributary streams of the Ohio: in grandeur they may be excelled by the alpine groups of the globe, but in loveliness they are not surpassed." (p. 2.)

"May 7. I spent a part of the forenoon in examining Judge T.'s cabinet of natural history. He has a fine collection of minerals, shells, and fossil organic remains. The minerals embrace nearly 1200 species, arranged in natural families. The fresh-water shells amount to nearly 100 species, the greater number of which are peculiar to our streams. The family of the *Uniones* alone contains about 90 species, all natives of the western waters. His collection of marine shells is also very fine. The library of the Judge embraces, besides a due proportion belonging to his own profession, many of the most valuable writings of Cuvier and Brongniart, in their original language, on the animal kingdom, as well as fossil organic remains. It is truly gratifying to see even a small part of the wealth of our country, and a share of its most brilliant intellect, devoted to the study and the developement of the natural history of 'the west;' a subject deeply interesting, but, until recently, shrouded in much darkness. Within a few years, however, many bright lights have been kindled, which promise to illustrate the hidden arcana of nature. The conchology and botany of the great valley have been pretty thoroughly examined, while entomology, one of the most fertile branches, has been but partially investigated, although the indefatigable Say made a very fair beginning. The study of fossil vegetable and animal remains, of which the valley of the Mississippi is one vast cemetery, yet remains an almost entirely unexplored field. But the time is not distant when this vast cabinet of natural history, formed by a benevolent Creator for the study and admiration of man, will be classed and arranged by our own naturalists. Amongst the minerals in the cabinet of Judge T., I observed a specimen of native cinabar, or sulphuret of mercury, in acicular crystals, being a fragment of a rolled mass of nearly a pound weight. This rare and beautiful mineral was found on the waters of Paint Creek, amongst the debris and rolled masses of primitive rocks which abound through the tertiary deposits*,

* I know no term more appropriate for the immense deposits of clay, sand, and gravel, which compose the western prairies, than that of tertiary:

from Chilicothe to the shores of Lake Erie, and must have been brought from the region north of Lake Huron or Superior."

In the course of his observations, the writer enters into some details respecting the horrible atrocities interchanged between the native Indians and the white borderers during the latter part of the last century. These do not specially come within the province of the naturalist; but, as they appear in the *American Journal of Science*, the admission there must justify a quotation from them for our own pages. Lest, however, our scientific readers should be disposed to quarrel with us, we will only notice the exploits of one "Indian-hater," or "free man of the woods," as the narrator terms them:—

"I left Beavertown in the mail coach at eleven A. M. for Poland, in Trumbull County, Ohio, distant thirty-eight miles. Directly on leaving Bridgewater, and crossing a small stream, on a neat bridge, we began to ascend a long steep hill, called 'Brady's Hill.' It received its name from an interesting border adventure, which occurred in 'early times,' near its base. Captain Samuel Brady was one of that band of brave men who lived, in the trying days of the American Revolution, on the western borders, exposed to all the horrors and dangers of Indian warfare, and whose names should be perpetuated in history. He held a commission under the United States, and, for a part of that time, commanded a company of rangers, who traversed the forests for the protection of the frontiers. He was born in Shippensburg (Pa.), in the year 1758, and removed, probably when a boy, into the valley of the Monongahela. At the period of this adventure he lived on Chartier Creek, about twelve miles below Fort Pitt; a stream better known, however, to the pilots and keel-boatmen of modern days by the significant name of 'Shirtee.' He died in 1796, soon after the close of the Indian war. Samuel Brady, the hero of the following adventure, was over 6 ft. in height, with light blue eyes, fair skin, and dark hair: he was remarkably straight; an athletic, bold, and vigorous backwoodsman, inured to all the toils and hardships of a frontier life, and had become very obnoxious to the Indians, from his numerous successful attacks on their war parties, and from shooting them in his hunting excursions, whenever they crossed his path, or came within reach of his rifle; for he was personally engaged in more hazardous contests with the savages than any other man west of the mountains, excepting Daniel Boone. He was, in fact, "an Indian hater," as many of the early borderers were. This class of men appear to have been more numerous in this region, than in any other portion of the frontiers; and this, doubtless, arose from the slaughter at Braddock's defeat, and the numerous murders and attacks on defenceless families that for many years followed that disaster. Brady was also a very successful trapper and hunter, and took more beavers than any of the Indians themselves. In one of his adventurous trapping excursions to the waters of the Beaver River, or Mahoning, which in early days so abounded with the animals of

they embrace all the characteristics of this formation; and if they do not rest on chalk, and cannot be called supercretaceous, they rest on lime rocks, which belong to the secondary deposits, and, in a geological view, these unconsolidated beds are strictly tertiary."

this species, that it took its name from this fact, it so happened that the Indians surprised him in his camp, and took him prisoner. To have shot or tomahawked him on the spot would have been but a small gratification, to that of satiating their revenge by burning him at a slow fire, in presence of all the Indians of their village. He was therefore taken alive to their encampment, on the west bank of the Beaver River, about a mile and a half from its mouth. After the usual exultations and rejoicings at the capture of a noted enemy, and causing him to run the gauntlet, a fire was prepared, near which Brady was placed, after being stripped naked, and with his arms unbound. Previously to tying him to the stake, a large circle was formed around him, consisting of Indian men, women, and children, dancing and yelling, and uttering all manner of threats and abuse that their small knowledge of the English language could afford. The prisoner looked on these preparations for death and on his savage foes with a firm countenance and a steady eye, meeting all their threats with a truly savage fortitude. In the midst of their dancing and rejoicing, a squaw of one of their chiefs came near him, with a child in her arms. Quick as thought, and with intuitive prescience, he snatched it from her, and threw it into the midst of the flames. Horror-struck at the sudden outrage, the Indians simultaneously rushed to rescue the infant from the fire. In the midst of this confusion, Brady darted from the circle, overturning all that came in his way, and rushed into the adjacent thickets, with the Indians yelling at his heels. He ascended the steep side of the present hill amidst a shower of bullets, and, darting down the opposite declivity, secreted himself in the deep ravines and laurel thickets that abound for several miles to the west of it. His knowledge of the country and wonderful activity enabled him to elude his enemies, and reach the settlements on the south of the Ohio River, which he crossed by swimming. The hill near whose base this adventure is said to have happened still goes by his name; and the incident is often referred to by the traveller, as the coach is slowly dragged up its side."

At p. 42. another marvellous feat of the same hero is recorded:—

"In the course of this afternoon we passed near several small lakes, from half to three fourths of a mile long, and nearly as wide: being embosomed among low green hills, they resembled beautiful pearls, surrounded by emeralds. Their shores, except at the outlets, are composed of a very white micaceous sand, which gives the water a pure pellucid cast. One of these, called 'Brady's Pond,' is seated about three miles from the cliffs, or the narrows of the Cuyahoga. It is named after Captain Samuel Brady, who, as already stated, commanded, for a number of years, during the Indian wars, a company of rangers, or spies, as they were called by the pioneers of the west.

"Capt. Brady seems to have been as much the Daniel Boone of the north-east part of the valley of the Ohio, as the other was of the south-west; and the country is equally full of traditionary legends of his hardy adventures and hair-breadth escapes, although he has lacked a FLINT to chronicle his fame, and to transmit it to posterity in the glowing and beautiful language of that distinguished annalist of the west. From undoubted authority, it seems the following incident actually transpired in this vicinity. Brady's residence was on Chartier's Creek, on the south side of the Ohio, as before noted in this diary; and, being a man of Herculean strength, activity, and courage, he was generally selected as the leader of the hardy borderers in all their incursions into the Indian territory north of the river. On this occasion, which was about the year 1780, a large party of

warriors, from the falls of the Cuyahoga and the adjacent country, had made an inroad on the south side of the Ohio River, in the lower part of what is now Washington County, but which was then known as the settlement of 'Catfish Camp,' after an old Indian of that name, who lived there when the whites first came into the country on the Monongahela River. This party had murdered several families, and, with the 'plunder,' had recrossed the Ohio before effectual pursuit could be made. By Brady a party was directly summoned of his chosen followers, who hastened on after them; but the Indians, having one or two days the start, he could not overtake them in time to arrest their return to their villages. Near the spot where the town of Ravenna now stands, the Indians separated into two parties, one of which went to the north, and the other west, to the falls of the Cuyahoga. Brady's men also divided: a part pursued the northern trail, and a part went with their commander to the Indian village, lying on the river in the present township of Northampton, in Portage County. Although Brady made his approaches with the utmost caution, the Indians, expecting a pursuit, were on the look out, and ready to receive him with numbers four-fold to those of Brady's party, whose only safety was in a hasty retreat, which, from the ardour of the pursuit, soon became a perfect flight. Brady directed his men to separate, and each one to take care of himself; but the Indians, knowing Brady, and having a most inveterate hatred and dread of him, from the numerous chastisements which he had inflicted on them, left all the others, and, with united strength, pursued him alone. The Cuyahoga here makes a wide bend to the south, including a large tract of several miles of surface, in the form of a peninsula: within this tract the pursuit was hotly contested. The Indians, by extending their line to the right and left, forced him on to the bank of the stream. Having, in peaceable times, often hunted over this ground with the Indians, and knowing every turn of the Cuyahoga as familiarly as the villager knows the streets of his own hamlet, Brady directed his course to the river, at a spot where the whole stream is compressed, by the rocky cliffs, into a narrow channel of only 22 ft. across the top of the chasm, although it is considerably wider beneath, near the water, and in height more than twice that number of feet above the current. Through this pass the water rushes like a race-horse, chafing and roaring at the confinement of its current by the rocky channel, while, a short distance above, the stream is at least 50 yards wide. As he approached the chasm, Brady, knowing that life or death was in the effort, concentrated his mighty powers, and leaped the stream at a single bound. It so happened that, in the opposite cliff, the leap was favoured by a low place, into which he dropped, and, grasping the bushes, he thus helped himself to ascend to the top of the cliff. The Indians, for a few moments, were lost in wonder and admiration; and, before they had recovered their recollection, he was half-way up the side of the opposite hill, but still within reach of their rifles. They could easily have shot him at any moment before; but, being bent on taking him alive, for torture, and to glut their long delayed revenge, they forbore the use of the rifle: but now, seeing him likely to escape, they all fired upon him: one bullet wounded him severely in the hip, but not so badly as to prevent his progress. The Indians having to make a considerable circuit before they could cross the stream, Brady advanced a good distance ahead. His limb was growing stiff from the wound, and, as the Indians gained on him, he made for the pond which now bears his name, and plunging in, swam under water a considerable distance, and came up under the trunk of a large oak, which had fallen into the pond. This, although leaving only a small breathing place to support life, still completely sheltered him from their sight. The Indians, tracing him by the blood to the water, made diligent search all round the pond, but, finding no signs of his exit, finally came to the conclusion that he had

sunk and was drowned. As they were at one time standing on the very tree beneath which he was concealed, Brady, understanding their language, was very glad to hear the result of their deliberations; and, after they had gone, weary, lame, and hungry, he made good his retreat to his own home. His followers, also, all returned in safety. The chasm across which he leaped is in sight of the bridge where we crossed the Cuyahoga, and is known in all that region by the name of '*Brady's Leap*.'

Trapping a beaver and shooting an Indian are spoken of with equal nonchalance, and referred to as matters of equally commonplace occurrence. A narrative of Lewis Wetzel, another hero whose fame arose from his skill in butchering the Indians, is thus concluded:—

"Like honest Joshua Fleeheart, after the peace of 1795, Wetzel pushed for the frontiers on the Mississippi, where he could trap the beaver, hunt the buffalo and the deer, and occasionally shoot an Indian, the object of his mortal hatred. He finally died, as he had always lived, a *free man of the forest*."

Among various other subjects which we find treated of in the course of these extracts, are some rather curious geological notices, in which two or three original and very expressive terms are introduced. "*Semi-tertiary deposits*" are those which are neither tertiary nor diluvial, but partake of the character of both these formations, being composed of clay, intermixed with boulders of primitive rocks, pebbles, and gravel. *Semi-diluvial*, we apprehend, would have conveyed the author's meaning more faithfully; or, in these *anti-diluvial* times, *semi-drift* would, perhaps, be a still more appropriate substitution. The following description of an *organised stratum*, which is to be called Belemnita-Madrepora, ought to have been omitted altogether, or at any rate should not have been inserted without some editorial comment. This stratum is stated to form the lowest bed of a section of rock strata exhibited at Yellow Creek, a southern branch of the Mahoning:—

"A stratum of an *apparently crystalline* calcareous fossil, shooting into pyramidal masses, closely compacted; about 4 in. in thickness. *Specific character.* Shape, conical; surface marked by numerous undulating circular striæ; colour, light slate; from 2 in. to 4 in. in length, and from $\frac{1}{2}$ in. to 1 in. in diameter at the base. I can describe the form and structure no better, than by saying they resemble a mass of conical 'candle extinguishers,' one placed within the other, and so arranged as to make a compact bed, 4 in. thick, and extending over an indefinite space. The thickness of the sides of the cones varies according to size, from an eighth to a twelfth of an inch. The form resembles some of the species of Belemnites, more than any other fossil. Its geological position, according to Blainville, is favourable to this supposition, being near the tertiary, or recent secondary, deposits. Its composition is calcareous, effervescing strongly with dilute sulphuric acid, when pulverised and mixed with it. It is not a deposit, but a regularly organised substance, like coral, or

madrepore, and, I have no doubt, formed through animal agency. It is also peculiar to the calcareous deposits of the coal series, and, I believe, found only on the outer margins of the great coal basins, in the valley of the Mississippi, where they approach the tertiary deposits. I have in my cabinet specimens of the same fossil, from the coal region on the Osage River, in the vicinity of Harmony, the missionary station, presented to me by the Rev. Mr. Boynton, who collected them with his own hands from the bed of the river, in place. It is there from 4 in. to 8 in. in thickness, and is named by the hunters 'coal blossom'; as where that is seen, coal is usually found in the vicinity. When exposed to the air, the fossil separates easily, and can be taken out whole, in the same way that a package of thimbles, or a pile of tin cones, placed one within the other, may be separated. I have the same fossil, but much larger and thicker, from the Gauley River, in Western Virginia, found embedded in bituminous shale, in rolled masses; also, from near Chillicothe, found in excavating the Ohio Canal, resting on gravel, at the depth of 8 ft. or 10 ft. These last specimens are siliceous, about 4 in. thick, and were broken from a water-worn mass, 1 ft. across the face, much resembling the transverse section of a log of wood. They were probably brought from the northern borders of the coal deposits, at the same time that the granite boulders were scattered over the tertiary region of the great valley, and by the same catastrophe. An appropriate name for this organised stratum might be *Belemnita-Madrepore*, provided it should, on further examination, be proved to be of the family of *Belemnites*."

An organised stratum, composed of calcareous fossil, shooting into pyramidal masses, and connecting the *Belemnites* with the *Madrepores*, is indeed something for palæontologists to descant upon.*

Many other notices of organic remains are dispersed throughout the paper. One of these relates to a fossil which the author supposes to be a *chiton*, though the accompanying woodcut would lead us to doubt the accuracy of his conclusion. The following description, we fear, will not enable our readers to form any definite opinion upon the matter:—

"*Fossil Chiton. — Description.* Length, 8 in.; breadth, 6 in.; nearly cordiform in its outlines, and fully 1 in. in thickness on the lateral margins. Back, slightly convex; shell, with ten valves, longitudinally arranged, and finely united on the back of the animal, somewhat resembling spinal articulations; surface of each valve, smooth, or very slightly striated, and distinctly marked with a very plain suture; margin, smooth. The dermoid portion is replaced by a beautiful greenish-coloured crystallised carbonate of lime, about one line thick.

"*Remarks.*— This beautifully preserved fossil animal was found, a few days since, embedded in a dark carbonaceous lime rock, which forms the bed of the Muskingum River, a short distance below the falls. In splitting the rock, the back of the animal was distinctly disclosed: the abdomen is yet buried in the fragment. The outlines are very perfect, showing the back and sides very distinctly. This fossil so much more resembles a *Chiton* than any of the family of *Asaphi*, that I have ventured to name it *Chiton occidentalis*, until some one more appropriate can be found."

* The fossil here alluded to is evidently a well known inorganic form.

In the coralline crag of Suffolk, several species of *Chiton* are found; but the genus is certainly unknown in the trilobitic limestones of *this* country. It is to be regretted that, prior to publication, the specimen was not submitted to the inspection of some person acquainted with organic remains.

We shall not extend our notice beyond the present article, as the remaining papers in this number principally relate to subjects which do not so directly concern us as the "Diary of a Naturalist." Speaking generally of the work, we think there is room for considerable improvement in the zoological department, both recent and fossil; and if, in this respect, Professor Silliman could obtain the assistance of some competent person, the value of his *Journal* would be greatly increased, and it would take a higher stand, as a scientific periodical, than it now occupies.

ART. II. *The Botanist; containing accurately coloured Figures of tender and hardy Ornamental Plants; with Descriptions, scientific and popular; intended to convey both moral and intellectual Gratification.* Conducted by B. Maund, F.L.S.; assisted by the Rev. J. S. Henslow, M.A., F.L.S., &c.

THIS publication has started under very favourable auspices, so far as public approbation is concerned; and the encomiums bestowed upon it have been so general as almost to supersede the necessity of any additional recommendation from us. The intrinsic merits of the work certainly fairly entitle it to the favourable reception it has received; for both the scientific and popular parts are written in an able and judicious manner, and the information is conveyed in a style which we think well calculated to promote the already widely diffused feeling of interest in one of the most delightful pursuits included in the whole study of nature. Whether the *Botanist* be successful or not, its conductors will, at any rate, have the satisfaction of knowing that no pains have been spared, on their part, to render it worthy of public encouragement. Mr. Maund has for some time been engaged in the publication of the *Botanic Garden*, and his success in that undertaking affords a fair criterion of his competency to enter upon the present; and it is quite unnecessary for us to comment upon the high talents of his coadjutor, Professor Henslow. Each number of this work contains four plates, which are coloured with considerable care, and are, in other respects, well executed. In the accompanying descriptions, a simple but good method is adopted for familiarising the reader with the basis of the artificial and natural arrangements. This is effected

by introducing neatly executed woodcuts of the parts of fructification, and mode of growth, along with each reference to any one class, or natural division, of the vegetable kingdom. The following extract from the introductory observations will furnish a good idea of the general plan and objects of the work : —

“Although we intend elucidating the principles of classification, as manifested by nature, from a conviction of its primary importance to those who aim at the attainment of gratification through an acquaintance with the works of creation, this will not be done to the exclusion of miscellaneous information. We hope to make the *Botanist* a work of general interest, by combining therein all information of a popular character which may seem to be connected, either directly or indirectly, with the plants described. A glance at the heads under which we have classified both the Scientific and Popular parts of the descriptions will show our design ; and we shall be careful to state not only our own experience, but also that of the most competent cultivators, for the benefit of those to whom the proper management of flowering plants is a desideratum. In fact, as far as we are able, we shall make the *Botanist* the depository of all knowledge connected with those subjects of which it treats.”

Along with the large paper edition is a dictionary of Latin and English terms used in botanical descriptions, written by Professor Henslow, and which will form, when complete, a valuable work for reference. We sincerely hope the *Botanist* may meet with that support which it amply deserves.

SHORT COMMUNICATIONS.

NOTES on, and Notices of, the Crossbill (Lóxia curvirostra Linn.). — During the latter end of the month of June, 1835, a flight of these singular birds was observed in and about the plantations at Saffron Walden and the adjoining villages, several of which were procured, during that and the following months, in their different stages of plumage, for the purpose of adding to the collection of British birds in the Natural History Society's museum at that place. In the early part of their visit, most of them were in a suit of plain, greenish, sober grey, some very dusky, so as to look very dark, almost approaching black, at a distance ; a few were in a dull red livery. They were evidently in moult, as the specimens obtained will afford abundant proof, and, also, as their plumage was continually changing; some getting more green, with more yellow on the back and rump; others becoming more red and orange; and some, even in March, 1836, retaining their more dingy and sombre dress. One, taken in December, 1835, more beautifully yellow than any of its companions, was sup-

posed to be an adult female; but it proved, on dissection, to be a male: from which it may be inferred that the males assume, as their intermediate dress, a much livelier yellow than the adult female; and, as the season of love advances, gradually become orange and red. As it appears from inspection of this bird, that a slight, but distinct, tinge of orange on its breast feathers is visible, may not the supposition be here hazarded, that they do not arrive at their greatest perfection of beauty in one year? A male, taken in February, 1836, was of a most brilliant red, and leaves far behind it any I had previously seen, and, apparently, though thus early, was in its most perfect wooing plumage. The mandibles of these birds are indiscriminately crossed, though in by far the greater proportion of those that came into my hands, the upper crossed the lower one to the right.* These busy strangers, with their incessant twittering, were continually seen flying from tree to tree, curiously examining every fir apple, and with one of their strong feet grasping the twig, and with the other the fruit, of the fir; sometimes in a horizontal, sometimes in a vertical, position; turning up and down with as much facility as if on a pivot; swaying their bodies to and fro in almost every possible attitude; breaking, with their strong, crossed, and admirably adapted bills, the scaly case; and extricating the seed from every cone. It was highly amusing to observe them in their indefatigable avocations, which, on their first appearance, was a matter of no great difficulty, as they seemed totally unused to the busy haunts of men, and had not yet learned to fear the approach of an enemy. So tame were they, as to be but little alarmed at the report of a gun, even when near them; but cruel experience soon taught them to be more wary, and to court the gaze of the destroyer less wantonly, although at no time could they be said to be wild or shy. The surprising dissimilarity in these birds was truly remarkable; some orange red, some yellow, some olive, some green, and some dusky; and one, shot from a flock in June, 1836, so dingy as almost to warrant the conclusion that it had chosen for its sleeping place a chimney. What seemed most puzzling to me was, that, up to March, they were gregarious; after that, they evidently went in pairs for about a month, during which time they were in their brightest colours; afterwards they were again seen in flocks, and began evidently to assume a less bright plumage, as may be plainly seen from specimens shot at different inter-

* Only three out of twenty-seven that I examined were crossed to the left.

vals.* I was naturally very curious to know whether they would breed in this country, and requested several persons near whose neighbourhood they were occasionally seen, to keep a sharp look out for me; but, though they were here somewhat more than twelve calendar months (from the latter end of June, 1835, till the twelfth of June, 1836, when the very dingy one I have mentioned was shot), I could never learn they made any attempt to build. Some eight or ten years ago, early in March, a pair made a nest at the Audley End aviary, near this town, in which the female deposited five eggs. The nest was of a loose texture, not unlike that of the common greenfinch, though not near so well or so carefully built; the eggs, also, were not unlike those of that bird, but larger; they, however, deserted them without ever attempting at incubation, although I believe they were perfectly undisturbed. About the same time, a pair also built their nest in a garden in this town, on an apple tree, but were shot before they had completed it.† A young male was slightly winged by a shot, and taken early in August, 1835, and kept in a cage, and fed with hempseed, which it preferred to every other kind of food, and appeared to delight in cramming itself with it to satiety. As soon as its first fright was over, in an astonishingly short space of time, it familiarised itself to whoever would feed it, suffering no symptoms of restraint from the presence of a stranger; always busy, always cheerful, even from the first; fluttering and jumping about its cage in a lively and impudent manner, now hanging from its top, and now upon the perch, but more frequently suspending itself by its powerful claws from the sides of its prison, in which seemingly uncomfortable position it always spent its hours of sleep. As it fed voraciously, it soon became very fat. After about three months' confinement it began to grow

* Several were procured up to January, 1836, of which I made no notes; two or three were taken in January, a few in February, several in March, two on April 7., five on April 19., two on May 3., three on May 17., and, finally, the dingy one above mentioned, on June 12. 1836; after which they were once heard, but from this time I lost sight of them.

† These wanderers, feeling the genial influence of the season, set about fulfilling the duties nature has imposed upon them; but, alas! they found, when too late, that they had strayed out of their latitude, and had but vainly attempted to fix their habitation in an uncongenial clime. I have known, more than once, the robin allured by the too tempting prospects of a few fine days, set about its nest, and deposit its eggs; but stern winter, again resuming his reign, has convinced the hapless dupe that it has been much too early, and it has abandoned its nest, in one instance without completing the number of its eggs. I have heard of a similar case with sparrows also. I once knew a partridge deposit her eggs early in February; but, winter visiting her too roughly, she forsook them.

dainty, although several sorts of diet were offered to it; and, finally, to reject any kind of food. Fir seeds, apple pips, &c., were offered; but all to no purpose. It began to assume a thin and withered appearance, and, with fits of dizziness and great weakness, lingered on for about a week, when it tumbled off its perch, and yielded up its life. When taken, its crossed beak was moderately worn, but during its residence in the cage grew exceedingly pointed; and, from being relieved from toil, the upper mandible especially became of an awkward length. Such is the beautiful provision of Nature, who, as she has designed this bird to a laborious life, has assimilated the re-creative power in the growth of its beak, to meet the constant wear from its incessant and unremitting employment. — *Joseph Clarke. Saffron Walden, Jun. 28. 1837.*

[As the author of the above notice did not request us to suppress his name, we have appended it in place of his initials, considering it very desirable that communications treating upon matters of fact should, as a general rule, have the names of the respective contributors attached to them.—*Ed.*]

Variation in the Plumage of Birds. — I notice your correspondent, F. T. Ellis, mentions, at p. 54. of your last Number, the circumstance of the coachman of the Buckingham stage reporting that he had frequently seen pied rooks about the village of Chalfont St. Peter. In corroboration, I beg to say that a family of rooks have, for many years, inhabited that district, which in every year have several of their brood party-coloured, black and white. This variegation of the plumage, however, disappears with the first moult; but among the next young families there are always a few pied ones. Some with white wings, and with head, body, and tail black; others with only a few of the quill feathers on one or both wings white.

This family of pied rooks were first noticed in 1798, and some of their descendants have continued to show this peculiarity of colour ever since. About the above date a *pure white* house martin was bred at some house in the same neighbourhood, and might be daily seen feeding with its congeners over the river, and with them nightly roosting in the willow trees overhanging the water, till they took their departure about the middle of October.

There are other birds which occasionally change colour: blackbirds have been seen in an entirely white dress; and house-sparrows are frequently seen in a magpie habit. Whether the variegation continues on the three last mentioned birds after the first moult is uncertain; but such is certainly the case with pied rooks.

Having mentioned the house-sparrow, I presume to notice one of their social actions, which I do not remember to have seen alluded to by any ornithologist; it is this. When the community are assembled, quietly feeding or hopping about among the branches of trees, in an instant a knot of the males will surround or join in pursuit of a single female, whom they ungallantly harass by their united endeavours to peck at her on every side. She defends herself with open bill, and with threatening attitudes attempts to keep her tormentors off; they, all the while, keeping up a noisy outcry of their common yelping note in the highest key, which may be heard over a whole village. After two or three minutes of noisy clamour, the males desist, are appeased, and all return to their ordinary employments again. Whether the persecuted female be a vagrant, and so made a show of, or an intruder, and therefore abused, is not easily guessed; but it is an action often occurring among a society of sparrows. If such rencounters only took place in the pairing season, they might be accounted for; but they happen at all times, and particularly in the depth of winter. Perhaps some of your readers may be able to give a better account of this strange demeanour of the sparrows. — *J. M. Chelsea, Jan. 3. 1837.*

Oxydulous Copper. — This substance, which is not very abundant in nature, has, nevertheless, been found in many localities. It usually assumes the form of the regular octohedron, more or less modified, and passing on one side to the cube, and on the other to the dodecahedron. In Siberia, at Chessy, and in Cornwall, it occurs, though rarely, in the cubic form. I am not, however, aware that its occurrence in detached cubes has hitherto been noticed; and although many months since I obtained a few of these, and was consequently aware of their existence, it is only very lately that I met with a considerable number of them, soon after their arrival from Cornwall. These cubes vary in dimensions from a quarter to nearly three quarters of an inch; they are of a very dark colour; many of them are nearly complete at all their angles, more particularly the smaller ones. Occasionally two or three are grouped together; some of them are accompanied by a small quantity of green carbonate of copper. Very few are slightly modified, having some of the planes which tend to the rhombic dodecahedron; and one very large crystal, being exactly half an inch long, which is adhering to a little quartz, has the planes of the octohedron as its solid angles. — *G. B. Sowerby.*

THE MAGAZINE

OF

NATURAL HISTORY.

APRIL, 1837.

ORIGINAL COMMUNICATIONS.

ART. I. *On Generic Nomenclature.* By J. O. WESTWOOD, Esq.,
F.L.S., &c.

As the propriety of the adoption of any theory is necessarily rendered most evident by pointing out the practical ill effects arising from its non-adoption, or the good effects which are to be produced by its being received, I beg leave to offer a few remarks in this paper upon the great disadvantages which have arisen, and still arise, from the want of a fixed principle in regulating the assumption of an old generic name for some one or other of the types into which the researches of recent naturalists have rendered it necessary to cut up many old and extensive genera. With this view, I purpose, first, to give a short catalogue of some of the most striking and best known of the insect tribes, all of which, owing to the non-adoption of a fixed principle regulating generic nomenclature, are, at the present time, systematically distinguished by two or three different generic names.

1. The giant beetles, *Hércules*, *Actæon*, &c., with which Linnæus commences the insect tribes, are named *Scarabæus* in France, *Geotrûpes* in Germany, *Dynâstes* in England, exclusive of the subgeneric names *Megasoma*, &c., of Mr. Kirby, proposed for some of them.

2. The sacred beetle of the Egyptians is *Scarabæus*, or *Helicocántharus*, in England, *Ateuchus* in France and Germany.

3. The blister fly is *Cántharis* in England and France, *Lýtta* in Germany.

4. The soldier beetles are *Téléphori* in England and France, and *Canthárides* in Germany and Sweden.

5. The locust is *Locústa* in England, *Acrýdium* in France, and *Grýllus* in Germany.

6. The cricket is *Acheta* in England, *Grýllus* in France.

7. The bug is *Cimex* in England and France, and *Acánthia* in Germany.

If such confusion exist in such well-known tribes of insects, it may be very easily conceived what sources of perplexity exist when several authors are engaged upon any particular and especially difficult group of small or obscurely characterised tribes; instances of which I proposed to notice, contained in the last three works published in this country upon entomology; namely, Stephens's *Illustrations*, Curtis's *Genera*, and Shuckard's *Fossorial Hymenóptera*.

The first of these authors, in his sixth volume of mandibulated insects, has described twenty-eight species of the trichopterous genus (*Leptócerus* of Leach), which he divides into three sections. No typical species is stated; but the first six species (composing the first section), instead of comprising the species for which the author should retain the generic name *Leptócerus* (in case of division in the genus, which, he says, is probable), comprises species of which Latreille formed his genus *Mystáxis* (*Mystacide*); Leach's real type of the genus, *L. interrúptus*, being the twelfth species in the middle of section 2. In like manner, the first section of the genus *Limnéphilus* of Leach (which ought to have contained Leach's typical species *Phryganea grisea* *Linn.*) is cut off as a distinct subgenus *Glyphotælius*, and the true type placed as the twelfth species of the second section.

The reader will observe that I do not here insist upon the necessity of placing a typical species at the head of a genus, because even our imperfect views of nature will enable us to see that such species ought often more naturally to be placed in company with others not arranged at the head of the genus, but I do insist, that, where an author does not state the particular species which he regards as the type of his genus, we are bound to suppose that he would place it at the head of his genus.

Mr. Curtis (*British Entomology*, pl. 632., February, 1837,) has illustrated the genus *Pemphrèdon*, giving *P. lugubris* as the type of the genus, and figuring another species (*P. unicolor*); stating, also, that *P. minutus* *Fab.*, and *trístis* *V. Lind.* (which last he had previously but incorrectly given as synonymous with *Psén pallipes* *Panz.* See *Shuckard, Foss. H.*, p. 188. and 227.), were typical species of his genus *Diodóntus* proposed and figured in pl. 436., April, 1834. In an article upon nomenclature, published in the first series of this Magazine, Vol. IX., I selected, amongst others, the genera *Pemphrèdon* and *Diodóntus* (then recently separated from that

genus by Mr. Curtis), as examples of what appeared to me to be an improper mode of treating the generic names of such groups. In order to show this, I first investigated the history of the old genus *Pemphrèdon*, proving that, at its first establishment, its characters were those of *P. minùtus*; which, indeed, Latreille, in his *Genera Crustaccorum*, &c., actually stated to be the type; and, in the second place, I noticed the injudicious plan adopted in such cases by Dr. Leach; its rejection by Mr. Curtis, who had, nevertheless, employed the name of *Pemphrèdon* for the typical *Cemòni* of Jurine, and had given a new name (*Diodóntus*) to the typical *Pemphrèdones*.

By the recent publication of the *P. lugubris*, &c. (or the typical *Cemòni*), under the name of *Pemphrèdon*, Mr. Curtis evidently retains his former opinion; and Mr. Shuckard, in his *Essay on Fossorial Hymenoptera*, states, in his observations on the genus *Pemphrèdon*, that "Mr. Curtis is certainly right;" and that I have "introduced confusion, by a string of inaccuracies, where the course was exceedingly clear;" giving, also, a history of the genus, which corroborates mine (which was confined to ascertaining the original type of the genus) in every respect; omitting to point out a single inaccuracy of mine*; omitting, also, the description of *Pemphrèdon* given in the third volume of the *Histoire Naturelle*, which is that of *P. minùtus*; not attempting to invalidate my principle, but giving a detailed, but partial, account of the treatment of the genus by Latreille, who subsequently changed his mind and his typical species together; did injustice to Jurine, violated the rules of generic nomenclature, and proved the incorrectness of his views relative to these groups, by uniting the original *Pemphrèdon* and Jurine's *Súgmus* into one genus. But Mr. Shuckard says that he "necessarily followed" Latreille's subsequent views; and it is by showing the nature of these subsequent views, that Mr. Shuckard's history and mine seem to disagree. But this leads to another practical question: whether an author, having named and characterised a genus, is at liberty to remodify it at a future time? and, if so, upon what conditions? And, I think, no one will deny that, if there be not good objections to such a step, an author has a right to modify his creations according to his more matured views. But I contend that, in this case, there were good grounds for opposing the alterations subsequently proposed by Latreille. *Pemphrèdon*, as originally, and again characterised, was a good

* I have sought for these inaccuracies in vain, with the exception of a troubled synonyme, concerning *Psén pallipes* of Panzer, which does not in the least degree bear upon the question.

genus; but Latreille did not know the name of its type. But the third time he treated upon the genus he gave the Cràbro lùgubris, as “l’espèce la micux déterminée de ce genre;” which was true enough, for it was the only species whose specific name he had determined, not being acquainted even with the name of the insect he had dissected and described as the type in his *Précis*. He was now under the necessity of giving a determined species of each genus: C. lùgubris was the only species which he had specifically ascertained. He thought, from its general habit, that it was a Pemphrèdon, and gave it as such; but it happened, unfortunately, that he subsequently (*Gen. Crust.*, iv. 83.) ascertained that it was not a Pemphrèdon; but he chose rather to persist in his error, and retained it in all his subsequent works as the type of Pemphrèdon. But, in the mean time, an elaborate volume on the Hymenóptera had appeared by Jurine, in which the genus Cemònus was established, divided into two families; the first consisting of P. lùgubris (*), P. minùtus (†); and the second containing a single species, P. unicolor (‡). The genus Stígmus was also here first proposed, the only named species being Stígmus àter (péndulus *Panzer*) (‡). From this work Latreille learned the specific name of his original type of Pemphrèdon, P. minùtus; and we have now to notice in what manner he got over the difficulty into which he had fallen, by giving an insect as the type of Pemphrèdon which was not a Pemphrèdon. In his *Genera Crustacèorum*, &c., he divided the genus into two sections, the first containing only Pemphrèdon lùgubris (*); and the second, only P. unicolor (‡). Thus the genus was synonymous with Jurine’s Cemònus, except that P. minùtus (†) was removed.

The next genus was Stígmus, divided into two sections: the first, containing only P. minùtus (†), to which this synonyme was added, — “*Genr. Pemphredon Latr. Préc. des Caract. Génér. des Insect.*, p. 128.”; and the second, containing only Stígmus àter *Jur.* (‡). Thus, instead of another generic name having been given by Latreille to P. lùgubris, when he ascertained that it was not a Pemphrèdon, the generic name was wrested from its true type, which was now united with, and made the type of, Jurine’s genus Stígmus, which was thus itself reduced to a secondary division of the genus of which it ought to have been retained as the type. The treatment, indeed, by Latreille, of the genus Pemphrèdon reminds one very strongly of the tragedy of Hamlet Prince of Denmark, the part of Hamlet being omitted by particular desire. But, jesting aside, the circumstances which I have stated are not such as would warrant the remodi-

fication which it has received from the hands of its original author. The course, as Mr. Shuckard observes, is clear enough, although it does not appear to be exactly that which he has followed. I should say, without hesitation, that the generic, or rather, perhaps, subgeneric, names of these groups ought certainly to be applied in the following manner:—

GENUS PEMPHRE'DON Latreille.

- Subgenus 1. Pemphrèdon proper (*Diodóntus Curt.*), real type *P. minutus F.*
 2. *Passalæ'cus Shk.* (*Xylæ'cus Shk. in tab.*), type *Diod. insignis C.*
 3. *Ceratóphorus Shk.* (*Pemphrèdon p. Curt.*), type *P. mório V.L.*
 4. *Cemónus Jur.* (*Pemphrèdon Lat., Curt., Shk.*), real type *lùgubris F.*
 5. *Dineùrus* Westw.* (*Cemónus Shk.*), type *P. unicolor Lat.*

I will first add, by way of reply to those who would retain a generic name for species not agreeing with the type species, which last may have subsequently been proved to belong to an already named genus, that it must be evident that the author, in constructing such genus, must especially have had in view the typical species, which, indeed, often furnishes the generic name; that, by removing such type, the creation is dissolved, the tie which held the remaining discordant materials together is broken; and that, after the removal of that type, it would be as improper as practically injurious, to speak of the remainder as constituting such or such a genus of the author by whom the name was proposed.

ART. II. *Rules for Zoological Nomenclature.* By HUGH E. STRICKLAND, Esq., F.G.S.

IN order to exhibit more clearly my views on this subject, I have drawn up a few general rules, divested as much as possible of unnecessary verbiage; and beg to submit them to the consideration of your readers. They have little pretension to originality, but are selected from the writings of several naturalists, especially from the *Birds* of Mr. Swainson, many of whose aphorisms are adopted here.

1. The Latin nomenclature forms the only legitimate language of zoology (*Swainson*).

Latin names are adopted by naturalists of all nations, and are therefore preferable to any other. Where one language is sufficient for the purpose, all others are superfluous.

2. Names which have been long adopted and established

* From the first submarginal cell receiving two recurrent nerves.

require a different set of rules from names which are given for the first time.

Founding new institutions, and amending old ones, are two very different things; and what is desirable in the one case, is not always so in the other. We will therefore consider,

First, Rules which relate to *established* Nomenclature.

3. The discoverer of a species, or the founder of a higher division, has the best right to give it a name.

The person whose industry or study establishes a new group or species is commonly the best judge of a suitable appellation for it; yet, even should he fail in this point, it is only fair that, if his group be adopted, the name which he has proposed for it should be retained. Therefore,

4. The *first* name given to a group or species should be perpetually retained. (*Westwood, Fabricius, &c.*)

This law is subject to the following exceptions; and, in my opinion, to no others:—

5. A name is to be expunged which, if specific, has before been given to some other species in the same genus; or, if of a higher order, has before been given to some other group. (*Swainson, &c.*)

6. A name may be expunged whose meaning is false, as applied to the object or group which it represents. (*C. T. Wood, &c.*)

Yet, in some few cases, where a name, though false, does not really mislead, it should be retained, if long established. (See *Mag. Nat. Hist.*, Vol. I. p. 130. n. s.)

7. A name may be expunged which has never been clearly defined. (*Swainson.*)

Unless a group is defined by description or figures when the name is given, it cannot be recognised by others; and the signification of the name is consequently lost. On this ground, many of Dr. Leach's genera were justly expunged, as they existed only in his own MSS. Many collectors of shells and fossils are in the habit of labelling those species which they do not find described, with names of their own invention; but, unless they publish descriptions of these new species, they cannot expect these names to stand.

These are the rules which concern *established* names. We will consider,

Secondly, Rules to be observed in naming *new* Species or Groups.

A. *General Rules which apply to Classes, Orders, Tribes, Families, Genera, and Species.*

8. A new group must have a new name, which has never before been given to any other group in zoology or botany.

A new species must have a name new to the genus. (*Swainson.*)

9. It is *desirable*, but not *essential*, that a name should have an etymological meaning. (See *Mag. Nat. Hist.*, Vol. VIII. p. 36.; and Vol. I. p. 129. n. s.)

10. Names should be taken either from the Latin or Greek languages. (*Swainson.*)

An exception may, however, be made in favour of *species* called by their names which are current in their native countries; such as *Coturnix argoóndah*, and *Halicora dugong*. Such names are of great use in identifying species.

11. The *meaning* of a name must imply some proposition which is true as applied to the object which it represents.

12. Names must not be borrowed from mythological, divine, historical, or moral terms. (*Willdenow, Swainson.*)

This is a good general rule, but admits of exceptions. (See *Swainson's Birds*, p. 233.)

13. Names should not be too long, even though classically compounded. (*Swainson.*)

14. The meaning of names should be founded on absolute characters, not on relative or comparative ones.

15. The name of a species or group should be taken from those characters which are most essential and distinctive, and not from such as belong equally to other cognate groups.

B. Rules which apply to particular Cases.

16. The names of tribes, families and subfamilies, should each have a distinctive termination. (*Swainson.*)

In consequence of the multiplicity of scientific terms, it is always desirable to assist the memory by indirect means, when it can be done without infringing the laws of nomenclature. In the case of genera and species, however, it is impossible to give a distinctive termination; and in that of classes and orders it is unnecessary, for they are so few, that the memory does not require this assistance. (See *Swainson*, p. 230.)

17. In zoology, genera should not be named after individuals. (*Guilding, Wood.*)

As this practice has prevailed in botany, it is better to avoid it in zoology, and thus afford an additional aid to the memory.

18. The names of families and subfamilies should be derived from the most typical genus in them. (*Swainson.*)

19. Generic names should, *in general*, be compounded of Greek words, and specific of Latin.

There seems no other reason for this, than that, as this practice has prevailed to a considerable extent, it serves to aid the memory.

20. Species may be occasionally named after persons, provided they have been distinguished in that peculiar department of zoology. (*Swainson.*)

This practice is liable to abuse, yet is often allowable, especially in large genera (e. g. *Ammonites*), where it is impossible to find an adjective which shall apply to each species exclusively.

21. The *best* specific names are short adjectives expressive of some *distinctive* character. They may be taken, 1st, from the form or colour, which is the best character for the purpose; 2dly, from the habits of the living animal; 3dly, from the size; 4thly, from the country. The two last characters are the least desirable for specific names, and should only be used when the others fail, and when a distinctive epithet can thus be obtained.

22. Specific names should be always written with a small initial letter; those of the higher groups with a capital.

This is so convenient a *memoria technica*, that, for the sake of it, I would disregard the otherwise inelegant appearance of the names *Cýgnus bewickii*, *Tétrao scóticus*, *Símia sátyrus*, &c.

ART. III. *On the Passerine Birds of Devonshire.* By EDWARD MOORE, M.D. F.L.S.

IN continuation of my catalogue of the birds of Devonshire, I transmit the following genera of the second order, *Pásseres*: among these will be found many rare migratory species, some of which breed here; and, also, some which may be termed only occasional visitors. Specimens of both might, doubtless, be more frequently obtained if greater attention were paid, and if landlords were less tenacious of allowing a gun to be carried in summer. Although I have anxiously looked out for a Devon specimen of the nightingale, I have been unable to succeed; and must, therefore, rest satisfied with the fact announced by Montagu, that he once heard it near Kingsbridge.

My object being merely to authenticate the individuals as Devon specimens, I do not enter into an account of the habits and manners of the species, as, in most cases, they are already known; but shall restrict myself to the mention of the names of those persons in my neighbourhood who now possess specimens of the rarer kinds.

ORDER II. *PA'SSERES.*

Fam. i. *Dentiróstres.*

Gen. *LA'NIUS.*

1. *Lánius excúbitor*, Great shrike. Rare: one was seen in the

plantations of Ham, the seat of Mrs. Collins, near Plymouth; and, in June, 1829, a male was shot on Haldon, by W. Tucker, Esq., of Mount Pleasant, near Dawlish.

2. *Lanius Collurio*, Red-backed shrike. Common about Plymouth.

Gen. MUSCICAPA.

1. *Muscicapa griseola*, Spotted flycatcher. Common.

2. *Muscicapa atricapilla*, Pied flycatcher. Scarce. A specimen is in Drew's collection; and one was seen near Barnstaple, in June, by Major Harding of Ilfracombe.

Gen. BOMBYCILLA.

1. *Bombycilla bohémica*, Bohemian chatterer. Several have been shot in this neighbourhood, and especially in the plantations of Mount Edgecumbe and Saltram. Specimens in Mr. Rowe's, Bolitho's, and Drew's collections.

Gen. TÚRDUS.

1. *Turdus Mérula*, Blackbird.

2. *Turdus torquatus*, Ring ouzel. Frequent on the borders of Dartmoor, where they breed. We have many specimens.

3. *Turdus viscivorus*, Missel thrush. Remains all the year.

4. *Turdus pilaris*, Fieldfare.

5. *Turdus musicus*, Thrush.

6. *Turdus iliacus*, Redwing.

Gen. CÍNCCLUS.

1. *Cinclus aquaticus*, Water ouzel. Common all the year, and especially on the rocky parts of rivers rising on Dartmoor.

Gen. SAXICOLA. — Subgen. 1. *Saxicola*.

1. *Saxicola rubicola*, Stonechat. Common all the year.

2. *Saxicola Rubetra*, Whinchat. Common in summer.

3. *Saxicola Œnánthe*, Wheatear. Common in summer: many breed in cavities of the rocks about Plymouth Sound.

Subgen. 2. *Ficédula*.

1. *Ficédula Rubécula*, Redbreast.

2. *Ficédula Rutacilla*, Redstart. Not unfrequent in summer.

Gen. CURRUCÁ. — Subgen. 1. *Philomela*.

1. *Philomela Luscinia*, Nightingale. Very rare in Devon. (See Montagu's *Dictionary*.)

Subgen. 2. *Salicaria*.

1. *Salicaria arundinacea*, Reed warbler. Rare. I possess one specimen.

2. *Salicaria Phragmitis*, Sedge warbler. Not uncommon.

3. *Salicaria Locustella*, Grasshopper warbler. A few specimens have been obtained here. I possess one; another is in Bolitho's collection.

Subgen. 3. *Curruca*.

1. *Curruca Atricapilla*, Blackcap. Common.

2. *Curruca cinerea*, Whitethroat. Common.

3. *Curruca Garrula*, lesser Whitethroat. Rare. I have one specimen.

4. *Curruca hortensis*, Garden warbler. Numerous in the Vale of the Plym all the summer. I possess three specimens.

Subgen. 4. *Melizophilus*.

1. *Melizophilus provinciális*, Dartford warbler. Rather scarce. Mr. Drew and Bolitho have specimens. They formerly abounded near Plymouth; but lately few have been obtained.

Gen. ACCÉNTOR.

1. *Accéntor modularis*, Hedge warbler.

Gen. RÉGULUS.

1. *Régulus auricapillus*, Gold-crested wren.

Gen. SYLVÍCOLA.

1. *Sylvicola Tróchilus*, Willow wren. Common.

2. *Sylvicola sibilatrix*, Wood wren. Abundant.

3. *Sylvicola rufa*, Chiffchaff. Common.

Gen. *TROGLODYTES*.

1. *Troglodytes europæus*, Common wren.

Gen. *MOTACILLA*. — Subgen. 1. *Motacilla*.

1. *Motacilla alba*, White wagtail. Assembles in large flocks at the end of August: a few remain all the year; probably old birds.

Subgen. 2. *Budytes*.

1. *Budytes flava*, Yellow wagtail. Summer. Large flocks of these birds congregate in our neighbourhood during the first week of September, but stay only a few days.

2. *Budytes boarula*, Grey wagtail. Winter; but I have seen a pair in June; and Mr. Gosling has found their nest at Leigham. A male, with the black throat, is in Bolitho's collection; so that, probably, they not unfrequently breed here.

Gen. *A'NTHUS*.

1. *A'nthus trivialis*, Tree lark, or Pipit. Common.

2. *A'nthus pratensis*, Titlark, or Pipit. Common.

3. *A'nthus aquaticus*, Rock lark, or Pipit. All the year, on sea shores.

Fam. ii. *Coriostres*.

Gen. *ALAUDA*.

1. *Alauda arvensis*, Skylark.

2. *Alauda arborea*, Wood lark.

Gen. *PÀRUS*. — Subgen. 1. *Pàrus*.

1. *Pàrus major*, Great titmouse.

2. *Pàrus ater*, Colemouse.

3. *Pàrus palustris*, Marsh titmouse.

4. *Pàrus cæruleus*, Blue titmouse.

5. *Pàrus caudatus*, Long-tailed Titmouse.

Subgen. 2. *Calamophilus*.

1. *Calamophilus biarmicus*, Bearded titmouse. Rare: found on the Exe, near Thorverton; and also near Topsham, as I am informed by Mr. Comyns of Mount Pleasant, near Dawlish, who has specimens.

Gen. *EMBERIZA*.

1. *Emberiza citrinella*, Yellow bunting.

2. *Emberiza Cirlus*, Cirl bunting. A nest was found by Mr. Luscombe of Yealinton; and the species is often brought to market in winter among the small birds.

3. *Emberiza Schœnsculus*, Reed bunting. A black variety is in possession of Mr. Comyns, near Dawlish.

4. *Emberiza miliaria*, Common bunting. All the year.

Gen. *PLECTROPHANES*.

1. *Plectrophanes nivâlis*, Snow bunting. If the tawny bunting is the same bird in different plumage, we have many specimens, obtained generally about October and November.

Gen. *FRINGILLA*. — Subgen. 1. *Pyrgita*.

1. *Pyrgita domestica*, House sparrow.

Subgen. 2. *Fringilla*.

1. *Fringilla cœlebs*, Chaffinch.

2. *Fringilla Montifringilla*, Mountain finch, or Brambling. Rare: one in Mr. Rowe's collection; another at Bolitho's.

Subgen. 3. *Carduelis*.

1. *Carduelis aurata*, Goldfinch.

Subgen. 4. *Linaria*.

1. *Linaria Spinus*, Siskin. Rare: a pair in Bolitho's collection. In

the autumn of 1836, five were caught in a trap on Devonport Lines.

2. *Linària canéscens*, Mealy redpole. Rare : one in Pincombe's collection.
3. *Linària flaviróstris*, lesser Redpole. Rare : one at Bolitho's.
4. *Linària cannábina*, greater Redpole, or Brown linnet. Common.
5. *Linària móntium*, Mountain linnet, or Twite. In Devon, according to Polwhele, in his *History of Devonshire*. Two in Bolitho's collection.

Gen. COCCOTHRÁUSTES. — Subgen. 1. *Coccothraústes*.

1. *Coccothraústes Chlòris*, Green grosbeak.
2. *Coccothraústes vulgàris*, Greater grosbeak, or Hawfinch. Found at Mount Edgecumbe. A specimen in Drew's collection ; another at Mr. Rowe's, bookseller, Plymouth.

Subgen. 2. *Pyrhùla*.

1. *Pyrhùla vulgàris*, Bullfinch.

Gen. LÓ'XIA.

1. *Lóxia curviróstra*, Crossbill. Not uncommon in the migrating season. Specimens at Mr. Drew's, and at Ham, the seat of Mrs. Collyns.

Gen. STÚRNUS.

1. *Stúrnus vulgàris*, Starling. Breeds in Devonshire. Mr. Comyns has a white variety.

Gen. PÁ'STOR.

1. *Pástor ròseus*, Rose-coloured ouzel. Some years since a pair was sent to the British Museum, by the Rev. Kerr Vaughan, of Aveton Gifford, Devon. Again, in June, 1834, a fine male was obtained there by the same gentleman ; and in October, 1832, a young bird, without the crest, was shot in Cornwall, and is now in the collection of Humphry Gylls, Esq., of Carnanton. The species has also been observed at Saltram, the seat of Earl Morley.

Gen. ORI'OLUS.

1. *Oriolus Gálbula*, Golden oriole. Occasionally found here. Mr. R. Julian of Estover shot one ; Mr. Drew has also a specimen, shot at Mount Edgecumbe.

Gen. FRÉ'GILUS.

1. *Frégilus Gráculus*, Red-legged crow. Winter. We have many specimens ; but they are not so numerous as in Cornwall.

Gen. CO'RVUS. — Subgen. 1. *Córvus*.

1. *Córvus Monédula*, Jackdaw. Breeds in the sea cliffs at Plymouth.
2. *Córvus frugílegus*, Rook. Common.
3. *Córvus Córax*, Raven. Breeds on the borders of Dartmoor and sea cliffs.
4. *Córvus Coròne*, Crow. Common.
5. *Córvus Córnix*, Hooded crow. Winter, though not very frequent.

Subgen. 2. *Pica*.

1. *Pica caudàta*, Magpie. Common.

Subgen. 3. *Gárrulus*.

1. *Gárrulus glandàrius*, Jay. Common.

Subgen. 4. *Nucífraga*.

1. *Nucífraga Caryocatáctes*, Nutcracker. A Devon specimen, mentioned by Montagu. Another was shot in 1829, near Washford Pyne Moor, by Mr. W. Tucker of Dawlish.

Fam. iii. *Fissiróstres*.

Gen. HIRU'NDO. — Subgen. 1. *Cýpselus*.

1. *Cýpselus A'pus*, Swift.

Subgen. 2. *Hirúndo*.

1. *Hirúndo úrbica*, Marten. These birds build in the cliffs at Wembury, near Plymouth, as well as about houses.
2. *Hirúndo ripària*, Sand marten. Builds in the sandy cliffs at Thurlestone, near Kingsbridge, and on the banks of our rivers. If much disturbed, they forsake the spot.
3. *Hirúndo rústica*, Swallow. These birds, and the three former species, appear to approach our districts in successive flocks previous to their departure, as I have often ascertained, by noticing that each flock differed from another; sometimes there being only swifts, then swallows and martens, then martens only; and others being accompanied by sand martens. They roost, in autumn, in the low brushwood of plantations near Dartmoor.

Gen. *CAPRIMÚLGUS*.

1. *Caprimúlgus europæus*, Nightjar. Common about the South Hams of Devonshire, where they frequent orchards.

Fam. iv. *Tenuiróstrés*.

Gen. *SÍTTA*.

1. *Sitta europæa*, Nuthatch. Common.

Gen. *CÉRTHIA*.

1. *Cérthia familiàris*, Creeper. Common.

Gen. *U'PUPA*.

1. *U'pupa E'pops*, Hoopoe. Several have been obtained here: one was shot at Warleigh, the seat of the Rev. Walter Radcliffe; another by Mr. Comyns, in September, 1828, on Kenton Warren. Two are in the collection of J. Newton, Esq., of Bridestow, near Tavistock. In 1827, two out of a flock were shot at Saltram, by Lord Morley's keeper; and three were obtained near Plymouth in 1830. Specimens are in the collection at Ham, at Mr. Rowe's, Mr. Drew's, and Bolitho's.

Gen. *MÉROPS*.

1. *Mérops Apiáster*, Bee-cater. A fine specimen was shot at Leigham in April, 1818; another at Ivybridge, in 1822; another is in Mr. Rowe's collection; and a flock of eleven was seen at Helston, Cornwall, in 1828; all of which were captured.

Gen. *ALCÉDO*.

1. *Alcédo íspida*, Kingfisher. These birds frequent our rivers all the year, and are always to be found among the sea weeds, at low water, in winter, where they feed on insects. I have seen one pounce on a butterfly in summer; so that their food does not appear to be exclusively fish.

Plymouth, March 3. 1837.

ART. IV. *Letter from* GOLDING BIRD, Esq., F.L.S. F.G.S., Lecturer on Experimental Philosophy at Guy's Hospital, *in Reply to some Observations published in the "Edinburgh Journal of Natural History," upon the Cause of Vegetable Divergence.*

THE editor of the *Edinburgh Journal of Natural History* has, I perceive, in the number for this present month, given a very nearly verbatim copy of my paper (*Mag. of Nat. Hist.*, n. s., vol. i. p. 57.) on the cause of the divergence of divided stems; and has appended to it some observations, in which he

has proposed a "*much simpler and equally satisfactory explanation of the phenomenon.*" From his opinion in this respect, however, I must beg leave to dissent in toto ; but, lest I should be accused of misconstruing the editor's meaning by giving another version of his observations, I shall copy that portion of them which he seems to think most conclusive against the theory I ventured to propose ; omitting only his figure of, and reference to, a longitudinal section of an exogenous stem : — " The plants found to exhibit it (i. e. divergence) are possessed of a vascular, fibrous, and a vesicular tissue. The latter occupies the central parts exclusively ; while the woody fibres occur towards the exterior, as do the vessels properly so called. Now, the woody fibres not being extensive, and the cellules at *a* (i. e. the centre of the stem) being dilatable, it will necessarily follow that, when the section of the stem is made, the cellules being filled with fluid or vapour, which readily passes from one to the other, the larger inner cellules, in consequence of the pressure caused by the unyielding cuticle and herbaceous tissue which compressed the interior when the stem was entire, being now allowed to expand to the full size, or in some degree ; while the outer cellules are bound together by the in-extensive woody fibres, the curvature outwards of the section is a necessary result so long as moisture is supplied by the unslit part of the stem, or communicated from without, this fluid ascending on the principle of endosmose. When, as in experiment 2., the slit stem is immersed in water, the divergence is increased on the same principle ; but when, as in experiment 3., a denser fluid is substituted, exosmose takes place in the vesicular tissue, in consequence of which the pressure is removed from the larger vesicles, which, by their elasticity, regain their original size. In the plant (experiment 4.) whose lower parts were destroyed by poison, the upper not having received a supply of fluid to replace the quantity evaporated in twenty-four hours, no divergence could ensue on slitting it ; but, as in experiment 5., should it be filled with fluid, it diverges as explained above. For the reasons stated, a dried piece of stem (experiment 6.) can, of course, undergo no change ; but, if restored to its natural state, as in experiment 7., it exhibits the usual phenomenon. In accordance with the explanation is the fact, that woody stems, when slit, do not diverge, because all their parts are equally bound together by firm longitudinal fibres, as well as that of purely cellular plants, such as *Ficus palmatus*, exhibiting no divergence." (*Edin. Journ. Nat. Hist.*, No. xviii. p. 87.)

After referring to my own paper, I must confess that I was completely foiled in attempting to discover anything original

in the passage just quoted. Nay, I would go further, and appeal to any of your readers as to whether or not the greater part of the above extract is anything else than a mere translation of my own observations contained in your Journal for February last ; part of it, in fact, being a tolerably perfect copy. The only point on which the editor of the *Edinburgh Journal* really differs from myself, is, that he conceives the elasticity of the woody fibre, to be an active agent in causing the segments of a stem to recover their state of rectitude ; whereas I felt inclined to consider it merely as occasionally assisting, but not causing, the recovery of this state ; expressly stating, that, “ on removing the piece of stem into syrup, a much denser fluid than sap, exosmosis, for reasons already explained, ensues, the cells become emptied, and the separated portions recover their former rectitude ; *the elasticity of the woody fibre present also, probably, assisting.*” Thus, we both admit the existence of elasticity as aiding the segments to recover their state of parallelism, but in different degrees.

As a proof that the elasticity of woody fibre is *necessary* to the developement of divergence, the case of *Fucus palmatus* (*Rhodomènia palmata*) is quoted ; this acrogen being made up *entirely* of vesicular (cellular) tissue, and exhibiting no divergence when divided. But this is very far, I conceive, from strengthening the position assumed by the editor of the *Edinburgh Journal* ; for it is self-evident that, for the developement of divergence on division, it is absolutely necessary that the cells or vesicles should be of unequal size, and arranged in a particular manner, larger in the axis, and smaller in the periphery of the vegetable structure ; and this not being the case with *Rhodomènia palmata*, I confess that I should be surprised to find that it, or any other acrogen (especially among the *Algæ*) *not possessing a distinct axis of growth*, exhibit divergence on dividing their fronds.

I am unwilling to occupy a larger space than necessary with this subject, or I might adduce other arguments in support of the position I have ventured to take. I might ask, In what manner could elasticity be supposed to assist in my 7th experiment, in which a piece of the stem of a *Stachys* was allowed to wither up and dry by exposure to the air, and yet manifested the most complete divergence on dividing it after its cells had been distended with syrup ? Here, I may observe that, if the existence of *all woody fibre at the circumference, and all vesicular or cellular tissue at the axis, of a stem* were really necessary for the production of divergence, endogens generally ought not to possess this property, which, however, they really do ; of which fact any one may readily be convinced by dividing

longitudinally dividing the leaf of a hyacinth, and then immersing it in water. Were I inclined to be hypercritical, I might, in my turn, make a few comments, and remind your northern contemporary that vesicular (cellular) tissue does not occupy the central part of a stem *exclusively*, nor do woody fibres and true vessels always occupy its circumference; for it is surely superfluous to observe, that cellular tissue is present in every part of a plant for the purpose of binding together the ligneous and vascular tissues; or that, in the stems of endogens, vesicular, ligneous, and vascular tissues are mingled together, without any true distinction, into pith, wood, and bark.

In conclusion, I may observe, that the researches of Dutrochet have demonstrated endosmotic action to be an active agent always going on in organised bodies: they have demonstrated its agency in producing what before appeared to be the mysterious irritability of the fruit of the *Elatèrium*, and valves of the *Impatiens*. Is it, therefore, I would ask, inconsistent with philosophical reasoning, or sound induction, to apply a similar explanation to an analogous series of phenomena, after having proved that endosmotic action is capable of aiding, or even of producing, them, and therefore, as far as at present is possible, tracing effect to cause? Is it not rather to be considered, that, calling in the aid of *two* physical agents to explain a *single* effect, after one has been proved to be sufficient, as somewhat militating against that beautiful simplicity every where observed in the varied phenomena so lavishly presented to us by the hands of nature?

22. *Wilmington Square, March 11. 1837.*

ART. V. *Some Observation upon the supposed different Species of Viper.* By G. W.

NATURALISTS appear to be unanimous in the opinion that, in England and Scotland, there is but one genus of venomous reptiles, that kind of creeping thing commonly called the viper, adder, or hagworm. Ireland, by virtue of its patron Saint, lays claim to a national exemption from all sorts of reptiles, poisonous as well as not. Ray, however, mentions the green lizard as indigenous; how truly is not affirmed: but the informed and the uninformed, the high and the low, from that country, do say, that nothing of the kind is to be found within the green limits of the "first gem of the sea." Sweden, as it is related in Barrow's agreeably written journal, claims a similar exemption; but, if Linnæus was not dreaming when he fancied himself

poisoned by a venomous reptile inhabiting the bogs of that country, it seems to be without foundation; and, perhaps, all that can be said in favour of the claim of either country is, that it is a popular prejudice; but, if it be taken seriously, then, indeed, with due gravity, the fact may be questioned by doubting if the cause, in the former country, be adequate to produce the effect; and, in Sweden, it may be asked, if any one has been at the trouble to ascertain it.

Had Wales been exempt from the visitation, Pennant, by no means deficient in nationality, would have claimed it for his native mountains. According to him (who, as an enquiring and observing person, is no mean authority on the subject, the more so, as he could speak from personal observation), vipers swarm in many of the Hebrides. In Scotland, they are not at all uncommon; and in England vipers are, in greater or lesser number, to be found every where: as localities suit or do not suit their habits, they are naturally more or less numerous; but no considerable district, upon anything like sufficient authority, can be said to be entirely free. In some parts of Yorkshire they abound. In Essex, vipers, as well as the common snake, are exceedingly numerous; and in all the chalk counties they are abundantly met with.

In Cumberland and in this county only the writer can speak from personal observation of the habits of the animal. The viper is common enough in moorlands, in sandy or light soils; and in peat land it is found in very considerable numbers; though in heavy clayey ground it is more rarely met with; and, from all accounts, it exists in the greatest number in the north-east, in those immense moors or morasses on the border, and in the south-western parts of the county, in which it has been known to grow to the largest size assigned to it.

Although there is said to exist, in England and Scotland, but one genus of reptiles whose bite is poisonous, this venomous genus is said, and by some very confidently too, to consist of no less than four, if not of five, distinct species. There is the *black viper*, the *blue-bellied viper*, the *red viper*, the *common viper*, usually described as of an ash colour tinged with dirty yellow; and to these is to be added the *Dumfries snake*, described as being venomous on that loose vague authority, which some eminent naturalists adopting, lays them open to the charge of extreme carelessness, or to discreditable credulity. Here we have no fewer than five distinct species of reptiles affirmed to be poisonous; but, in point of fact, is there more than one? Not to be dogmatical, for, in the absence of more extended observation there may, it is allowed, not be sufficient ground to determine the question absolutely; yet

there appears to be a fair doubt whether or no the vipers thus enumerated are really distinct species, or merely varieties; and even their being varieties admits of query. An intelligent observer, E. N. D. (in *Mag. Nat. Hist.*, vol. vi. p. 526., and vol. vii. p. 176.), raises the question, by inclining to the opinion that there is but one species of poisonous reptile; and, so far as personal observation (limited, as already mentioned) extends, that opinion is borne out by fact; and, more generally speaking, no reason, or well-founded authority, is known upon which to dispute the truth of the opinion, that there is but one species of venomous reptile throughout Great Britain. Let us examine the matter a little.

In the first place, the habits of the ophidian genera are very imperfectly known, and what is related respecting them seems to be as confused as it is inexact. Nor is this to be wondered at, seeing how disgusting reptiles are, and how dangerous (but much more in apprehension than reality) they are reputed to be. Country people, besides, being inexact (although their occupations afford them frequent and good opportunities for making observations), in their accounts, are seldom to be depended upon: they are not nice observers of that which does not immediately affect their concerns; and disgust, or fear, or indifference, incapacitates them for taking accurate notice; and these feelings induce contradiction, confusion, and exaggeration. Viper-catchers may be better authorities, as from use they overcome the not unnatural repugnance to these animals; but in their case accuracy depends entirely upon individual intelligence, and, except the reporter be unexceptionable, their statements ought to be cautiously received.

The experience of professed naturalists upon this matter, singular as it may appear, seems to be more confined than hitherto is suspected, or will willingly be admitted. Many there are, who, like Goldsmith, never saw the creatures they undertake to treat of; and their own observations are too few to entitle any one on their authority to decide the question of whether there be one only or more kinds of venomous reptiles. Dr. Leach, and Dr. Fleming coincides with him, (the latter strangely enough giving a place to the Dumfries snake as a distinct species of *Natrix*, or snake, probably poisonous!) has reduced the multiplied species of black, blue, and red vipers "to the rank of varieties." Dr. Leach, as a naturalist, is an authority not to be lightly treated, and both he and Dr. Fleming are of opinion there is but one species of poisonous reptile, and that the common adder, or viper.

There are many credible accounts of vipers having been kept in cages for a great length of time (from six to ten, and so

long as twelve, months); but the results thus obtained, or, at least, remarked upon, have been authentic proofs only of their extraordinary powers of life in a state of complete abstinence: though, as we know they lie long in a dormant state, it is not quite so surprising as at first sight it seems to be. On one occasion, it is said that, instead of eating its food, a viper, confined with a mouse introduced as food for it, was itself partially eaten, and not improbably, as surmised, killed by the mouse. (*Mag. Nat. Hist.*, vol. vi. p. 457.) In its natural state, such a turning of the tables upon the viper could scarcely have happened: it does not, at any rate, with our present information, seem within the range of the probable. But who is there that has caught and caged the common female viper with young; has seen the young brought forth; observed and noted down the changes incident to sex, age, and season; and, at the same time, fixed (which is no less necessary) a certain standard of their hues, from the time of production as long as they should live? The habits of the viper, living in holes, and seldom appearing, except when basking, prevent the making of accurate observations, of which guess-work is too often allowed to take the place; and, besides, in a state of nature, it is next to impossible to distinguish individuals for the purpose of experiment; but, though difficulty exists in ascertaining facts, that is no reason for being guided by anything that is said, merely because it is said, which, for the most part, seems to be the reason of its acceptance. Though not without ground of objection, it may be urged that the experiment of the cage, as a certain test, can not be relied on; as, being debarred from exercising its natural habits and appetites, the animal might not exhibit the changes common and proper to it when at large. There is something in this objection. Granting there is difficulty inducing doubt, yet, on the contrary, when this is granted, still it must be admitted that such an experiment would form, not only a considerable approximation to the truth, but, from the nature of the animal, afford the nearest that can be made towards a satisfactory determination, by observation and fact, of the disputed point, whether there exist a black, a blue, and a red species of viper; or but one species, of which these different hues *, it is contended, are merely incidental to individuals, owing to changes connected with sex, age, season, or, possibly, to local circumstances, as the nature of the habitat, or a peculiar kind of food. Making allowances, then, for the difference likely to arise from the viper being confined in a cage, and

* If specific distinctions are to be founded upon shades of colour, one might make out three or four species of bass or perch, (?) which vary in colour according to the nature of the habitat and food.

correcting the observations made of it in the cage with those accurately made of the animal when at large in the fields, there appear good grounds for arriving at some more certain conclusion than any that is satisfactorily received amongst naturalists, who, by correcting the results of a sort of theoretical experiment, and of actual out of doors observation, the one with the other, may ascertain the desired fact of there either being several, or but one, species of viper.

Fleming, unquestionably a perspicuous scientific systematiser, enumerates but twelve species of reptiles inhabitants of these islands; but of these twelve one is doubtful, namely, the *Dumfriesshire snake*. It is not a little singular, that this celebrated systematist, generally so precise and accurate, upon so vague an account as he has given of it, should class this snake, or viper, of doubtful existence, among the actually discovered and fixed species of reptiles, when both he and Leach concur in discarding the black, blue, and red as distinct species of vipers. The fancied discoverer of the *Dumfries snake*, as Fleming tells the tale, says, "Only one specimen has been seen," about 5 in. long; so that "much," as is naïvely remarked, cannot be said of its usual size. No, assuredly, not "much:" can any thing? Was it young or old; had it attained full growth? It is classed with the snake destitute of poisonous fangs, yet presumed to be a variety of a smooth viper (in Cuvier's *Animal Kingdom*, by Griffiths, it is proposed that snake and adder should be used to distinguish certain of the serpent form which are not venomous; and viper, those which are: in that sense it is understood to be used by Dr. Fleming) common in Germany and France: but was it venomous, or not? From the brief and vague account given of it, surely nothing positive can be deduced. Of this opinion seems to be Sir William Jardine, who, in a note to his edition of White's *Selborne*, says, the *Natrix dumfriensiensis* (*Dumfriesshire snake*) "seems to be of very dubious authority as a species." And, moreover, from what Dr. Fleming says of it himself, and from what E. N. D. (Vol. VI. p. 526.) says of the supposed red viper, this *Natrix dumfriensiensis* would appear to be the young of the common viper, as E. N. D. calls it, after Linnæus, *Vipera Bèrus*; and, therefore, if deserving of distinction as a separate species, it should have been placed as a variety along with the now, it may be assumed, exploded distinct species, the black, blue, and red vipers, as arranged or mentioned as varieties in Fleming's *History of British Animals*.

Besides the discrepancies already noticed in the classification and biography of the *Dumfriesshire snake*, another anomaly is to be considered, and which presents itself in Pennant's

Zoology (ed. 1812, vol. iii. p. 49.), in which an account is given of a new snake, as described in his *Tour in Scotland*, and in his *Zoology*, as the Aberdeen snake (*A'nguis E'ryx*, *Lin. Syst.*, 392.)

The editor of the edition of the *Zoology* referred to appends a note to the description in the text of the Aberdeen novelty, saying, "The Dumfriesshire snake of Mr. Sowerby's *British Miscellany*, tab. 3., is probably the young either of this (the Aberdeen snake, to wit), or of the ringed-serpent:" meaning, it is presumed, the *Natrix torquata*, or common snake, of Fleming; a conclusion possessing all the advantages of arguing in a circle, inasmuch as, so soon as error is started, it is run down, indeed, but only to make a fresh start of it.

It is not known what authority or weight is due to the opinion of this editor; but, at any rate, it is at variance with that of Dr. Fleming, who is, however, inconsistent with himself, supposing, as we have seen, the animal to be a kind of smooth viper (of course, poisonous), yet classing it with the snake, which is not poisonous! Altogether, on the extremely slender data given, and the contradictory conclusions drawn, or (not with impropriety it may be said) opinions haphazard upon little else than the barest probabilities, it may safely and warrantably be assumed that the *Natrix dumfriessensis*, whether figuring away as Aberdeen or Dumfriesshire snake, has been shown to have no claim whatever to be classed as a distinct species in the creeping department of the British fauna, and, by rejecting or ejecting it therefrom, consequently reducing Dr. Fleming's twelve species to eleven. Fifty years ago, Gilbert White, in his seventeenth letter, says he was puzzled how Pennant made out his twelve species of reptiles, unless it was by the various species of *Lacerta*; and of these species he uses the expression, "or rather varieties;" indicating pretty plainly that he thought there was but one species of viper, of which animal he had been speaking immediately before, making the remark upon the number of reptile species.

Though not immediately connected with the subject, yet, as serving to show with what indifference or carelessness species are first spoken of, and then adopted, a remark may be ventured on the classification of the lizard species, suggested by a note made by Sir William Jardine, who says, "I think it very probable that there may be more than one species of *Lacerta* yet undiscovered, which will make up the number." Now, here is a premium for a new species; and it will be odd indeed if it is not found to order, that somebody's name may be appended to it, and be immortalised in a note by Sir William! The number spoken of refers to the twelve species as

made out by Fleming, and which Sir William reduces to eleven by discarding the Dumfriesshire snake. As Sir William treats the Dumfriesshire snake, so does Dr. Fleming deal with Sir William's lizard species, treating them as mere varieties of the existing, or post-diluvian, class of *Saúria*.*

As, in making out the number of the different saurian species, so, in filling up that of the venomous ophidian genus, the contributors "have exalted the varieties of the animal into distinct species, chiefly from characters depending on their colours." Taking colour for a guide, Pennant makes but two varieties, one dirty yellow, the other wholly black; yet even in this latter kind he says the rhomboidal spots are very conspicuous.

Colour is a most uncertain test, because people differ so much in their ideas of it. For example, what Pennant (and, after him, Fleming) calls dirty yellow, the writer would describe as the colour of a healthy clean-barked ash tree, that is, more grey than yellow; for, of a number of specimens examined, but one decidedly answered to Pennant's dirty yellow: the rest were more or less dusky, or greyish. About two dozen vipers, varying from 10 in. to 26 in. in length, have been narrowly examined. Those which were under, or about, 1 ft. in length, may be described as being of a pale bright ash-colour, with a hue inclining to very light brown — reddish, if it please others to call it so; but the dark spots, though not so distinctly and deeply dark as in the larger specimens, did not exhibit a "deep mahogany colour." In 1829, a specimen killed by being trodden upon was brought: it was little more than 10 in. long, and of an extremely light colour: but, perhaps, it had been bleached in the sun a day or two. Another and fresh-killed specimen, somewhat longer than the last mentioned, inclined to a reddish hue; and, had the fancy been strong enough, it might have passed muster as the red viper, though perhaps 4 in. longer than Mr. Strickland's specimen, of which an account, in Vol. VI. p. 399., is given. By an entry in a note-book, it appears that a viper

* In 1830, on removing some logs of timber, under one I saw and secured a small lizard, entirely black on the back and sides, and nearly black, but with a brownish tinge, under the throat and belly, something, but not much, lighter than the other parts; the length nearly $3\frac{1}{2}$ in.; toes very slender; and, except that the snout was rounded like an alligator in miniature, having on the ridge of the back, from the neck to the tip of the tail, a row of hook-formed points, shaped like the thorn of the briar. It agrees with none of the five varieties as described by Ray. Is it possible, then, this little "gentleman in black" can be the hitherto undiscovered species destined to fill up Sir W. Jardine's desiderated number twelve? If so, it shall be named, not after so illustrious a person as the discoverer, but after the place where found; namely, *L. waverbankiana*!

was brought measuring in length between 17 in. and 18 in. and of a bright light ash-colour, what is called a bright grey, the dark spots inclining to that colour, but still dark enough to be called black. Now, this latter specimen might be said to form the grey species by any one falling in with the whim of the day, which is to invent species by way of being illustriously obscure. All these specimens were considered the young of the common viper; meaning thereby, E. N. D.'s *Vipera Bérus*; the latter one a female, according to Pennant. As to the blue-bellied species, the specimen mentioned as answering to Pennant's description of the common kind (namely, of a dirty yellow colour), had by much the bluest belly of any seen; a variety of others, differing in colour, as more or less dusky-grey or nearly black, also had blue bellies, more or less deep; so that, in fact, nothing can be plainer than that the colour of blue, in a lesser or greater degree, is common to all; and these specimens, supposed to be of reddish hue, had it also, but not so strongly. The dusky, or dark, or black coloured specimens, as to colour, appeared the most decided; and, if colour could justify the placing of them as a distinct species, the kinds of a dark colour might well be so classed. But of this dark colour, as of the others, it is apprehended it is a circumstance incidental to the age of the animal, perhaps; and the time of the shedding of its skin has something to do with it too, as appears from the following extract from the writer's note-book:— "1831. August. A viper was brought to me the beginning of this month, in size (that is, thickness) and length the biggest I had ever seen. It was a female, measuring 2 ft. 2 in., of a colour so dark, that the rhomboidal dark marks were barely visible; and I persuaded myself that there was a black kind of viper, and that it existed in Cumberland; but in this supposition, I found, on further examination, I was mistaken. Having taken off the skin on opening the belly, it was found to contain six young ones, perfectly formed, and apparently ready to come forth: they were lying straight, and measured exactly 6 in. each; the skin darker than I expected to find it in young ones; the marks distinct, and every part beautifully perfect: they exactly resembled the full-grown animal in every particular; and, in the smallness of size, and exactness of proportions to that size, reminded me of a butterfly on first breaking the chrysalis, before the wings have expanded to the full size, when each colour is as marked and perfect in miniature as in the perfect insect. On taking the skin off a stretching stick, it must have been near the time of casting it, as a dark but very thin skin (except colour, almost like gold-beaters' skin) remained ad-

hering to the stick, whilst I held a pretty thick one in my hand, of a bright ash-colour in the light parts, and dark only in the rhomboidal marks, which were as distinct and visible as an oil painting becomes when rubbed over with varnish or a wet sponge. After this there could, I thought, hardly be a doubt of the non-existence of the black viper." And a similar observation has been made of a male viper, which measured 15 in., and was as dark, or darker than the female just mentioned. A thin dark skin, or, perhaps, more properly terming it, cuticle, peeled off, and left the under skin much lighter, the dark marks distinct; and, though inclining to grey, the colour of the under skin could not be mistaken, by a casual observer, for black, or anything approaching to it.

Upon the whole, so far as observation and fact have been had, and with the concurring testimony of observers eminent as naturalists, it is concluded, that there is but one species of venomous reptile in these islands, and certainly but one in the county of Cumberland; for, as before mentioned, taking colour as a test of difference of species, all enquiries have been answered, both by gentle and simple, as the phrase is, "A black thing, like," or, "Dark-coloured," in all parts of the country.

Having, then, shown that the four or five different species have been admitted as such upon the most vague and contradictory accounts, another question presents itself; namely, Is there any better reason for admitting the animals described as differing in colour even as varieties? As already remarked, mere systematists are mainly to blame for much of this kind of fertile work; and, seeing into what errors the filling up of systems have led to, it is time to ask if the varieties have any better claims to admission than the discarded species? It is thought not; and the variance in colour, if it be not mere fancy, is thought to be incidental to the animal in its progressive stages to its maturity, and depending upon, it may be, sex, or age, or season (particularly the skin-shedding period), or locality, or food; mere accidents in the individual, which no more change its kind than a piebald, or chestnut, or black colour does that of a horse. Then let it be enquired into; and as fact, derived from actual observation by accurate enquirers, shall determine, so let it be.*

* As a history of British Reptiles is announced for publication, we have inserted the above article (which has been some time in our possession); and though the line of argument which the writer has adopted does not much affect the general question, perhaps his remarks may attract the attention of some of our correspondents, who may have collected some fresh facts relating to this subject. — *Ed.*

ART. VI. *Sketch of the Botany, &c., of the Neighbourhood of Hyères.* By G. MUMBY, Esq.

IN the course of a tour made during the last summer (1836), in company with Messrs. Percy and Wells, for the purpose of exploring the natural productions of the south of France, the neighbourhood of Hyères, of which I now intend giving some description, appeared to me the most interesting part of the country.

The town of Hyères is situated at the most southern extremity of the department of the Var, which forms a part of the ancient Basse Provence, taking its name from the river Var, which bounds it towards the east. Hyères was known to the Greeks by the name of Hieros, but afterwards received that of Arcæ from the Romans, who enriched this town with many monuments, the whole of which have disappeared at the present day, having been destroyed by the Africans, who made several incursions into France during the thirteenth century. The present town of Hyères is built in the form of an amphitheatre, upon the southern slope of a hill which overlooks the Mediterranean; being protected from the north and east winds by hills which surround it. The streets are narrow and dirty; and the remains of the castle, nothing of which is left but the entrance, is the only object of interest which art presents to the tourist: we may, however, except the bust of Massillon, the celebrated divine, who first drew breath at this place. The climate is delightful, consisting of a perpetual spring; and on this account Hyères becomes the winter residence of a host of invalids and hypochondriacs, who are blest with the means of supporting the expense attendant on a sojourn in a distant country. The number of rainy days averages forty during the year: during last year (1835) the number was reduced to thirty-three. Snow is rare; and, from 1806 to 1835, inclusive, the ground has been covered with it eight times only: in 1830, it remained on the ground a whole day; and in 1829, as long as two days.

We arrived at this interesting spot on the 29th of June, having walked from Toulon, which is at a distance of about twelve miles. Although we arrived at Hyères almost melted by the heat of the sun, and blinded by the reflection of its rays from the limestone roads, yet we considered ourselves amply repaid by meeting with, for the first time, the *Convólulus althæoides*, which expanded its blushing flowers in abundance on the road side; we also gathered the *Lavatera O'lbia**, pushing its branches to the height of 10 ft. or 12 ft.,

* So called by Linnæus, from Olbia, an ancient name of the town of Hyères.

loaded with thick clusters of lilac flowers. This plant, together with the shrubby *Atriplex Halimus*, are woven together with the prickly branches of the *Smilax aspera*, and form an impenetrable fence to the few patches of ground that are enclosed. These two plants are also the most interesting to an English botanist, who, in his own country, has been accustomed to see species of this last genus scarcely able to raise their head from the ground; and he who has been fortunate enough to meet with the *Lavatera arborea*, which adorns some of our mountainous provinces, will be capable to judge of the magnificence of a tree of the same genus. The *Equisetum ramosum* is another interesting specimen of the vegetation of the neighbourhood of Hyères. But our admiration was most excited by the date palms, one of which caught our attention on entering the town, raising its crested head to the height of nearly 30 ft.; the *Chamærops humilis* is not uncommon in the gardens at Hyères, but does not form a very conspicuous object. The *Agave americana*, though certainly not indigenous, finds means of support upon every old wall by the road side. This plant, together with the two palms just mentioned, almost realise the idea of a tropical climate. The bright scarlet flowers of the pomegranate tree attracted our attention at every step; and this brilliant production of Flora and Pomona, raised in our conservatories as an invalid, here rejoices in the open ground, basking itself in the rays of the sun, and exposing its branches to the free and pure air of the Mediterranean.

The cultivation of the caper bush is carried on to a great extent in the neighbourhood; and the few flowers that are allowed to expand* arrest the attention of the traveller by their large pure white corolla, filled with a fascicle of stamens tinged with purple. The rarest plant that we met with in the neighbourhood of Hyères was the *Acanthus mollis*, which we found abundantly at the foot of an old wall near the church. The *Nerium Oleander*, although a native of tropical climates, is generally indicated as growing in the south of France; and I was indeed delighted to see this beautiful shrub in full flower, forming a hedge of about a quarter of a mile in length at the outskirts of the town. There is a great scarcity of wood in the neighbourhood of Hyères: the surrounding hills are clothed with a vegetation consisting principally of *Pinus halepensis* and *Picea*, *Arbutus Uredo*; *Quercus Ilex*, *coccifer*, and *Süber*; *Erica arborea vagans* and

* It may not be generally known to your readers that it is the bud of this plant which is sold in the shops under the name of capers.

scopària, Pistàcia Terebínthus and Lentíscus, Dáphne Gnídium, Mýrtus communis, Cýtisus spinòsus, &c.

Perhaps the richest herborisation in the neighbourhood of Hyères is that comprised in the salt marshes of the peninsula of Giens, which is connected with the mainland by a narrow band of sand, less than twenty yards in breadth, and nearly two miles long, upon which we met with a number of interesting plants, amongst which were, *Matthiòla tricuspidàta*, *Echinòphora spinòsa*, *Salsòla Sòda*, *Limbàrda crithmòides*, *Sónchus marítimus*, *Medicàgo marina*, *Diòtis marítima*, *Silène nicaénsis* and *quinquevúlnera*, *Salicòrnia macrostàchia*, *Convòlvulus Soldanèlla*, *A`triplex portulacòides*, *A`ster Tripòlium*, and *Pòa littoràlis*. The dry and arid parts of the peninsula furnished us with *Zacíntha verrucòsa*, *Crucianèlla angustifòlia*, *Júncus ericetòrum*, *Paronýchia imbricàta*, *Polycárpon tetraphýllum*, *Bupthálmum aquàticum*, *Helianthemum guttatum*, *Polycnènum arvénse*, and *Tòlpis barbàta*: whilst the lower and more humid parts repaid us for our researches with *Euphòrbia pilòsa*, *Thalíctrum angustifòlium*, *Ranúnculus Philonòtis*, *Scírpis Sàvi*, *Cenánthe globòsa*, *A`pium gravèolens*, *Triglòchin Barrelièri*, *Támarix gállica*, *Lòtus angustíssimus*, *Convòlvulus althæòides*, *Dorýcnium herbaceum*, *Lýthrum hyssopifòlium*, and a crowd of other interesting plants.

But it is not the spontaneous productions alone of Nature that attract the attention of the naturalist in this highly favoured spot. The hand of man has transplanted from its native clime the golden-fruited orange tree; and, from the Var to the Pyrenees, Hyères is the only town where the cultivation of this delicious fruit has been successfully attempted. The gardens of MM. Filhe and Beauregard are the principal depositories of this tree: the former of them is now cultivated by M. Rautonnet, from whom, without any other introduction than that of being engaged in the study of botany, we received every attention possible, and, through his kindness, were allowed the novelty of tasting the highly sugared fruit of the *Méspilus japónica*, which ripened in the open ground under his care. Within the space of two *arpents* are contained upwards of 15,000 orange trees, which average an annual receipt of 35,000 francs (1400*l.*). Before the disastrous winter of 1820, during which all the trees were cut down to the root, their number was 18,000, and the annual receipts proportionally increased. The orange trees are planted so close as to touch one another: the largest of them is 20 ft. high, and bore, in 1835, 1200 oranges. They are watered by means of channels, through which water is con-

veyed in a continual stream. This stream, which is called in the patois of the country, "béal," constitutes the value of the land; when supplied with one of these streams, an *arpent* of land is worth 480*l.*; when deprived of it, nothing. The orange does not ripen until many months after the fall of the flower: if it is allowed to remain on the tree until the next period of flowering, it loses its juice. The fruit, immediately gathered from the tree, has a sharp taste, and should be allowed two or three days to acquire an agreeable flavour. The oranges ripened at Hyères are generally sent to Lyons and Paris, and other towns in the north of France; the inhabitants of the south making use of the fruit ripened at Malta, Sicily, or Majorca. Although the oranges from these last-mentioned places are of a much superior flavour, yet the fruit grown at Hyères resists much better the effects of carriage, being of a much finer texture: they are gathered at the time when the first yellow spot appears upon the rind.

I would fain speak of the silvery olive tree, which, under this propitious climate, attains sometimes the age of 700 years; but, as Hyères is not more benefited from the cultivation of this tree than many other parts of the south of France, I will pass on to its more peculiar treasures, which consist of the great number of tropical plants which are acclimatised in this favoured spot. The most remarkable of these are *Melaleuca linarifolia*, which is 30 ft. high, and was entirely covered with its feathery white flowers at the time we visited Hyères; *Acacia Julibrissin*, which has reached the height of 40 ft., and whose stem is 4 ft. in circumference: *Casuarina equisetifolia* is at present 38 ft. high, although it was cut down in 1819, after having suffered from the frost, being at that time six years old: *Cassia corymbosa*, 16 ft. high, six years old, bears fertile grains, flowering in September: *Pittosporum sinense*, 15 ft. high, twenty years old, and flowers in April. Amongst a number of other plants that flourish in the open ground in the garden of M. Rautonnet, may be mentioned, *Acacia tomentosa*, 15 ft. high; *Laurus Persea*, 4 ft. high; *Bambusa arundinacea*, *Andropogon squamatus*, *Psidium aromaticum* and *pyriferum*, *Acacia farnesiana* and *echinula*, the latter of which was raised from seed in the Botanic Garden at Toulon: *Musa paradisiaca*, *Canna angustifolia*, *Gnidia simplex*, *Datura arborea*, *Lantana Camara*, *Polýgala flexuosa*, *Grévia orientalis*, *Cæsalpínia echinata* and *Sáppan*, *Menispermum laurifolium*, *Solanum auriculatum* and *betaceum*, the latter of which is 7 ft. high, and produces eatable fruit; *Hibiscus Rosa sinensis*, *Mespilus japonica*, which,

as I have already mentioned, ripens its fruit: *Metrosidèros álba*, *Schînus Mólle*, *Ficus elástica*, and *Anòna tríloba*, which was sown by M. Rautonnet in 1829; it is now 9 in. in circumference, 15 ft. high, and bears eatable fruit. The different species of *Eucalýptus*, which flower so freely in the Botanic Garden of Edinburgh, exposed to the rigour of the climate of Scotland, never attain above a certain size in the gardens at Hyères, owing, as it would appear, to the winds from the north-east, which destroy the branches that are of a sufficient height to be exposed to their influence. After having merely enumerated the different plants cultivated at Hyères, I leave it to the imagination of the botanist or horticulturist to form to himself a picture of this little Paradise.

At a distance of about eight miles from the mainland, are situated the Islands of Hyères: they are three in number, bearing the names of Porquerolles, Portecroz, and Ile du Levant.

These islands were called *Stœchades* by the ancients; which name is supposed to be derived from the *Lavándula Stœchas*, which grows abundantly upon their almost naked surface. They are supposed by many authors to represent the Island of Calypso, immortalised by Homer; but, if this supposition be true, they have most lamentably degenerated since the time in which that venerable poet lived. They have also received the name of the Golden Islands; but this title was given, not on account of their fertility, but from the micaceous schist which composes the greater part of Porquerolles, reflecting the colour of that precious metal.

Porquerolles is the only island that we had an opportunity of visiting. It is the largest of the three, and is situated at the distance of 1300 toises from the peninsula of Giens. It is formed principally of an argillaceous schist, intersected with long veins of amorphous quartz. The most extreme aridity pervades every part of the island. The almost total want of water will prove an eternal bar to its cultivation: not the smallest stream traverses the immense masses of pine trees and tree heath, which brave the scorching heat and dryness that prevail during the continuance of the summer months. A battery that we visited at the eastern extremity of the island, and situated at a distance of nearly six miles from the village, is entirely deprived of this necessary of life; consequently, a voyage of twelve miles must be made for every cistern of fresh water that is consumed; the inhabitants endeavour, as far as possible, to supply its place with goats' milk and wine. The natives of Porquerolles (which is the only inhabited island)

are civil and obliging in the highest degree, far differing in this respect from their continental neighbours, the brutish peasantry of Provence.

Upon arriving at the island, we were conducted by a soldier to the governor's house, in order to explain the object of our visit; which being satisfactory, we were allowed to go in search of an inn, the choice of which was soon decided upon, as there were only two on the island. We amused ourselves with examining the rude attempts at painting with which the walls of our room were adorned: after reading the explanation placed at the foot of these productions of art, we found at length that they represented different scenes in the life of Telemachus. The vegetation of the island consists of extensive forests of *Pinus Picea* and *halepensis*, together with groves composed of the myrtle, strawberry tree, cork tree, *Quercus Ilex* and *coccifer*, *Erica arborea* and *scoparia*, the former of which (tree heath) reaches the height of 12 ft., with a stem 3 ft. in circumference; *Rhamnus Alaternus*, *Phillyrea angustifolia*, *Styrax officinalis*, *Rosmarinus officinalis*, *Cytisus candicans*, *Pistacia Terebinthus* and *Lentiscus*, together with three species of *Cistus*; viz. *C. albidus*, *salvifolius*, and *monspeliensis*. The myrtle and lentisk tree are so firmly united by the prickly branches of *Smilax aspera*, as to render these groves for the most part impassable. Nothing can exceed the beauty of the myrtle in full flower, covering as it does large tracts of the island, whilst the powerful heat of the sun distils from its leaves the characteristic odour of this favourite plant. There are but few plants which are, in a manner, peculiar to these islands, and these few were entirely burnt up by the heat of the sun at the time we visited them; we were, however, fortunate in meeting with the *Asplenium obovatum* on some rocks at the eastern extremity of Porquerolles; and in the same locality we found the *Delphinium Requièni*, although this last plant grows also abundantly near the sea shore on the northern side of the island. The Ile du Levant is said to be covered with *Teucrium Marmum* and *T. massiliense*; the *Papaver setigerum*, supposed to be the origin of *Papaver somniferum*; *Nonea lutea*, *Heliánthemum Tuberaria*, *Euphorbia dendroïdes*, *Genista linifolia* and *candicans*, *Prismatocarpus falcatus*, *Triticum Nárdus* and *phœnicoides*, *Carduus Casaubonæ*, *Daphne Tarton-raïra*, *Echium maritimum*, *Statice oleifolia* and *minuta*, *Cineraria maritima*, *Anthyllis Bárba Jovis*, *Aïra capillaris*, *Inula odora*, *Gladiolus communis*, *Briza máxima*, and *Linaria Pelisseriana*, form the most interesting plants of these islands. The *Dorýcnium hirsutum* var. *incanum* is generally called *lotus des Iles d'Hyères*, from its locality.

Although an inhabitant of the north of Europe may find pleasure in admiring the rare shrubs with which the soil is covered, yet far different are the feelings of a native of these countries, if we may be allowed to judge from the following passage in Lauvergne's *Treatise on the Botanical Geography of the Port of Toulon*: — "It is impossible to conceive a more monstrous aspect than that which the field of our botanical excursions presents: the traveller accustomed to the *luxury* of the vegetation of the north, to the gigantic forest trees, and plants luxuriating in the shade and moisture, perceives here only the sombre colour of the olive tree, endeavouring in vain to shadow with its branches the stony arid soil upon which it grows; thus allowing the scorching rays of the sun to destroy, in a few weeks, the flowering season of plants, which, in the north, endures throughout the entire summer."

Although botany was the principal object of our pursuit, yet we picked up whatever insects might fall in our way. The pine trees were covered with immense quantities of *Cicadæ*, the united singing, or rather drumming, of which insect incessantly rung in our ears. For the purpose of feeding, these animals pierce the bark of trees, and instil into the wound an irritating liquor, which causes an accumulated flow of sap to the part, thus producing large excrescences on the branches, varying in size from that of a walnut to 3 in. or 4 in. in diameter. The principal *Coleóptera* that we met with on the island were, *Buprèstis mariàna*, *Callidium fèrum*, *Mýcterus griseus*, *Arístus fúlvipes*, *Orýctes Grýpus*, *Thamnóphilus carbonàrius*, and *Clythra 4-punctàta*. The *Nymphàlis Jàsius* was very common; but its flight was so rapid, that we were unable to capture any specimens. The *Lacérta víridis* is abundant on the island, and one that we caught measured nearly 18 in. in length and 6 in. in circumference. Although we found very few insects on the island, we were more fortunate in the immediate neighbourhood of Hyères. We met with *Ateùchus semipunctàtus* in abundance on the sandy sea shore, together with three species of *Cicindèla*; viz. *C. circumdàta*, *trisignàta*, and *littoràlis*, the latter of which occurred in immense profusion. We also found *Scarites lævigàtus* in the same locality. Upon the flowers which adorned the road side we remarked *Mýlabris melanùra* and *variàbilis* in amazing quantities: *Clythra lóngipes* and *Cetònia mòrio* were almost equally common. Amongst the multitude of butterflies that fluttered in the sun's rays, the golden-feathered wings of *Gonépteryx Cleopàtra*, and the velvety black plumage of *Sátyrus Silène* principally attracted our attention.

I have thus slightly sketched over the most interesting pro-

ductions of Hyères and its neighbourhood, as far as its botany is concerned; and highly delighted should I indeed be, if my description were able to tempt any English naturalist to explore these regions: a visit to the Iles d'Hyères, in the months of April and May, would amply reward any person interested in the science of natural history.

Impasse des Vignes, 2. Rue des Postes, Paris, Nov. 21. 1836.

ART. VII. *On the Habits and Peculiarities of the common Bottletit, or Mufflin (Mecistura vâgans Leach, Pârus caudatus of Linnaeus !).* By EDWARD BLYTH, Esq.

HAVING been several times interrogated why I styled this curious little bird the rose muffin (p. 394.), and upon what grounds I ventured to consider it distinct from Pârus, it may be as well to point out a few of its discrepancies with the tit genus, in order to show that there are sufficient grounds for its alienation.

That it is nearly allied by direct affinity to the Pâri, I am fully disposed to admit, notwithstanding the many particulars in which it differs from them; and I am, furthermore, aware of the existence of a newly discovered species in the Himmalayas, intermediate in all its characters. Still I consider that Dr. Leach was quite warranted in instituting his genus *Mecistura*, for reasons that will appear in the sequel.

Were I to be called upon to give the general characters of the tits (Pârus), I should say that they were small omnivorous birds, miniatures, in a variety of respects, of the jays and allied genera; that they feed on insects, grain, fruit, and especially on oleaginous seeds; which latter they always hold firm to their perch by means of both feet, while they pierce a small hole in the husk by quickly repeated hard knocks of the bill, through which they extract the kernel: that they likewise resemble the jays, and other corvine genera, in concealing what food they cannot eat; a curious particular, which I have had many opportunities of observing: that they invariably nidificate in holes, and, for the most part, retire to roost in such situations; that they are social among themselves, except at the breeding season, but do not remain together in families; that their manners are familiar, and easy of observation; and that, more particularly in winter, they much affect the vicinity of human habitations, frequenting dust-bins, and such like places, where they glean their subsistence partly from the refuse of our abundance. The whole of these characters would more or less apply to all the genuine Pâri.

But, if the bottletit is to be classed with these birds in the same minimum division, it must be an exception to every attempt at generalisation. It is not omnivorous, but subsists wholly upon insect food ; during the winter, chiefly on small Coleóptera, which it finds about the twigs and branches of trees. It has not the slightest notion of holding its food with the foot, so conspicuous a habit in the Pàri. On giving one, in confinement, a large spider's nest, it was evidently at a loss to know how to pull out the eggs ; tried to nibble out a small portion, and laid the remainder beside it on the perch, but was unsuccessful ; and, on my returning to look at it after a few minutes' absence, it was still found carrying it about in the bill ; but, on fastening it to a perch, it was demolished in an instant. A tit would not have experienced a moment's difficulty. It has no idea of hiding its superfluities of food ; which, indeed, could hardly be expected, seeing that it is exclusively insectivorous. Its bill is of a slightly arcuated form, the upper mandible curving a little over the under ; consequently, it could not be used for breaking the hard husks of seeds, in the manner already detailed in which the tits employ this instrument. It does not nidificate in holes, but constructs a very beautiful and peculiar domed nest, affixed to a furcate bough, or to a few contiguous stems in the centre of a tall and dense evergreen ; neither does it roost in holes, like the Pàri, but retires to the horizontal branch of some thick evergreen (a holly or spruce fir), where the family roost together in a line, returning every evening to the same situation. It is seldom noticed about human abodes, because the attractions which draw the tits to such places have no influence upon its appetite ; and, lastly, though social with its own species, its gregariousness is of a different cast from that of the various species of Pàrus : the latter will fly in company with any small bird of similar habits ; and it is not unusual to find all the species in the same troop, accompanied, perhaps, with a number of kinglets, and often one or two wrens, or treecreepers. All these will, indeed, commonly join in with a troop of bottletits ; but the latter do not court their society ; and, not unfrequently, it will be observed that they very soon part company, the mufflins striking off in a different direction from the main body. The tits breed more than once in the season ; the other only once ; and the whole family of the latter remain together till the return of spring, which is not the case with the Pàri. Sometimes it happens that two or three families of the bottletit unite in the course of their day's ramble, forming an endlessly long succession of them from tree to tree ; but at night they are sure to separate, and each retires to its own roosting place.

It is amusing, indeed, to observe these little fellows returning at dusk to their wonted perch; to see the family arrive straggling to the spot, chirruping forth, as they approach, their peculiar *twittrr*, but changing this note as they alight, one after another, to a low, scarcely audible, soft twitter. They are a long while, however, composing themselves to rest; for, like a brood of young birds which have just left the nest, there is always a deal of shuffling for the inner berths; those on the outside continually flying up, and working their way into the centre; whereupon the two next succeed and do the same; and so they continue till it is almost dark, twittering their soft note all the time, till on a sudden all is quiet. During a whole winter, I have known a family of them resort every evening to the same branch, where at length they were barbarously shot by a bird-stuffer who had observed them.

The tits have a regular roosting place; and, in winter, at least, invariably find their way into holes of some description. So marked is this habit, that a marsh tit I once kept in confinement used, for a long while after he was imprisoned, to retire every night to a tin seed-pan attached to his cage; certainly as inconvenient and chilly a couch, to all appearance, as could be imagined. A great many find a comfortable shelter in hay-ricks, and not a few under the tiled roofs of out-houses, and other holes in buildings. Last November, as I was rambling one evening, with a friend, under the precipitous banks of red sandstone overhanging the Severn, while stopping to contemplate a very curious vegetable production, a little blue tit made its appearance, and manifested a deal of anxiety, fluttering backwards and forwards, and chattering as if to enquire what we did there. We hardly noticed it, till by and by it flew to a hole in the bank, close to where I was standing: it was afraid to enter, however, and, in a minute or so, flew off again, chattering and scolding at us as before. After a little while, it again flew to the bank, and entered the hole; upon which I scraped away the sandstone, enlarging the orifice till I could get in my hand; whereupon I caught the little fellow in his snug retreat, and drew him forth, biting and screaming with all his might. My object in this was to ascertain whether they lined their sleeping apartments, which was not the case in this instance, though the hole had been evidently enlarged and rendered commodious by means of the bill.

Among the jay-like propensities of the *Pàri*, is their carnivorous appetite, which is particularly noticeable in the large and blue species; though I have never known either of them to attack a live bird in their wild state, however unceremoniously

they will then proceed to make a meal off a dead one. ... When newly caught, however, the large species will frequently do so in confinement; and it will sometimes not even spare its own kind, though such instances are, perhaps, rare. Bechstein relates a case of one killing a quail. Yet there are many that will, in captivity, live in perfect amity with other birds; and I have seen a stout healthy individual submit to be buffeted by that quarrelsome little active species, the white-breasted fauuet, or lesser whitethroat, which is considerably its inferior in size. I have known the cole tit, also, one that had lived for many months in a cage, full of the smaller insectivorous birds, seize a young half-fledged kinglet, and begin very deliberately to eat it. Of course, no such sanguinary appetite, in the least degree, exists in the rose muffin (*Mecistura*).

Both the tits and the muffin (but chiefly the former) are in the habit of plucking off the buds of trees, to get at the insects that lurk within them; for which heinous sin, in many parishes, a price is still set upon the heads of the unfortunate "tomtits." Let any one who is prejudiced against the tribe watch for a minute or two the proceedings of a tit that is so employed, and he will then see occasion to be grateful to the little creature for its services. He will perceive it examine bough after bough, and leave them untouched, so long as it can descry no traces of its insect prey; but presently it will find a cluster of buds, which it attacks and pulls off with avidity; buds that are, in fact, already destroyed in the centre by an insidious brood of maggots. These are the prey of the tit family. The bullfinch feeds upon the buds themselves. I have no desire to varnish over the real depredations of the tits; for sometimes they will commit sad havoc upon the ripe apples and pears: they are, indeed, almost the only small birds that feed on the former. But the bottletit is free from even this imputation, and should not, therefore, be ranged among the guilty.

Few birds are so preeminently distinguished for the beautiful workmanship of their nests as is the species now under consideration; the domed cradle of which forms, without exception, the most exquisite fabric of the kind to be found within the British islands. Several weeks are occupied in its construction; and yet it is often finished by the close of the month of March or beginning of April; though, in this case, as can be shown pretty clearly, it is never the production of birds of the preceding year. The bottletit, we know, remains in families till the return of spring; and an individual of this species is never seen, as the tits often are, solitary, unless it has a nest to provide for. Now, it invariably happens, among birds, that

the older individuals are the first to feel the influence of the vernal season; and accordingly, therefore, the old bottletits are found to pair, and leave their progeny, some weeks before the latter cease to be gregarious; and have thus often completed the laborious work of nidification before the younger ones commence. This is not mere supposition; for, as a bird of this species that has moulted twice is easily distinguishable from a younger individual by its superior beauty, and especially by having a larger patch of roseate upon the scapulary feathers, I have been enabled to ascertain the fact by shooting a few detached pairs of them in early spring, whilst the younger individuals were still in society. This is, indeed, the most advisable method of procuring handsome specimens for the museum; and it consequently follows that, when the *Mecistura* pairs, it must do so for life. There is no difference in the plumage of the sexes, save that the males have generally somewhat less black about the head. According to Temminck, the head of the male is wholly white; and I am told that this is the case with all the specimens obtained about Paris. It is therefore possible that there may be two closely allied species.* Certain it is that, out of the great numbers that I have examined in England, I have met with only one, a male, in which the black markings on the head were nearly obsolete. Of its nidification it would be superfluous to say anything, further than that I have never seen a nest with two openings, out of many dozens of them that I have examined. It may be remarked, however, that it is entirely constructed by the female bird, while the materials of which it is composed are wholly collected by the male; a fact on which I am enabled to speak quite positively, having paid particular attention to the subject. I once found one wholly lined with the feathers of a cock pheasant; and have seen another beautifully placed amid the thickly blossomed twigs of a wild crab.

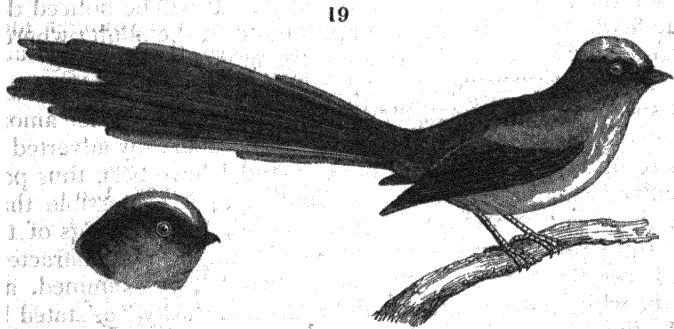
I have said that in this bird the sexes are much alike; but the young, in their first or nestling garb, are extremely different. I am aware of no author who has described them in this state of plumage. Mr. Jenyns says, "The young birds have the white parts more or less mottled with brown and dusky; and the black on the back not so deep and well defined;" which is apparently a translation from Temminck †, and does not

* I have not seen a Continental specimen; but there are one or two particulars in Mr. Temminck's description which rather lead me to suspect that this is the case.

† Les jeunes ont de petites taches noires sur les joues, et des taches brunes sur la poitrine: le noir du dos n'est point aussi décidé. (*Manuel d'Ornithologie*, tom. i. p. 297.)

exactly apply to those which I have seen. It is impossible for any naturalist who has examined the young bottletit to overlook its many peculiarities, more especially its extreme length of tail. I subjoin a figure of it (*fig. 19.*), and shall proceed to describe its plumage somewhat in detail.

At the period it leaves the nest, the mandibles of the bill are of equal length; black, except the tip of the upper, which is whitish, where, in the course of about six weeks, it grows and curves over the under. The bill, also, appears con-



siderably larger than in the old bird, from its base not being hidden by projecting feathers: the nostrils are then exposed, whereas in the adult bird they are completely covered by the plumage. The irides are, at first, dull grey, like those of a young cuckoo, in the course of two or three weeks becoming much paler and brighter, and more inclining to blue; then gradually darkening, till, in eight or ten weeks, they assimilate to the colour of the pupil, so as only to be distinguished when examined closely. The colour of the bare skin around the eye, at first, is brick-red, afterwards becoming very bright and conspicuous (about the time the irides are darkest); the upper part changing to orange yellow at the time of the autumnal moult; the under, not for several months later. Crown of the head (a much larger portion of it than in the adult), together with the whole under parts, and a few of the lower scapularies, pure white, without a tinge of roseate, but appearing on the flanks greyish, or intermixed with black; the feathers of these parts being very lax and flimsy, and showing much of their blackish inner portions. Ear-coverts, which in the adults are whitish with a few dusky spots, dull black. Line over the eye, and the whole upper parts, also black; the few white scapularies forming a narrow but conspicuous white line. The wings and tail marked as in the adult, but more indistinct; the black being every where more dusky than in the old bird.

The tail, also, of the young bottletit is considerably longer than in the adult; the two feathers next the middle measuring 3 in. seven tenths; those next again measuring about a tenth more; the middle ones wanting a tenth of 3 in., being a mere trifle longer than the fifth. In the adult kind, the proportions are: middle feathers the same as in the young; the two next, which are longest, only one fifth of an inch more; the longest feather being thus seven tenths shorter than in the young; a difference which, however trivial it may seem, is very striking when the two birds are seen together. It will be noticed that the feathers next the middle are longest in the adult; whereas those next again exceed them in the immature plumage.

The foregoing detail is taken from a considerable number of specimens, amongst which there is no variation; nor among the adults is there any, save what has been already adverted to as resulting from disparity of age: and I have been thus particular in noting down all the minutiae, as it is possible that, in the event of there being two species, the markings of the nestling plumage may afford some distinguishing characters. It is certain that, in no specimen that I have examined, are "the white parts mottled with brown and dusky," as stated by M. Temminck.

And now let me offer a few observations on the habits of this bird, as observed in confinement. Being desirous of a more intimate acquaintance with the species, I once procured a nest containing ten young ones, which were all reared without difficulty on chopped meat and egg, and soon learned to feed of themselves. They then became extremely quarrelsome, and fought with each other most cruelly. There being so many together, and all of them very active, one would occasionally fly up against another, and nearly overturn it; whereupon the latter would immediately attack whichever happened to be nearest, seizing it by the bare skin around the eye; and, in an instant, each would have its claws on the other's head, and both would fall together to the ground. There they would lie struggling for many minutes, uttering all the time a shrill twitter, and clinging so tightly, that it was no easy matter to separate them. After trying in vain to part them without tearing them to pieces, I have repeatedly tossed them up high without their ceasing to fight. Sometimes three, or even four, would thus lie entangled together on the ground, and yet, strange to say, they never seemed to hurt one another. The chief point of attack was always the bare skin around the eye: which latter, by the way, is a character that does not occur among the *Pari*.

This quarrelsome propensity may be observed in most young birds; its obvious purpose being, one would think, to promote their dispersion: yet this explanation cannot exactly apply to the present species, as the families keep together till the return of spring. It certainly was not want of space that caused it, as they were confined in a very roomy cage; and, even when suffered to fly loose about the apartment, it was just the same: without any apparent cause, one would often follow another, and attack it. It, however, lasted only for a few days, and afterwards they lived amicably together. I have occasionally noticed similar and almost equally violent conflicts, in spring, among the wild birds, at the period when those of the preceding year are pairing.

The power which this diminutive species has of grasping with the foot is very considerable; its claws being longer, and also more curved and sharp, than in the tits; and, when the individuals I have been describing were young and playful, it was not uncommon to see one clinging (sometimes by one leg) to the long tail of another, and not to be easily shaken off. They bathed less frequently than the tits; but, like many other birds, were fond of sunning themselves; that is, of extending themselves towards the sun, with neck stretched out, every feather erect, and tail and sunward wing spread wide. An observer, unaccustomed to the sight, would fancy they were dying, or that something very bad was the matter.

As soon as they were fully able to take care of themselves, I turned them into a spacious cage, containing a variety of other small birds; and here they unexpectedly found a protector: a tree pipit, which had been long in confinement, and which I still possess, fed and tended them with all the care of a parent. They had for some weeks picked up their own food, but had still no objection to be fed; and it was often interesting to observe the pipit, so incongruous a species, looking up anxiously at the ceaselessly active young bottletit, with food in his mouth, and patiently waiting till one of them could find leisure to come and take it.

This interesting little family had now, for a time, thriven so well, that I began to fancy that I should be overstocked with them. Two or three of them were, accordingly, given away; and soon after one of them died suddenly; then another, and another, till the stock was at length reduced to four. This number continued for some time, till one morning, without any apparent cause, three of them were found lying dead. The sole remaining one survived the others about three

months, and at length died, when it had nearly finished moulting. It is worthy of remark, that this individual would hardly ever touch meat, of which all the rest were extremely fond. To this, possibly, may be attributed its comparative longevity. It principally fed on bread and milk, and upon crumbled bread and bruised hempseed; would sometimes just taste a little fruit, but did not eat it, like the tits; and it was at all times extremely active and lively, and, out of its cage, troublesomely tame.

I am unaware that this species had been ever previously kept in confinement; for which reason I have described it somewhat minutely, as observed in the cage: the more particularly, as the individuals which are captured old will never live; and there are few who will take the trouble of rearing them from the nest. The bearded reedling (*Calamophilus biarmicus*) is also extremely apt to go off suddenly, when apparently in a state of perfect health; and the same may be noticed, though less frequently, in the true *Pari*. I do not consider, however, that there is much affinity between the *Calamophilus* and *Mecistura*, the former being a very peculiar genus, to which I am unaware of a single form that is nearly allied.

It may be added, that the bottletit progresses by hopping, like the tits; whereas the bearded reedling advances by alternate motion of the feet. Towards the last-mentioned species there are some very remarkable approximations among the shrikes, of which the *Lanius erythronotus* may be cited as an example. The bill of the *Calamophilus* is a true bruising or compressing instrument; and its large craw and very muscular gizzard separate it widely from those birds with which it has been commonly associated. In its stomach and craw I have generally found reed seeds, the remains of small beetles, and, not unfrequently, shelled *Mollusca*, of a size which I should have thought it impossible for the bird to swallow. I have often fed it with small snails in confinement.

It will be noticed that the general character of the plumage and markings are quite different in the genera *Parus*, *Mecistura*, and *Calamophilus*. In the penduline, which has also been recently very properly separated, it is diverse again; and I think it may be asserted that all the characters of these four divisions, so commonly still confused under the name *Parus*, are decidedly more distinct than those of several genera of the *Fringillidæ*, and various other groups, which have been almost universally accepted. Why naturalists should be so

exclusively tardy in admitting these genera among the tits, is altogether past my comprehension.

In the former part of this paper, I alluded to a Himalayan species, intermediate between the tits and bottletit. It was shown me as a new species of the latter. To judge, however, only from its preserved skin, I should be inclined rather to class it in *Pàrus*, but to designate it by some significant epithet, which would imply its near affinity for *Mecistura*.* It is an interesting link between the two, conclusively illustrative of their physiological proximity.

ART. VIII. *Observations upon the Salmon in Loch Shin, in Sutherland.* By JAMES LOCH, Esq., M.P.

THE following memoranda respecting the breed of salmon in Loch Shin, in Sutherland, may appear worthy of being noted.

The river Shin is one of the principal tributaries of the river Oykell, or, as it was anciently called, the river Port-na-culter, which separates the counties of Ross and Sutherland.

The Shin is entirely a Sutherland river: its course is short, not exceeding six miles; issuing out of a lake of the same name. The river is divided into nearly three equal parts. The upper and the lower portions having a fine gravelly bottom, and full of excellent spawning beds. The central portion consists of a series of rocky rapids, terminating in a considerable cataract, up which none but the most powerful fish could make their way; this impediment, together with the absence of all craive dikes until the year 1788, appears to have produced an uncommonly large breed of fish; for, up to a recent period, many salmon, weighing from 30 lb. to 40 lb., were caught in this river; but, as it became more closely fished, their size diminished.

Loch Shin, from which this river issues, extends in an easterly and westerly direction about 16 miles. Its average width is about three quarters of a mile. Its depth is various, shoaling, of coarse, towards the mouths of the rivers which fall into it; and the few islands that are interspersed in it affording many excellent spawning places; but, in general, its depth is too great for this purpose.

The rivers that fall into the loch are four; three of which, namely, the Tyrie, the Fiag, and the Merkland, flow from the north: the Kean-loch-bervie flows from the west.

* It has been since characterised as *Pàrus erythrocephalus*.

The first and the last of these rivers have many excellent spawning grounds, but flow through no loch. The Fiag and the Merkland have also good spawning beds, but flow through lochs of considerable size, in which there are also spawning grounds.

Upon Timothy Pont's MSS. map of Scotland, which is deposited in the Advocate's Library, there is the following memorandum:—"Y^e greatest and largest salmon of all Scotland are in this Loch, but no salmon in all the river Terriff, which is wonderfull in respect of y^e plentie of y^{em} in y^e Loch." This observation is not entirely correct; for, although no salmon were ever to be found in the rivers that emptied their waters into Loch Shin, few were to be seen in the loch itself, and those that were seen were of no extraordinary size.

In 1832, the Shin fishings were reannexed to the estate of Sutherland by the late Duke of Sutherland, having been parted with to a younger branch of the family so far back as the year 1186.

As soon as they became His Grace's property, steps were immediately taken to remove by gunpowder rocks which formed the cataract before mentioned, in the expectation that, by admitting a larger number of salmon up the river both the loch and the rivers flowing into it would be stored with breeding fish.

This expectation was not realised; for, although a vast number of fish passed up into the loch, none were ever seen afterwards. This induced the writer of this memorandum to direct the manager of the fishings to stock the several rivers flowing into Loch Shin with breeding fish; and, as the experiment is a curious one, the reports of Mr. Young, the manager, as to the method pursued in making it is subjoined.

Copies of Letters from Mr. Young to Mr. Loch.

"*Invershin*, Sept. 11. 1835. — I have returned from another Loch Shin voyage, where we have at last proved successful. We appeared at first outset to have bad luck, as a number of the fish died soon after we caught them; but at last we got three pairs, which we carried safe to the Corrie River. Our bored boat invention answered the purpose very well; for, although the salmon appeared a little fatigued by the long carting to Lairg, as soon as we got under weigh in the Loch, they increased in strength, and were as well when we put them in the river as when we caught them in the Kyle. The pair we put in the Fiag last week, notwithstanding the low state of the river, have ascended to the third pool from where I put them in the river, and appear to do well. The three

pair upon the Tyrie have not been seen since. They are in a large pool, and cannot be seen sooner than the first speat (flood) remove them up the river. There is no doubt of their all spawning this season, whether or not they return next season. The river has abundance of excellent spawning fords."

"*Invershin, Feb. 2. 1836.* — According to your orders, I carried salmon to the Tyrie, the Fiag, and the Corrie. On Aug. 28. I put three pairs in the Tyrie; on Sept. 2. I put one pair in the Fiag; and on Sept. 8. I put three pairs in the Corrie River. I placed a man on each of these rivers, to watch their progress, who saw them frequently on the rivers, before they commenced spawning. We put the Tyrie salmon in the first pool above the Shinness Road: one pair went up to the ford above Dalnichie before spawning, and the other two pairs spawned about a mile below Dalnichie. The pair put into the Fiag ascended the river about four miles from where they were put in. Of the three pairs put into the Corrie River, one pair spawned at the junction of a burn which divides the property of Her Grace the Duchess from Poyntzfield's estate; and the other two pairs higher up the river. So whether the salmon actually return to the same river where they spawn and were spawned, another year will determine, as all we carried up have done very well this season."

"*Invershin, Oct. 24. 1836.* — As our watchmen at the top of Loch Shin have not noticed that they have seen salmon spawning in the Fiag River, and, as we put in fish in that river this season, I intend to go up to-morrow and have a general inspection of all the rivers in that quarter, that we can be certain to speak of the salmon returning back to their mother rivers."

"*Invershin, Feb. 4. 1837.* — On Sept. 15. we carried four pairs of salmon up to the river at Currkinloch, but left the Fiag and Tyrie without putting any in either of them this season. To ascertain whether any of our last year's planting would return this year, I placed two of our fishermen, who had been watchmen formerly, to watch the salmon we carried up this season, and also the Fiag, and to report whenever they saw any salmon on that river. About Oct. 20. they sent me word they had seen four salmon on the Fiag; and on the following day I went up the loch; but, unfortunately, wind and rain commenced while we were on the loch, and, before we could reach the rivers, they were all flooded. I was, however, perfectly satisfied that the information I received was correct, as the men had frequently seen them or others on

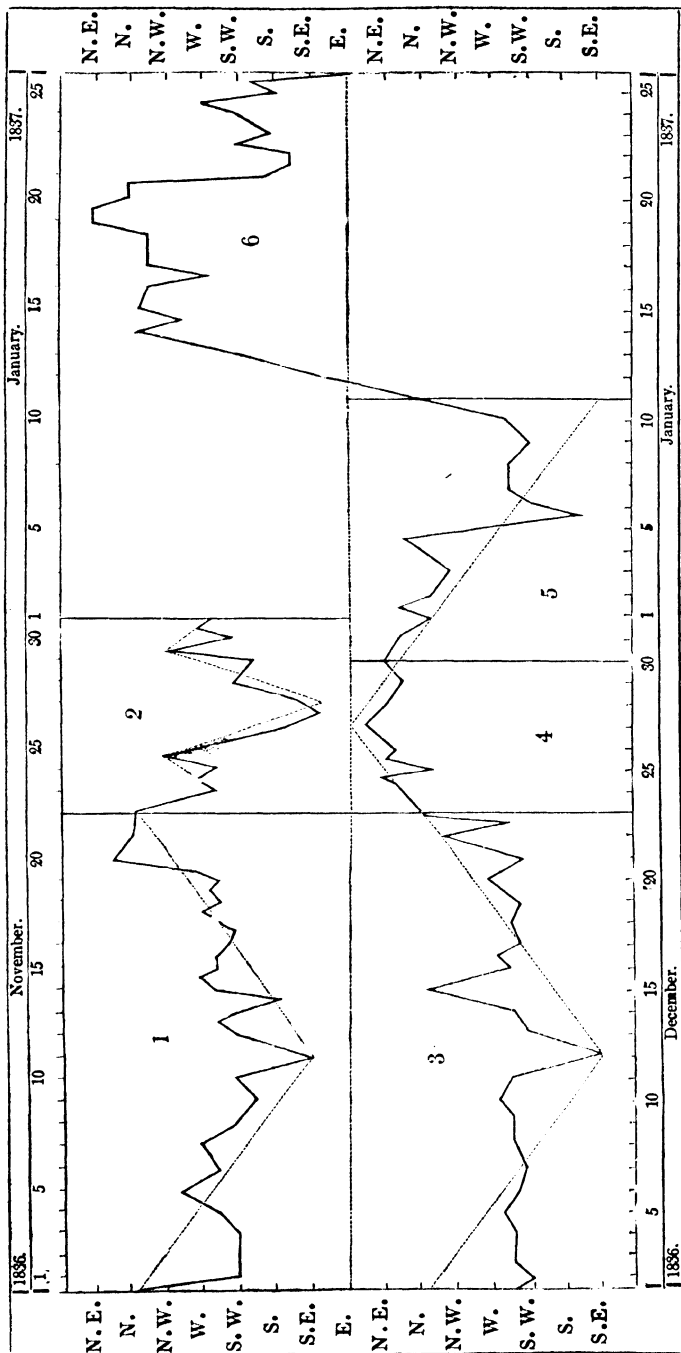
the river; and they also thought, by the appearance of fish on the Corrie River, that more salmon were also there than what we carried up this season; and, after I returned, the watchmen saw a large salmon near the foot of the Fiag; but those which they formerly saw were some miles up the river. Therefore we can no longer doubt of the salmon returning to the same rivers where they spawn or were spawned; and that each river has a particular breed of salmon of its own also."

ART. IX. *On the Anemonal Curves described during November, December, and January, 1836-37.* By R. BIRT, Esq.

UPON carefully observing and tabulating the direction of the wind, we find it describes various curves, and exhibits, to a certain extent, a degree of regularity which, perhaps, may not be generally suspected; especially as the wind is usually employed to represent fickleness and inconstancy. It is not my intention, on the present occasion, to draw any conclusions from the anemonal phenomena hitherto observed, but simply to lay before the reader the facts that have come under my observation during November, December, and January last, and point out the probable utility that may arise from an accumulation of observations arranged in a similar manner.

I shall present the reader with the observations arranged in the form of curves, which are obtained by regarding the direction of the aerial currents as ordinates, the east point being, in the present instance, zero. During the months of November, December, and January, three well-marked curves were described; the first (*fig. 20. 1.*) extending from Oct. 31. to Nov. 22.; the second (*fig. 20. 3.*), from Dec. 1. to Dec. 23.; and the third (*fig. 20. 5 and 6.*), from Dec. 30. 1836, to Jan. 25. 1837. On Oct. 31. the wind was observed from north by west; and it had a tendency to approach the south-east point during the next eleven days, it being observed in that direction on Nov. 11. The continuous line exhibits the actual curve described, while the dotted line shows the general tendency of the wind. After Nov. 11., the tendency is reversed, the direction of the dotted line being from south-east to north by west during the next eleven days. On Nov. 22. the wind was observed from the latter point.

The curve described during December is, in many respects, similar to that observed in November, particularly in the direction being south-east on the eleventh day from its commencement, and its subsequent approach to the north point. One of the most interesting features of these curves is their



relation to the dotted line. It will be observed that, during the first five or six days, the curves are below the dotted line: they are afterwards above, until they arrive at the central point; and they continue above during the same number of days while describing the remaining portions, being found below at the close as at the commencement. This is more conspicuous in the December curve than the preceding.

The curve described during January exhibits a very different character to either of the preceding. The east point is still zero; but the first half is below, and the second above, a dotted line coincident therewith. The variations exhibited by this curve are much greater than those that occurred during the preceding periods. During January, they extended to seven points on each side east; while in November and December they were confined to seven points only; those between north-east and south-east including the north-west and south-west points. There are some interesting features in the curves of December and January, that claim attention. The descent to the south-east point in December forms an acute angle; and three days afterwards a similar angle is noticed, the apex being in the opposite direction, and situated in nearly the opposite point. Similar complementary angles are also conspicuous in the January curve, a couple occurring about six or eight days after the commencement, and another pair, in the opposite part, a few days before the close. It may be remarked, that the pairs of angles occur about the same points of the compass.

It may naturally be enquired, of what character were the anemonal movements in the intervals between the curves? There are some very interesting points connected with the curves described during these intervals that merit attention. The period just before the commencement of the November curve was characterised by a considerable depression of temperature; the interval between November and December was of an opposite character, being marked by an elevation of temperature, and a depression of the barometer, and accompanied by gales, particularly the tremendous one of Nov. 29. The interval between December and January exhibited a return to cold. We have, consequently, opposite characters alternately exhibited during these intervals. *Fig. 20. 2.* shows the curve described between the November and December curves; and *fig. 20. 4.* that which occurred between those described in December and January. This is so placed in the diagram as to show that a well-marked curve was described from Dec. 12. to Jan. 11., both portions being, to a certain

extent, similar. This is particularly remarkable in the pairs of complementary angles before spoken of, one of which occurred at the commencement (Dec. 11. to Dec. 16.), and the other a short time before the close (from Jan. 3. to Jan. 7.). The dotted line in *fig. 20. 2.* exhibits the symmetrical nature of the connecting curve between November and December.

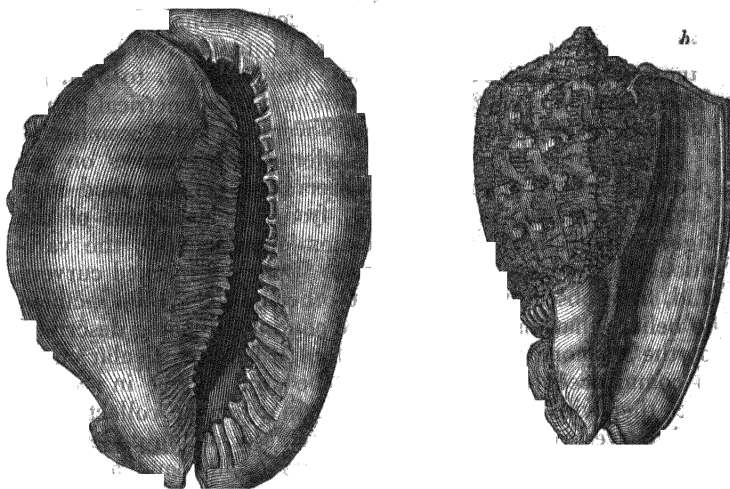
It now remains for me to offer a few remarks on the probable utility of arranging observations of the wind in a similar manner. It is evident, from an inspection of the figures, that, during the above-mentioned months, the variations of the wind were such as to form well-marked curves; and, from observations made at other periods, I am inclined to believe that distinct curves are continually being described by the anemonal movements; so that, when a particular curve is commenced, the variations of the wind will be in accordance therewith until it is closed. An extensive collection of such curves would afford facilities for ascertaining under what peculiar circumstances similar curves occur; and a careful comparison of such curves with each other, and the curves generally with the barometrical, thermometrical, and hygrometrical changes of the same periods, could not fail of increasing our stock of data in that most interesting and, at the same time, difficult branch of natural history, meteorology.

ART. X. On *Cypræcassis*, a proposed new Genus of Univalve Shells, for the Reception of certain Species of Brugière's Genus *Cassis*. By SAMUEL STUTCHBURY, Esq., A.L.S., Curator of the Bristol Institution, &c.

CYPRÆCASSIS.

SHELL, *when young*, striated, reticulated, or tuberculated; outer lip simple: *when mature*, outer lip involute, and toothed; columella lip also toothed; aperture straight, anteriorly terminated by a recurved canal, posteriorly by a shallow channel. Animal with the mantle bilobed; operculum none.

The above genus has hitherto been confounded with *Cassis*, and, in the form of their shells, a considerable analogy certainly exists; but it will be found that these genera differ in the following important characters:—The true *Cassides* possess ~~an~~ operculum; and the animal, by means of its mantle, completes the mouth in the young shells, at each separate period of growth, as perfectly as in the most mature; protecting the upper portion of the shell by an epidermis: while, on the contrary, the genus before us never forms or



Cypræcassis rufa: a, mature; b, immature.

completes its outer lip but once during its life; consequently, it is destitute of varices. It has, also, no epidermis, nor is it furnished with an operculum. In the latter characters it approaches much nearer to the *Cypræadæ*, than to the *Cássides*.

Taking the *Cássis rufa* as the type of our new genus, upon comparing it with *Cypræa*, and particularly with those divisions of that genus which are denoted by being rough on the upper surface, including the striated and pustulated species, we shall find in its shell such an affinity to these latter, that, independently of the distinctness of its animal from that inhabiting the true *Cássides*, we are only surprised that an examination of the shell alone should not have attracted the attention of conchologists to the necessity of making the present separation.

The principal distinction between this genus and *Cypræa* consists in the two lobes of the mantle of the animal not meeting on the dorsum of the shell. Had the lobes of the pallium in *C. rufa* extended so far as to have covered the whole of the shell, as we find to be the case with nearly all the cowries, the deposit of a smooth enamel-like coat, similar to that of the inferior or basal surface, would then have extended itself over the rough surface of the upper portion, or dorsum, including the recurved beak, or canal, and nearly obliterating the spire; would, in fact, have made it a perfect *Cypræa*.

It may be observed, in many species of *Cypræa* that, after a certain age, the dorsal line which marked the division of the two lobes of the mantle (so well exemplified in *Cypræa mappa*) is obliterated, and that the basal edges become much thickened. This is well exhibited in *Cypræa caput serpentis*, *vitellus*, and most particularly in adult specimens of *caurica*. In these cases, the mantle of the animal is in precisely the same circumstances as in the typical species of our genus; with this difference only: we suspect in *Cypræcassis* the lobes of the animal never entirely enveloped the shell, while in *Cypræa caurica*, and others, the animal was capable of enveloping the shell while it retained its cylindrical form, but not after it began to expand laterally.

The above specified distinguishing characters we think quite sufficient to justify us in creating a genus for the reception of that division of the genus *Cassis* denoted by the total want of varices, the absence of an epidermal covering, and also in being deficient of an operculum.

The following species, abstracted from the genus *Cassis*, will now form species of our genus *CYPRÆCASSIS*, bearing the same specific names. *C. rufa Brugière*; *C. Massénæ Kiener*; *C. coarctata Valenciennes*; *C. testiculus Brugière*.

It is our opinion, therefore, that this genus will stand in much closer proximity to *Cypræa* than to *Cassis*.

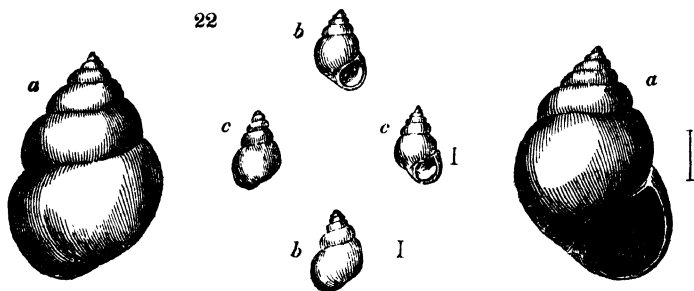
In the year 1826, the author met with specimens of *C. rufa*, having the animal alive, among the reefs of the Paumotu, South Pacific. They were in shallow waters, precisely in the same circumstances as the *Cyprææ*; namely, under large stones, which not only protected them from their natural enemies, but also from the burning rays of the sun. Since then, his friend Dr. Cutting of Barbadoes has kindly examined the animal of *C. testiculus*, which, in conjunction with the characters of the shell, fully corroborates these determinations; and, finding that in the late works of Blainville and Kiener they still continue to be regarded as *Cassides*, he hesitates no longer in making the division.

In the beautiful work now in course of publication by L. C. Kiener, entitled, *Spécies général et Iconographie des Coquilles vivantes*, there is a figure of the animal of *Cassis glauca*; and this author refers to D'Argenville's *Zoomorphose*, Adanson's *Voyage au Sénégal*, MM. Quoy and Gaimard's *Voyage de l'Astrolabe*, and to Poli *Sur les Coquilles de la Sicile*, for the anatomy of the animal of the genus *Cassis*; but they all refer to species typical of the *Cassides* as reformed by this division. The genus *Cypræcassis*, like *Cypræa*, is distributed over a vast geographical area, but we are not aware

of its extending far outside the northern or southern tropics, while the smallest species of *Cypræa* range as high as 50° north and south, the larger species being confined to a range not much exceeding 30° of latitude.

ART. XI. On *Nematùra* of Benson, a new Genus of Univalve Shells. By G. B. SOWERBY, Esq.

NEMATU`RA is a new genus of univalve marine shells. It was first discovered and described by Benson in the *Calcutta Journal of Science*. In 1835, he sent me specimens, collected by himself at the mouths of the Ganges. I have never seen his description, nor, of course, have I seen the animal: judging, however, from the nature of the operculum, I suppose it to have been pulmonobranchous. The species he sent to me was named by Benson, in his letters, *Nematùra Deltæ*. I have since met with another recent species among some minute shells from the West Indies, and a fossil species from the calcaire grossier, from Grignon and Orglandes. These two



last species have been in my possession, although unobserved, for several years. I have given specimens of all three to Mr. Gray. The characters of the genus, as far as they can be collected from the shells alone, are as follows:—

Shell nearly oval, somewhat depressed, rather acuminate posteriorly; spiral; volutions few, the last very large and ventricose; aperture nearly round, placed obliquely and anteriorly, contracted, and very small in proportion to the last volution; peritreme continuous; operculum spiral, horny, of few volutions, somewhat concave externally, rather larger than the aperture.

At present I am only acquainted with a single shell to which the *Nematùræ* appear to bear any affinity; this is the

Cyclóstoma lucidum of Lowe *, which is found "in *Maderæ humidis sylvaticis* ;" a locality not at all incongruous with the notion that it may belong to the same family. In several of its characters, this last-named shell very nearly resembles the *Nematùræ*, though, in the absence of all knowledge of the animals of either, I dare not venture any assertion of their congeneric relation. The propriety of placing this shell with the *Cyclostómata* appears to me rather doubtful.

Spec. 1. Nematùra Deltæ Benson. — This is the largest of the three species ; and, when complete, measures from one eighth to one sixth of an inch in length : it is rather more compressed than the others ; its colour is yellow, and its surface dull, not polished : from the Delta of the Ganges. (*fig. 22. a.*)

Spec. 2. Nematùra mínima Mihi. — This is about one fifteenth of an inch in length, and is translucent : it has a smooth polished surface, and a small umbilicus, and it is of a light brown colour. Many specimens were found in a chip box, among minute shells, in the collection of the late George Humphrey, marked by him "from the W. I." (*fig. 22. b.*)

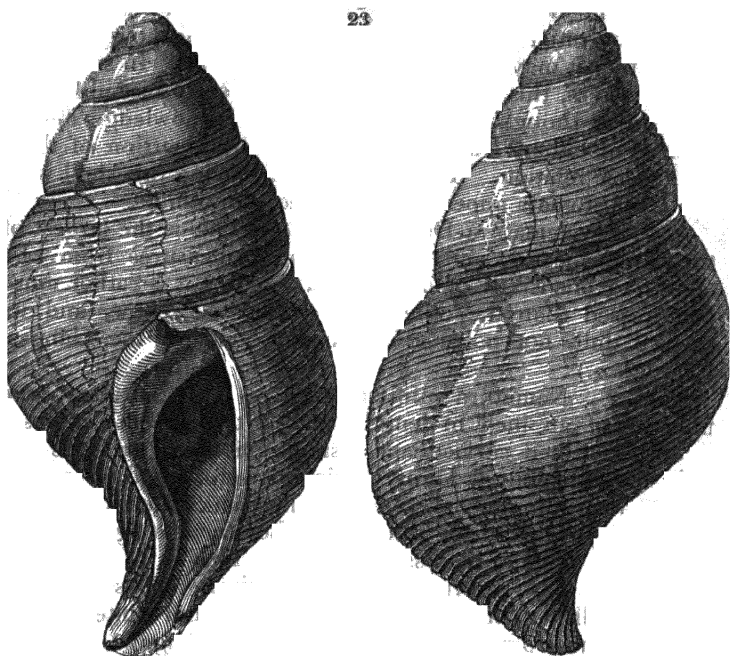
Spec. 3. Nematùra fóssilis Mihi. — This is of the same length, but more ventricose than *N. mínima* : it has a smooth, but not polished, surface ; and it is opaque and white. Found in shell sand from Grignon and Orglandes. (*fig. 22. c.*)

ART. XII. *Notice of a new Fossil Shell from the Coast of Suffolk.*
By EDWARD CHARLESWORTH, F.G.S.

THE annexed figures (*fig. 23.*) represent a very singular fossil shell found on the beach at Felixstow, possessing characters which render it difficult to determine to what genus it is most nearly allied. Its general form is that of a *Fusus* or *Fasciolària*, with a short subreflex canal ; but it wants the plaits which are characteristic of the latter genus ; and is also distinguished from it and the former, by a remarkable callosity upon the columella, extending from about the widest part of the aperture, along the margin of the inner lip, towards its upper or posterior part, where it terminates abruptly in a prominent obtuse tooth, forming a deep notch with the outer lip, when the shell is entire.

In many species of *Nássa*, and in Mr. Gray's genus *Póllia*, a tooth, or plait, occurs at the posterior part of the columella ; but in these instances it extends internally in a direction at

* Transactions of the Cambridge Philosophical Society, vol. iv. p. 66. pl. 6. f. 40.



right angles to the axis of the shell; while in the fossil under notice it is simply confined to the margin of the inner lip, and appears not to have been produced until the shell had attained its full period of growth.

In the former cases, too, there is either a corrosion of the columella, or an extension of shelly matter over its surface; neither of which conditions exists in the present specimen. The shell is destitute of varices, and is covered with very regular spiral striæ, which are uniformly disposed over the whole surface, giving the fossil a handsome appearance. The volutions are six, and the apex of the shell is remarkably obtuse, resembling that of *Volûta Lamberti*. The length of the aperture nearly equals that of the spire, and its width is about two thirds of its length.

From the circumstance of this fossil having been procured from the beach, and as it is the only specimen of the kind with which I am acquainted, the particular deposit whence it has been derived cannot be positively determined. It has not the very recent character presented by many specimens of *Volûta Lamberti*, which are found under similar circumstances; and, from its possessing some of the ferruginous appearance

Singular electrical Phenomenon

the red crag fossils, most probably it was originally em-
bedded in that formation. For the loan of this interesting
specimen I am indebted to William Fitch, Esq., of Ipswich,
who has collected many rarities from the Suffolk crag. Should
it be thought necessary to place this shell in a new genus, it
might be called *Atractodon*, with the specific name of *élegans*.*

T. XIII. *Notice of a singular electrical Phenomenon on the
Night of Feb. 18. 1837.* By the Rev. W. B. CLARKE, A.M.
F.R.S., &c. [Read at the Meteorological Society, March 14.
1837.]

THE weather, during the last few weeks, in the south and
east of England, has been extremely variable: heavy rains
and violent gales of wind, at intervals of two or three days,
have succeeded each other continually.

On February 16. there was a slight aurora, about 9. P. M.,
to the north; and at 11 P. M., a wide and brilliant halo, com-
prehending within it the planets Mars and Jupiter, as well
as the moon. The following day (17th) was warm, bright,
and sunny—a perfect spring day; but the calmness of the air
was accompanied with a certain milky haze along the edge of
the western horizon, which, together with the southerly di-
rection of the wind, betokened what I predicted, heavy rain
and wind. From midnight till about 4 P. M. of the 18th, it
rained heavily, with high wind; but, clearing off about 7 P. M.,
the moon came out in a bright cloudless sky.

About 9 P. M., however, there arose from the west a band of
dark clouds, separated from each other, and about 2° wide,
which gradually advanced, till about 11½ P. M., across the
zenith, and a few degrees below the moon towards the east,
where they disappeared. These clouds were of a *dull fiery*
hue, and were evidently like the reflection of a fire from the
earth; but their character was decidedly auroral, and, though
they emitted no flashes, occasionally exhibited a gradual
darkening of the hue which they assumed; the smallest pale
stars shone through this red filmy vapour; and, during the
process, there was a degree of illumination in the northern hori-
zon considerably stronger than that of the light of the moon,
but tempered and softened into a *white cloudy* appearance.
These red clouds vanished in the east, and were succeeded,
about 25 minutes afterwards, by white fleecy scatterings
of clouds from the north and north-west, which were suc-

* The generic name was suggested to me by Mr. Searles Wood.

ceeded by a most tremendous fall of rain during the whole of the 19th, and a gale of very furious character, which did not subside till the morning of the 20th, when the wind veered round to w., n.w., and s.w.

There can be no doubt, I think, that this phenomenon was truly electrical, and of the character of the aurora borealis, and, like it, succeeded by wind and rain from the west and south-west.

Stanley Green, near Poole, Feb. 21. 1837.

SHORT COMMUNICATIONS.

NOTICE of a Meteor seen on Saturday, February 25. — On Saturday, the 25th ult., at 8½ p. m., a most brilliant meteor became visible very near Stella Polaris. Meteors generally take an oblique direction towards the earth; but the one above mentioned fell perpendicularly, and vanished at an altitude of about 20°. The diameter of the nucleus was about one fourth of the apparent diameter of the moon. The lower part was of a flame-colour; and the body of the meteor was of a fine brilliant light blue. Its train was in length about four times the diameter of the meteor, perfectly conical; the base having the same diameter as the meteor; and the apex seemed to consist of a single spark. It remained visible seven or eight seconds; during which its brilliancy was so great as to cast shadows as strong as those cast by the moon when she is three or four days old. The night was clear and frosty; wind n. w., rather strong. Thermometer 30° during the night. — *W. H. White, Secretary to the Meteorological Society. March 10. 1837.*

Singular Auroral Light seen at Wycombe. — On Saturday, the 18th inst., about half-past ten p. m., an auroral light, of rather an extraordinary description, was observed: it consisted of two streams of a bright vermilion colour; the one arising in the north-east, passing over Arcturus and Ursa Major, and the other originating in the south-west, leaving Orion on the south, and passing over Aldebaran and Capella, and meeting in the zenith, forming a luminous arch of no great breadth. The western limb was by much the brightest, and shot forth, at intervals, rays of light approaching to a flame colour. The whole soon faded away: the eastern portion, spreading wider, and becoming fainter, assumed a mottled appearance, like that denominated mackerel-sky, but of a light red tint. The barometer stood at 29.37, and the thermometer

indicated a temperature of 40° : there was a light breeze from the westward; the moon, at the time, shining brightly, Mars being at the south-east, and almost touching that luminary; and Jupiter at a short distance from her western limb; the whole having a most interesting appearance. The stars were visible through the aurora, which had entirely disappeared at 11 o'clock. — *James G. Tatem. Wycombe, Feb. 20. 1837.*

Luminous Appearance at Birmingham. — Soon after 10 o'clock, on Saturday night (Feb. 18.), a beautiful luminous arch of the loveliest rose-colour, spanned the heavens from N.W. to S.E., at first preserving the rainbow form, but soon breaking, and shifting into various groups of clouds and streamers, through which the stars shone brightly. The moon was particularly brilliant, and the wind high and intensely cold. At 52 minutes past 10., Mars was occulted by the moon, as we afterwards found, though, at the time, my profoundly astronomical remark only informed our shivering company that he was "slipping under." Little meteors darted about the crimson glow at intervals, and columns of faint yellow light slowly traversed it in different directions; till, at about half-past 11, a long faint streamer of light stretched towards the north, and soon after all the glorious show faded slowly away. — *L. A. T. Birmingham, Feb. 22. 1837.*

Pugnacity of the Robin. — On September 27. last I had an opportunity of observing an extraordinary instance of the pugnacity of the robin. Hearing one warbling in a tree in one of the small gardens near my house, I was induced to place on the window sill a beautifully stuffed specimen of the bird, in the hope that it would attract the attention of his living brother. Nor was I disappointed. The song became louder and in longer strains; and, at last, he made a flight of inspection as far as the window. Shortly after, he flew up from his tree, and made so violent an attack on the stuffed specimen, as to throw it from a height of two stories to the ground, pursuing it even while falling, and continuing its violence when down. I then perched it on an empty box in the yard, the live bird remaining within a few feet of me all the time; and, directly I had retired a few paces, the attack was renewed with redoubled vigour, and so obstinately, that I could easily have caught the living combatant. On my withdrawing the stuffed bird from the unequal contest, its opponent resumed his place on the box, strutting about with an expanded tail and erect attitude, as if claiming and pronouncing a victory. Noticing the bird to be still hovering about the place, I replaced my stuffed specimen on the win-

dow sill, securing the stand by a bradawl; and hardly had I done so before the robin resumed the war by settling on the head of his unconscious foe, digging and pecking at it with such ferocity and violence, that, had I not interfered, the utter destruction of my poor specimen must have ensued. The experiment, of course, was not renewed; but the robin, during the rest of the day, kept watch in the immediate neighbourhood, and was singing even in the shade of the evening. — *Kent. Dover, Jan. 5. 1837.*

Preservation of Zoological Specimens. — I have often noticed with regret, both in some public and private museums, in this country, that the damp was making fearful inroads among the zoological specimens; and, as I learned, while in France, some time since, a most simple and efficacious remedy for that evil, I beg to submit it to you for the benefit of your readers and the public.

A glazed flower-pan, of the size of a dessert plate, placed in the cases, at intervals of 8 ft. or 10 ft., and filled with quicklime, will rapidly imbibe all damps, and will only require renewing when it is found that the lime is completely saturated.

As a preventive to moth in museums, I have seen used, and have used myself with great effect, the huile de pétrole, put into glass vessels like shallow finger-glasses; and four or five in a case of 20 ft. long will produce so powerful an effluvium, that it is necessary to have as many watch-glasses, with small portions of musk in them, to make it bearable. But this, in good air-tight cases, is of little consequence. — *Kent. Dover, Jan. 5. 1837.*

Occurrence of Helix virgata in vast Numbers. — I noticed, in your valuable and entertaining Magazine for October an account of a “Congregation of Moths in the Interior of a Tree.” I have now, Mr. Editor, for the information of your readers, to record almost as curious an accumulation of shells. In passing through Wymondham, in my way to Norwich, while my horse was baiting, I strolled into the churchyard of that place, for the purpose of examining the church, which I had previously been informed was worth looking at. I had not been two minutes there before my feet trampled upon, and were crushing, a number of very small snails; and, taking a few of them in my hand for examination, found them to be specimens of *Helix virgata* of Dr. Turton. (See Turton’s *Manual*.) They were of various sizes, and in different stages of growth. Some were crawling up the steeple to a great height; some sticking to the trunks

of the trees; some on the gravel walks, and many apparently feeding on the blades of grass, to which they adhered by a thin pellicle. Upon extending my walk further, I found they had also migrated to the neighbouring fields and gardens of the cottagers. As I had never met with anything of the kind before, I was naturally surprised at the immense quantities that were accumulated there. I am certain there were millions. It seemed as if they had dropped from the clouds. Upon reaching home, I consulted Turton's *Manual*, one of the latest works upon the subject, and there found some elucidation upon the subject.

After describing the species and its varieties, he observes (p. 41. and 42.), — "In autumn these shells are often *suddenly* collected in such great numbers as to give rise to the popular notion of their having fallen from the clouds; and, in very hot weather, the young, both of this species and the *H. cingénda*, may be found in clusters adhering to the stalks of various plants." I have sent with this a few specimens, and will give some of them to any of your conchological friends. — *George Hubbard, Surgeon. Bury St. Edmunds, November, 1836.*

Sphinx A'tropos. — That this large and beautiful insect has become more abundant of late years in England, and especially since the increase of the cultivation of the potato, seems certain; but whether from increased propagation, or emigration, may, perhaps, be questioned. That, at least, it is capable of the *will* to cross the Channel, the following incident will show; while its powers of flight leave but little doubt of its capacity to cross in safety: — Sept. 29. The wind strong from the east. The death's-head sphinx flew on board a fishing boat, at about the distance of three leagues from the east coast of Cornwall, and, knocking itself against the mast, it fell to the bottom. After being sufficiently examined, it was left to itself; when it again took flight, and, though not in the direct course of the wind, flew away seaward. — *Jonathan Couch. Polperro.*

Award of the Woolaston Medals. — The council of the Geological Society of London has this year awarded the Woolaston Medals to Captain Proby Cautley of the Bengal Artillery, and to Dr. Falconer of the Bengal Medical Service, for their geological researches, and their discoveries in fossil zoology in the sub-Himalayan Mountains. (*Proceedings of the Geological Society, Feb. 1837.*)

THE MAGAZINE

OF

NATURAL HISTORY.

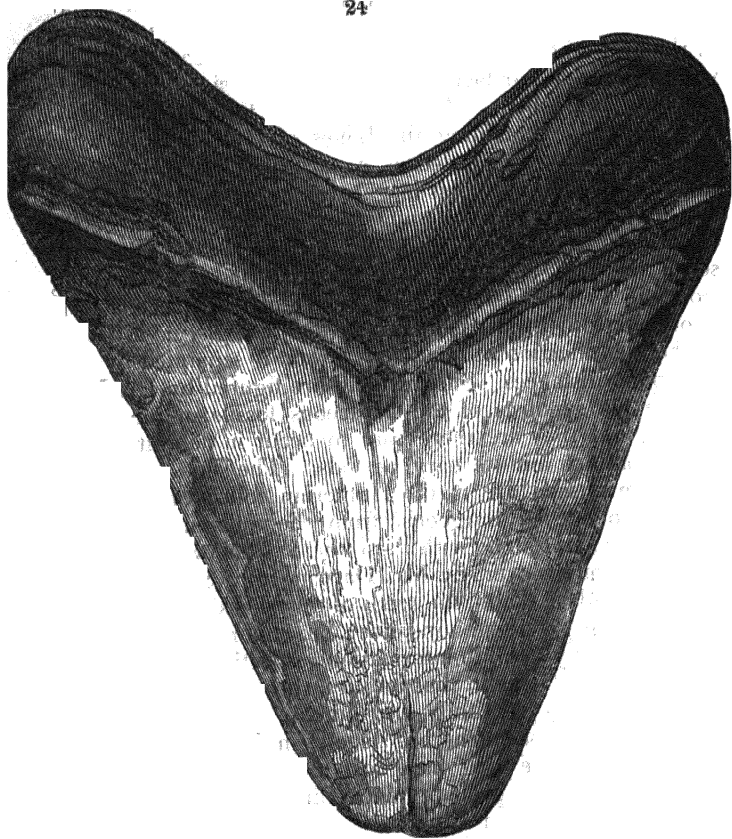
MAY, 1837.

ORIGINAL COMMUNICATIONS.

ART. I. *Notice of the Teeth of Carchàrias megàlodon occurring in the Red Crag of Suffolk.* By EDWARD CHARLESWORTH, F.G.S.

THERE are, perhaps, no fossiliferous beds, the history of which, at the present time, involves points of greater interest, than the tertiary formations bordering our eastern coast; and in noticing several of the more remarkable fossils from these deposits, and the conditions under which they occur, it is with the hope of imparting some information respecting them, which may facilitate the researches of others who may feel disposed to enter upon the same field of geological investigation.

Palæontologists will readily recognise in the annexed figure a well-known Maltese fossil, and, perhaps, feel some surprise at the announcement of its occurrence in this country. Within the last few years, however, many specimens of these extraordinary teeth, belonging to a species of the genus *Carchàrias*, probably of gigantic size, have been found on the shore and in the red crag of Suffolk. No other portion of the skeleton has yet been observed, by which we might ascertain how far the general dimensions of the animal correspond to the proportions exhibited by the teeth; nor is it probable that future discoveries in the crag will throw any light upon this point, since the preservation of the dental structures is the only record of the presence of cartilaginous fish during the formation of that deposit. The remains of fish, and of chelonian and saurian reptiles, which are often found in a very complete state in the tertiary strata of Harwich and the Isle of Sheppey, usually owe their preservation to the nodules of indurated clay which have formed around them. Nothing at all analogous to these nodules occurs in

*Carchàrias megalodon* Agass.

the crag ; and, from the very slight consolidation of the beds, and the general lithological character of the deposit, the discovery of connected skeletons can never be expected. All the information that we can acquire, respecting the vertebrated animals whose remains are there embedded, must be derived from the examination of detached bones and teeth. These latter, belonging to various species of the shark tribe, occur in abundance ; but, with the exception of the genus *Carchàrias*, all the forms may be identified with those in the London clay ; from which deposit it is highly probable that many of them have been removed. The circumstance, however, of specific agreement would not alone lead to the above supposition, since, throughout the whole tertiary series, and even in the more recent secondary rocks, many of the aneloid fish appear to have closely resembled existing types.

This affinity is, perhaps, most strongly marked in several species of the genus *Lamna*, the teeth of which are abundant in the crag and London clay, and are even occasionally met with in some of our lacustrine deposits, associated with fluviatile and land shells. In the coralline beds, and in those marine strata containing the bones of land animals, which have been usually regarded as a part of the crag formation, the teeth of the *Carcharias megálon* have not been detected; and they would, therefore, appear to be characteristic of that deposit which extends from Walton, in Essex, along the south coast of Suffolk. As this species has a vertical range from the secondary to the more recent supercretaceous formations, its fossilised remains afford the geologist no assistance in the identification of particular strata, if separated by great horizontal distances. Similar teeth are figured by Dr. Moreton, in his synopsis of the cretaceous fossils of the United States; and they are there said to occur in deposits both of the secondary and tertiary periods. The finest specimens that I have seen are in the Hunterian collection, belonging to the College of Surgeons, from the well-known beds at Maestricht; and along with these there is one which has been recently brought over, by Mr. Darwin, from South America. In the Island of Malta, the teeth of this shark have been procured in the greatest abundance; but I am not aware that we possess any definite information respecting the geological relations of the beds in that locality, throughout which these fossils appear so plentifully distributed.

The foreign specimens are usually in a very perfect state; but those from the crag have lost their covering of enamel and serrated edges, probably depending upon the attrition to which they have been subjected. William Colchester, Esq., of Ipswich, whose collection of crag fossils is one of the choicest extant, has in his possession the tooth from which the accompanying figure was made. Specimens are also in the Ipswich Museum, and in the hands of other collectors in Norfolk and Suffolk.

ART. II. *Climbing and Gallinaceous Birds of Devonshire.* By E. MOORE, M.D. F.L.S., Secretary to the Plymouth Institution.

To pursue my catalogue of Devon Birds, I send those of the two succeeding orders, Scansôres and Gallinæ.

It is very possible that the race of the black cock may soon become extinct in Devonshire, as the cultivation and enclosure of great part of Exmoor, and other causes, depend-

ing on the want of attention to the preservation of the red deer, in consequence of the decline of the hunt, equally operates against the heath fowl, and will probably lead to the latter becoming ultimately as scarce as the bustard.

The stock-dove is often seen in large flocks in the woods in winter. The rock-dove also occurs in flocks, sometimes, in winter, associating with the tame pigeons. In the breeding season, they are mostly found on the north coast, which is more mountainous and secluded than the south; and the sea cliffs where they build are more precipitous, and afford greater facility for nesting: but Lundy Island is the chief resort of this bird at that period.

ORDER III. SCANSO'RES.

Gen. PÍCUS.

1. *Picus víridis*, Green woodpecker. Common all the year.
2. *Picus mājor*, Greater spotted woodpecker. Frequent.
3. *Picus minor*, Lesser spotted woodpecker. Not so common as the last. Specimens in my collection; also at Drew's and Bolitho's.

Gen. YÚNX.

1. *Yúnx Torquílla*, Wryneck. Rather scarce near Plymouth; more plentiful near Dawlish, where they breed, as I am informed by Mr. Comyns of Mount Pleasant, who has specimens.

Gen. CÚCULUS.

1. *Cúculus canòrus*, Cuckoo. Common, from April to July.

ORDER IV. GALLINÆ.

Gen. TÉTRAO.

1. *Tétrao Tétrix*, Black grouse. This is the only Devonshire species of grouse. They were formerly abundant on the borders of Dartmoor and Exmoor; but the increase of population and cultivation has diminished their range. Specimens are still, however, often procured. I have purchased both the male and female in Plymouth market; Sir G. Magrath, Drew, and Pincombe have specimens.

Montagu states that Lord Caernarvon endeavoured to produce, but unsuccessfully, hybrids between the heath grouse and pheasant: that such, however, does occur, is verified by the fact that, in September, 1829, one of this kind was shot at Whitey, near Plymouth, by the Rev. Mr. Morshead. A male pheasant, female grouse, and one young, had been observed in company for some time by the keeper. Mr. Morshead shot the pheasant, and, in a few days, the young hybrid; but the grouse escaped. The young bird bears the marks of both parents, but the most prominent characters are those of the grouse. The space above the eye, however, is not bare, as in the grouse, but entirely feathered, as in the pheasant; the whole of the neck is covered with black feathers, somewhat mottled; the tail is not forked, but fan-shaped, and half as long as that of the pheasant; the tarsi are bare, as in the

pheasant; the colour is generally, except the neck, that of the pheasant; but it has the white spot on the shoulders, as in the grouse. This bird was sent to Mr. Drew for preparation, where I saw it; and is now, I believe, in the possession of Captain Morshead.

Gen. PE'R'DIX. — Subgen. 1. *Pérdix*.

1. *Pérdix cinerea*, Common partridge.

Subgen. 2. *Coturnix*.

1. *Coturnix vulgaris*, Common quail. Not very abundant: generally obtained in October; but I bought one in Plymouth market in January, 1830; and two were obtained in Devonport market in January, 1831, of which one, a male, has the black crescent on the throat, and is now in Pincombe's collection.

Gen. COLÚ'MBA.

1. *Colúmba Palúmbus*, Ring-dove. Common.

2. *Colúmba Cénas*, Stock-dove. Rare: appears sometimes in flocks in winter.

3. *Colúmba Lúvia*, Rock-dove. Rare. Mr. T. E. Gosling, late of Leigham, informs me that it is found wild on the south coast of Devon; and Polwhele (*History of Devonshire*) states that they are found on the north coast, near Combe Martin and Lundy Island.

Subgen. 1. *Túrtur*.

1. *Túrtur vulgaris*, Turtle-dove. Rather unfrequent here; but more numerous on the woody borders of the moors. Specimens are in Mr. R. Julian's, Mr. Comyns's, and Mr. Drew's collections. Mr. Julian's specimen was shot by himself, in the lawn of his residence at Estover, near Plymouth.

Plymouth, March, 1837.

(*To be continued.*)

ART. III. *Examples of Natural Phenomena observed in 1833, and registered.* By the Rev. W. B. CLARKE, A.M. F.L.S., &c.

THE following observations are in part original, and in part collected from various authentic documents to which I have had access. They are not, however, presented to the public as a perfect calendar of natural phenomena for the year 1833, but as a contribution towards one; and, though imperfect as to the whole of the physical occurrences of that year, they may be received as useful memoranda of its character, as well as illustrations of the opinions adverted to in my former papers on "The Connexion between atmospheric and terrestrial Phenomena," contained in Vols. VI., VII., and VIII. of the 1st series of this work, and which it is my intention to resume, after I shall have published a similar calendarium for the years 1834, 1835, and 1836. The difficulty of presenting these phenomena in a tabular form, in the small pages of a work like the present, has compelled me to give the months and days consecutively, with their separate occurrences, in the order of an almanack. Could I have made a better arrangement, the con-

nexion of phenomena would have been more closely traced: as it is not difficult to see, in some few of the examples thus brought together, a *contemporaneousness* which is very remarkable. A portion of them have been embodied in the papers before mentioned; but they are here necessarily reincorporated. If accurate observations were made, and all occurrences that fall in the way of observers recorded, extensive data might be so established for the developement of a general theory, such as that I have endeavoured to maintain in previous publications. In the calendars for the last four years there are so many extraordinary coincidences, that I am fully impressed that my hypothesis is a correct one; and it is impossible to consider the strange vicissitudes of the seasons during the present year, compared with years of similar character long ago, and not be convinced that, as to the sun, and moon, and stars, so there is to the earth, a cycle of recurring phenomena, all pointing to a *general law*, regulating the internal movements of the terrestrial sphere, and its circumambient atmosphere.

Stanley Green, April 11. 1837.

1833. *January* 4, 5, 6. Earthquakes in South Wales, Ireland, and England.* — 13. Earthquake in Sweden. — 18. Arica destroyed by an earthquake. (Sea rose 30 ft.)

N.B. The *weather*, during this and the preceding and succeeding months, particularly *mild* in the arctic regions. (*Teste* Capt. Ross.) There was a violent tornado at Suspendersville, in Georgia, uprooting pines, oaks, &c.

February 2. Cholera and drought at Madras. — 8. Earthquakes at St. Kitts, Nevis, &c., continued till April. — 19. Earthquake in lat. 22° N. 79° W. long. Hurricane in lat. 22° S. 79° E. long. — 20. Italian poplars at Morlieux, oozing black gum, and dying, as during the cholera in 1832. (*Annales de la Soc. d'Horticulture.*)

March 7. Ice floatings in the Atlantic. Tide, this day, ebbed and flowed at Cape La Hogue and Cherbourg, so as to leave the wrecked ships of the great battle of 1692 for the first time dry. — 27. Earthquakes in the West Indies generally. — 31. Earthquake at Horsham, Sussex.

N.B. *Locusts* this month in France. Insects, unknown there before, destroying the corn in Spain.

April 1. Drought in Buenos Ayres, continued from January: 2,000,000 head of cattle lost from the effects of it. Drought at Manilla. The water in the river there suddenly decreased,

* Whenever no *locality* is assigned, it is to be understood that the writer's residence in Dorsetshire is intended.

and became discoloured, unpleasant, and useless; occasioned, as supposed by the natives, by a volcanic eruption in the interior: pestilence feared in consequence. (*Canton Reg.*) Drought at Cape of Good Hope, continued from August, 1832. Influenza in Turkey, Egypt, Syria, &c. — 4. Earthquake at Vicenza. — 10. Rain fell slightly (in midst of long-continued drought) in Bengal. — 12. to 19. Frosts in England. — 14. Dreadful hail storms in Lancashire. — 17. Hurricane in lat. 28° s., long. 52° E. — 25. Earthquake ($10\frac{1}{2}$ A.M.) at Juasco, Coquimbo, and Copiapo, South America.

N. B. At the end of the month (date not precisely known), earthquake at George Town, Demerara, probably connected with that of 25th. At the end of the month, also, rain began to fall at Sydney, New South Wales.

May 2. Drought in Prussia. Earthquake in Trinidad. — 3. Sudden and violent thaw in Lake Ladoga. — 10. to 14. Ships entangled in ice in the Atlantic. — 17. Brilliant aurora disturbing the needle in Pennsylvania. — 21. Hurricane at Calcutta from N. E., destroying thousands of lives, and vast quantities of produce. *Same day*, hurricane at New Orleans, from N. W. (See 19th Feb.)

N. B. Throughout this month, drought in England, Holland, &c. During this month (date not known), hurricane in Nova Zembla, for three days, from the north; on the evidence of Lieut. Pachtusoff, Russian navy.

June 6. Rain in Jamaica, very heavy. — 11, 12. Hurricane all over England, France, &c. Graham Island in eruption. Cholera in Mexico. — Up to 12th. Heavy rains and N.E. winds in Bengal, commenced April 10. — 19. Earthquake at St. Kitts. — Up to 25. Cholera in New Orleans and United States: mortality 80 per diem.

July 1. Unusual hail storms, ruining crops, &c., in the province of Liège. — 2. Rains commenced in Hungary, lasting thirty-seven days. — 4. Aerolites with hail fell in Russia. — 10. Aurora affecting the needle, accompanied by change of wind and dryness of the air in Philadelphia, as on May 17. — 12, 13. Graham Island again above the sea. — 13. Earthquake in Staffordshire, Notts, &c. — 14. Thunder storms of a frightful character in the sphere of action of the earthquake of the 13th. — 15. Epidemic in London. — 17. Cholera at Deptford and Sunderland. — 21. Influenza at Portsoy, affecting cattle as well as man. Meteor (9 P.M., moon setting) from to E. to W. Aurora in the north; cloudy to south. (Parkstone, Dorset.) — 22. Rain from south all day, with wind, consequence of aurora of 21st. — 23. Cholera in London. — 25. Slight fall of rain at Madras, in the midst of drought.

Great snow storm at Madeira, New South Wales. — 1. to 25. Dreadful rains and floods in China; crops ruined; 10,000 lives lost; trade suspended. — 27. Earthquake at Washington, North America. — 1. to 31. Cholera at Tampico, and in New Spain. Drought in Sicily. Epidemic amongst cows in France, as at Portsoy. (See 21st.)

N. B. In the latter part of this month, Galway infested with mice, doing great damage.

August 1. Floods continued in China. — 3. Gale off Cuttack. — 4. Rains and furious gales off Cape of Good Hope till September. Meteor seen in Hungary. Snow on the Alps. — 8. Rains in Hungary moderated. (See July 2.) — 10. Falling stars and meteors in Worcestershire (10. to 12 P.M.) — 11. Snow at Rottenberg. Great cold, about this time, in Spain. — 12. Cholera at Limerick. — 13. Vesuvius in eruption. — 14. Hurricane in Lancaster Sound (Ross), Prince Edward's Island, Quebec, and Bermuda. — 14, 15. Hurricane at Antigua. — 17. Hurricane at Guadaloupe. — Up to 18. Drought at Odessa. (No snow there in 1832, 1833.) — 20. Hurricane in lat. 35° s., 21° E. long.; and off coast of Finland. — 23. Earthquake at Hulst and in the Axel. — 25. Tremendous storm at Sydney, New South Wales. — 26. to 31. Earthquakes in India. — 27. Earthquakes in Maryland, Virginia, &c., doing great damage. Rains in India very great: lasted twenty days. Epidemic in Sicily. — 29. Cholera at Lucknow, Patna, Cawnpore, Banda, Tuttipore: 700 deaths per diem. Drought there, and no rain. Aerolites, meteors, lightning at Candahar. — 30. Drought and yellow fever at New Orleans. — 30, 31. Hurricane all over England, France, &c.

N. B. End of month. Earthquake in Jamaica during the month. Cholera in Russia, Holland, Belgium. Cholera, drought, and famine in Madras territory. Cholera at New York. Drought in South Russia. Drought in Sicily. Drought at Berbice: only half coffee crop. Drought in Demerara: heat so great, that the *bush* caught fire. Great floods in New South Wales. Great sickness in Bengal: 300 deaths per diem. Vintage in France and on the Rhine better than since 1811: no average crop in Hungary, owing to the check in July and August.

September 1. Rain fell in the midst of drought at Antigua. — 1 to 11. Ten shocks of earthquake at Khatmandhu, North India. — 3. Snow fell at Macon, France. — 4. Drought in Egypt. *Nile not yet risen.* — 6. Snow at Dijon. Partial rains at Ahmedabad. — 14. Hurricane, 45° N., 17° W. Great irruption of bears in Paul's Bay, Canada, driven thither by hunger. — Up to 14th. Cholera in Mexico and Vera Cruz.

— 15. Famine and drought at Ellore; women eating their children for food.—17. Snow in Caithness. Aurora ($9\frac{1}{4}$ p.m.). — 18. Rain, s.w. Aurora, $8\frac{1}{2}$ p.m. Singular light at sunset this evening. Earthquake at Chichester.— 26. Meteor seen by late Prof. Farish at Cambridge. Furious gales commenced at Odessa: lasted ten days.

N. B. Throughout. Drought in Lincolnshire, Dorsetshire, Gloucestershire. Drought in Cape de Verd Islands: 20,000 deaths in consequence. Drought in Isle of Wight. Wells dry since August.

October 3. Cholera at Whitby.— 4. Earthquakes at Garakpoor and Allahabad, Monghyr, Calcutta, Chittagong, and Jubalpoor, and in Nepal. Earthquake in Auvergne.— 5. Hurricane in lat. 56° s., 23° e.— 7. Epidemic at Malaga.— 9. Tempestuous weather in the Mauritius.— 11. Drought in Russia, with scarcity. Gale, &c., off Isle of Amsterdam (wrecks).— 12. Gales and inundations in Canada. Splendid aurora. Tremendous gales at Madeira, Quebec, &c.— 12 or 13. Earthquake at Antigua.— 13, 14. Aurora all night. (See Parry's third Voyage, p. 172.)— 15. Chain pier at Brighton struck by lightning.— 17. Spots on the sun.— 18. Earthquake, same range as that of 4th in India.— 21. Aurora, followed by heavy gale.— 22. to 30. Ice in the Atlantic.— 22. Violent gust of wind throughout Cornwall.— 24. or 26. Aberration of tides at Leith.— 26. Hurricane off Candia, Scilly Isles, and Montreal. Earthquake at Allahabad.

N. B. Arica and Teeno again desolated by earthquakes this month. During October. Drought and scarcity in the Crimea, South Russia, &c. Cholera in Mexico: 22,000 deaths in thirty-five days. Drought in Dominica, Trinidad, St. Lucie, &c. Coffee plants without leaves. Drought at Bahia and Rio Janeiro.

November 1. Dreadful storm in the Clyde. Inundation at Embden.— 2. Drought oppressive in Demerara. Tremendous tides at London, Ipswich, Liverpool, accompanied by furious gales.— 3. Hurricane off the Norfolk coast.— 8. Earthquakes in Nepal.— 12. Fog in south of England.— 13. Earthquake at Chichester, 4 a.m. Shower of meteors all over states of North America.— 14. Dreadful cold in Canada; crops cut off; wild geese arrived in Dorsetshire.— 16. Earthquake at Khatmandhu. First woodcocks seen in south of England.— 18. Cholera at Lucknow. Fog all over France. Gale off Cape de Gatte.— 21. to 28. Gales, with lightning, from s.w.— Up to 21. Drought at Rio de Janeiro, Brazil. Rains and floods at Rio Grande, Brazil. Rains at Hayti prevented crops being got in.— 24. Vesuvius in eruption.

Dreadful earthquakes and volcanic eruption in Java. — 25. Snow on Quantoc Hills. — Up to 25. Nile not risen. Drought still in Demerara. — 26. Hurricane off Scilly. (See Oct. 26.) Earthquake at Khatmandhu. (Full moon.) — 27. Extraordinary phosphorescence in Weymouth Bay.

December 1. Vesuvius still in eruption. — 2. Spots on the sun. — 3. Rains fell at Berbice and Demerara. — 9. Stormy petrel killed on London Bridge. — 10, 11. Hurricane, lat. 46° N., long. 13° W. Hurricane, lat. 41° N., long. 43° W. — 14. to 16. Hurricane at Constantinople and Paros. — 23. Dreadful gales, with hail and snow, till Jan. 5. 1834, off St. Andrew's, North Britain. — 26. Hurricane in the Bosphorus. Tornado at Trieste, from N. W., for two hours, restricted within a mile of the spot; beyond it, smooth water. — 29. Aurora. — 31. Terrible gales in London, Liverpool, &c. Commencement of terrific storm at New Orleans, till Jan. 1. Heat of 70° to 80° , followed by ice and snow for four days; when heat came back again, on Jan. 5.

N. B. During December, there rose floods in England, Ireland, and Holland, France, and Germany. Snow began to fall on Mount St. Bernard. Gales of wind, with lightning, for thirteen weeks, in Europe, commenced. Severe weather at New Orleans. Gales in North America; especially about the lakes. Meteor at Brunn. Scarcity at Oran, Africa. Gales blocked up St. Valery, Dieppe, &c. The mildness, warmth, violence of S. W. winds, and the deluges of rain and thunder storms, have extended nearly all over Europe. In France, there were inundations higher than any since 1740; the Rhine, the Rhone, the Neva, overflowed. The Baltic remained so open, that only nine English ships wintered at Cronstadt. In Scotland, the weather was severe, with winds at N. E. At New York, birds, not usually seen there in the winter, were abundant.

ART. IV. *On the Errors which may arise in computing the relative Antiquity of Deposits from the Characters of their embedded Fossils.* By HUGH EDWARD STRICKLAND, Esq., F.G.S., &c.

GEOLOGISTS are indebted to Mr. Charlesworth for having pointed out two important sources of error in the application of Mr. Lyell's rules for fixing the age of tertiary deposits. The following remarks are intended to show that these errors do not affect the *principle* of Mr. Lyell's test, but its *prac-*

tical application *; and that, although they may diminish, they do not destroy, its utility.

Mr. Lyell's proposition may be stated thus: — "The ratio of extinct to existing species of animals in the tertiary deposits is proportionate to their antiquity." To this Mr. Charlesworth objects, first, that naturalists differ greatly in their estimate of specific characters, and, therefore, that we cannot make accurate enumerations of species; and, secondly, that fossils of different ages are liable to become mixed in the same stratum, and that we may thus be misled in inferring their contemporaneous existence. We will consider each of these objections separately.

The *essential* point in Mr. Lyell's test is this: that fossil forms recede from existing ones in a degree proportionate to their antiquity. This general proposition is admitted by all who are conversant with geological facts. Observations made in all parts of the world, upon the whole fossiliferous series, tend to establish this truth; and, though a few isolated exceptions may exist, they do not affect its general application. The difficulty is to find a correct *measure* of the resemblance or disagreement between living and extinct forms. In the secondary strata, where the fossil species are admitted to be wholly extinct, we have, at present, no other *measure* than the general estimate of resemblance and disagreement which persons conversant with organic forms may be capable of making. We cannot, I think, venture upon *numerical* comparisons of extinct and existing *genera*, for these groups are, as yet, little more than vague human generalisations, to which arithmetical calculations cannot be correctly applied.

But in the tertiary series, where existing species are supposed to make their first appearance, Mr. Lyell conceived that a measure of zoological resemblance might be found in the numerical proportion of these existing species to the extinct ones which accompany them. Now, those persons who, unlike the Lamarckian school, believe in the reality and permanence of specific distinctions, must admit that this is a very logical path to the desired truth; for, on comparing the faunæ, or entire assemblage of animals of two geological periods or geographical regions, we shall commonly find that the numerical ratio between the species which are

* "These observations have no reference to the principles which Mr. Lyell has advocated in determining the age of tertiary deposits; they apply exclusively to the errors which may arise in the application of those principles." (*Charlesworth, on certain Errors which may affect the Determination of the Age of Tertiary Deposits. In London and Edinburgh Philosophical Magazine for 1835, p. 468.*) — *Edit.*

common to both, and those which are peculiar to each, is proportionate to the total resemblance between the two faunæ, so that, when the number of *identical* species is great, the *similarity* of the remainder will be great, and *vice versâ*. Hence, the degree in which the fauna of any tertiary deposit resembles the existing creation may be arithmetically expressed by the number of living species which it contains, and its relative antiquity may be inferred accordingly.

Mr. Charlesworth, however, objects to this numerical test of Mr. Lyell, because he finds that hardly any two naturalists agree in their estimate of specific differences. This is certainly an important, but I trust not a fatal, objection. It seems to be rather a proof of human infirmity than of imperfection in the *per-centage* principle*, which is shown above to be not essentially unphilosophical. I would rather suppose that this variation of opinion proceeds from our imperfect acquaintance with specific distinctions, and our inaccurate estimate of their importance, than from those characters being themselves really mutable and indefinite. In proportion, therefore, as our knowledge of zoology advances, the utility of the *per-centage* test will increase, and though mathematical accuracy is not to be expected from it, it will probably be found to indicate the zoological similarity of different deposits, and, consequently, their relative age, with more certainty than any other rule which can be laid down.

I now proceed to Mr. Charlesworth's second objection to Mr. Lyell's principle, grounded on the liability of fossils of different ages to become mixed up in the same deposit. This is a subject which has not yet excited the attention which it deserves, and important errors may arise from oversight on this point. Mr. Charlesworth considers that many fossils of the coralline crag have in this way been enveloped in the red crag, whence they are again removed by the waves, and mingled with the present inhabitants of the German Ocean.

* "Greatly as the discordance of these results is to be lamented, as retarding the progress of geology, it must mainly be attributed to the *imperfect condition of conchological science, and not be supposed to invalidate the general course of induction pursued by Mr. Lyell*. Nevertheless, it must be admitted that the practical application of the principle advocated by this eminent geologist in the classification of the supracretaceous rocks will be extremely limited in operation; for, even if we suppose that conchologists universally admit the soundness of the principle upon which the present system of chronological arrangement is founded, they cannot equally make use of it as a means of obtaining numerical relations of affinity, since the characters thought by one to constitute a distinction of species, are by another looked upon as mere modifications of form." (Charlesworth in *London and Edinburgh Phil. Mag.* for 1837, p. 7.) — *Edit.*

Mr. W. Richardson, also, has described (*Mag. Nat. Hist.*, vol. i. p. 122. n. s.) the manner in which bones and shells are daily removed from the gravel and London clay of Kent, and deposited in the estuary of the Thames. Most geologists must have had opportunities of witnessing the same phenomenon. Among instances which have come under my own observation, may be mentioned the highly interesting, though little known, *sponge-bed* of Farringdon. This deposit, which has many analogies to the coralline crag, is supposed to be of the age of the green-sand. It is a thick bed of sand and fine gravel resting on hills of coral rag. It contains multitudes of beautiful sponges and other Zoóphyta; also various shells, especially Terebrátulæ, which are commonly empty, and exhibit the curious bony apparatus of the inside in a rare state of perfection. Along with these delicate and beautiful fossils are rolled fragments of Belemnites, and other remains, which, to all appearance, are derived from the subjacent coral rag.

I lately saw a remarkable instance of the same kind in the cabinet of M. Nicolet, at Chauxdefond, near Neufchatel. Most of the valleys in that part of Switzerland are partly filled with *molasse*, a Miocene deposit, containing O'streæ, Péctines, and various tertiary shells. Intermixed with these, occur numerous secondary fossils, such as Ammonites, Belemnites, Trigóniæ, Terebrátulæ, &c., derived from the surrounding hills, which correspond to the English series from the Oxford clay to the chalk inclusive.

Superficial gravel, or ancient alluvium, exhibits the same intermixture of fossils of widely different epochs. In the gravel of Worcestershire may be found corals from the Silurian rocks, plants from the coal, Gryphites from the lias, Terebrátulæ from the oolite, and Spatáangi from the chalk, mixed with bones of the rhinoceros and hippopotamus, and freshwater shells of existing species.

On a review of these facts, a person not conversant with geology might exclaim, "How vain, then, must be the attempt to class formations by their organic remains, and how gratuitous the assumption that the fossils of any stratum are contemporaneous with its deposition!" This, however, would be jumping too fast to a conclusion; and the following considerations will show that, though geologists should always be on their guard against errors arising from the intermixture of fossils of different ages in the same stratum, yet the possibility of these errors is so rare, as not to affect the general deductions of geology.

In the first place, an aqueous action of considerable vio-

lence is necessary to remove fossils from one formation, and to deposit them in another. Hence, all fine-grained deposits are beyond the limits of the above error, and they form the largest portion of the whole stratified series. No one can doubt that the fossils of the carboniferous limestone, the lias, the chalk, and the London clay are contemporary with the deposition of these strata respectively; for a current sufficiently strong to bring these fossils from a distance would not have allowed the fine-grained matter which now envelopes them to be deposited.

Moreover, the fossils of an older formation can hardly become enveloped in a newer one, unless the two deposits are unconformable. The older deposit must be raised up, so as to form sea cliffs and projecting rocks, before its destruction can take place; for we can scarcely suppose that the sea ever denudes its own bed to such a depth as to lay bare and extract the fossils of a preceding and extinct creation. Hence, when we have a long series of conformable deposits, as in the Silurian or oolitic rocks of England, there can be no doubt that the various groups of fossils are contemporary with the beds which they characterise, even though the sandy or gravelly structure of some of these beds may indicate the flow of submarine currents. I am not aware whether the red crag can be shown to be unconformable to the coralline crag; but, if it cannot, I should be inclined to think that all the tertiary fossils found in the red crag are contemporaneous with its deposition.

Again, in the cases where an admixture of fossils of different ages has unquestionably taken place, there can rarely be any difficulty in distinguishing the genuine ones from the erratic.* To take the examples above cited in the Farringdon *sponge-bed*, the Belemnites, which I suppose to be derived from the coral rag, are all worn and broken, while the sponges and Terebratulæ indigenous to the spot are in the most delicate state of preservation. Again, the secondary fossils found by

* "It may be said that these older shells, entering into new deposits, carry with them evidence of the stratum from which they have been derived, or that, at all events, their worn appearance would distinguish them from the more recent Mollusca with which they are associated. This is so far from being the case, that considerably finer and more perfect specimens of the *Voluta Lamberti* can be picked up from the sea shore, where they have been dashed by the waves on a shingly beach, than can ever be obtained from the beds of the crag formation itself. In fact, this gradual process of degradation appears to be of all others the most favourable for detaching organic remains from the matrix in which they are embedded." (*Charlesworth* in Proceedings of the British Association for the Advancement of Science, *London's Mag. of Nat. Hist.*, vol. ix. p. 540.) — *Edit.*

M. Nicolet in the molasse, though very slightly worn, are easily distinguished by their solidity and petrified condition, independently of their zoological characters, from the tertiary shells which accompany them.* In the beds of ancient alluvial gravel there can be no difficulty: the secondary fossils there found are not only petrified and worn, but are commonly attached to portions of their original matrix; while the mammiferous bones and fresh-water shells are both uninjured and unaltered, except by the subtraction of part of their animal matter. There can, therefore, be no doubt that these bones and fresh-water shells are contemporary with the deposition of the beds of gravel.†

To the above arguments it might be added, that the removal of fossils from one stratum to another must always be a local and partial occurrence, and, therefore, that, when any species is found to characterise a given formation over a large area, we cannot err in regarding it as an inhabitant of the sea which deposited the stratum. There is, however, no occasion to enlarge on this topic; enough has been said to prove that the errors likely to arise from the removal of fossils from one stratum to another, though not to be lost sight of by geologists, are yet confined within very narrow limits.

* "This introduction of secondary shells in the tertiary beds of Norfolk and Suffolk has been detected solely by an attention to lithological characters; and the evidence derived from this source is no longer available, when there is reason to suspect an admixture of organic remains belonging exclusively to rocks of the supracretaceous series. The species which are common to the chalk and red crag are very few, when compared with those common to the red crag, and to the subjacent tertiary strata. In the latter case, however, we have no means of ascertaining whether those individual species which occur in separate formations existed throughout distinct periods, or, like the fossils of the chalk, were, by the natural process of degradation, removed from their original matrix, to be again entombed with the races of a more recent epoch. Unless this difficult problem be solved, it is clear that the application of the percentage test may be attended with the most fallacious results." (*Ibid.*, p. 541.) — *Edit.*

† Mr. W. Richardson concludes his interesting account of the mixture of bones from the gravel and shells from the London clay, with existing shells in the estuary of the Thames, with a speculation as to the geological appearances of that estuary, and the errors into which they might lead a future geologist. He says, "The sedimentary and tranquil character of the formation, consisting of alternating bands of sand and clay, and the total absence of extraneous materials, give assurance to his (the supposed geologist's) conclusions; and the synchronous existence of the organic contents is instanced with unhesitating confidence. He meets with no fact that can excite suspicion, or create distrust; the intrusive and extinct fossils are linked with the recent by the closest of all ties: they lie in peaceful juxtaposition, and upon undisturbed beds of oysters." This hypothetical statement is probably not quite accurate. If the formation was of a "sedimentary and tranquil character," the bones of large

ART. V. *Observations on the Existence of electric Currents in vegetable Structures.* By GOLDING BIRD, Esq., F.L.S. F.G.S., Lecturer on Experimental Philosophy at Guy's Hospital, &c.

PERHAPS there are few points connected with the history of vegetable physiology of which so little is really known, as that forming the subject of the present observations, which are offered less with the view of increasing our information upon this difficult and obscure matter, than of placing what is already known concerning it in a more generally useful form.

It has not been unfrequently stated, in botanical works, that certain vegetable productions evolve, at particular periods, so much free electricity as to give off sparks to any conducting body in their neighbourhood. It is a matter of extreme regret to the physiologist that these conditions have been described so vaguely; for, if they really exist, a knowledge of them would be of the highest interest and importance in physiology. I have not met with many authors who mention this supposed electric state of vegetables at all; and those who do advert to it scarcely devote more than a few lines to its consideration; and the individual *species* possessing this charge of free electricity are frequently not even mentioned. Thus, in a manual now before me (*Résumé complet de la Physique des Corps imponderables*, par MM. Babinet et C. Bailly, 1825), the following are the only observations made on this subject: — “Plusieurs végétaux donnent, dans certains momens, des étincelles électriques; c'est un cas tout particulier

Mammàlia could not be transported into it; or, if they could, gravel and extraneous materials would accompany them, and would “excite suspicion and create distrust.” Indeed, Mr. Richardson himself states that the interior of the bones fished up on the Whitstable oyster-beds is “still filled with the yellow loam and small flints of the gravel.” The *probable* appearances presented would be these: in the central and tranquil parts of the estuary, the geologist would find shells which are *now* existing in a perfect state; and mixed with these would be the “lighter and fragile portions” of the gravel, bones, and London clay shells. The broken condition of the latter would excite his suspicions, which would be confirmed as he approached the margin of the estuary. He would there find a shingle beach of various erratic pebbles, and containing entire those bones and shells of which he had before found only small fragments. They would, however, be in general more or less rolled, and easily distinguishable from the Mammàlia or Mollúsea which were living in A. D. 1837. Rolled masses of London clay would probably occur; and the shells derived from that formation would often contain portions of it in their interior, different from the more recent matrix in which they were now embedded. All these circumstances would soon lead a geologist to a true conclusion, even if no cliffs of London clay and gravel remained to prove that those formations were anterior and unconformable to the one under investigation.

de rupture d'équilibre des fluides : on observe surtout ces phénomènes dans la *capucine* et dans le *fraxinelle*." (p. 73.)

Capucine, it appears, is the French name of the common garden nasturtium (*Tropæolum majus* Lin.), of the electrical properties of which I must confess my entire ignorance. The *fraxinelle*, or *Dictamnus albus*, is stated, by other authors besides those above referred to, to evolve free electricity. I am not acquainted with any facts in support of this opinion, or with any experiments which appear to countenance it; although I think that the following observation of Professor Lestiboudois will assist in throwing some light on this supposed property of the *Dictamnus*, and serve, in some manner, to explain the circumstance to which the opinion of its electric properties is indebted for its origin: — "Dans les temps chauds, la fleur (de la *fraxinelle*) répand une *vapeur inflammable* en si grande abondance, que si on en approche le soir une bougie allumée, il paroît une *flamme qui ne l'endommage point*." (*Botanog. Belgique*, t. ii. p. 140.)

To turn from this vague and unsatisfactory part of my subject to one far more interesting, I would refer to some experiments of an exceedingly talented philosopher, Dr. Donné, who has devoted some time to the detection of electric currents in organic tissues, and has succeeded in demonstrating their existence in both animal and vegetable structures. These currents are exceedingly feeble, and, of course, of very low tension, as must necessarily be the case; for, if of considerable intensity, it is evident that they could not be insulated by organic tissues, especially when moistened by their proper juices; but would escape, as soon as formed, to the earth, through the stem, which is always a sufficiently good conductor for this purpose. This circumstance, I may observe, *en passant*, militates most strongly against the probability of living vegetable tissues ever (unless by artificial means) becoming so charged with electric matter as to afford a spark, as stated by Rabinet and Bailly.

M. Donné inserted two pieces of platinum wire, connected with a very delicate galvanometer, into different kinds of fruits, one wire being always inserted near the apex, and the other near the base, of the fruit: a deviation of the magnetic needle always ensued, in different degrees, according to the kind of fruit; sometimes even extending to 30°. In apples and pears, the current of electricity appeared to be directed from the base to the apex of the fruit; whilst in peaches, apricots, and plums, the current assumed an inverse direction. No current whatever could be detected when the platinum wires were plunged into the fruit at equal distance from the

centre, on a plane at right angles to the axis of the fruit. To determine how far these currents of electricity were owing to the different structures of the fruit, or to a difference in composition of the sap or proper juices in different parts, M. Donné divided a plum transversely into two different portions, and expressed the juice from each into two glasses, connected only by a slip of moistened bibulous paper; then, on immersing the wires of the galvanometer into the two glasses, the magnetic needle immediately deviated in the same manner as if they had been inserted into the entire fruit; proving that the electric current was owing to a difference in chemical composition between the juice from the apex and base of the same fruit. Thus, in the case of the plum, the juice from its upper half (apex) acted on the galvanometer like an alkali, and that from its lower half, or base, like an acid. These experiments demonstrate most satisfactorily the existence of electric currents in some kinds of vegetable tissue, although they fail to show how far these currents depend upon the vital action of the vegetable structure. The researches of M. Pouillet* serve, however, to throw some light on this part of our subject. This philosopher took twelve capsules of glass, 8 in. or 10 in. in diameter, carefully varnished with gum-lac, and placed them on a table also covered with the same resin; he then filled them with vegetable mould; and, having connected each of them by metallic wires, he planted in each some seeds (as of wheat, lucerne, wallflower, garden cress, &c.), and then connected one of the capsules with the upper plate of a condenser, the lower being connected with the earth; insulation being preserved, as carefully as possible, by keeping the air of the room free from moisture (by exposing in the apartment large quantities of quicklime). In the course of two days, the seeds swelled, and the infant plants extended about a line beyond the envelopes of the seed; but no electricity could be detected by the aid of the condenser. When the plumules had fairly extended into the atmosphere, and completely cleared the earth which had covered them, electricity was readily detected; for, on separating the plates of the condenser, the gold leaves of an electrometer, with which it was in communication, diverged to a considerable extent. This electricity was constantly negative; from which circumstance M. Pouillet supposed, with great probability, that, during the action of the oxygen of the atmosphere upon the cotyledons of the embryo, the gas disengaged carries off the positive electricity,

* *Annales de Chimie et de Physique*, tom. 35. p. 414.

and leaves the infant plant in a negatively electric state. I am aware that an objection may be, and I believe has been, raised against the deductions from M. Pouillet's experiments, as to the origin of the electricity detected by the electrometer, on the ground, that the mere evaporation of the moisture contained in the vegetable mould employed, would be sufficient to elicit free electricity. This objection, however, I regard as very slight; for not only is the evolution of electricity much more considerable than evaporation of moisture would account for, but it *does not appear until the plantule has extended into the atmosphere*; although it is evident that evaporation of moisture must have commenced from the first instant of placing the mould in the capsules.

Let us now attempt the investigation of the probable origin of these electric currents developed during germination; for I am unwilling to consider *their* origin, or, indeed, that of any other of the varied phenomena occurring in organised tissues, as a purely vital effect, so long as any probable physical explanation can be applied. Whenever electric currents are set in motion, we have good reason to suppose, in most, if not in every case, the previous or simultaneous occurrence of chemical action; for the elaborate researches of Dr. Faraday and M. de la Rive have been more than sufficient to demonstrate that electric currents and chemical action bear to each other the relation of cause and effect; and, therefore, that an acid cannot combine with a base, a simple body with oxygen, a new compound be formed, or one already formed decomposed; without electrical action coming into play. It is scarcely necessary to state, that most important chemical changes are constantly occurring in a vegetable, from the first instant of germination to the last moment of organic existence; the least of which changes are fully competent to the production of a considerable *quantity* of electricity of low *intensity*. To follow out the enquiry with some minuteness, let us, for an instant, glance at the physiology of a true seed. This we find destined to perpetuate the vegetable species, containing that vital germ which requires but heat, light, and moisture for its developement. This germ, or embryo, at the first instant of germination, possesses a degree of vitality far too feeble to elaborate food for itself from the crude materials: it may, indeed, be compared to an animal during its foetal existence, but wanting that maternal connexion by which nourishment may be conveyed to it. And here we observe a most beautiful provision of nature for the supply of fit food to the infant plant. A reservoir of amylaceous matter, or starch, is laid up, either in the cotyledons of the embryo,

or in an organ constituted for the purpose, to which the term *albumen** is generally applied; not from its containing albuminous matter (chemically speaking), but from its performing for the vegetable embryo an office analogous to that supposed to be performed by the *albumen*, or *white*, to the chick in the egg; viz. that of affording a supply of nourishment, until its vital powers are sufficiently developed to enable it to seek food for itself.

The existence of this reservoir of starch may be very elegantly shown by dividing longitudinally a seed of any of the grasses (of wheat, for example), and dipping it into an aqueous solution of iodine; when it will be found that the albumen will assume a fine blue colour, from the action of the iodine on the starch it contains; whilst the embryo will be merely tinged yellow; showing, in a very satisfactory manner, the division of the seed into embryo and albumen. If, on the other hand, we examine in a similar manner an exalbuminous seed, as that of the horsechestnut (*Æsculus Hippocástanum*), or of the garden bean (*Phascolus vulgàris*), nearly the whole of the divided surfaces will assume a blue tint, in consequence of the cotyledons of the embryo containing the reservoir of starch, in the absence of a distinct and separate organ for the purpose. Amylaceous matter is well known to be not only an organic, but an organised, substance, consisting of an investing membrane or sac, including a transparent matter soluble in water. In this state, it would be capable of affording but little nourishment to the expanding embryo; but, in consequence of its being readily convertible into sugar (a soluble and nutritious substance), it is peculiarly fitted for the purpose. This change of starch into sugar is capable of taking place apparently independently of any vital action exerted by the embryo; for, under the influence of that degree of heat and moisture required for the developement of the latter (aided, I believe, by the chemical composition of the tissue containing it), we find the vesicles of starch burst, and the substance previously contained in the ruptured sacs becomes rapidly converted into saccharine matter; thus presenting a supply of nourishment under a form readily capable of being absorbed and elaborated by the yet delicate organisation of the infant plant.

Let us see how far these physiological considerations will enable us to explain the developement of electricity during germination, in the interesting experiments of M. Pouillet. First, then, we find starch disappear, and be replaced by sugar; this change being accompanied by an evolution of carbonic

* Perisperm of many authors: surely a more appropriate term than albumen.

acid gas, as well as the formation of free acetic acid ; which may be readily proved, by allowing seeds to germinate in moistened protoxide of lead. The acid developed combines with the oxide, forming acetate of lead, which, by digestion in water, may be dissolved and crystallised ; the crystals thus obtained evolving a pungent odour of acetic acid on the addition of a little sulphuric acid. In consequence of this formation of acetic acid, litmus paper, on which seeds are allowed to germinate, becomes red ; a fact shown to hold good with many kinds of seeds by Becquerel, to whom we are indebted for an extensive series of observations on this subject, of such physiological interest, that I need scarcely offer an apology for transcribing a tabular view of the results obtained by allowing different seeds to germinate on moistened blue litmus paper.*

Natural Order.	Species of Plant.	Action of the germinating Seeds on Litmus Paper.
Graminææ	Wheat -	{ Assumes a red tint in an hour, becoming very distinct in 12 hours. Effect distinct, but less decided. Effect intermediate between that of wheat and rye. Effect similar to that of rye.
	Rye -	
	Barley -	
	Oats -	
Leguminosæ	Ervum Léns	{ Did not tint the litmus paper red until after an interval of 90 hours. The litmus paper became red almost immediately.
	Peas -	
	Beans -	
	Sweet pea -	
	Clover -	
Cruciferae	Lucerne -	{ The litmus paper became red very quickly, and in 12 hours the development of acid was very decided.
	Sinapis álba	
	Sinapis nigra	
	Garden cress	
	Turnip -	
Cichorææ	Cabbage -	{ Production of the red tint very decided.
	Wallflower	
Umbelliferae	Lettuce -	{ A feeble evolution of acid in about 24 hours.
	Carrot -	
	Parsley -	
Pinææ	Two species of Pinus -	Very intense action on the litmus.
Cucurbitææ	Melon -	Distinct reddening.
Linææ	Linsced -	Distinct reddening.
Liliææ	Leek -	{ No action on litmus until after a lapse of 4 days, when reddening commenced.
	Onion -	

Having thus learned that, during germination, the supply of starch in the albumen or cotyledons is replaced by sugar, and crabonic and acetic acids, let us endeavour to ascertain how

* *Traité de l'E'lectricité et du Magnétisme*, tom. iv. p. 186.

far chemistry will enable us to understand the rationale of these changes, and account for the developement of electricity. According to the analysis of Berzelius, the atomic constitution of starch and sugar (hydrate or crystallised) is as follows:—

Carbon, 7 atoms in starch, 12 atoms in sugar.

Oxygen, 6 — 11 —

Hydrogen, 13 — 23 —

If, then, we suppose, that 8 atoms of starch undergo decomposition during germination, it will be found that their ultimate elements will be sufficient, under a fresh arrangement, to form 4 atoms of sugar (hydrated), 1 atom of acetic acid, and leave such a residue of oxygen, hydrogen, and carbon as to require the absorption of 10 atoms of oxygen from the atmosphere to form 4 atoms of carbonic acid, and 3 atoms of water. Thus, the 8 atoms of starch become converted into

4 atoms of (hydrated) sugar,

1 atom of acetic acid,

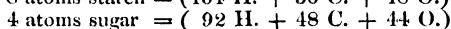
4 atoms of carbonic acid, and

3 atoms of water.*

It would be little short of excessive presumption, in the present state of physiological and chemical science, to assert that the above changes are really those which *always, and only*, take place: I merely venture the above remarks because they are consistent with every thing we are yet acquainted with on the obscure process of germination, and serving, in the absence of a better explanation, to account for the developement of electricity during the growth of the embryo.

In limiting myself to the changes peculiar to the starch during germination, I have, of course, noticed but one of the vast series of chemical changes proper to vegetable existence: still they are more than sufficient to account for the supply of electricity in the interesting experiments of M. Pouillet; for, if we take as an instance but one of the changes already alluded to, common to the infant and adult plant (*viz.* the formation and decomposition of carbonic acid), we shall find that the

* This reasoning will be rendered more evident to the chemical student by the aid of the following formulæ:—



Then, $(104 \text{ H.}, 56 \text{ C.}, 48 \text{ O.}) - (92 \text{ H.}, 48 \text{ C.}, 44 \text{ O.}) = (12 \text{ H.}, 8 \text{ C.}, 4 \text{ O.})$, which represents the composition of acetic acid $(6 \text{ H.}, 4 \text{ C.}, 1 \text{ O.}) + (6 \text{ H.}, 4 \text{ C.}, 1 \text{ O.})$, which requires the addition of (10 O.) to be entirely converted into 4 atoms of carbonic acid and 3 atoms of water, or $4 (\text{C.} + 2 \text{ O.}) + 3 (\text{O.} + 2 \text{ H.})$

N. B. In the above formulæ, it will be observed that I have followed Berzelius in the composition of water, and taken the double atom of hydrogen as unity.—G. B.

oxygen, at the instant of its combination with carbon, sets free positive, and the latter negative, electricity, thus developing an electric current in a certain direction : but this is not all ; for, whilst exposed to the influence of solar light, healthy and adult plants decompose the carbonic acid that has, by any means, accumulated in their tissues ; retaining the carbon, and evolving the oxygen ; giving rise to an electric current in a direction contrary to that set in motion during the *formation* of carbonic acid. From a consideration of these circumstances, it is fair to presume that, in healthy adult plants, electric currents are constantly occurring in different parts of their tissues ; their direction being altered by the absence or presence of light, according as carbonic acid is formed or decomposed ; changes which Saussure has long ago shown to depend upon the presence or absence of the solar rays.

(*To be continued.*)

ART. VI. *On the Enlargement of the Eggs of some marine Molluscs during the Period of their Hatching.* By JOHN EDWARD GRAY, Esq., F.R.S., President of the Botanical Society.

A SHORT time ago, in a discussion on the parasitic or non-parasitic nature of the cephalopode, usually found in the argonaut shells, I stated, as a reason for believing this animal to be a parasite, that the shell which it inhabits, when just hatched (as is proved by the size of the nucleus on the apex of young specimens), must have been larger than could be expected to come from the eggs which are found on the upper part of the cavity of the shell containing the *Océthoe*.

In this argument I had premised that the egg of all the molluscs, like the snails and other free-air-breathing molluscs, did not enlarge their shell after being laid. Having, however, from some observations which I have been able to make on the egg of *Buccinum undatum*, found that this is not the case with all the marine gasteropodes, I hasten to correct my former theory, which, curiously enough, has not been objected to by any of the persons who have differed from me in opinion, though some of them have endeavoured to depreciate the value of the observations, by attempting to prove that the real nucleus was merely a small point on the apex of what I considered as that part.

The eggs of *Buccinum undatum* are (like the eggs of all the zoophagous ptenobranchous gasteropodes that I know) included in coriaceous cases, which, in this species and the allied *Fusus despectus*, are oblong, and cemented toge-

ther into a large oblong or rounder mass, very commonly thrown on the coast, and known by the name of *oyster spat*, *sea roses*, *wash walls*, and several other similar designations. These cases, which do not change their form or size after they have once been deposited, have been considered as corals by Esper and others, though these authors figure the shell which is contained on the side of them. When first deposited, they are rather soft, and contain a cream-like glairy fluid; but they shortly harden, and are, at length, filled with very numerous small, yellow, roundish eggs (a hundred or more), from one seventh to one ninth of a line in diameter, which are enclosed in a transparent membranaceous skin, and, under the microscope, appear to be composed of a number of unequal-sized transparent particles, from the 300th to the 100th part of a line in diameter.

In progress of time, a few of these eggs enlarge, and appear to prevent the developement of the others; so that only four or five, on an average, come to perfection in each case. When first hatched, the animals are covered with a rather irregular shell, about one line in diameter, some being rather smaller, with acute tips, and others larger and blunt-topped; so that these eggs must have increased, during the time they were enclosed in the egg-cases (supposing that they only enlarged sufficiently to contain the shells alone), from seven to nine times the diameter they were when first deposited.

Applying these observations to the egg of *Ocýthoe*, or the animal usually found in the argonaut shells, which I proved, on examination, to be about half a line in diameter (the egg of *O. Cránchii* being rather larger than those of the Mediterranean species), supposing them to enlarge in the same proportion as those of *Buccinum undatum*, the nucleus should be about four or five lines across, which is about the average size; so that, if there were not other reasons, which I consider unanswerable, such as the form of the body, the non-adaptation or adhesion of the body to the shell, &c., the size of the nucleus would not offer any difficulty with respect to the *Ocýthoe* being the maker of the shell which it inhabits.

ART. VII. *On Generic Nomenclature.* By W. E. SHUCKARD, Esq., V.P.E.S., Librarian to the Royal Society.

IN a paper on generic nomenclature, published by Mr. Westwood in the last Number of this Magazine (p. 167.), being the continuation of a paper on the same subject in Vol.

IX. p. 561. of the former series, he takes occasion to cavil at my reprehension of his inaccuracy in the latter paper, in the observations I made upon the genus *Pemphredon*, contained in my *Essay on the Fossorial Hymenoptera*. He says I take a partial view of the case, and that I charge him with inaccuracies which I omit to point out. This would be very invidious conduct, could they not be pointed out; and would imply a wish on my part to undermine, insidiously, a fair scientific reputation. Those who know me will, I feel convinced, fully acquit me of this charge; but, as the paper may be read by many who do not know me, I owe it to myself to reply, and to show that I have asserted nothing more than the truth, nothing less than the truth, and only the truth. To prove this, as my work may not be in the hands of your readers, I will just repeat what I did say.

“*PEMPHREDON*.—This genus was established by Latreille, in his ‘*Précis*,’ without naming any type; but it may be presumed to have been a male of a species of the present genus *Diodontus*, from his description of the mandibles. In his next work, the ‘*Histoire*,’ vol. xiii. p. 325., in naming the genus *Pemphredon*, he does not describe the mandibles, but refers to the *Crabro lugubris* Fab., *Sphex unicolor* Panz., as the ‘best determined species of this genus.’ In his ‘*Genera*’ (which ought to be considered his final view, for, in his last work, the ‘*Règne Animal*’ of Cuvier, vols. iv. and v., he constantly refers to it), he describes the genus *Pemphredon* as having spoon-shaped and quadridentate mandibles, and adduces the *P. lugubris* of his ‘*Histoire*’ as the type; and refers the *P. minutus* (which he there, for the first time, states to have been the original type of his genus *Pemphredon* in the ‘*Précis*’) to the genus *Stigmus* of Jurine, and makes it the first section of this genus. In the ‘*Nouv. Dict. d’Hist. Nat.*,’ t. xv. p. 151., 1817, he further confirms this, by stating that the mandibles of *Pemphredon* ‘are stronger (in comparison with *Stigmus*), and dentate all along their inner edge.’ Thus, therefore, although the original type of this genus was the *Pemphredon* (*Diodontus*) *minutus* F., yet, as Latreille subsequently changed his views, I necessarily follow the course he has adopted, and consider the *Crabro lugubris* F. as the true type of the genus *Pemphredon*. I have given this history of the genus in consequence of Mr. Westwood having, by a string of inaccuracies, in a recent periodical (*Loudon’s Mag. Nat. Hist.*, No. 67. vol. ix. p. 565.), introduced confusion where the course was exceedingly clear, and this is the more unfortunate, as they are produced as an example in a paper on nomenclature, where the strictest correctness was requisite,

and even additionally requisite, if such a condition be possible where accuracy is always indispensable, because he there corrects what he considers the inaccuracy of Mr. Curtis, but who is certainly right." (*Essay on Fossorial Hymenop.*, p. 193, 194.)

This is what I said; and, in justification, I will proceed in the following order.

1. I will exhibit the apparent principle upon which Mr. Westwood has acted.

2. I will endeavour to discover how far my statement is a partial one.

3. I will prove Mr. Westwood's inaccuracies.

And then, lastly, I will conclude; as I presume by that time the reader will be tired of me, Mr. Westwood, and the whole affair.

Firstly, then, as to the apparent principle which Mr. Westwood advocates, which, as far as I can gather from the course he has taken, seems to be that "the first name applied to a genus or subgenus should be invariably retained;" and that the author himself of the genus or subgenus should not be allowed, "without good reasons," to infringe this law. This, I admit, is an admirable maxim, and I agree that it is important that it should be universally adopted: but, as a corollary to it, I would suggest that it is equally important that it be a fixed principle; and the indispensable condition to the establishment of a genus, that the type be at the same time exhibited, which would insure justice being done to the original describer, by the necessity for retaining his generic name to the type, whatsoever might subsequently become of its congeners, upon the occurrence of new views, or the introduction of new creatures.

It is trite to advert to the vast accessions that have been made to all branches of natural history since the days of Linnæus, who must certainly be considered as the first promulgator of the modern mode of treating the science scientifically; even without doing injustice to the memory of our immortal Ray.

The necessary consequence of these immense additions and new discoveries is, that the genera established by Linnæus have become either such vast receptacles as to be useless, or comparatively so, to the promotion of the object for which they were designed, or inadequate to the characteristic of the creatures introduced. To meet this difficulty, Fabricius, who succeeded Linnæus in the entomological subdivision of natural history, constructed new genera; and, in doing so, he wished to supersede what he could not improve upon in principle, and he introduced new characters; but new only in

their application to the objects, for the theory he still borrowed from his great predecessor. Yet much merit must be ascribed to this, it being the germ of the recent, and certainly much profounder and more philosophical, views that have gradually developed themselves in the treatment of entomology. These few observations, however, are almost foreign to the subject in hand; I have merely introduced them for the purpose of remarking that, as a matter of convenience, it would, perhaps, have been desirable that modern entomologists should not have gone further back than Linnæus for generic nomenclature: this would have obviated the confusion that has occurred. If this had been adopted as a rule always, and if, at the same time, the first Linnæan species had been taken as the type, one rule would have been universal, and different countries would not have had the privilege of exercising a capricious discretion, whence has arisen the variety of generic names which Mr. Westwood shows is applied in different countries to the same insect.

In advocating this principle, and in the wish to see justice done to the merits of Linnæus, I am compelled to remark upon the gross neglect it seems to have become a fashion to treat him with. Why, for instance, are some of his generic names retained, and others not? Why have we *Cicindëla*, *Cárabus*, *Cerámbyx*, &c., and not *Curcùlio*, *Buprèstis*, *E'later*, &c.? With what audacious impunity are not more recent names constantly substituted for his trivial ones! Really, this wants looking to, and ought not to be tolerated. If Mr. Westwood would undertake this, he would earn infinitely more fame than he can expect to achieve in the sorry affair of *Dineðrus versus Cemònus*; which brings me immediately to the next subject under consideration, viz.,

Secondly, that I must endeavour to discover how far my statement is a partial one. By referring to the commencement of these remarks, it will be seen that, in my *Essay on the Fossorial Hymenoptera*, I gave all there that was absolutely necessary to the matter then in hand; namely, a chronological account of Latreille's treatment of the genus *Pemphrèdon*. All that I had suppressed in the statement was the notice that Latreille had, in the interval between the *Précis* (1796) and vol. xiii. of the *Histoire* (1805), given a description of the genus *Pemphrèdon* in vol. iii. of the same *Histoire* (1802); and there also instanced the *Cràbro lugubris Fab.* as the type of that genus. I cannot here, by any endeavour, perceive how I have given a partial account, which would imply unjust dealing towards Mr. Westwood. The above voluntary, and, as it appeared to me at the time, unimportant omission, was,

perhaps, an important link in my chain of evidence, as he there first distinctly named the type; and it prejudiced my argument, instead of Mr. Westwood's; and, therefore, he was not justified in calling it a partial view of the case. After noticing this omission, he says, "he does not attempt to invalidate my principle;" viz. that an author has no right to change a name he has once given, "without good reasons." Certainly not. I support it as a good and a sound principle, as I have shown above, and that it ought to be strictly adhered to; but, where such capricious changes are made, they ought to be reprehended at the time, and not after a lapse of years, when such reforming Quixotism would introduce more confusion, by proceeding to correct delinquencies that are already grey, than it should be its earnest endeavour to prevent. Entomological law should, like the statute law, have a period beyond which it can take no cognisance, or, I fear, we shall not know where we are. Why did not Mr. Westwood correct St. Fargeau and Serville in the instance adduced by him of the *Musca pipiens* (*Xylôta* of Meigen)? Is not the establishment of a generic name in the *Diptera* upon such easy conditions as sure a guarantee of immortality, as may be compassed by thrusting Mr. Curtis on one side in the *Hymenoptera*, pushing Latreille into his place, justling Jurine into the situation of Latreille, and then very demurely getting into Jurine's warm seat? There are many reforms he can introduce upon this principle; but he cannot always substitute his own names; although, in some instances, he may. In the present, he is certainly at fault: yet, whether his name must not stand in lieu of Jurine's, is, perhaps, a question of courtesy, rather than of right; but, even if so, it was, I think, my privilege to name it, as I had laboriously worked out the entire group; and he should have had the civility to allow me to do so, instead of interpolating his *Dineurus*. I will just examine how this stands, and then proceed with *Pemphrèdon*, in which I still dispute the question with him, and shall show that he is wrong as to the original type, Latreille's citation in the *Genera* having misled him.

With regard to *Cemônus*, I will copy verbatim what I have said upon it in my *Essay on the Fossorial Hymenoptera*, that Mr. Westwood may not captiously take an objection, by presuming that I beg the question by endeavouring to prejudice the reader. It thus runs:—

"This genus was formed by Jurine for the insects which Latreille had previously named *Pemphrèdon*, and which he (Jurine) divided into two families: it consequently fell into a synonyme of that genus, as they stood prior to my separa-

tion of them, as his division was not admitted by subsequent writers. I therefore think it but just to Jurine to re-establish his genus by the type he intended for it; although, by some accident, he figured the *Pemphrèdon lugubris* F. by that name. This genus, consequently, consists of his second family; as I consider that the strictest rules of generic nomenclature admit of my using his name for that division which does not furnish a type for a previously established genus." (p. 199.)

As Jurine had unknowingly given a different name to insects already named by Latreille, yet, as he divided them into two families, and, consequently, the genus contained two types (for, by his system of classification, his second family was as fully of generic value as the first); and, as he made a mistake evidently in the figure (for he intended to figure the *Cemònus unicolor*); I thought it but justice to him to retain his name for the second family. Perhaps, strictly, his name ought to be considered as merely the synonyme of the first family: if so, Mr. Westwood's *Dineùrus* must stand. But should not modesty have prescribed a little latitude? Yet I am not quite sure that I was not right in the first instance; and I therefore invite the opinion of competent judges. In adopting Jurine's name of *Cemònus* for his second family, I certainly did not commit so great an error (if it be one at all, and which I consciously did, for the sake of retaining Jurine's name) as that which Mr. Westwood ascribes to Dr. Leach; namely, by applying the synonyme to another insect in the already named family; for Latreille evidently did not know Jurine's second family, but was fully acquainted with the first.

As to *Pemphrèdon*, Mr. Westwood says, in his philippic against me, at p. 171. of the present volume of this work, that his history of the genus was confined to ascertaining its original type, and that my history corroborates his. This I deny; and I shall show that it does not, when I come to the summary of his inaccuracies. But there still exists the question, whether Latreille had not a right subsequently to fix definitely his type, upon making *all* the characters conform; especially as I shall show that the previous characters, conjunctively, suited neither the presumed nor the adduced type; and this has evidently been conceded by those who have since written upon the subject; namely, by St. Fargeau, Van der Linden, Mr. Curtis, and myself; and has, besides, a possession of nearly thirty years to substantiate it, even if it had been wrong. But Mr. Westwood's attack upon me has induced me to reexamine the subject; and I am prepared now to say, upon the internal evidence afforded by a critical investi-

gation of the characters in every one of Latreille's descriptions, that Mr. Westwood has not found the original type (which never could have been an arduous task with his views; as, by his own admission, Latreille's own act had pointed it out to him in his *Genera*); as it most certainly is not the *Cràbro minùtus* of Fabricius, notwithstanding Latreille's presumed assertion, by placing the genus *Pemphrèdon* of his *Précis* as a synonyme to the first section of *Stígmus* in his *Genera*. In the first place, because I doubt whether the *Cràbro minùtus* of Fabricius be not the *Psén atràtus*, proved by Fabricius's own reference to Panzer's figure of *Sphéx pállipes Faun. Germ.*, 52. 22.: see *Picz.*, 316. 9. But, if this objection be overruled, and it be allowed to be what has since passed as the *Pemphrèdon minùtus* (namely, as the *Diodóntus minùtus* of Curtis), I contend that this insect never furnished Latreille with characters for any of his descriptions of the genus *Pemphrèdon*. I will take these descriptions consecutively in order of time; and, to save room, I will cite only what bears upon the point; and the reader may be assured that I will suppress nothing that will at all support Mr. Westwood's position.

In the first work (viz. the *Précis*, published in 1796), Latreille says, the mandibles are "grandes, arquées, bidentées." This character, I admit, does not exactly conform to the *Cràbro lùgubris F.*, which has quinquedentate mandibles; but it as certainly will not agree, except in being bidentate, with the mandibles of the *Cràbro minùtus F.*, which are small and slender. Besides I have occasionally met with individuals of the *Pemphrèdon lùgubris* in which the mandibles were worn, as is frequently the case in wood-boring insects; yet, I admit, neversomuch as would render them merely bidentate, although such an individual may have fallen into the hands of Latreille. But the other characters will not in any way agree with the *Cràbro minùtus*; for Latreille says, in continuation, "Tête grosse, paroissant cubique vue en dessus. Abdomen ellipsoïde, pétiolé." This suits only the *Pemphrèdon lùgubris*, and cannot, by any interpretation, be made to fit the *Cràbro minùtus*; for in the latter the head is distinctly transverse; and the abdomen, what is technically called subsessile.

In his next work, the *Histoire*, tom. iii. an. x. (1802), the characters are almost a repetition: "Mandibules unidentées au côté interne. Tête très-grosse, paroissant carrée vue en dessus. Abdomen ovale, brusquement et distinctement pédonculé." To which I apply the same observation as above; and, in confirmation of my opinion, he also there adduces, for the first time, the *Cràbro lùgubris F.* as the type.

In tom. xiii. of the same *Histoire*, 1805, p. 325., he does not

describe the mandibles or the head in the generic character; but he says, "L'abdomen tient au corselet par un petit filet cylindrique, et formé brusquement. L'espèce la mieux déterminée de ce genre est le *Crabro lugubris* de Fabricius." Thus further confirming my view, that the *Crabro lugubris* *P.* ever was, and is, and must remain, the type of the genus *Pemphredon*.

In his next work (his *Genera*, at tom. iv. p. 83., 1809), he perfectly describes the mandibles and the wings of the *C. lugubris*, and refers, amongst the synonymes, to all the figures of it, and to his own *Histoire*, tom. xiii. p. 325.; and this same view he takes in all his subsequent works, which, to save time, as sufficient is already proved, and he never subsequently changed his opinions, I need not cite. It is therefore evident that Latreille had misled Mr. Westwood, by inadvertently placing "*Genre Pemphredon* Latr., *Précis des Carac. Génér. des Insectes*, p. 128.," as a synonyme to his first section of *Stigmus*, under his citation of the *Pemphredon minutus* of Fabricius; and that Latreille made a blunder here, is shown by his also referring to the *Psén pallipes* of Panzer, which is a petiolated insect. I may therefore assume that I have thus fully proved that the *Crabro lugubris* of Fabricius was always the type of the genus *Pemphredon* of Latreille.

This brings me, thirdly, to the next topic for consideration; namely, to the proof of Mr. Westwood's inaccuracies. He boldly challenges me to do so; for he says I have "omitted to point out a single inaccuracy;" and, in a note, he says, he "has sought for these inaccuracies in vain." I will therefore proceed to show where and how they exist, as I owe it to my own veracity; and his words would insinuate that I had made a general charge without being able to substantiate it. But I will proceed rapidly, not only because I fear the reader's patience is exhausted, but also because the task itself is disagreeable, for I yield solely to the imperative necessity.

The first inaccuracy, and which he admits, is the "troubled synonyme of the *Psén pallipes*." The second inaccuracy is, in citing Latreille's *Genera* before his *Histoire*, which preceded it, in order of time, by several years; and this is so far important, that, in two distinct places, and in two different volumes, of this *Histoire*, Latreille expressly states the type of *Pemphredon* to be the *Crabro lugubris* of Fabricius. The third inaccuracy is, where he states that Latreille says, in his *Histoire*, tom. iii., that the mandibles of *Pemphredon* are unidentate; whereas Latreille distinctly says, "Mandibules unidentées au côté interne:" and this is an important difference, as it makes the mandibles bidentate, instead of unidentate. The fourth inaccuracy is one of omission, in not noticing what Latreille

says in tom. xiii. of his *Histoire*. The fifth inaccuracy is, in citing Fabricius's characters of the genus, when it is self-evident, from the insects he made congeneric, that he knew nothing at all about it. Fabricius is certainly a bad authority for genera; and his only value is as a describer of species. The sixth inaccuracy is, where (at the end of the same paragraph in which all these errors occur, and which is only twelve lines long, consequently a very small space to contain so many *inaccuracies*!), in referring to the Pemphrèdon lùgubris, he says, "which has bidentate mandibles, and a long peduncle to the abdomen." This is a crowning error, for certainly no Pemphrèdon, even as the genus stood before Mr. Curtis and myself dismembered it, possessed the combined characters of "bidentate mandibles," and "a long peduncle to the abdomen." This, I hope, is sufficient to show that I have not unjustly charged Mr. Westwood with "a string of inaccuracies."

But it is time that I finish; and I will therefore merely advert to one remark, which especially struck me in perusing the papers; and I will then sum up.

Towards the end of his first paper, he asks the startling question, "How is it possible to form a name derived from *several* Greek words, and confine it *always* within the bounds of *three* syllables?" This is certainly a puzzler, and there is much originality in it; but it is plainly in behalf of his beloved *sesquipedalia*.*

But, to sum up, the argument concludes thus: — Latreille established the genus Pemphrèdon in 1796, without naming a type; in 1802, he repeats it, and names the type as Cràbro lùgubris of Fabricius, with which insect the combination of characters agrees, and only one apparently disagrees. He partly repeats this in 1805, and again names the same type. In 1809, he again describes the genus, and here all the characters entirely conform to the type; but, under a different genus, he refers to another insect, which is placed under this different genus, as having been the original type of his genus Pemphrèdon. But this assertion, by a critical investigation of the combination of characters, is shown to be erroneous; and that the insect he had, from 1802, considered as, and named as, the type, was so certainly; and, consequently, the genus Pemphrèdon must stand as follows, and not as Mr. Westwood has given it at p. 173. of this Volume.

* "Nomina generica sesquipedalia, enunciata difficilia vel nauseabunda, fugienda sunt." And again: "Pulchritudo artis brevitatem exposcit, nam quo simplicius, eo etiam et melius, et stultum est facere per plura, quod fieri potest per pauciora; Natura etiam ipsa compendiosissima est in omni sua actione." (*Linneus, Phil. Bot.*)

Genus PEMPHRE'DON Latr.

- Subgenus 1. *Diodóntus* Curt., type *Pemphrèdon tristis* V. D. L.
 2. *Passalæ'cus* Shk., type *Pemphrèdon insignis* V. D. L. *Diodóntus* Curt.
 3. *Ceratóphorus* Shk., type *Pemphrèdon mòrio* V. D. L.
 4. *Pemphrèdon* Latr., type *Cràbro lugubris* F.
 5. *Cemónus* Jur., (? *Dineùrus* Westw.) type *Cemónus unicolor* Jur.

ART. VIII. *Description of a new Genus of British parasitic Hymenopterous Insects.* By J. O. WESTWOOD, Esq., F.L.S., &c.

Of all the animal organs, none have so greatly perplexed physiologists as the antennæ of insects. If regarded as tactors, or feelers, the fact that, in many species, these organs are so minute as to be incapable of reaching beyond the mouth, opposes such opinion: if as organs of the sense of smelling, or of hearing, we find them, in many instances, encased in a hard and horny covering, which seems quite incapable of permitting the passage either of scent or sound; whilst, at the same time, the singular and almost endless varieties of form which these organs exhibit in the different species, and more especially the different manner in which they are often constructed in the opposite sexes of the same species (the males having them ornamented with branches, whorls of hair, &c.), seem to indicate the existence of some other use for these appendages, distinct from touch, smell, or hearing. This is not, however, the place to enter into this highly interesting question, my present object being to describe a new British hymenopterous insect, remarkable for the beautiful structure of its antennæ, at least in the males.

Antennæ having some of the joints furnished with long and slender cylindrical processes are termed *ramose*, or branched. This structure is confined almost exclusively to the males. It exists in some coleopterous species, but is by no means of common occurrence in that order. The tribes of predaceous beetles (*Cicindélidæ*, *Carábidæ*, and *Dytícidæ*), the lamellicorn beetles (*Scarabæus* Linn.), the clavicorn beetles (*Sílpha*, *Derméstes*, &c.), the black portion of the *Heterómera*, the weevils (*Curculio* Linn.), and the *Brachélytra*, or rove-beetles (*Staphylínus* Linn.), do not present any species having *ramose* antennæ: indeed, it is chiefly in insects of exposed habits, such as the *Elatéridæ*, *Cerambycidæ*, &c., that we find this structure most prevalent. No hemipterous nor homopterous insect is furnished with branched antennæ; neither can any of the *Orthóptera* be said to be thus

provided; the antennæ of some of the male Mántidæ being only bipectinated, which is also the case in the nocturnal division of the Lepidóptera. A very few Díptera are provided with ramose antennæ, as in the genus Ctenóphora. In the Hymenóptera this structure is rather more prevalent; but it is almost entirely confined to the stingless division (Terebrántia Latreille); although in the genus Psammothérma*, and in a beautiful species of Pompilus, which I have seen in the Royal Museum at Berlin, the antennæ are ramose, or, rather, flabellate. In Lophýrus, a genus of saw-flies, the males have a double series of branches, which is also the case in Pterygóphorus of Leach. But it is chiefly in the interesting family Chalcídidæ that we find the greatest number of species having ramose antennæ. The genus Chirócerus Latr., and some species of Thoracántha (both belonging to the subfamily Chalcídes), are thus distinguished, as well as Eùlophus Geoffroy; in which last-mentioned genus, and in Elásmus, the males have three long slender branches arising from the upper side of the middle joints of the antennæ. In my genus Dicladócerus two, and in Pentacládia five, branches are similarly emitted. These four genera belong to the subfamily Eulóphides. I have now to describe an insect having four branches, belonging to another division, or subfamily, in which (although various anomalous forms of antennæ have been described) no species has yet occurred with ramose or flabellate antennæ.

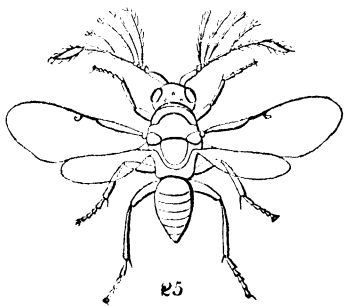
Genus, TETRACNĒMUS Westw. (*Tetraknēmos, qui quatuor habet radios.*)

Genus quasi intermedium inter Encyrtum et Eulophum. Corpus oblongum, minutum. Caput thorace paullo angustius. Ocelli distantes. Antennæ capite cum thorace longiores; 8-articulatæ: articulo 1mo, elongato; 2do, parvo, obconico; 3tio, 4to, et 5to, minimis, singulo ramum elongatum supra emittenti; 6to, longo, tenui, apice supra ramum emittenti; 7mo, paullo breviori; ultimo, magno, oblongo-ovato. Thorax ut in Encyrtis formatus, scutello magno subrotundato. Alæ anticæ nervo subcostali, cum costâ spatio parvo conjuncto, et ad apicem ramum parvum clavatum et curvatum emittente. Pedes sat longi atque graciles, intermedii ut in Encyrtis formati. Tarsi 5-articulati pulvillo magno. Abdomen parvum, ovatum, subdepressum; apice subacuminatum. Mas.

Species unica mihi adhuc cognita.

Tetracnēmus diversicórnis Westw.

— Caput nigro-æneum, vertice tenuissimè et transversè rugosum. Antennæ nigrae, pilosæ. Thorax æneus,



25

* There are two species of this beautiful genus in the Berlin Museum.

scabriculus; tegulæ piceæ. Abdomen nigricans. Pedes nigricantes, geniculis rufescentibus, tarsis piceis, calcaribus et articulo basali pedum intermediorum luteis. Long. corp. $\frac{1}{2}$ lin.; expans. alar. 1 lin. Habitat in quercetis apud Sylvam Coombe, die 3tio Julii, 1835, captus.

Obs. The very minute size of this insect (1-24th of an inch long), and its great rarity, have prevented me from examining the structure of its mouth, &c., so carefully as I could have wished.

ART. IX. *On the Reconciliation of certain apparent Discrepancies observable in the Mode in which the seasonal and progressive Changes of Colour are effected in the Fur of Mammals and Feathers of Birds; with various Observations on Moulting.* By EDWARD BLYTH, Esq.

ON reference to the description of the ermine weasel, in Mr. Bell's *History of British Quadrupeds*, it will be seen that a statement is there annexed, as a foot-note, on my authority, to the effect that the hyemal change of tint in this animal is sometimes, at least, effected by an actual shedding of the coat, instead of a mere change of colour in the existing fur. I had seen this; and the fact was much too glaring to be misinterpreted. In an animal that I had not long before examined, the brown fur was every where loose, and came out on smoothing it with the hand, while abundance of new white hairs were perceptible in every stage of growth.

At the time of penning this observation, however, I was much less familiar than at present with a variety of interesting facts that are about to be stated. Most naturalists are well aware that, among the Anátidæ, or duck family, in a large proportion of those species in which the sexes are dissimilar, the males retain the female garb during the first winter, and exchange it early in spring for that of maturity.

The mode in which this change is brought about has lately engaged my particular attention; and the abundance of wild-fowl, of numerous species, which are exposed for sale in the London markets, has most amply supplied the necessary variety of subjects for examination.

Here it may be mentioned, that, during the colder months, very nearly the whole of the ducks that are brought to market are adults in perfect plumage; and it is not until the middle of February that the young of the preceding year make their reappearance, the males in every stage of progress towards presenting the adult livery. Certain species, also, as the white-eyed pochard, according to my experience, are only brought at the commencement and close of winter;

while others, as especially the gadwall and gargany teal, are rarely to be met with except in spring; but at this season not unfrequently. These statements are the result of several years' observation; and it may be added, that particular species, as the velvet scoter, are by no means rare in the course of some winters, while a number of seasons sometimes elapse without a single specimen making its appearance.

But, to keep to the subject more immediately in hand, it will be seen, on examination of all the young mallards, that their assumption of the mature garb, astonishing as this will seem, would appear to the inexperienced observer to be wholly effected by a change of colour in the existing plumage, with merely the exception of the two curling central feathers of the tail, which must necessarily have been changed. They occur in every stage of this apparent mutation; from having the under parts scarcely, if at all, differing from those of the female, to the exhibition of the same lineated brown markings in all grades of obliteration. It may, therefore, be supposed, that the earlier stages of the transition had been passed through previously to their re-appearance.

In the widgeon, however, and many other species, it will be found that the adult livery is obtained, in spring, by an actual change of plumage, every feather being cast and renewed, except, of course, the wing and tail primaries. And here it may be remarked, that the two central caudal feathers, which in all birds visibly differ from the rest, being of softer texture, and commonly of another colour, partake of the nature of the tertiaries and wing-coverts; and, in double-moulting species, are, like them, very usually shed and renewed with the vernal renovation of the clothing plumage. Their position differs from that of the other tail feathers, having their points of insertion situate above even the line formed by those of the rest.

On first detecting this seeming discordancy in the mode of assumption of the adult livery in different species, I took some pains to ascertain which of them obtained the mature colouring in the one way, and which in the other; and may here briefly state that, as a general, but not unexceptionable*, rule, the young Fuligulinæ (or diving ducks, which have a lobated hind toe), and all the Merginæ (or mergansers), the latter very late in the season, undergo a change of feather in the spring; whereas the Anatinæ (or ordinary ducks, with the hind toe not lobated) agree, for the most part, in this

* For instance, the red-headed pochard accords herein with the mallard.

particular with the mallard ; the shoveller, widgeon, and sheldrake furnishing the exceptions.

I had not, however, very extensively pursued this investigation before I met with a pintail and shoveller ; the former moulting, the latter merely changing its colours, which it had effected to a very considerable extent, without the slightest trace being any where discernible of a renewal of the feathers. The pintail was a fine and healthy-looking specimen ; whereas the other, I could not but remark, was in very poor condition.

I had previously noticed the highly interesting fact, which had long puzzled me, that, in the same specimen, it was not unusual to perceive new feathers shooting forth in abundance, simultaneously with the most complete and surprising changes of colour in those loose, and about to be shed ; and, as I knew, from observation, that many species underwent their seasonal changes exclusively in the one way or in the other, it became difficult sometimes to assign to which class such specimens should be referred. A golden plover, for instance, that is now before me, is every where in deep moult, renewing both its upper and under plumage ; while, coincidentally, most of the loose old feathers of the lower parts have changed, more or less completely, from white to black, the hue of the new feathers which are growing. I have known the young bay-breasted merganser to exhibit patches of the dark adult colour on the sides of the head, previously to any appearance of a change of feather ; and, to give an instance still more conclusively illustrative, if possible, of the fact of a change to the summer hue in the old feathers preceding the vernal moult, it may be mentioned, that I at present know of a specimen of the long-tailed sarcelle, in which species the scapulary feathers are considerably longer in winter than in summer, which exhibits these plumes of their winter dimensions, but partially coloured, and even deeply so, as in those of summer ; the real moult having elsewhere perceptibly commenced upon the same specimen. It would be easy to enumerate a tedious variety of additional instances ; but I shall confine myself to a few observations on the ptarmigan genus, as erroneous impressions are very current concerning the mode in which their seasonal changes are brought about, occasioned by these very deceptive appearances.

It has been asserted, that, in the common ptarmigan, the time of moulting would seem to be confined to no particular season ; and that the excessive periodical changes of hue, *en masse*, observable in these birds are, therefore, independent of a renewal of the feathers ; a conclusion which is, indeed,

sufficiently borne out by appearances, but which the following observations will serve to qualify very considerably. At the time this species first appears in the London markets, towards the close of autumn, it will be found that all of them are in deep moult, pushing forth abundance of white feathers; but, during the whole winter, it would be in vain to search for any appearance of a change of plume. The wing primaries, which, at first, have more or less colour, are gradually bleached by the cold weather; and I perceive that, in the present very protracted season, the black on the tail feathers, and black shafts to the quills, which have been supposed to be permanent, have, at length, yielded to the continued severity of the season; many of the *Lagopus saliceti* (a species brought most abundantly from Norway) now exhibiting the shafts to the quills completely whitened, and some of them having also the outer caudal feathers more or less blanched; this change commencing at their base, and proceeding outwards. These birds will now very shortly disappear, so that their vernal change cannot be studied in the markets: but, that an actual renewal of the feather does take place in spring, is conclusively shown by some interesting specimens of the British species killed on the 12th of May, forming part of the beautiful collection of Mr. H. Doubleday. The examples alluded to are still in thorough moult, but have renewed the greater portion of their feathers; though it is remarkable that their wings continue the same as in winter, as is the case with every summer specimen of the ptarmigan which I have hitherto inspected. They lose, at this time, the very dense feathering to the tarse.

But, to return from this digression to the ducks, it will be observed, that, in the latter, a varying amount of change of colour in the old feathers is a most ordinary concomitant of the assumption of the mature plumage by a moult; and the formerly disputed fact, therefore, is thus demonstrably established, that, as the secretions which colour the growing feathers also tinge those which are about to be renewed, a circulation (evidently nutrimental; for, when a bird is ailing or ill fed, the consequences soon appear in their diminished lustre) must, consequently, obtain in feathers, even to the extreme period of their remaining attached; so that the hypothesis is unsupported by evidence which ascribes the moulting of a bird to the same cause which has been erroneously supposed to bring about the fall of a leaf; namely, that the pores through which the fluids circulate become gradually obstructed, and that it consequently dies, and falls off.

It would be easy to disprove the same notion by reference to other facts. A snowfleck (*Plectróphanes nivális*) which I

have kept some years in captivity, from weakness, never underwent a moult the first season, but retained its feathers until the following autumn, when they were renewed freely. This shows that their natural shedding is dependent on a periodical condition of the bird, and is, moreover, incompatible with a weakly state; though, in the latter case, we have already seen that, in instances where the new plumage would have been of a diverse hue, as in the shoveller before mentioned, the retained feathers become tinged with the colouring secretions, as is likewise observed even when they are about to be replaced. The tendency to cast the feathers would thus seem to be a connected sequence of the elaboration of these secretions, but requiring a more vigorous state of the constitution to promote its effectuation: the implied dependency, however, will appear unreal as we proceed.

Here it may be inferred, that, when a bird is moderately vigorous, its seasonal change of tint may be partly induced in both ways; many of the old feathers being retained, but altered in tint, to correspond with those newly put forth: for it may be noticed, that as the disposition to change feathers continues only for a certain period, during which it is so strong, in a healthy individual, that I have even known those which had been accidentally lost and renewed but a few weeks previously, to be again shed and replaced by others at the regular moulting time; so, on the other hand, as in the instance mentioned of the caged snowfleck, and as I have also had occasion to observe in other cases, when this season of natural renovation has passed by, and a bird had been too weakly to renew its feathers then more than in part, the remainder have been invariably retained till the next moulting period, however distant.

(To be continued.)

REVIEWS.

ART. I. *The Naturalist; illustrative of the Animal, Vegetable, and Mineral Kingdoms.* Edited by Neville Wood, Esq., joint Editor of the "Analyst," Author of "British Song Birds," &c. No. 7. Vol. II. London: Groombridge.

THE late conductors of the *Naturalist*, Messrs. Holl and Maund, having found it expedient to resign the editorship of that publication, its continuation has been undertaken by Neville Wood, Esq., of ornithological celebrity; distinguished more for the zeal and enthusiasm which he has displayed in pursuing that department of zoology, than for the

benefit science has derived from the record of his observations.

On the *first* appearance of this periodical, we did not think its contents calculated to affect, in any material degree, the march of enquiry into either the animal, vegetable, or mineral kingdom; and when, a short time since, a prospectus fell into our hands, announcing a change in the editorial arrangements, the perusal of that document by no means impressed us with favourable anticipations of future improvement. *Puffing*, in any shape, we have an utter aversion to; but, in matters professedly connected with the advancement of science, the slightest indication of it cannot be too carefully avoided; and though, owing to the credulity of some classes of our countrymen, a tradesman may find it answer his purpose to advertise his goods as fifty per cent better than those of his neighbours, yet we doubt whether the employment of similar means on the part of either *editors* or *proprietors* has a tendency to increase the respectability, or promote the circulation, of a scientific journal.

"The proprietors of the *Naturalist* beg to return their sincere acknowledgments to the public for the very favourable reception it has been pleased to give this periodical." The "*proprietors*" farther state, "It may be affirmed, without fear of contradiction, that in no other monthly publication on the subject will be found half so much or such various intelligence as in the *Naturalist*, at the same price." Had not our copy of the above been forwarded through the proper authorities, we should certainly have supposed that some wag had been playing off a joke at the expense of the "*proprietors*" and "*eminent scientific men*" by whose assistance the *Naturalist* was to have been carried on. So *favourable* was the reception given by the public to this periodical, that it was discontinued after six numbers had appeared; and the scientific world would, probably, never have been in possession of the seventh, but for the enterprising spirit of Mr. Neville Wood. How far the keeping the public in a state of suspense during two or three months was a proper return for favours received, is a point that, perhaps, we ought not to venture an opinion upon; but the "*proprietors*" very judiciously observe, in their notice to correspondents, that "this delay has enabled them to effect various important improvements in, and additions to, the work; and, as they promise, if liberally supported, to continue the publication regularly, they trust the omission will be forgiven." These *alterations*, seven in number, have been approved by several individuals eminent in natural science. The first is the omission of the coloured

frontispiece; and the last, by far the most important of all, an intimation that "the papers admitted will be of a more practically interesting and useful character than heretofore: and fairness and impartiality may always be relied on by authors appearing before the critical tribunal of the *Naturalist*." The former conductors will, doubtless, fully appreciate the compliment thus paid to them, in their editorial capacity, by the "proprietors," in framing this seventh alteration. After, however, the notice which appeared in the *Naturalist* of "British Song Birds," we own that some hint about *future* impartiality in the reviewing department was by no means impolitic. We certainly felt, when perusing that critique, rather puzzled to comprehend why the reviewer should so "deeply marvel," and express such profound astonishment, at a production which, from a casual acquaintance, appeared to us not to indicate anything more than that its author possessed, in common with a host of others, the power of observing the habits of birds, and of committing those observations to paper. The article forcibly brought to our recollection a passage in the first number of the *Naturalist*, where Mr. Mudie speaks of those ages in which "single scintillations" were regarded as "stars of the first magnitude, after which the *benighted children of men wondered and worshipped*." Shortly, however, after Mr. Neville Wood's prodigious attainments had been thus blazoned forth in the *Naturalist*, his name appeared, in conjunction with the editor of that periodical, as joint editor of the *Analyst*!

We must turn, however, to the number before us, being the seventh from the commencement, and the first of the second volume; and here we have great satisfaction in observing that its contents fully justify the promise, held out in the prospectus, of an improvement in the general matter and tendency of the articles admitted. The communications have not that artificial character with which many of those appearing in the early numbers were invested; and we do not remark one that deserves to be spoken of otherwise than in terms of commendation.

The subjects introduced are, first, a paper on the Lemuridæ. The writer treats of the general habits and characters of the Lemur family, and its relations to allied groups, which are pointed out in a clear and interesting manner. The genera Lemur, I'ndris, Propithæcus, Galeopithæcus, and Cheirogaleus are described in detail; and the subject is to be continued in a future number. The author's name is not given; but his remarks seem founded on personal observation, and indicate

considerable practical acquaintance with the family which he describes.

Description of the Muscular Apparatus of the Wings of Birds. By William Macgillivray, M.A., &c. This is principally a paper of anatomical detail; giving the origin, insertion, and action of each of the various muscles brought into operation during the flight of birds. Mr. Macgillivray remarks that "The flight of birds has not been hitherto described, further than in the vague and general manner in which it is treated in anatomical works, and in the descriptions of ornithologists. It exhibits, however, a vast variety of modifications, some of which I shall endeavour to describe in a further communication, to which the present will answer as a basis." This, and the preceding paper, are illustrated with woodcuts.

Notes on the Amarae, by Peter Rylands, Esq., contains some very useful suggestions.

An explanation of the Latin names of British Birds, by the Rev. F. O. Morris, B.A., and a Catalogue of the poisonous Plants found in the Neighbourhood of York. (Anon.)

Sense of Smell in Carrion Birds, by the Rev. F. O. Morris, B.A. Mr. Morris relates a fact of some crows discovering a carcass buried under a deep fall of snow. He remarks, "I have read the discussion carried on on this subject by Mr. Waterton in *Loudon's Magazine of Natural History*. I was always of opinion that Mr. Waterton was right; and I am now confirmed in that opinion. Certainly, in the case in question, the crows must have been directed to their food by the sense of smell alone, no part of the carcass being visible to the sight."

Habits of the Fitchet Weasel (*Mustela putorius* Linn.) This is an interesting notice. The writer states that he has examined many holes of this animal, but has never yet met with anything to confirm the fact related by Bewick, of its preying upon fish.

The contributors of short communications are, Edward Blyth, Thomas Allis, J. D. Salmon, the Editor, James Stuart Menteath, P. J. Selby.

ART. II. *Conchological Illustrations; or coloured Figures of all the hitherto unfigured Recent Shells.* By G. B. Sowerby, jun. Published by G. B. Sowerby, Sen. 50. Great Russell Street, Bloomsbury.

WE have been much pleased with the examination of this well-executed and highly useful publication; and, upon

making some enquiries respecting its origin and progress, the result is highly creditable to the industry and ability of its conductor.

It appears that the arrival of Hugh Cuming, Esq., into this country, with large accessions to the then known species of shells, gave rise to the first idea of establishing an illustrative work, to make them known to the public; and, as new species are continually occurring, while many other species, which, although known, have not been correctly figured, the work was not likely to be soon at a stand for want of subjects. It was commenced in October, 1832; between which and the present time 118 parts have been published. These, as we learn from a notice on the wrappers, contain about 975 figures of about 678 species and varieties belonging to 15 genera.

Mr. G. B. Sowerby, sen., has considerably increased the value the work, by inserting in it, from time to time, complete catalogues of several genera, containing references to figures of each species in this or some other conchological work, with descriptions of those species which have not been previously characterised. Catalogues of the genera *Cypræa*, *Cancellaria*, *Nucula*, *Amphidésma*, *Ebúrna*, *Eùlima* and *Fissurèlla* have already appeared; and, from the careful manner in which they are compiled, as well as from the eminence of their author, promise to be extremely useful.

Although we understand, from the titlepage, that the work is intended only to illustrate such species as have not been figured elsewhere, yet it seems that this rule has, in two or three instances, been departed from: for instance, the genus *Cypræa*, the new species of which occupied the first 8 parts, is now being continued from Part 101., in order to give the whole of the species, whether published before or not; thus forming a monograph of the genus. Such parts of the work must, as far as we can judge from our knowledge of the parties engaged, and of the materials which they possess, form the most complete monographs ever published.

Upon the whole, we feel no hesitation in strongly recommending this work, as a desirable acquisition to those who are interested in that branch of natural history which it is intended to illustrate.

ART. III. *A Synopsis of the Family of Naïades.* By Isaac Lea, Member of the American Philosophical Society, &c.

THE rivers in North America, and especially those to the west of the Alleghany range of mountains, abound with an astonishing variety of species belonging to Lamarck's family

of Năiades ; and, for some years past, the attention of American naturalists has been particularly directed to the study of this curious and interesting group of molluscs. The memoirs of Mr. Lea upon the Uniones, and other fresh-water genera, constitute a leading feature in the pages of the *American Philosophical Transactions*; and, besides the distinguishing characters of numerous species, we are indebted to the researches of this conchologist for much valuable information upon the subject of their animal economy.

The difficulty attending the discrimination of the species of Năiades, and the unsatisfactory nature of the attempts made to point out decisive characters for the subdivision of this family, have been acknowledged by conchologists when the individuals composing it were thought to be considerably less numerous than the number with which we are now acquainted, and to which new forms are being constantly added. In those instances where, as in the case before us, there occurs a large number of very closely allied species, their separation into subdivisions, either by natural or artificial characters, becomes almost indispensable, in order to facilitate the labours of both the student and the experienced conchologist. To effect a systematic and natural arrangement of the Năiades has been an object of primary importance with Mr. Lea; and the opportunities which he has had for pursuing this enquiry must necessarily have been of a most extensive nature.

The genus termed Symphynôta, formerly established by this author for the reception of those species in which the valves were united by a testaceous connexion above the hinge, is, in his present classification, regarded as a subordinate character; and it is proposed to divide the Năiades into two genera, Margarita and Iridina; the former of which comprehends five subgenera; namely: Unio, having a cardinal and lateral tooth; Margaritana, having one tooth (cardinal); Dipsas, having a linear tooth under the dorsal margin; Anodonta, having no teeth; and Pleidon, having the dorsal line granulate. Each of the first four of these is divided into symphynote and non-symphynote shells; and these, again, into plicate, nodulous, spinous, and smooth shells; which subdivisions are again separated, according to the form of their outline; as quadrate, triangular, oblique, &c. The species included in the genus Iridina are comparatively few; and the generic character is founded upon the animal being furnished with tubes.

The whole number of species included in the *Synopsis* is 344; and of these about 250 belong to the subgenus Unio. Mr. Lea states that he has endeavoured to follow out Macleay's

views in his investigation of this family ; but in this respect he has been unsuccessful. The present work must have required a great deal of laborious research in its compilation ; but we cannot help expressing our regret that the author should not have attached the names of the localities in which the various species occur, and also references to the works in which they are described or figured. Had this plan been adopted, the usefulness of the work would have been increased tenfold, and without requiring a proportionate expenditure of labour. The *Synopsis*, however, will always be valuable as a work of reference, and should certainly be in the hands of every conchologist.

ART. IV. *Woodland Gleanings*. By the Editor of the "Sentiment of Flowers;" with numerous Illustrations. One Vol. 12mo. London, Tilt, 1837.

SINCE the publication of Dr. Aikin's *Woodland Companion*, upwards of forty years ago, nothing, on a similar plan, sufficiently popular in its character, has appeared in this country to record the thoughts and rich fancies of our poets respecting the most ornamental of its features — the trees, which rise from the bosom of the earth in majesty and grace. The present volume, however, seems well calculated to supply what had become a desideratum: a pocket companion for those who, unacquainted with the principles and practice of botany, yet feel an interest in trees, and might wish to identify such trees as they meet in their rambles with the accounts they may have read of them, or to link the individual tree which presented itself before them with any passage in some favourite bard. For either purpose, the *Woodland Gleanings* will be found an eligible manual ; more especially as, in addition to many well-known quotations from anterior poets, the editor has introduced many from more recent sources, chiefly from Wordsworth and the American poets. That Wordsworth has made a valuable increase to our stock of images respecting trees and sylvan scenery, and delineated as no pen but his own can do the elevating effect of contemplating such objects, no one who is familiar with his writings is ignorant. Many, however, have yet to gain an acquaintance with his refined and soul-purifying works, and may, perchance, be first induced to read and value them as they deserve from meeting with such extracts as this volume supplies.

The illustrations scattered through its pages are of two kinds ; a delineation of the aspect of the entire tree, as a picturesque object ; and a specimen of the leaves, flower, and

and fruit by which each tree may be determined, even by one unskilled in botanical lore. From this peculiarity, the volume may be advantageously added to the library of those who may already possess Gilpin, or similar works; while it strongly recommends it to those who have yet to select a work for their summer companion and friend.

ART. V. *A Synopsis of the Birds of Australia and the adjacent Islands.* By John Gould, F.L.S., &c. Part II.

NEARLY half the birds in this and the preceding part of Mr. Gould's *Synopsis* are new to science; and, from the number of species, hitherto undescribed, which will be brought forward in the course of this publication, it must constitute one of the most important ornithological works that have appeared in this country. Although the illustrations are principally confined to a representation of the head of each species, yet, for practical purposes, this work will be found almost as useful as those which have appeared on a more extensive scale by the same author; for the plates are executed with such minute fidelity, and the characters exhibited by the head alone are, in most instances, so well marked, as to render a figure of the entire bird unnecessary.

MISCELLANEOUS INTELLIGENCE.

ART. I. *Provincial Museums.*

HISTORY and Arrangement of the Ashmolean Museum. — In your Magazine for April, 1835, some notice is taken of the improvement of the Ashmolean Museum, in a communication from Mr. Lansdown Guilding, St. Vincent's, dated May 1. 1830. I am not aware that any further statement, since 1835, respecting this Institution, has appeared in your valuable Magazine. I therefore beg leave to inform your readers that, through the zeal, liberality, and scientific knowledge of J. S. Duncan, Esq., the late curator, and with the same views and spirit of his brother, the present curator, the Ashmolean Museum is now as well filled, and arranged with as good specimens in every department of zoology, as any other museum in the kingdom. The collection is far inferior, in number of specimens, to those of the British Museum or Zoological Society, and probably of some others; but its two large rooms are nearly as full as they can conveniently hold, and exhibit, in the different classes, sufficient types of orders

and genera for scientific lectures on zoology. A popular course on this science has been given, gratuitously, by the present curator, to the members and ladies of the University; and the citizens of Oxford have had the benefit, also, of some instruction on this attractive study in the Ashmolean Museum.

To each class of animals is attached a tablet, describing, 1. the organic character of the class; 2. the scientific arrangement of the animals in that class; and, 3. the names of such authors as have written the most useful works on each branch of the science, many of which are in the library of the Museum. Thus he who walks round the rooms may collect much information on zoology in a morning's view, and learn where to collect more.

The interesting assortment of antiquities, coins, and curiosities is now well arranged and exhibited. There has, also, been lately published a catalogue, giving a general history of museums, a particular history of the Ashmolean Museum, and such an account of the specimens exhibited, with a numerical reference to the name and donor of every article, as will convey all the instruction that can be expected or required. The valuable collection of books and MSS. is now in good order; and a very minute catalogue of the latter is in the press, and will, ere long, furnish much interesting matter for the researches of the antiquary.

The excellent collection of books of natural history in the Radcliffe Library is now so accessible, by the liberality of the present librarian, to whom we are indebted for a complete catalogue of the same, that every facility for the study of your favourite science is now presented in this University. — *W. Kirtland, Underkeeper of the Museum. Ashmolean Museum, April 5. 1837.*

The above letter was accompanied with a copy of the catalogue, which is drawn up in a manner that will render it extremely useful to those who consult the collection with other objects in view than those of mere curiosity. We extract from it the following short history of the Museum, which may, probably, interest some of our readers: —

“It is well known that the first collection of the curiosities, natural and artificial, which now form but a small part of the contents of the Ashmolean Museum, was made by John Tradescant, by birth a Duchman, who is supposed to have come to England about the end of Queen Elizabeth's or the beginning of James the First's reign.

“He was a considerable time in the service of Lord Treasurer Salisbury and Lord Wootton. He travelled in various parts of Europe, as far as Russia; was in a fleet sent against the Algerines; and collected plants in Barbary and the isles of the Mediterranean. He had a garden at Lami-

beth ; and, in the reign of Charles the First, in 1629, bore the title of the king's gardener. He was a man of extraordinary curiosity, and was the first who in this country made any considerable collection of the subjects of natural history. His son, of the same name, went to Virginia, and imported many new plants from thence. His museum, called Tradescant's Ark, attracted the curiosity of the age, and was much frequented by the great, by whose means it was also considerably enlarged, as appears by the list of his benefactors, printed at the end of his *Museum Tradescantianum* ; amongst whom, after the names of the king and queen, are found those of many of the first nobility, the Duke and Duchess of Buckingham, Archbishop Laud, the Earls of Salisbury and Carlisle.

" In what year the elder Tradescant died is uncertain, though it appears most probably to have happened in 1638.

" The son inherited his collection, and bequeathed it, by a deed of gift, to Elias Ashmole, who lodged in Tradescant's house. It afterwards becoming a part of the Ashmolean Museum, the name of Tradescant was sunk. John Tradescant, the son, died in 1662. His widow erected a monument to the family in Lambeth churchyard, which, having been much injured by time, was repaired by a public subscription in 1773. The quaint epitaph inscribed on it is as follows (the date is 1662) :—

' Know, stranger, ere thou pass, beneath this stone
Lie John Tradescant, grandsire, father, son ;
The last died in his spring ; the other two
Liv'd till they had travell'd art and nature thro',
As by their choice collections may appear,
Of what is rare in land, in sea, in air ;
Whilst they (as Homer's Iliad in a nut)
A world of wonders in one closet shut :
These famous antiquarians, that had been
Both gardeners to the rose and lily queen,
Transplanted now themselves, sleep here ; and when
Angels shall with their trumpets waken men,
And fire shall purge the world, these hence shall rise,
And change their garden for a Paradise.'

" Ashmole, amongst his various pursuits, had at one time studied botany, which first, probably, led him to form an intimacy with the Tradescants, at whose house he is said to have lodged ; and to this circumstance he was probably indebted for the gift of their collection.

" He was the son of a saddler in Litchfield, and was born, as he states with his accustomed punctuality, at near half an hour after three o'clock in the morning, on the 23d of May, 1617. He was successively a solicitor in chancery, an attorney in the Common Pleas, a gentleman in the ordnance, when Oxford was garrisoned by the royal army*, an exciseman, a comptroller of the ordnance, a freemason, astrologer, botanist, chemist, anatomist, physician, and, though last not least, a very learned herald.

" Heraldry seems to have been his fort, and astrology his foible. It is difficult to reconcile the acquisition of so much dry business-like knowledge with the taste for so much visionary nonsense.

" Ashmole enriched the Tradescant collection (which consisted chiefly of the skins and bones of animals) with a collection of medals, coins, and gold chains, which had been presented to him by the Elector of Brandenburg and others ; and with manuscripts and printed books on heraldry

* At this time he also officiated as a clergyman, having, as he states, christened Mr. Fox's son.

and astrology; for he had purchased the library of Lilly, the celebrated astrologer.

"The Museum has since been increased by Sir W. Dugdale's, Anthony Wood's, and the Aubrey manuscripts, which last have furnished much amusing matter for a publication which was printed some years ago by the Rev. J. Walker of New College. It has also been enlarged by Martin Lister's collections of shells and fossils, Lloyd's, Plot's, and Borlase's, and other objects of natural history, and by Mr. Rheinhold Forster's collection of the dresses and various instruments of the natives of the South Sea Islands, and those of the Esquimaux Indians, presented by Captains Lyon and Beechy, Sir Thomas Philips, and Lieutenant Harding.

"It has been, from time to time, enriched by the valuable donations of many other benefactors, particularly by those of the Alfred gem, the large magnet, the very curious group of figures made with humming birds' feathers, and, lately, by a great portion of the antiquities described in the *Nænia Britannica*, presented by that liberal antiquarian Sir Richard Colt Hoare.*

"In a pecuniary point of view, its most munificent benefactor was Dr. Rawlinson, who bequeathed a salary for the curator, under several exclusive conditions. For many years the Museum had been so much neglected, that it attracted but little curiosity; when, in the year 1824, it was fortunately entrusted to the care of Mr. J. S. Duncan, since presented in the theatre with the honorary degree of D. C. L. He found that the skins of animals collected by the Tradescants had fallen into total decay; that cabinets for those objects which were liable to injury from time were wholly wanting; and that the apartment dedicated to the exhibition of them had become much dilapidated.

"Happily, at this time, a taste for the study of natural history had been excited in the University by Dr. Paley's very-interesting work on natural theology, and the very popular lectures of Dr. Kidd on comparative anatomy, and Dr. Buckland on geology.

"Availing himself of this spirit, the curator induced the trustees to sanction a general repair of the Museum. Their wish was seconded by the liberality of the vice-chancellor and convocation.

"When the room had been cleansed, repaired, and put in its present condition, the next step of my predecessor was to fit it up with cabinets, in which he might arrange in proper order what he found in a very disordered state in the Museum, and in which he might place those objects of natural history, antiquities, or curiosities which he himself purchased, or which might be given by benefactors. The Museum now exhibits a well-arranged collection of many of the genera in every department of zoology, with some beautiful and rare species included in each genus.

"This has not been done without considerable expense; but I am very sure he has never regretted that expense, when he considered that it might contribute to the instruction and amusement of the members of a university for which he has always felt the grateful affection and attachment of the most devoted of her sons.

"The arrangement which he has made of the various specimens of

* I must not omit to mention, with gratitude, the names of the late Bishop of Durham, the Hon. and Rev. C. Perceval; R. Barclay, Esq., of Bury Hill; Sir John Franklyn; Sir Edward Parry; W. Burchell, Esq.; Major Stacy of Calcutta; Dr. Such of London; Dr. Prattinton, Prof., and Mrs. Buckland; Rev. R. Walker of Magdalen College; J. Murray, Esq.; Miss Murray, Albemarle Street; Rev. Dr. Turner; late Bishop of Calcutta, as munificent contributors to the zoological department of this Museum.

natural history, according to the plan of Dr. Paley's *Natural Theology*, has given an exalted interest to the collection, such as no exhibition of the kind has hitherto displayed.

"He thus very clearly explains the plan of his arrangement of the contents of the Museum:—

" 'The first division proposes to familiarise the eye to those relations of all natural objects which form the basis of argument in Dr. Paley's *Natural Theology*; to induce a mental habit of associating the view of natural phenomena with the conviction that they are the media of Divine manifestation; and, by such association, to give proper dignity to every branch of natural science.

" 'The second division exhibits relics of antiquity, arranged according to the order of time, with some specimens of curious art of uncivilised, as well as of refined, nations.

" 'In the exhibition of animals the order of Cuvier has been generally adopted. The name of every specimen is conspicuously affixed; and hand-catalogues explain the general principle of the arrangement, and the contents of each cabinet to which they refer.' "

Dover Museum. — This Institution owes its origin to Mr. Thompson, an inhabitant of this town; who, in March, 1836, called a public meeting of his fellow townsmen, offering them the whole of his valuable collection as a nucleus, provided they would establish a museum in the town. The offer was accepted; officers were appointed, and books opened for donations and subscriptions; the former being for the purpose of fitting up a large and appropriate room (late the town hall); the latter, to meet the current expenses of the establishment. The appeal was successful, and 120 members immediately enrolled their names; and, on Aug. 29. the rooms were thrown open to the public. Mr. Thompson had been working silently and perseveringly, for the last seven years, in collecting and preparing his specimens, consisting of nearly 400 stuffed birds, in the greatest perfection, and several hundred British coleopterous and lepidopterous insects. The birds consisted of many foreign specimens, and of nearly a perfect collection of British ones; and among them most of the rarest species; viz.:—*Fálcó ossífrágus* (shot at Canterbury), *Lagòpus apívorus*, *palumbàrius*, *cyàneus*, *Pygárgus*, *Subbùteo*, *Lithofálcó*; *Stríx Bùbo*, *passerína*, *Scòps*; *Lànius excùbitor*, *rùfus*; *Córvus Gráculus*, *caryocatáctes*; *A'mpelis Gárrulus*; *Coràcias gárrula*; *Oriòlus Gálbula*; *Mèrops Apiás-ter*; *A'rdea Grús*, *Nyctícorax cáspica*, *minùta*; *Scólopax màjor*; *Trínga islándica*; *Phaláropus lobàtus*; *Colýmbus glaci-àlis*, *àrcticus*; *Procellària pelágica*; *Mérgus serràtor*, *albéllus*; *A'nas mollíssima*, *fúsca*, *nígra*, *clypeàta*, *acùta*, *glaciàlis*, *Clán-gula*; *A'lca A'lle*. The following have been added since:—*Fálcó Haliaëtus*, *Picus mártius*, *Hirúndo pratíncola*, *Tétrao Urogállus*; *O'tis tárda*, *Tètrax*; *Charàdrius Himántopus*, *A'rdea Cicònia*, *Platàlea leucoròdia*, *Tántalus ígneus*. The Dover Museum thus presents, in this department, a collection

of British birds, which is not only highly creditable to it in its infant state, but would vie with most of the provincial museums in the kingdom. It has received some valuable donations of Chinese and Brazilian insects. It has about sixty specimens in ichthyology; and it is intended to form a complete collection of the fish frequenting these shores. It can make no great boast of its minerals and fossils; but every effort will be made to put them on a respectable footing. A series of lectures, to be delivered once a fortnight, are in progress, and are fully attended; and *conversazioni* are held once a week, which afford much gratification; objects of natural history, from private collections, and works of art, being exhibited on those evenings. The whole arrangement has assumed an importance and a footing which bid fair to make the Institution permanent and beneficial, and which must be highly gratifying to the projector and founder. [*From a Correspondent.*]

ART. II. *Short Communications.*

POLYOMMATUS Artaxérxes. — This little butterfly, once esteemed by entomologists as an object of the highest possible rarity, and still considered a very local species, occurs rather plentifully, every season, at the east end of Will's Braes, about a mile to the westward of Dundee, on the banks of the Tay. The locality is a precipitous bank, overlooking the river, sparingly planted with trees, and covered with a profusion of grasses and wild flowers; among which, *Spiræa Filipéndula*, *Geranium sanguineum*, *Rosa spinosissima*, and *Heliánthemum vulgare* hold a conspicuous place. The butterflies are here found in June and July, generally associated with *P. Alsus* and *Lycæna Phlæas*. Their motions are not so rapid as those of the latter insect, so that they are more easily taken; but the best time for captures is early in the mornings, when they are found resting upon the culms of the grasses. *P. Artaxérxes* is figured in the *British Diurnal Lepidoptera, Naturalist's Library*, pl. 34. fig. 4., and in Brown's *Butterflies*, vol. iii. pl. 18. The figure in the *Naturalist's Library* is rather smaller, and that in Brown's *Butterflies* rather larger, than the specimens I have captured. The antennæ are not elevated at the tip, as represented in Brown's figure. In some specimens, there are orange-red lunules on the upper surface of the posterior margins of both pairs of wings; and in others these are very indistinct, or altogether wanting. Brown's figure does not represent any of the red crescents above, nor the white margin which sur-

rounds all the wings; and the white angular discoid dot is too large. These are better represented in the figure in the *Naturalist's Library*; but the under side there portrayed differs from my specimens in the following respects:—In the figure, there is a continuous band of orange-red round the margins; while in my specimens it is distinctly separated into spots by the nervures, and the lower part of each spot is white as far as the pupil; and, in the figure, none of the white central spots have pupils; while in my specimens most of them are furnished with a small black one. Attention to such minutiae, however, could scarcely be expected in a work of such unrivalled cheapness as the *British Diurnal Lepidoptera*. But, with such slight exceptions as the above, the figures are most admirable likenesses of the beautiful objects they represent. *P. Alysus* is not a common species, but is met with occasionally in other localities in this neighbourhood, besides the one already mentioned. I have taken it at the Hare Craigs, near Broughty, Sands of Barrie, and among the Sidlaw Hills. *P. Aléxis* is very abundant, in every kind of situation, from the airy summit of the mountain, to the deepest recess of the wood; but they give a decided preference to warm sandy downs, such as the Sands of Barrie; where, in some seasons, they may be seen in thousands. *P. Aléxis* generally begins to appear in May, and continues to adorn our scenery till the end of September; so that it is evidently double-brooded: but *P. Artaxérxes* I have never found after July; and it is, therefore, likely that only one brood is produced annually. — *William Gardiner, jun. Dundee, Forfarshire, Jan. 20. 1837.*

Transformations of Cássida obsolèta. — On June 22. 1834, I found, at Will's Bracs, the curious larva of this little tortoise beetle feeding on the leaves of *Centaurea nìgra*; and more, at the same place, on *Cnicus arvensis*, on July 6. These were of an oval form, and flattened, like an *Oniscus*; of a dull green colour, with a black head, and the sides furnished with a row of blackish branched spines, placed in a horizontal manner nearly all around the body. The recurved fork at the anus was surmounted by what has been aptly termed the "stercoraneous parasol" of the insect; and I had occasion to observe that it served it another purpose besides concealing it from its enemies, and sheltering it from the sun's rays. In the box where I placed these creatures, there were several small larvæ of lepidopterous insects; and these frequently attempted to cross over the backs of the *Cássidæ*, when in their way, rather than go round them; but they always suffered in this attempt; for the parasols of the

annoyed were brought down upon them with such force, that a severe crushing was the sure consequence of their intrusion. I regularly supplied them with fresh leaves, the parenchyma, or soft spongy parts, of which constituted their food; and, during the period they existed in the larva state, they several times changed their skins. By July 3. those first taken were transformed to pupæ; and differed little in this state from the larvæ, except in being motionless, firmly attached to a leaf, of a dusky black colour, with the thorax paler before, and wider than the abdomen. On July 12. the perfect insects appeared; being only nine days in the condition of pupæ. On the 20th of the same month, both larvæ and pupæ were taken from the plants, and in the locality, indicated above, and went through their transformations in about the same space of time. The only other species of *Cassida* taken in this vicinity is the *C. rubiginosa*; a single specimen of which occurred near the foot of the Sidlaw Hills, in May, 1836. For excellent descriptions of both these, see *Entomologia Edinensis*, p. 292, 293. The authors of this valuable volume would confer a high boon on the lovers of entomology in Scotland by the publication of a supplement, including descriptions of those species given as *addenda*, and those indicated as Scottish, throughout the body of the work.—*W. Gardiner. Jan. 20. 1837.*

Contemporaneous Deposition of Salt and Gypsum.—The contemporaneous deposition of salt and gypsum, as exhibited on the Island of Ascension, was to me an interesting and novel phenomenon. I walked to the windward side of the island, the only part where it is exhibited, to witness the circumstance. As you approach the shore, the rocks are encrusted with salt and small beds of sulphate of lime; but on the table ledges of the rocks, which project a little to seaward, and which are elevated about 20 ft. or 30 ft. above the level of the sea, a heavy spray is continually thrown up. Evaporation goes forward rapidly, by which the saline particles are left; a constant percolation taking place at the same time through the fissures or crevices of the rock. The sea has undermined the base, and left a sort of cavern, the roof of which is a thick bed of rock. Year after year the process goes on. The spray, being thrown up into the hollow part of the ledge, is evaporated, until a large quantity of the saline contents are accumulated, consisting of muriate of soda, sulphate of magnesia, and sulphate of lime. The two former, being soluble, are, of course, carried off by percolation through the rocks: the sulphate of lime, being the more insoluble, remains, and forms a bed of earthy gypsum 1 ft. or 2 ft. in depth, with occasional masses of radiated crystals. The sea-

water, continuing to be thrown up, runs through the bed of gypsum, and carries with it a minute portion of the earthy substance, which crystallises as it trickles from the roof, and becomes appended thereto, forming a stalactite of gypsum. Upon the floor of the cave, from the drippings before mentioned, is produced a stalagmite of the same formation. Thus, in the lapse of years, are formed gypseous caves, and beautiful stalactites of alabaster, from the evaporation of sea-water.

The rock on which it is formed is augitic basalt; the *constant south-east trade wind* keeps up a heavy surf on this side of the island, and replenishes the pool or basin in the rock before it is emptied. On the surface of the rock I found a bed of earthy gypsum 2 ft. or more in thickness, with some small portion of salt. On going down to the caves, which is occasionally impracticable from the great swell, I saw the water oozing from every pore of the rock: it was extremely salt, and the cavern abounded with the most elegant translucent stalactites and coarser stalagmites. Some were of great size, 4 ft. or 5 ft. in length, and 40 lb. or 50 lb. in weight; but others were of the most delicate proportions. The larger ones were tinged within of a bright green, probably from a sulphate or muriate of iron derived from the action of the water on the basaltic rock. On the basement floor of the cave were some little pools of very strong bitter salt water, and around the edges of the rock crystallised salt: the water contained sulphate of magnesia, or Epsom salts.

Gypsum occurs in volcanic islands: we found it at South Shetland. It is abundant at St. Helena, in veins among the lofty ridges of basaltic rock. But it may, in these cases, have a very different origin, and be a true igneous formation, from the evolution of sulphureous acid coming in contact with the earthy base, and thus form a hydrous gypsum: for we had sulphur and alum, at South Shetland, with the gypsum. Here we have demonstration of its marine origin, forming extensive beds, and crystallising in a variety of ways. There is, also, evidence of the contemporaneous deposition of common salt, and the production of sulphate of magnesia. At St. Helena, they have aperient springs issuing from the rocks near the gypsum veins; but, nevertheless, I do not think it an analogous formation to this now described. It is right to state that, in some of the low parts of the island, near the shore, casual crosier-shaped crystals of acicular gypsum are picked up.

I have been particular in stating these circumstances, and in connecting them with others, because facts are valuable only in reference to some general law; and what is obscure in

one part is often elucidated in some other, and the interest of the whole is increased by comparison. — *W. H. Webster.*

Signs of Spring, 1837. — As any indications of the return to order of the present extraordinary season are now doubly interesting, I think the following memoranda, confirming as they do my previous observations on the cuckoo, valuable. (See Old Series, Vol. VII. p. 342.) — *March 26.* Toads croaked loudly, Stanley Green. — *April 4.* Swallow seen at Woolbridge, near Wareham. — *8.* Two swallows seen at Julian's Bridge, near Wimborne. — *14.* Tadpoles of toad seen by me: numerous, apparently four or five days old, in a pond at Lytchett Minster. (Snow falling every day.) — *17 and 18.* Cuckoo's mate heard here. (This bird annually builds in a tree in my garden.) — *19.* Cuckoo heard here.

The observations on the swallows were made by Mr. Wm. Thompson of Lytchett, who communicated to Mr. Yarrell the fact of the *hare taking the water*, recorded in Vol. V. p. 99.; and who repeated the account to me the other day, appealing to a workman of his who also was witness. The same gentleman confirmed the assertions about *snakes taking the water* (see Vols. I., III., and IV.), made by Mr. Murray, myself, and others, by stating that he killed a large snake, which was seen crossing a branch of Lytchett Bay, Poole Harbour, when 200 yards from the shore. Mr. Thompson asked how the reptile could possibly know to what point it was steering, having so little elevation for its eye, and so small a horizon in consequence? — *W. B. Clarke. Stanley Green, April 19. 1837.*

Natural Phenomenon of Ventriloquism in a Bird. — The bird endowed with this singular control over his vocal powers is our favourite and pugnacious little robin, whom I discovered to be as complete an adept in this art as any human ventriloquist could possibly be. While in my garden a few weeks ago, the notes of the red-breasted warbler fell deliciously on my ear, being mellowed, as I believe, by distance. I expected to descry my musician on some distant tree; but, to my great surprise, I perceived him within a few yards of the spot I occupied. I was near enough to observe the alternate contractions and expansions of the breast; but I could not see any motion of the bill. — *Edwin Edmunds. Penzance, Cornwall, March 18. 1837.*

[We have heard, upon authority that cannot be questioned, a precisely analogous instance related of the singular control which the robin appears to possess over his vocal organs. — *Ed.*]

Campóntia crucifórmis. — In Vol. VIII. p. 179., I observe a description and figure of *Campóntia crucifórmis*, by Mr. George

Johnston, who, it appears, is uncertain whether it be the larva of a fly, or not. Having myself observed it undergo the change, I can answer that it *is*; and, I believe, of the order of *Diptera*; though I cannot be positive, having lost the fly before I had time to examine it. I was taking a drawing of it under the microscope at the time the fly came forth; and have the exuviae by me now; though, from its mutilated condition, but little more can be gathered from it, except that I now observe it to be studded all over with very short thick spines, which were not visible when the larva was alive. However, I did not see them. I may observe, that I took mine in *fresh water*, though it exactly agrees with the description given by Mr. Johnston (p. 179.), as far as it goes, at least. If I should be fortunate enough to have another change, I will take better care of the fly, and send you further particulars, if you wish it. — *H. Green.* 272. *Bradford Street, Birmingham, April, 17. 1837.*

ART. III. *Literary Notices.*

WE observe, by the prospectus, that the first number of Mr. Yarrell's work on *British Birds* is to appear on the 1st of July, 1837. "All the species will be illustrated by engravings on wood; two representations of many of them; and, in some cases, even three figures will be given, to represent the various changes dependent on age, sex, or season. The whole of the birds will be engraved by, or under the direction of, Mr. Thompson, whose name is at once a guarantee that the execution will be excellent and uniform throughout." John Van Voorst, 1. Paternoster Row.

The *British Reptiles*, by Professor Bell, will appear in August. "The woodcuts will be numerous, corresponding, in their general style, with those of the preceding work; and, in addition to a figure of each species, and of some of the most important varieties, will comprise many illustrations of structure and developement, particularly the transformation of the Batrachian genera. The reptiles of this country, although few in number, are not devoid of considerable interest; their habits are popularly much misunderstood, and several innocent and useful species are shunned and destroyed, from a mistaken notion that they are directly or indirectly noxious to man. The elucidation of their habits, the distinctive description of the species, their geographical distribution, and the history of the transformation of all the amphibious forms, are amongst the subjects which will be fully discussed." John Van Voorst, 1. Paternoster Row.

THE MAGAZINE OF NATURAL HISTORY.

JUNE, 1837.

ORIGINAL COMMUNICATIONS.

ART. I. *On the Structure of the Fossil Saurians.* (From the "Palæologica zur Geschichte der Erde und ihrer Geschöpfe; von Hermann von Meyer. Frankfort, 1832.) Translated by G. F. RICHARDSON, Esq., Curator of the Sussex Royal Institution, and Mantellian Museum, Brighton. Communicated by GIDEON MANTELL, Esq., LL.D. F.R.S.

IF we review those analogies which are found between animals of the most varied kinds, and which appear to be repeated in every class, we cannot be surprised to observe the existence of analogies between reptiles and other classes of animals. The osteology of the reptiles (*Amphibia*) is far more intricate and more difficult than that of the *Mammalia*. Grew, Peter and Adrian Camper, Faujas, Spix, Oken, Sömmerring, Bojanus, Bourdel, Geoffroy, Cuvier, Wagler, and others, have applied themselves to this subject. Geoffroy * has developed, in particular, the osteology of the crocodile in a distinguished manner. Alex. Brongniart † divides the reptiles, according to their mode of respiration, into four orders. Chelonians, Saurians, Ophidians, and Batrachians. Wagler ‡ divides the *Amphibia* into eight orders, Testudines, Crocodili, Lacertæ, Serpentes, A'ngues, Cæciliæ, Ranae, and Ichthyodi. Before Geoffroy had enjoyed the opportunity of studying the Crocodiles more intimately, in Egypt, they were reckoned among the Lacertæ, from which they were considered as distinguished only by their size. Meerem names the order of Crocodiles Loricata; and unites with other Saurians the first family of the Ophidians, the

* Mém. du Mus., x. s. 67. t. 3. s. 249. xii., s. 97. Ann. des Sci. Nat., 3. s. 245.

† Alex. Brogn. Essai d'une Classification Naturelle des Reptiles. Paris, 1805.

‡ Wagler Système des Amph., s. 131.

A'ngues. The arrangement of the apparatus of hearing induced Blainville to place the Crocodiles in a peculiar division, which he terms Emydosaurian, in order to express their place between the Lacértæ and the Tortoises. Geoffroy, however, does not agree in this arrangement, he considers the pterygoid (a bone of the head, which in the human subject is the inner palatal bone), to be distinctive as regards the Crocodile, and relying on this part of the structure, distinguishes the Caïman, Crocodile, and Gavial; as he also further divides these from the Lacértæ. The arrangement of the nasal canal appears to him to afford a satisfactory mark of distinction; since the elongation of it varies in a very remarkable degree in different animals. In the Mammàlia this canal is more important than in reptiles; in crocodiles it is still more so, for the opening lies behind the strongly developed pterygoid. The study of the ear also enabled him to distinguish several genera among the crocodiles which had hitherto been united under the name of Caimans.

The structure of fossil animals of the Crocodile and Lizard species has induced me to select Brongniart's nomenclature of the Saurians, and to include in it animals which are commonly termed Crocodiles, Monitors, or Lacértæ. The difference of species is usually determined by the structure and colour of the skin. Differences in the form of the single parts of the osteology afford, according to their importance, occasion for the establishing a genus or subgenus; while some numerical relations connected with them establish a family or a distinction of still greater extent. Among many of the fossil Saurians, however, a distinction of species is almost impossible, since the parts which would distinguish them have become obliterated by their long continuance in the earth. Usually only those portions of the bones are discovered, the differences of which serve to indicate either subgenera or genera; but in some of the earlier fossil Saurians, the very diversity of species appears to be clearly impressed on the skeleton. Among the Saurians, however, from the so termed transition formations, differences have been considered as merely specific, which are, in fact, of more importance. Cuvier arranges these fossil Saurians into the Crocodiles, the Monitors, and the Lacértæ, or the Saurians in the stricter sense. They are, however, for the most part formed according to a plan which differs from the living Saurians, in its far greater abundance of types (an abundance, which our knowledge of the existing animals would not lead us to expect); and also by its blending those structures which are separated in the legitimate crocodiles and La-

cértæ.* The number of fossil Saurians is still comparatively small; which may probably arise from the circumstance of their requiring to be wrought out from the solid rock. The examples of these animals which, in earlier times, ruled over the earth, are however sufficient to enable us to increase the extent of the Saurian world, and to arrange it in a systematic manner.

The difference of the Crocodiles and the Lacértæ depends chiefly on the strongly scaled skin of the former, and the lightly scaled skin of the latter; on the system of the teeth, their formation, number, &c. Among the fossil Saurians, these characters are by no means invariably preserved. The general form of the head, the structure of the teeth, the situation of the teeth in the alveoli (either separated, or placed in a common channel), the strongly or lightly scaled skin, the situation of the apparatus of hearing, or of the nasal canal, as well as other portions of the structure, do not afford characters which enable us to class the animals with a sufficient degree of precision or facility. I am therefore induced to avail myself of the development of the organs of motion as the foundation of the chief types among the Saurians, and to attempt their systematic arrangement by these characters. The structure of the organs of motion has not a mere exterior importance: for these organs open to the creature the medium in which it moves, feeds, and chiefly exists, and to which the other parts of the structure must be adapted. The further division can be determined by other single parts of the structure. The paucity of types of the Saurians, at the present moment, proceeds from the circumstance of their being sub-arranged under the division A. of the following scheme. The fossil species enable us to arrange the Saurians in a far more perfect manner than the other reptiles; the Mammalia, also, are completed by their fossil species. These last receive, however, at the utmost, only an accession of genera; while, among the the existing arrangement of Saurians, whole families have to be inserted. The Saurians, by this means, receive an extension and a systematic classification, by which they are established as Flyers, Swimmers, and Walkers [Flieger, Schwimmer, und Gänger], since they unite in themselves types of different classes of animals. A classification of animals, according to form is strikingly to be observed among the Batrachians, which undergo an actual metamorphosis. The same individual breathes first, while young, by means of gills, is actually a fish and

* The *Hyleosaurus* of Dr. Mantell has the coracoid of the Lizard, with the omoplate of the Crocodile. Vide *Geology, S. E. of England.*—Ed.

afterwards becomes a reptile. The observations which I have introduced above respecting the analogies existing between fishes and birds, and particularly between the Mammàlia on the one hand, and reptiles on the other, is equally distinctive for reptiles. Among the Ophidians there are legitimate snakes, in which rudiments of hind limbs are to be observed *, even exteriorly, by which these animals are connected with creatures possessing limbs.

The fossil Saurians, from the transition beds, are to be compared, with reference to their organs of motion, to the Mammàlia with heavy limbs, to the Mammàlia with limbs adapted for swimming, and to the flying Saurians. Single parts of the skeleton of the flying Saurian (*Pterodactyle*), remind us of the *Ornithorhynchus*. If, however, in these fossil Saurians the structure of one part of the body approaches that of the Crocodile; in the same individual, the structure of another part reminds us rather of that of the *Lacértæ*. Hence it follows, that conclusions drawn from a single part of the skeleton, and applied to the whole, have necessarily proved erroneous, and have deceived even such anatomists as Camper. While we remain ignorant of the plan according to which the structure of the whole animal is formed, but little can be deduced from the single parts. A fossil *Sáurus*, with an elongated beak, like that of a Gavial, is not necessarily from that circumstance alone a Gavial, a creature for which it has commonly been taken: the other portions of the skeleton may be totally different from this latter animal. How little we can infer from one fossil Saurian as to the structure of another, is shown by the *Megalosáurus* and *Geosáurus*, the teeth of which are very similar, while they have nothing else in common. In the apparatus of the teeth of the fossil Saurians, which we have to consider, there is usually expressed a combination of the characters of the Crocodile with those of the *Lacértæ*; to which are occasionally added peculiarities which remind us of the apparatus of the teeth of Fish, of *Cetæea*, and even of the land Mammàlia, both herbivorous and carnivorous. The vertebral column, in almost all these animals, is provided with a surface which is concave behind, instead of convex, like that of the living Saurians, and may hence be compared with that of the *Cetæea*, Fish, or *Batrachians*, without its having been known that the fossil Saurians, in their youth, might have possessed a nature similar to that of fish, and have breathed, in some measure, by means of gills. The observation, therefore, which Mantell † applied to some

* Mayer Nov. Acta Acad. Leop. Carol. Nat. Cur., 12.

† Geol. Sussex, 65.

bones of species of living crocodiles sent to him by Sir Stamford Raffles, that the epiphyses of the bones of young animals have been cartilaginous, and that hence it may have occurred that the vertebræ have been deprived of their convex surfaces, is no farther applicable to this concavity of the posterior surface. Vertebræ, whose posterior surfaces are convex, occur, for the most part, in the tertiary beds. A few examples only of such vertebræ from older beds are known, and these occur in the more recent secondary formations; for instance, the fossil remains of an actual crocodile (*C. Harlani*), which Harlan describes from a marl of North America, probably belonging to the green sand formation.* This fossil crocodile is distinguished most strongly from other crocodiles by the greater thickness of the teeth with relation to their length; in perfect accordance with which circumstance are the very short, thick, and blunted teeth, it being the young teeth only which are of a pointed and conical form. The teeth, also, are more cylindrical, and there are fewer in a given space than in the *Crocodylus acutus* or *C. Lucius*; the distance, also, from the fourth tooth (which is comparatively very large) up to the outer edge of the symphysis is twice as great in the fossil Crocodile as in the above-mentioned living species. Such peculiarities would justify us in constituting a new subgenus of the creature to which this fragment of a jaw belonged. Several vertebræ were also found in the same spot, which, according to the engravings, possess a concave, as well as a decidedly convex, surface, as in the living Crocodiles. None of them are sufficiently long to have appertained to this individual; while they differ from those compared with them, in particular by a peculiar compression on the side and under parts of the body. Mantell† also mentions that his collection contains three very small vertebræ, which are from the Wealden beds, older than the tertiary formation, and which are concave before and convex behind, as in the living iguana.‡

It is not to be denied, that the difference in the organs of locomotion in the fossil and the living Saurians is, at first sight, surprising; but this circumstance arises only from our not being accustomed to see the former in the living types. We should be equally astonished if we only

* Journ. of Philad., iv. p. 21. t. 1.

† Illust. Geol. Sus., p. 77.

‡ These prove to have belonged to turtles; but Dr. Mantell has recently discovered several large vertebræ of the true crocodilian type; that is, concave anteriorly, and convex posteriorly. — *Ed.*

found the Mammàlia which possess limbs adapted for swimming (the Fish-like Mammàlia), and the Bats, in a fossil state; since we now know it by no other means than that the class of Mammàlia is formed according to these types. We ought, in fact, rather to wonder that there are bird-like flying and fish-like swimming Mammàlia, than that there are such Saurians, since these last naturally stand in a closer relation to birds and fishes than the Mammàlia. It now becomes a question, whether there were not merely Vivipara,* but even Mammàlia, among the Saurians?

The tertiary deposits chiefly contain Saurians which are analogous to our present crocodiles and lizards. The chalk and the green sand also afford examples which are similar to the recent Saurians. The structure of the Saurians of the transition strata is, on the contrary, for the most part very dissimilar. I have already communicated these results, together with the essential parts of my system, in September, 1829, at the meeting of Naturalists and Physicians, at Heidelberg. More recently, at the sitting of the Academy at Paris, on the 9th of May, 1831, Geoffroy declared, that Crocodiles were found only in the tertiary formations, and that it is only the large Saurians of the gypsum beds of Montmartre, of the pottery clay of Auteuil, and of the chalk (?) of Meudon, which are true Crocodiles, and similar in their forms to the Caimans or Crocodiles, with short beaks. On the other hand, those with pointed beaks, with jaws like those of the Gavials, are, he stated, from the marine beds of the transition order, and are of an older family, and of a different type. At first, this difference struck Geoffroy only as regards the Gavial of Caen, which he, for this reason, named the *Teleosaùrus*. He now bestows the same name on the whole tribe of Saurians with beaks similar to those of Gavials of the regular type, and distinguishes among them several species; among which, for instance, are the Gavials of Sömmerring and Faujas, those of Havre and of Honfleur, the Crocodile of the collection of Geneva, the crocodile of Boll, and, finally, all the Saurians of the Oolite of Normandy. These creatures, however, which Geoffroy here seeks to unite,

* Vivipara occur in most divisions of animals. Among the cold-blooded Vivipara there are, the so termed false or apparent Vivipara. Rennie and James Starck have remarked, that the *Lacerta agilis*, which in Germany and France lays eggs, in Scotland brings forth its young alive. Oviparous snakes may be made to produce their young alive by hindering them from casting their skin, and retarding them in their time of laying. Besides this, the poisonous snakes, as far as we know them, are viviparous. Among the Batrachians, as well as among the fish, are several kinds which bring their young alive into the world.

are, in some respects, totally different, and do not all possess the Gavial-like beak and swimming organs of motion which Geoffroy supposes in his family of Teleosaurians. Since this arrangement cannot prove lasting, I assign the name of Teleosaurus only to the Gavial of Caen. My arrangement is contained in the following table; my chief object having been to consider those Saurians more particularly which cannot be arranged among the living genera.

A. Saurians with Toes similar to those of the living Species.

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|---------------------|--|--|
| I. With four toes. | $\left\{ \begin{array}{l} 1. \text{Aeolodon } H. v. M. \\ 2. \text{Rhacheosaurus.} \\ 3. \text{Pleurosaurus.} \\ \text{Geosaurus.*} \\ \text{Macrospöndylus.*} \\ \text{Mastodonsaurus.*} \\ \text{Lepidosaurus.*} \end{array} \right\}$ | Fossil Saurians similar to the living Caimans and Gavials. |
| II. With five toes. | $\left\{ \begin{array}{l} \text{Protorosaurus } H. v. M. \\ \text{Lacerta Neptunia Goldfuss.} \end{array} \right\}$ | Fossil Saurians similar to the living Lacertæ. |

B. Saurians with Limbs similar to those of the heavy Land Mammalia.

1. Megalosaurus Buckland. 2. Iguanodon Mantell.†

C. Saurians with Limbs for swimming.

- | | |
|-------------------------|---------------------------|
| 1. Ichthyosaurus König. | Saurodon Hays. |
| 2. Plesiosaurus Cony. | Teleosaurus Geoffroy. |
| 3. Mososaurus Cony. | Streptospondylus H. v. M. |
| Phytosaurus Jaeg. | Metriorhynchus H. v. M. |
| Saurocéphalus Harlan.‡ | |

D. Saurians with flying Limbs.

Pterodactylus Cuvier.

A. Saurians with Toes similar to those of the living Species.

I. With Four Toes.

1. AEO'LODON.

As one of the most complete, I place this Saurian before the rest. Von Sömmerring has described it fully under the name of the Crocodilus priscus. The form of the head is, in general, like that of the Gavial, while the structure itself is however totally different, and the rest of the skeleton indicates an animal which cannot be classed with the Crocodiles. The beak of the fossil Saurus is somewhat shorter than

* The extremities of these animals are either wholly or partially unknown. The discovery of more perfect specimens will determine whether this place in the series, thus temporarily assigned to them, be correct.

† The Hyleosaurus of Dr. Mantell probably belongs to this division. — Ed.

‡ Referred to the fishes by Agassiz. — Ed.

in the Gavial, and the differences between the single bones of the head are in both animals far more considerable than between the two living species of Gavials. The teeth stand, as in the crocodile in distinct alveoli; but in the under jaw they are alternately longer and shorter, which is not the case in the Gavials. The longer tooth is usually twice as long as the shorter. The teeth of the upper jaw appear to be of equal size. On each side are first two small teeth, followed by one very much larger, the largest of the whole. In the living Gavial, we find on each side, first, a small tooth; at a little distance another small one; while again at some distance follows a larger, and afterwards one somewhat larger still: the rest being nearly similar to each other, and as long as the lower teeth. The teeth of the fossil animal appear to be more pointed and more strongly bent, and to have stood out more prominently than in the Gavial; and, besides, they are finely striated lengthwise. The posterior surface of the vertebræ is in the *Æolodon*, somewhat concave, which has not yet been found in any living *Saurus*, but is only remarked in the *Cetacea*, *Batrachians*, and *Fish*. The number of vertebræ in the fossil animal is 79; in the Gavial, never more than 68. This difference consists in the tail of the former animal, which contains 10 vertebræ more; which, however, in consequence of their shorter, and therefore stouter, form, strengthen the tail, but do not lengthen it with relation to the body. The heads of the bones of the arm and leg, and of the phalanges, appear to be formed more roughly, to terminate more strait, and appear more similar to those of the *Cetacea*, than of the living *Saurians*, in which the elevations and depressions of the heads of the bones approximate more nearly to those of the land *Mammalia*. The number of the fingers and toes accords with those of the *Crocodiles*. The relation of the long bones is, however, different. The length of the femur amounts to somewhat more than double the length of the tibia, which is the case in none of the living *Crocodiles*: in the Gavial this length only amounts to a quarter more. The tibia, also, is comparatively larger than in the Gavial. The pelvis differs widely from the *Crocodile* and *Lacerta*, and excludes the fossil animal from any association with these. Along with the fossil skeleton there were also on the same bed of stone, scales which must have belonged to this animal, so that its skin appears to have consisted of actual scales. This fossil *Saurus*, whose type cannot be classed with any genus or subgenus of the division of the living *Crocodiles* or *Lacertæ*, I have, from the alternating size of its teeth, named the *Æolodon*. It is the Gavial de Monheim of

Cuvier, with which he also classes his Gavial de Boll, the remains of a totally different Saurian, which I have considered as the *Macrospóndylus*. Of the *Aeólodon* there hitherto exists but one species *A. príscus*, from which the above description is taken.

2. RHACHEOSAURUS.

The remains which enabled me to establish the *Rhacheosaurus* I discovered in the year 1829. They have been fully described by me, and figured of the size of nature, in the *Acts of the Royal Leopold and Caroline Academy of Naturalists*. They are incomplete as regards the head, the neck, the apparatus of the breast, the forelimbs, and the tail. The vertebral column exhibits in its posterior surfaces the concave form, and is only half as long as that of the *Aeólodon*. The relation of the diameter to the length is different in the vertebral column of both animals. Towards the pelvis, the vertebræ become the longest; while both the Crocodile and Monitor differ in this particular. The spinous processes are extremely broad; the highest are placed before and behind the pelvis, and also on the longest vertebræ. The spinous processes of the caudal vertebræ differ from those of the dorsal vertebræ, and from the spinous processes of all Saurians hitherto known, in this particular, that a second spinous process rises before it, which is smaller, thin, and pointed like an actual spine. A like structure only occurs in fishes. The chevron process is also found in the vertebræ of the tail, and, like the other processes in general is most similar to the analogous structure in the Crocodile. This animal, it is probable, possessed no lumbar vertebræ. The ribs are attached by their head to an inequality of the vertebræ, and are also articulated to the transverse processes. The last ribs were probably connected only by their head with the vertebræ; in which particular they more resemble the ribs of the *Lacértæ*. The section of the ribs is nearly round. The abdomen of the animal also possessed its ribs, which formed a continuation with those of the back. In the middle of the belly, they joined in a point, which was probably directed forwards. The pelvis rather resembles that of the Crocodile than of the Monitor; its bones, however, are much shorter, stronger, and broader. The transverse processes of the vertebræ of the pelvis are much longer than in the Crocodiles. The femur appears to have been more bent than in the *Aeólodon*, though not so much so as in the crocodile. The length of the tibia is less than the third part of the length of the femur. The toes are very long compared with the leg. There are four,

and there is also the rudiment representing the fifth, as in the Crocodile. The first bones of the toes almost exceeded the leg bone in length. I have obtained two vertebræ of the pelvis of this animal. There are 15 vertebræ of the back, and 23 of the tail may also be reckoned. The end of the tail, however, and the fore part of the trunk, are wanting. On a comparison with the *Aeólodon*, this *Rhacheosaurus* must have measured $5\frac{1}{2}$ Paris feet. The skin consisted of much thinner and lighter scales than those of the Crocodile. I am acquainted with but one species, which I name *R. grácilis*.

3. PLEUROSAU'RUS.

The remains on which I establish the genus *Pleurosaurus* I found in the collection of Count Münster. As in the *Rhacheosaurus*, the head, the neck, the apparatus of the breast, the fore limbs, and the tail, are wanting. The vertebræ, together with their spinous processes, are much crushed; as far as the pelvis they were furnished with ribs. The abdomen also had its ribs: these were in pairs, and consisted of a longer and shorter, which lay near or upon each other, and of which it is probable the longer only were connected with the ribs of the back. The relation of the length of the leg with that of the thigh is as two to three. The phalanges of four toes are perceived. The skin, it appears, was thin, scaly, and light. The size of the animal could not have much exceeded 1 ft. The name is formed from *pleura*, a rib. I know only one species, which I name *P. Goldfússii*. I have stated more particulars of this animal in the *Acts of the Academy of Leopold and Caroline*. This *Saurus* is probably the same which Count Münster (*Zeit. f. Geog., Geol., &c.*, 1829) refers to a new animal, allied to the Chameleon.

GEOSAU'RUS.*

Privy Counsellor Von Sömmerring has, in the *Transactions of the Royal Academy of Sciences of Munich* made known the existence of a Saurian, which he names the *Lacérta gigantèa*. Baron Cuvier declares it to be a new subgenus between the crocodiles and monitors, which he names *Geosaurus*. I, however, consider this animal to be no more referrible to the Crocodiles or Monitors than the foregoing. The form of the head, on the whole, more resembles that of the Monitors. The single bones of the head, however, are often differently formed from those of Monitors, and approach nearer to those of the Crocodiles. The sclerotica, as in the

* This Saurian, as well as the following, which have no number prefixed, are only placed provisionally in this division until their toes are more fully ascertained.

Monitors, Turtles, and Birds, is strengthened by a ring of bony plates, and reminds us of the enormous eye of the *Ichthyosaurus*. The teeth are flat, pointed, somewhat bent, edged before and behind, and these edges are finely serrated. In the upper jaw, there are at least 17 such teeth in each row. In the vertebræ, the posterior surface is concave, and the transverse processes are large. The pelvis nearly resembles that of the *Rhacheosaurus*, but differs from it in the form of the single bones. The species found in the state of Solenhofen I name, from its discoverer, *G. Sommerringii*. Are the remains found in New Jersey different from these?

MACROSPONDYLUS.

With the animal which I have named the *Æolodon*, Baron Cuvier classes the remains of a totally different animal. Dr. Jaeger describes it as the *Crocodylus bollensis*. I have investigated these remains with partly the same assistance which Cuvier and Jaeger possessed, and find them neither referable to the *Æolodon* nor to the *Crocodylus*. The bones of the leg are only in a small degree shorter than the femur; the vertebræ are longer and smaller, and their posterior surface is concave. No other portion of the skeleton is extant. From the form of the vertebræ, I name the creature to which they belonged *Macrospondylus*. I have furnished more complete details of this fossil Saurian in the *Acts of the Academy of Leopold and Caroline*.

MASTODONSAURUS Jaeger.

Dr. Jaeger describes teeth of a conical form, with longitudinal striæ, beginning at a certain distance from the point, and not penetrating deep. Of these teeth the one measures $46\frac{1}{2}$ " long, and $17\frac{1}{2}$ " broad at the base. Other teeth, of the same species, are smaller. These teeth have probably only adhered to the inner upper surface of the alveolar process. The animal to which these teeth belonged Jaeger named the *Mastodonsaurus*. Some bones have since been discovered, which may, probably, be referred also to this animal; but they have not yet been described. I name the animal to which the large teeth belonged, after its discoverer, *M. Jaegeri*.

LEPIDOSAURUS ?

I discovered, in the year 1829, together with the *Rhacheosaurus*, scales which were so large and considerable, that they probably belonged to the skin of a large Saurian. Any farther disquisitions, however, concerning this animal, must remain uncertain, till bones have been found together with such scales, since it is possible that they may have belonged

to a fish. Meanwhile, I term the animal with these fine scales the *Lepidosaúrus*, but without reference to the class of animals to which it belongs. Krüger (*Annual Register of Scientific Criticism ; Jahrbücher für Wissenschaftliche Kritik*, No. 24. 1831, p. 191.) conceives that he recognises in these scales a fucus allied to, but differing from, the *Fucoides Brárdii* of Adolphe Brongniart; which, however, is scarcely possible.

II. With Five Toes.

1. PROTOROSAÚRUS.

This animal Cuvier receives into the class of Monitors: it is the so-termed crocodile of M. Link. Schwedenborg has also examined similar remains, which are preserved at Vienna. The original engraving of this fossil, with a corrected drawing of the foot, taken from the fossil itself, as well as a sketch of the petrification of Link, for the communication of which I was indebted to the late Privy Counsellor Von Sömmering, were my guides in this investigation. The remains described by Spener, from the mine of Kupfer-suhl; a similar relic in the Royal Cabinet of Natural History at Berlin; and perhaps, also, the metallic *Lacértæ*, of Kundmann, belong, with those noticed by Schwedenborg, to one and the same species of animal. The form of the head has, on the whole, some similarity with that of the crocodile of the Nile; but, instead of the 15 teeth in each half of the lower jaw, and 17 or 18 in the upper, which reach as far as the half of the cavity of the eyes, the fossil animal contains only 11, which reach to the anterior corner of the cavity of the eyes, as is the case in the Monitor. The body of the vertebra evidently terminates, at both ends, at right angles to its axis, and resembles the usual form of vertebræ in the fossil Saurians, which, in this particular, decidedly differs from that of the living species. The spinous processes of the dorsal vertebræ are remarkably high. The number of the teeth answers to that of the Monitors and *Lacértæ*. The leg was somewhat longer in relation to the thigh and foot. This species I have named, after Spener, *Protorosaúrus Spéneri*.

2. LACE'RTA NEPTU'NIA Goldfuss.

Professor Goldfuss, in the *Transactions of the Leopold and Caroline Academy*, describes a small *Saúrus* under the name of *Lacérta Neptúnia*. It measures no more than 3 in. 5 lines, Paris measure. It wants, strictly speaking, only the tail; but many parts are so crushed, that their form is no longer to be distinguished. The skull is short; and its general form similar to the *Lacértæ*. In the upper jaw are 26 teeth, which

are comparatively much larger and stronger than in the *Lacérta ágilis*, and are not so pointed. The four front teeth are separated further from each other, and are larger and more blunted than the four following on each side; the hinder teeth gradually increase in size; and the hindermost are the largest of the series. Of vertebræ are reckoned 7 of the neck, 15 of the back, 2 of the pelvis, and 25 of the tail; which, however, represent only two thirds of the length of the tail: the last third is wanting. All the dorsal vertebræ possessed much wider ribs in comparison than in the *Lacérta ágilis*; and, as far as I can perceive in this animal, slender ribs existed on the belly, which were continuous with the former. If these were united in an opposite direction, their union was effected only in a very simple manner. The vertebræ appear to have possessed a similar termination at both ends, as I usually found in the Saurians of the transition strata. The pressure which they have experienced at this point renders their complete examination a difficult task. Of the superior spinous process nothing can be determined, as the animal is placed on its back. The first caudal vertebræ present inferior spinous processes; and in several of the caudal vertebræ large transverse processes are seen, which gradually decrease in size. Of the pelvis and the apparatus of the breast it is difficult to pronounce decisively. The arrangement of the limbs accords, on the whole, with that of the *Lacértæ*. As no traces of the skin of this little Saurian were found, it is probable that it was not covered with many scales, but with a soft skin.

(To be continued.)

ART. II. *Observations on the Existence of electric Currents in vegetable Structures.* By GOLDING BIRD, Esq., F.L.S. F.G.S., Lecturer on Experimental Philosophy at Guy's Hospital, &c.

IN my last communication I have given a brief account of the experiments which indicate the existence of electric currents in vegetable structures; and mentioned certain chemical changes which take place during the process of germination, and which appear of sufficient energy to develop these currents. I next wish to direct attention to some circumstances, connected with this subject, which deserve notice, on account of their intimate relation to the physiological and chemical changes proper to germination.

From the result of Becquerel's experiments, in which he allowed seeds to germinate on litmus paper, it is evident (as shown by that philosopher), that an individual seed, during

germination (or during the conversion of its starch into sugar), may be compared to the negative plate of a voltaic pile; for, in addition to other phenomena, we find an acid developed at its surface. It may be doubted by many whether the weak voltaic current established during germination is of sufficient intensity to entitle it to be regarded as the effect or cause of the chemical changes before alluded to. It is now, however, well known that currents of the lowest intensity (if the time during which they are in action be not limited) are sufficiently energetic to produce most important chemical changes; and I think I am fully borne out by experiment in asserting, that an electric current, from whatever source it may originate, is able to effect the decomposition of any compound body capable of conducting it. This opinion, however, of itself, would possess but little weight, if it were not fully supported by the known action of currents of the feeblest intensity on some of the proximate principles of vegetables. I shall confine myself to the action of these currents on starch, as it is the alteration which takes place in this principle during germination that I have more particularly considered in my last communication.

From many experiments, illustrative of the general subject of this paper, I shall select one of M. Becquerel's*, which I have carefully repeated, and which has an immediate reference to the changes to which amylaceous matter is subjected during germination. When a disc of copper is soldered to one of zinc by its flat surface, and the compound disc plunged into distilled water, an exceedingly feeble current of electricity is set in motion, proceeding from the copper to the zinc, thence to the water, by which it is communicated to the copper, and so on in a succession of circles, or electric tides, if I may be allowed the expression. Let two of these compound discs be placed in separate glass cups, in different positions, the copper surface being uppermost in one, and the zinc surface in the other; and place on the upper surface of either disc a piece of bibulous paper, on which some potato starch has been scattered; then fill the glass cups with distilled water, care being taken that the discs are completely immersed. In the space of twelve hours, it will be found that the starch on the copper surface of the disc will exert an alkaline reaction on reddened litmus; while the starch on the zinc surface will turn blue litmus paper to red, demonstrating the evolution of an acid on the zinc, and of an alkali on the copper, surface of the compound disc. It will scarcely be

* *Traité de l'Électricité et du Magnétisme*, tom. iv. p. 175.

necessary to enquire what is the source of the acid and alkali developed in these experiments; for it is obvious that the water, in which the plates of metal were immersed, having been freed from saline ingredients by distillation, cannot be regarded as yielding either of them; we must therefore look to the starch, which substance always contains (not as an impurity, but as a necessary constituent) saline matters. This will scarcely be objected to, since the elaborate researches of Raspail, who certainly appears to have demonstrated the fact that, for an organic molecule to assume organisation, it is necessary that it should combine with a saline base, at least when that molecule, as in the case of starch, consists of carbon with oxygen and hydrogen in the proportion to form water. “Une molécule de carbone et une molécule d’eau s’associent pour former la molécule organique sous forme sphérique; la molécule organique, en se combinant avec une base, forme les parois des tissus ligneux si la base est fixe, et glutineux ou albumineux si la base est ammoniacale.”* This being granted, and knowing that chloride of sodium, or common salt, is most generally present in organic matter, we cannot but refer the acid and alkali developed by the weak electric currents in the above experiments to a decomposition of that salt, hydrochloric acid appearing at the zinc, and soda at the copper, surface of the compound discs. If the starch remaining on the discs after the experiment be examined under a microscope, we shall find multitudes of ruptured vesicles of amylaceous matter lying strewn through the mass, their contents having been set free, and partially decomposed, by the weak electric currents, to the action of which they had been subjected.

Guided by these experiments, we shall have no difficulty in appreciating the results obtained by allowing seeds to germinate whilst under the influence of electric currents. It is obvious that, if the seed, during germination, acts in a manner analogous to the negative plate of a voltaic apparatus, in expelling acids and attracting bases, we ought (allowing this function of the seed to be necessary to the perfection of germination) to expect that, by causing the seed to assume an oppositely electric state, the process of germination would be retarded, or, perhaps, altogether checked; and this was found, by the results of numerous experiments, to be the case.

M. Becquerel covered the surfaces of the compound disc (used in the experiments with the starch) with moistened cotton, on which he allowed seeds to germinate, after placing

* Raspail, *Nouv. Syst. de Chimie Organique*, 1833, p. 545. See, also, *Nouv. Système de Physiologie Végétale*, par Raspail, 1837, *passim*.

the discs on glass supports, and taking care to supply moisture as fast as it was removed by evaporation. In every case, some of the seeds were allowed to germinate on a glass plate, for the purpose of affording comparative results. In the first experiment, the cotton was moistened with *distilled* water, and seeds of the garden cress (*Lepidium sativum*) were placed on its surface.* In the course of two or three days, the radicles appeared on all three surfaces (i. e. copper, zinc, and glass), of almost equal vigour and size in each. In a very short time, however, germination continued with great vigour on the copper, but had nearly ceased on the zinc surface of the compound discs. The plantules on the latter gradually withered up and died: those on the plate of glass were tolerably healthy, but by no means so vigorous as those on the copper surface of the discs. Seeds of the common pea (*Pisum sativum*) afforded precisely similar results. On examining with test-papers the cotton on the surface of the zinc, it was found to be acid, and that on the copper alkaline. As the water with which the cotton was moistened had been previously distilled, the evolution of acid and alkali can only be attributed to the decomposition of saline matter present in the seed itself. For the purpose of ascertaining what substances were really set free by the action of the voltaic current on seeds, M. Becquerel made an analysis of the water in which some garden cress had been allowed to germinate during two months on zinc and copper surfaces, and found it to consist, in 100 parts, of

Oxide of Zinc	-	-	0.0005
Hydrochloric Acid	-	-	0.0007
Soda	-	-	0.0002
Water	-	-	99.9936

I repeated M. Becquerel's experiments, substituting mustard seeds (*Sinapis alba*) for those of cress or peas. I placed the mustard seeds on the zinc and copper surfaces of compound discs, placed in saucers, and kept constantly moistened with rain-water: the metallic discs were covered with flannel. The experiment commenced on April 14. The temperature of the room in which the saucers were placed was kept pretty constantly at 64°.

April 17. Copper surface. Testæ burst; cotyledons all separated, radicles protruding about one-sixth of an inch.

Zinc surface. Testæ burst; cotyledons scarcely separated; in most of the seeds the line of division only distinct, radicles of very few protruding.

* Becquerel, *Traité de l'Électricité et du Magnétisme*, tom. iv. p. 177.

April 20. Copper surface. Cotyledons widely expanded, but still yellow; elevated one third of an inch above the flannel, to which they are attached by their radicles. A piece of reddened litmus paper, when brought in contact with the flannel, becomes blue.

Zinc surface. Cotyledons, in many of the seeds, not even expanded: in some, and generally in those most remote from the zinc, the cotyledonary leaves had become expanded, and elevated about a quarter of an inch above the flannel, to which they were attached by their radicles; but even the most forward of these presented a far different aspect to the vigorous plantules on the copper surface of the compound disc. On bringing a piece of litmus paper in contact with the flannel, it assumed a faint red tint.

April 30. Copper surface. Plantules between 2 in. and 3 in. in length, presenting every appearance of health and vigour, in which they far exceeded those which had been growing on a glass plate the same length of time.

Zinc surface. Plantules scarcely exceeding 1 in. in length: the majority had shrivelled up and died: even amongst the most vigorous the cotyledonary leaves retained their yellow tint, presenting a most striking contrast to those vegetating on the copper surface.

May 8. Copper surface. Plantules present every appearance of perfect health: they have grown rapidly during the last week; their primordial leaves are of a deep and healthy green.

Zinc surface. Most of the plantules are withered and dead. Some, however, continue to exist, scarcely exceeding 1 in. or $1\frac{1}{2}$ in. in length; their primordial leaves being of a pale, unhealthy, yellowish green.

From the results of these experiments, we are, I think, authorised in believing that electric currents are not only developed during germination, but that their influence is important, if not necessary, to the proper performance of that process; for the results of M. Becquerel's experiments are sufficient to demonstrate that germinating seeds expel acids and attract bases, and hence bearing some resemblance to the negative element of a voltaic arrangement; whilst the actual developement of electricity during germination has been fully proved by the experiments of M. Pouillet, detailed in the last Number of this Magazine. We can have no difficulty in understanding the rationale of the action of the zinc and copper surfaces in accelerating or retarding the developement of the seed; for, on the copper plate, forming the negative

element of a feeble battery, we find bases, as potass, soda, and probably ammonia, formed by the union of hydrogen of the water and nitrogen of the air, gradually developed. These unite with and neutralise the free acid expelled by the vital (? electric) influence of the germinating seed, and place it under circumstances most favourable for its development, by virtually removing those substances which would prove injurious to it. Accordingly, on the copper discs we find the seeds rapidly germinate; their growth is accelerated, and vigorous and healthy plants are produced, far exceeding in vigour those cultivated under similar circumstances, but without the voltaic influence of the metallic disc. On the zinc, or positive surface of the disc, we have a far different state of things. In consequence of its electro-positive state, it unites with oxygen, to the partial exclusion of the seed. Acids are set free on its surface, which tend to retard, by their depressing, or perhaps chemical, influence, the development of the infant plant; and, finally, the plantules either struggle for a time through a sickly existence, or die from those changes necessary for their development being arrested. The copper surface of the discs, from assuming an electric state analogous to that of the germinating seed, tend, therefore, to assist its evolution; whilst the zinc surface, by being in an oppositely electric condition, oppose its feeble vital state, and enfeeble, or altogether check, its development.

In the above remarks, I have confined myself almost solely to the process of germination; for, obscure as it is, I do think that, by the light of chemistry, we have been enabled to traverse some of its mazes with more success than those of the more concealed, and consequently obscure, functions of the adult plant. In these imperfect and somewhat desultory observations, I trust that enough has been advanced to demonstrate, —

1st. The great improbability of vegetables, on account of their feeble insulation, ever becoming so charged with electricity as to afford a spark*; and the probability of those luminous phenomena said to be exhibited by some plants depending on other sources than electric currents.†

2d. That electric currents, *of very feeble tension*, are always circulating in, and exerting their influence upon, vegetable tissues at every stage of development.‡

3d. That electric currents are developed during germination,

* Babinet et Bailly, *Résumé, supra citat.*

† Lestiboudois, *Botanographie Belgique*, tom. ii., *sup. citat.*

‡ Donnée et Pouillet, in *Traité de l'Électricité et du Magnétisme*, par M. Becquerel, tom. iv. p. 164. *et seq.*

and assist in producing the important chemical changes proper to that process; and that, by causing the seed to assume an oppositely electric state, we retard or check its development.

In conclusion, I may be permitted to remark, that such of the reasoning in this paper as depends on the results of ultimate chemical analyses cannot be shaken or overthrown by differences in the results of the analyses of subsequent chemists; for, as I have limited myself solely to starch and sugar (which substances, under every variety, consist of carbon united with oxygen and hydrogen in the proportion to form water), it is obvious that the utmost discrepancies existing between the results of analyses can only amount to the addition or subtraction of an atom or two of the elements of water, which cannot seriously affect the view I have taken of the chemical changes proper to germination. I felt myself compelled to make these concluding remarks; as, since I penned the first part of this paper, the third edition of Mitscherlich's *Lehrbuch der Chemie* has reached this country; and I find that his analyses of the different forms of sugar and starch differ somewhat from those of Berzelius*, whom I took for my authority in the commencement of these observations. The following is a view of the composition of sugars and starch, as given by Mitscherlich; and the remarks that follow are sufficient to show that, although he differs from Berzelius, yet that, for the reasons just stated, they cannot seriously affect my view of the changes in the germinating seed.

	Cane Sugar.	Anhydrous Starch.	Sugar of Milk.	Grape Sugar.
Carbon - -	12 volumes.	12 volumes.	12 volume s.	12 volumes.
Hydrogen - -	22 —	20 —	24 —	28 —
Oxygen - -	11 —	10 —	12 —	14 —

“In diesen vier substanzen *sind sauerstoff und wasserstoff ganz in demselben verhältniss wie im wasser enthalten.* Die umänderung des amidous und milchzuckers in traubenzucker würde also darauf beruhen, dass mit beiden sich noch wasser verbindet und zwar als wasserstoff und sauerstoff, bei welcher verbindung die schwefelsäure wei bei der aether-bildung, und das poröse platina oder das gährungsmittel bei der essigbildung wirkt; sie verändert sich dabei durchaus nicht.”†

* *Traité de Chimie*, par M. Berzelius, tom. v. p. 207.

† *Lehrbuch der Chemie*, von Mitscherlich, 3te auflage; erster band, s. 164.

“In these four substances oxygen and hydrogen exist in the very same

Want of leisure prevents my continuing some experiments connected with the action of electricity on adult vegetables; but, should I again resume them, and arrive at any satisfactory or interesting results, I shall be happy to make them public in the pages of this Magazine.

22. *Wilmington Square, May 9. 1837.*

ART. III. *On the Reconciliation of certain apparent Discrepancies observable in the Mode in which the seasonal and progressive Changes of Colour are effected in the Fur of Mammalians and Feathers of Birds; with various Observations on Moulting.* By EDWARD BLYTH, Esq.

(Concluded from p. 263.)

IT is a curious fact, that many denti-rostral birds, as the song-thrush and the grey flycatcher, actually commence the renovation of their nestling body plumage before the primaries have attained their complete growth; and it is most interesting, and highly instructive, to observe the relationships of affinity indicated by a variety of circumstances connected with these changes in different groups. Thus, the *Lanius Collurio*, as if in reference to this early moulting in the thrushes and flycatchers, puts forth a series of new feathers along each side of the breast almost immediately after quitting the nest, these being of precisely the same hue as the rather more downy feathers that are cast; and I have incidentally noticed, in a young male of this species which had been captured and caged, that the feathers which, on its being first imprisoned, it had rubbed off its forehead, were succeeded by others of the same brown colour, with similar transverse bars; whereas it is well known that, in a young cock bullfinch, if a few of the breast feathers are pulled out, even before it leaves the nest, these are replaced by some of the colour indicative of its sex, in adult livery: whence this method is constantly resorted to by the dealers to ascertain the sex of their nestling birds. The very partial moulting, however, of the young shrike, above noticed, appears to be quite unconnected with its subsequent change, for I find that, about October, these birds renew their whole plumage, and assume the adult livery.

proportions as in water. The conversion of starch and sugar of milk into grape sugar depends upon the combination of both substances with a fresh quantity of water, or, rather, of oxygen and hydrogen, by the action of sulphuric acid, as in the process of ætherification; or by spongy platinum, or fermentation, in the production of acetification; they undergoing no further change."

Now, a knowledge of the fact just stated, of a seeming reference in the changes of one group to those of others, to which it is related by the tie of physiological affinity, might induce the inference that, as some groups moult twice in the year, and others in autumn only, it would follow that single-moulting birds, which had not been able to complete their change at the proper season, would do so at the time of the vernal renovation of the others, did not observation fail to confirm this highly reasonable supposition, as in the case mentioned of the snowfleck. It is true that some species are, in confinement, subject to an unhealthy loss of feather in the winter months, which, early in spring, exhibit a sudden restoration of clothing, that might be mistaken for a moult; but this is connected with the general invigoration of the whole system, which always then takes place, coincidently with an internal development, and is unaccompanied by any *casting* of the plumage.

Here, it may be mentioned, by the way, that I am not quite certain that all single-moulting birds change their plumage in autumn, having met with one fact, at least, which renders this somewhat doubtful. A fine healthy-looking specimen of the black-throated loon, in thoroughly mature plumage, obtained in one of the markets, early in January, had obviously not changed its feathers the preceding autumn: the purple gloss upon its throat had almost disappeared; and the black terminations to its white-spotted scapularies had come off, leaving the white terminal, as observed in the seasonal shedding of the deciduous tips to the feathers so prevalent among the smaller Insessores; in a word, the whole plumage bore every indication of a twelvemonth's wear; and there appeared sufficient reason at least to suspect that it would have been renewed in spring, as always happens with the younger birds of this genus; though whether the same constantly obtains with the adults, I have not, at present, the experience to decide. Should it prove so, this would be a singular negation to an otherwise universal rule, so far as I have hitherto been able to investigate.

It is now several years since I happened to notice, while sojourning at the house of a friend, that a young jackdaw that was running about his garden moulted its nestling primaries; while a variety of young thrushes, also in his possession, retained the quill and tail feathers while shedding their clothing plumage. To illustrate this familiarly, it may be presumed that many persons have noticed, that a young jackdaw or magpie, that had had its wing clipped as soon as it could fly, regained the use of its wings at the first moulting season; whereas a young caged blackbird, that had injured its wings

when young, retains its broken quill-feathers till the second autumn: indeed, it is furthermore observable, in the latter instance, that, while a young cock blackbird becomes otherwise wholly black at the first moult, its brown nestling quills present an obvious contrast till the next general change of feather; and this while it is equally perceptible that the brown nestling primaries of a starling of the same age had been changed, from the absence of corresponding diversity. A recourse to the measure will generally determine which species moult in either way; for, in those which shed their nestling quills the first season, these, with few exceptions, will be found much shorter than the feathers by which they are succeeded: the same applies equally to the tail; besides which, in most instances where the latter deviates from an even form, the approach to this is greater in the young. It would be needless, however, to enter into long details of exemplification, my object being rather to show that attention to these and many similar minutiae is oftentimes of the greatest assistance in enabling us to trace out correctly the affinities of groups: for instance, the tits (*Parus*), of which the general characters are intermediate between those of the warbler and corvine genera, invariably retain the wing primaries, like the former, and moult their tail-feathers, as in the latter, at the first autumnal change of plumage.

There are many other birds, however, as the *Falcónidae* and true gulls, which undergo no change of feather till the second autumn, though some of these exhibit a manifest change of colour before the moulting time. I have particularly noticed this in the male *Circus cineræus*, and the *Larus argentatus*, both of which I have known to become almost wholly grey previous to the casting of their first plumage. The common kestrel may be sometimes observed to throw out a few adult feathers during the first autumn; but, out of many dozens of them that I have examined in the winter months, I have never yet seen one that had renewed more than a very few of its feathers: indeed, the disposition to change them ceases, as has been already noticed, in the course of a few weeks; and the dissimilar old and new feathers are retained together till the second autumn; there being, in this instance, no tendency to a change of colour in the existing plumage.

Having mentioned the kestrel, I cannot do better than introduce here a notice of a most interesting fact, which I have learned respecting the plumage of a bird of this species. Few Londoners are unacquainted with an exhibition to be seen constantly, in fine weather, upon Southwark Bridge, where a man, by everlastingly gorging a number of cats, hawks, and

owls, contrives to get them to live amicably in the same cage with a host of rabbits, guinea-pigs, pigeons, rats, mice, and small birds. A few months ago, I saw in this collection a common kestrel, which had taken to feed a number of importunate adult starlings. The man told me that he had had it in his possession about four years; a circumstance which I was led to doubt, as, from its small size, it was obviously a male bird, and was clad in the livery of the other sex, as all the males are when young. However, on questioning him, he assured me that he had kept it so long; and incidentally mentioned, as something worthy of remark, that the preceding year it had had what he designated a "pigeon tail;" clearly alluding to the common adult plumage of the male kestrel, which has the tail grey, with a black bar near its termination: it was therefore more than probable that some injury had deprived it of sexual power, in consequence of which, it had ceased to exhibit the external characteristics of its sex; nay more, had even acquired the feminine habit of feeding young, as in a capon.

Now, the above fact, presuming that I do not labour under a misapprehension regarding its verity, would appear to be contrary, rather than analogous, to that of the assumption of the male plumage by female birds that are aged or similarly injured; inasmuch as the same privation would, in the one instance, act as a hinderance, in the other as an immediate cause, of the attainment of the perfect plumage typical of the species. As concerns, however, the fact of female birds occasionally obtaining the male livery, I have repeatedly found that this, in particular instances, has no sort of reference to any internal defect. A female scaup pochard, that I lately examined, contained numerous eggs, though in plumage scarcely differing from the male, which I took it to be before dissection; and I believe the same occasionally happens with the white-eyed pochard. I have seen the hen *Lanius rufus* vary from considerable dissimilarity to almost exact resemblance of the other sex; and instances of the same fact, in the allied *L. Collurio*, have been recorded in former volumes (old series) of this Magazine. The adult male dress is, of course, the typical plumage of a species; and in every instance, it will be observed, wherein the first or immature garb differs from this, that of the female either entirely resembles the one or the other, or is in various degrees intermediate; in numerous instances, however, manifesting a decided tendency to advance in the scale, in vigorous and healthy individuals. Last winter, I saw a fine bright female of *Calamophilus biarmicus*, with jetty-black under tail-coverts, as in the male.

I am fully persuaded that, not at all uncommonly, a female bird in masculine attire is thrown aside as a dull specimen of the male, being considered as unworthy of preservation. That I have myself done this, in the case of the common shrike, I entertain no doubt whatever. Montagu, it will be remembered, shot many specimens of the tree sparrow, in the hope of procuring a hen, before it occurred to him that the sexes might possibly resemble. Indeed, there are few of us but have occasionally seen a female sparrow-hawk with a blue back, which is readily noticed in this instance, merely because of the great sexual disparity of size. Not long ago, I saw in confinement what I considered to be a female *Circus cyaneus*, with brown body plumage, but grey wings and tail: a young male would have assumed at least some traces of grey on its clothing plumage previous to its moult, and would certainly, I presume, never exhibit adult primaries before it had begun to change its smaller feathers. That both sexes of the peregrine falcon become quite blue with age (the female, however, more slowly than the male), is a fact familiar to most naturalists; and the same is noticeable in other species of *Falconidæ*. Still, it is not wished to be insinuated but that such incidents are of rare occurrence in most birds, and, probably, do not ever take place in some.

In fact, it may be observed, that, in almost every large group wherein the immature dress differs in some species from the adult, there will be found others in which neither sex advance beyond the primitive markings, although these may subsequently assume a more contrasted and adult-looking appearance: thus, to give a few examples, the barred markings characteristic of the immature dress of the green woodpeckers (*Chrysóptilus*) are permanent in many species of the allied division *Coláptes*; so, likewise, the mottled upper parts of various Eastern and Australian thrushes (and which also occur among the mature *Ianthocínclæ*), are analogous to those of the nestling garb of our native *Merúlidæ*. In like manner, some of the shrike tribe never advance beyond a style of marking characteristic of only the first plumage of the *Lanius Collurio*; and the fixed livery of the bitterns may be said to be similarly correspondent to what is cast at an early age in the genera allied to them. To take the next grade, other species will occur, wherein the males only present a departure from the original aspect of plumage; even these requiring, in some instances, more than a single moult to bring about the diversity. Thus, Mr. Hoy assures me that, comparatively, very few of the male orioles which he has found breeding differed at all in plumage from the other sex;

and, on the other hand, in males of other species which differ in uniform from their mates and young, every amount of diversity is apparent, in a series of species (or, perhaps, genera), from all but resemblance, to very considerable dissimilarity. So, in the females, as already stated, there is every gradation towards the assumption of the typical plumage; and this not only as exhibited in a series of distinct species, but as shown in a greater or less tendency to obtain it at a later period of life than in the males, or analogously to what is seen in the adult male oriole, when compared with other species. The *Lanius Collurio*, and more especially the *L. rufus*, would seem to exemplify what has been just asserted.*

Indeed, in the latter species, I have chanced to notice a fact which is particularly worthy of mention here; namely, that, although the young, in their nestling plumage, almost always considerably resemble in their markings those of *L. Collurio*, exhibiting a series of transverse bars on the upper parts, yet specimens do sometimes occur, even at this age, in very nearly the livery of the adult†, but which are, of course, readily distinguished by the much looser texture of their feathers. A more striking instance of this disposition to advance, or, rather, of the vacillation (so to speak) occasionally discernible in species of an intermediate character, can scarcely be imagined possible. To apply such facts, we are naturally led to infer, that, as the sexes of the common sparrow, for instance, are constantly dissimilar, while those of the tree sparrow are always the reverse, in intermediate species, such as the *Passer cisalpinus*, some inconstancy in the plumage of the old females might be expected; also, whereas, at the one extremity of the scale, it would not seem unlikely for species to exist of which even the adult male plumage was analogous to that of the female and young of the common sparrow, at the other it is equally probable for even the nestlings to present corresponding markings to those of the adult male of the same bird: indeed, I could prove as much by reference to known species in several groups. I will content myself, however, by citing an additional instance illustrative of the gradation noticeable in species of intermediate character, as observable in the assumption of the male livery by the female dwarf-bitterns (*Ardèola*). Alexander Wilson, who was well aware of the usual similarity of the sexes in this tribe of birds, much more so than contemporaneous European

* In connexion with these facts may be cited Mr. Gould's figure, in his *Birds of Europe*, of a male *Circus rufus* with its plumage partly grey.

† An example of this may be seen in the Museum of the Zoological Society.

writers, in the instance of the American *A. exilis*, describes them separately; and, although Mr. Selby, in his *British Ornithology*, asserts that those of the European *A. minuta* differ in no respect, this is contrary to my own experience of several individuals, some of which contained eggs considerably advanced, and would certainly have bred in their existent state of plumage. I have since learned that this is the case, and that the proportion such females bear, at the breeding season, to others which have assumed the perfect livery of the male, is much the same as has been already noticed of the other sex of the oriole. The herons never propagate but in mature plumage; and the affinities of the tiny dwarf-bitterns are in no way more beautifully exemplified than by the simple fact which has been just detailed.

The young of the different species of *Strigidae* exhibit some remarkable nonconformities in the character of their first plumage, which, if duly investigated, would, doubtless, help to enlighten us a good deal respecting their mutual affinities, which are at present very obscure. Those of the common barn owl, for instance, remain extremely long in the nest, wherein they slowly elaborate a plumage adult in its appearance and texture, which, as in the *Falconidae*, is not moulted till the second autumn. The young of the *Aluco stridula*, on the contrary, are clothed, at an early age, with rather flimsy downy feathers, which are entirely moulted, including all the primaries, before the first winter.

It is hoped the announcement of these and analogous diversities will serve to awaken the attention of practical observers to the investigation of all such particulars. But, without descending, on the present occasion, into the details of every group, let us endeavour, rather, to deduce the general laws which prevail in the abstract, and in which all seeming discrepancies and merely apparent anomalies will, most probably, be found eventually to merge, however useful a correct knowledge of them has been shown to be in tracing out the physiological relations of species. We have seen that the amount of constitutional vigour is a very important modifier; and in no instance is this more strikingly exemplified than in the case of species which ordinarily require a number of years to attain their fixed or perfectly adult livery. The loons (*Colymbus*), for example, commonly advance through several intermediate stages ere they exhibit the complete markings of maturity; yet I know of one preserved specimen of *C. glacialis*, which was killed while exchanging its first or greyish plumage for the nearly or quite perfect garb, thus omitting the intermediate gradation. We also know that eagles, and analogous

species, in a captive state, are much slower in acquiring the adult colours than when in their native wilds; wherefore, it may be presumed that locality and circumstance may sometimes exercise a very considerable influence in accelerating or retarding, in hindering or otherwise modifying, the attainment of typical perfection. At the same time, we must not forget the aggregate of difficulties which every species has to encounter when occurring beyond the sphere of its adaptations, and which rarely permit of its maintaining a prolonged existence elsewhere than in its normal habitat, where all alike conduces to its security and welfare.

However, some of the facts above mentioned quite warrant us in suspecting (what, indeed, proves to be the case) an occasional variation in the mode in which the seasonal changes of colour in the clothing of animals are brought about, even in the same species, when under the influence of diverse circumstances. It would seem that the effort of nature, in most instances, was to throw off and renew the covering; but that this tendency is susceptible of being modified, or even counteracted, not only by specific peculiarity, but by the relative amount of constitutional vigour in different individuals of the same species; intermediate gradations obtaining, probably, in both instances, analogous to what have already been described. The effects of confinement in obstructing regular natural changes are manifested in a variety of instances: thus, the common squirrel, which, in the wild state, renews its fur in spring, obtaining a much coarser and redder coat, and, at the same time, losing the ornamental long hairs which, in winter, adorn its ears, rarely exhibits even an indication of this change when in captivity; and it is well known that the linnet tribe, when under the restraint of the cage, display not the slightest trace of those seasonal brightenings, which so remarkably distinguish these birds in a state of freedom. Indeed, in the latter instance, as the linnets breed prolifically in confinement, we can hardly assume that physical weakness is the cause of this; and it becomes difficult to assign to what external influence their summer brilliancy may be attributable, or, rather, to determine the reason of its suppression in vigorous captive specimens.

The bleaching of cuticular productions by severe cold can hardly be esteemed analogous to other alterations of colour; neither does it seem to be more akin to those sudden changes of the human hair to grey, which have happened during continued intense emotions of fear or anxiety. It is, however, difficult to assign to what extent the changes of arctic animals are dependent on external influence; for though, in

the ermine, they undoubtedly seem to be produced by temperature only, I think there is much reason to suspect that the double-moulting ptarmigan would become white in winter, even though removed from its frigid habitat. This can only be ascertained by keeping them for some time in confinement, which I am not aware has ever been attempted.

It is now time, however, that I reverted to the explanation of those appearances in the young mallard, and also the pintail, and some other species, which would lead any unpractised observer to suppose that the excessive change from the feminine to the male garb was effected in these birds without a renewal of the feathers. To a certain and very considerable extent, a change of hue unquestionably does take place; but, without resorting to observation of the domestic breed for assistance in the elucidation of this difficulty, I think that a little attention to the following circumstances will go far towards determining that an actual moult had taken place, in which the birds had assumed an intermediate garb, in various degrees removed from the perfect livery, according to the respective vigour of each individual; the completion of the colours being subsequently induced by a change of tint only in the same feathers.

Nothing is more usual than to perceive traces of the feminine markings in the new feathers which we see growing, in spring, on those *Anátidæ* which are brought to market in a state of moult; this fact being precisely the reverse of that already noticed, of the tinging of the old feathers with the new colouring matter, which is commonly visible in the same specimens. The younger, therefore, a bird of this tribe might be at the time of undergoing its moult, the greater admixture of these traces of the female colouring we should expect to find upon its new plumage. Supposing the young mallards, therefore, to have completed their moult at the time we see them, there is nothing to excite surprise at the considerable observed intermixture of the female markings.

But, that a change of feather had certainly taken place, at least in one instance, is conclusively shown by their all possessing the singular curled feathers of the tail, while not the slightest trace of these having been recently renewed is discernible. The same applies to the analogous elongated central tail-feathers of the pintail; and, in both instances, I have constantly found that these are shorter and smaller-looking than in the older birds. I have mentioned that, in one case (but this out of many hundreds), I have seen a male pintail moulting in spring; and it is worthy of remark, that, in this bird, the long central tail-feathers were developed to

their full extent; whereas, had it changed its plumage at an earlier age, this, probably, would not have been the case. It is not a little singular, that the females of the mallard and pintail renew their feathers in March, at which period all we see are quite ragged; while the most careful inspection fails to detect any signs of a contemporaneous moult in the males: in the latter, I have noticed, in numerous instances, that those which, so late as this, present any appearance of the female lineated markings, are uniformly in poor condition, which had retarded the obliteration of them.

Now, it is not for a moment likely that the female birds should renovate their plumage without a corresponding renewal occurring in the males; and, though it is sufficiently remarkable that the latter should take place several weeks (apparently even months) earlier, yet this is less improbable than that the moulting should be confined to the female sex, especially as the change of colour is so considerable in the males. The circumstance, however (on which there can be no mistake), of the middle tail-feathers having been changed, is, from analogy, conclusive evidence of the whole clothing plumage being likewise moulted, however the retention of the feminine markings on the under parts, and, indeed, elsewhere, might seem to induce the opposite opinion. That these are gradually lost as the spring advances, without another change of feather, I am perfectly certain of from observation.

The seeming discrepancy, therefore, which, on a superficial view, appears to prevail in the mode in which different species of ducks obtain the adult livery, is shown to be quite dependent on the period of changing their feathers, and not, as almost any one would be apt to conclude from looking at them, upon some species renewing their feathers, while others merely changed their colours. The earlier the moult takes place, the less mature is the colouring of the new feathers, and the greater, consequently, the change of hue which subsequently takes place in them; a fact which disproves the supposition of any necessary connexion between the moult and the mere change of colour; while it demonstrates the continued circulation pervading the pores of the feathers. Of the spring-moulting species, it may be remarked, that none have more mottling upon the new feathers, when first put forth, than the common shieldrake; a species of which the sexes only differ in intensity of tint.

I cannot conclude this subject without adverting to another seeming discordancy, which I have never had the opportunity of investigating so extensively as I could wish. I shall there-

fore content myself with a simple statement of the facts, in the desire to call attention to the subject.

It is well known, that, in most of the *Anátidæ* of which the sexes differ, the males undergo, at midsummer, a most remarkable change of colour, reassimilating to the other sex. Now this, in some species, appears to be effected by a moult; in others, by a mere change of colour.

In the common drake and pintail, every feather is cast, even the primaries being then changed; and the new plumage resembles that of the female. Here, too, I have noticed that, previous to the reassumption of their appropriate garb, a slight tendency to regain the colours of the latter is evinced: thus, in the pintail, I have seen the white lateral line of the neck become tolerably defined; no trace of this having been discernible at first. It is not so generally known, however, that the females, also, at this time, renovate their plumage, though without any alteration of colour. When they are incubating, I have invariably found, on examination, that the domestic ducks are always in deep moult.

Other species, however (and it would seem those of which the young moult into the adult garb comparatively late), assume the female dress at midsummer, by an alteration of colour only, without renewing the feathers, as if the male tints were superimposed on those of the female, and could be discharged without affecting the latter; which, indeed, seems to be the case. The bay-breasted merganser is a good example of this, the beautiful colours of which completely disappear, and very rapidly; and what may be regarded as peculiarly interesting in this instance is, that, synchronously with the deep bay colour on the breast being lost, leaving this part white, the originally white portion of its ornamental shoulder-tuft becomes mottled, with gradually increasing confluent streaks of brown. I do not know of a more remarkable change than that which then pervades the whole plumage of this species.

It would be unnecessary to treat further, on the present occasion, on the seasonal changes prevalent among this interesting tribe of birds, considering the length to which this paper has been already extended. In the adults of most of those species of which the young undergo a moult in spring, a series of large side feathers, to throw over the closed wing when swimming, is pushed forth at the period when the immature birds are moulting; these being a great adornment to them as seen alive.

It would be ungrateful to finish this article without acknowledging the kind assistance rendered me by Mr. Bartlett,

animal preserver, of Museum Street, in the conducting of these and many similar researches. The liberal manner in which he has permitted me to inspect the great variety of recent wildfowl that continually pass through his hands has enabled me to speak with precision and confidence on many points, concerning which I should otherwise have been, to say the least, doubtful. It is needless to add, that a wide field for observation is here open to the practical ornithologist.

North Brixton, April 12. 1837.

ART. IV. *On the Preservation of Botanical Specimens from the Attacks of Insects.* By J. P. BROWN, Esq.

THE preservation of his herbarium from the attacks of insects is, of course, a subject of the first importance to every botanist: but on what means can he rely with any confidence of success? Sir J. E. Smith strongly recommends washing with a solution of corrosive sublimate, as "perfectly efficacious." Dr. Lindley objects to this plan, as "a doubtful mode of preservation, expensive, and, in large collections, excessively troublesome;" and prefers the use of camphor, suspended in small open paper bags, fixed to the inside of the doors of his cabinets. (*Instr.*, p. 467.) It being, then, a point on which "doctors differ," it may be satisfactory to some of your readers to be informed of the result of a severe trial, borne by my own collection, which, at the recommendation of Sir J. E. Smith, has been washed with the corrosive solution.

Having to quit our former abode before our present residence was ready for our reception, the Château of Thun presented the only eligible temporary quarters to be obtained in the neighbourhood. You are, no doubt, aware that the château in question is situated on a sharp hill, up which it would be by no means desirable to drag heavy furniture, collections of minerals, insects, plants, &c., with the certainty of having soon to transfer the whole to the top of another hill in precisely the opposite direction. I was therefore glad to accept the offer of a large room in the immediate vicinity of the house we were about to inhabit. The room was not in my friend's residence, but in that of the farmer, whose house, which is tolerably ancient, is constructed almost entirely of wood, as is customary amongst the peasantry of this country. On entering the room, the first circumstance which struck my attention was, that there was scarcely a plank or a beam in its walls, floor, or ceiling, which did not appear to be, or to have been, inhabited by a colony of insects: it was a per-

fect entomopolis, in which no one would venture to deposit a dried plant which he was not pretty confident had been by some means secured from danger. The result of long experience induced me to run the risk; and my collection, made up into between seventy or eighty packets, was deposited in the room, in the month of May, 1836. Contrary to my intention, the heap into which the packets were formed rested immediately on the floor. The summer was warm, and peculiarly favourable for the increase of the insect population; and my plants remained in this situation till the month of December. It was not until the end of January that I had leisure to commence the examination of the herbarium, which I did with certain feelings of anxiety, and with the following result. That the amount of damage may be compared with the extent of the herbarium, it may be necessary to premise that the number of individual specimens may be assumed as at least 30,000; and that, with a view to revisiting the attached plants, every one which bore the slightest indication of having had an insect in the paper containing it was noted. They were as follows: — 1. *Aconitum intermedium* D. C., several specimens; one only slightly gnawed on the edge of the helmet of one of the flowers. 2. *Potentilla multifida* L., a few specimens; one of them attacked at the root. 3. *Pyrus Malus* L., one attacked in the flower. 4. *Angélica scabra* Petit, three specimens; one of them with traces of an attack in the root. 5. *Férula glauca* L., a single plant, with a slight attack on one of the rays of the umbel. 6. *Sónchus Plumieri* L., a few plants; one nibbled at the base of one of the flowers. 7. *Sónchus oleraceus* L. (including ásper), many plants; one only gnawed in several places: the only plant in the collection attacked in the stem, near which was the depredator, wriggling away as if he did not like either his quarters or his commons. 8. *Sónchus lævigatus*: a small quantity of dust in the paper; but, as I cannot detect any injury in the plant, it has, most probably, fallen from some other paper. 9. *Lactuca viròsa* L., many plants; one with a single flower attacked. 10. *Lactuca perennis* L., several plants; one slightly gnawed on one of the peduncles. 11. *Prenánthes vimínea* L., a Pyrenean specimen, with a small trace of injury at the tip of a branch; many Valesian specimens untouched. 12. *Hypochæris maculata* L., several specimens, no one of which shows any damage; but a small quantity of dust was in the paper. 13. *Scrophularia canina* L., many specimens, of which only one had two or three of its flowers attacked. 14. *Iris foetidissima* L. One of the specimens, in seed, had a good deal of insect excrement inside of one of the capsules, which had opened since the plant

had been placed in the herbarium, and of which the inside of the capsule had, of course, escaped being washed. 15. *Lilium tigrinum* Garwl., one of the flowers gnawed.

The above is a faithful account of every vestige of an insect I could detect, and having shown the mischief in mass, amounting to an average of one, usually very trifling, indication of an attack in 2000 specimens, I may be permitted to make a few observations, to place the circumstances in a clearer point of view. The first thing to point out is, that in no one instance was a specimen sufficiently injured to induce me to remove it from my herbarium, in order to replace it by another taken from my duplicates; indeed, on again referring to all the plants in the foregoing list, I doubt whether any person would observe that a single one had been attacked, now that the traces left behind by the insects have been brushed away. The second point worthy of attention is, that holding my duplicates freely at the disposal of my friends*, and not wishing to be unprepared if called upon, I took them to the château, where they were deposited in a large airy room, exposed to the full light of the sun. In the course of the summer, the whole were gone over four or five times, in order to make up different parcels; and I may safely assert that, on *each occasion* of passing them in review, there was not one of the thirteen packets into which they were formed, that did not furnish much stronger traces of insects than the whole of my herbarium, after remaining so long untouched in the midst of danger.

It will be observed that, with the exception of a most unimportant attack on a single flower of *Aconitum intermedium*, we pass unscathed through the whole of the large subclass of *Thalamifloræ* in which were two considerable packets of *Cruciferae*, peculiarly subject to depredations from insects; and two others, of *Caryophyllæ*, to which they are by no means averse. The *Leguminosæ*, filling five of the largest parcels, are unharmed; and, in *Rosaceæ*, of which insects are sufficiently fond, the damage was confined to the nibbling of an apple flower, and slight damage to the root of a specimen of *Potentilla*, by which the plant had been held while being washed, so as to receive but little of the solution; and by the side of which were lying the mortal remains of a fine specimen of *Ptinus Fûr*. We then pass over the whole of the orders comprised in the third volume of De

* I hope that, among others, W. T. B. received the "pinch of Saxifrage," and the *et cæteras*, forwarded in the autumn of 1835, as I am aware that the friend who took charge of the packet and chip box afterwards transferred them to the care of a third person.

Candolle's *Prodromus*, of which, to my sorrow, I must confess, I can make no great show: and arriving at the Umbelliferæ, which seldom escape we have to regret but two very insignificant traces of damage, one of them on a large woody root, and most probably on an unwashed part of it. In the Compositæ, forming, perhaps, the ninth part of the whole collection, and one of the orders the most difficult to preserve from insects, not a vestige of them was to be found in the large divisions, which, to avoid writing more long names than necessary, we will still call Corymbiferæ and Cynarocéphalæ. In Cichoracææ was the grand attack, seven out of the fifteen injured plants belonging to that tribe; and I think that an examination of the circumstances of this case will prove a good deal in favour of the solution, with the exception of *Hypochæris maculata*, which is included in the list in consequence of my having found there some dust proceeding from the works of insects, but without being able to detect any injury to the plants. All the others in the list are of neighbouring genera, so that the whole of the injured specimens, with all the intervening ones, might have been taken from the herbarium by the removal of a few sheets; all the damage was at the extremities of the specimens, near the open edges of the papers, excepting in the case of *Sónchus olerâceus*, where a larva was found in no very thriving condition; now this was exactly the place in which he might have been expected. Although inclined to admit the specific distinction of *Sónchus olerâceus* and *ásper*, I had placed them together before I had made up my mind on the subject, and had not since separated them. Looking to the great variation in *S. olerâceus*, from its deeply pinnatifidiform, to its state with entire leaves, and the different degrees of asperity in *S. áspér*, it may be concluded that this sheet was well filled, while the great size and extreme commonness of the plants would make them likely to have been washed in a rather careless manner. Is it unreasonable to suppose that all the damage in the Cichoracææ, and, consequently, nearly half of that in the whole collection was the work of this one individual, which, being born in another sheet, had wandered from plant to plant, without finding one on which he could subsist, until he arrived at that which was probably one of the least effectively poisoned in the entire herbarium? From the Compositæ to the end of the chapter, but three plants are noted: one of these three individuals contained, perhaps, ten times as much insect excrement, &c., as all the rest of the herbarium together; and where?—in the inside of a capsule, whose internal surface had certainly never been touched by the solution.

Sir J. E. Smith speaks also of the effect of the sublimate in preserving the colours and fresh appearance of the plants; my late examination has afforded me strong proof of this also. Being aware that many specimens had been put away amongst the duplicates, which ought to have been in the herbarium, I took the opportunity, while going through the latter, of turning over the former also; they had been kept in the same room, but it was most striking to compare the freshness of the washed plants with the faded colourless appearance of the others gathered at the same time. In the case of specimens received from other collections, and which may have been dried some years, a great improvement in their appearance is produced by the mere act of washing.

As to the expense and trouble, they would, no doubt, be an object to any one undertaking to wash a large herbarium already formed, but would scarcely be felt by a person who adopted the plan before his shelves were well filled. Here the solution, made with the best spirits of wine, costs about thirteen pence a quart, which, on an average, will wash from 700 to 800 individuals. This I state from experience, as independently of the regular trifling accessions, I received some time since, about 4000 specimens, including many of my largest ones, with several banksias and other plants, whose heads absorb rather more than their due share of solutions, as did also many of the woolly plants of Greece and Asia Minor. I have since had more than 2000 at one time; and in neither case was the consumption greater than I have stated; but much, both of economy and efficacy, depends on the system adopted. My only object has been to enable my brother botanists to judge on a disputed point, without any wish to establish a character for the solution to which it is not entitled; and I should be most happy to abandon the use of it in favour of any other plan which would afford the same security, with less expense and trouble; but I have had two decided proofs of the utter uselessness of camphor, and I suspect that Dr. Lindley has a more efficacious protection which he has said nothing about. It is, that his herbarium does not lie idle; for after all, I believe that the one which is the most used will be the least gnawed.

Eichenbühl, near Thun, May 8. 1837.

ART. V. *Observations in Reply to Mr. Shuckard's Article on Generic Nomenclature.* By J. O. WESTWOOD, Esq., F.L.S., &c.

I CRAVE a short space for a *replication* to Mr. Shuckard's observations (p. 248.) on generic nomenclature. This shall be by way of *demurrer*, and as *brief* as possible.

I cannot sufficiently admire the coolness with which Mr. Shuckard charges me with cavilling at and attacking him when I was defending myself from his attack and charge of inaccuracy. His light manner of treating the matter as a sorry affair, after he had made this charge of inaccuracy (as though credit for accuracy was not of the slightest importance), is equally cool. If Mr. Shuckard means to apply the two passages quoted in the foot-note of p. 256. to generic names, I fear that Linnæus will be himself included in his own charge of stultification, as I find a few long generic names even in the *Systema Naturæ*; e. g. Tabernæmontàna, Chrysosplènum, Mesembryáanthemum, &c. But if Mr. Shuckard had studied the *Philosophia Botanica*, he would have seen that the passage which he so politely cites in italics did not apply to generic names, but that it was against a sesquipedalianism of words, not of letters, in specific names, that Linnæus brought this charge; for he adds, "*Horrenda itaque sunt nomina specifica veterum sesquipedalia, quæ descriptiones loco differentiarum sistunt*;" giving examples, consisting of specific names composed of between twenty and thirty words, according to the old plan.

In stating that Mr. Shuckard gave a "detailed but partial account" of the matter in question, I beg to assure him and your readers that I had not the least intention of charging him with partiality in an objectionable sense, but that his account was not complete.

Mr. Shuckard mistakes my principle entirely. It is, that the species which can be shown to have been considered as the type of a genus should always be retained as such type; or, in other words, that a genus should always be typified by its original type. The ill effects resulting from the neglect of this principle I have sufficiently detailed; but I have to thank Mr. Shuckard for another illustration. Why, he asks, are some of the old Linnæan generic names retained, and others not? Why have we *Cicindèla*, *Cárabus*, *Cerámbyx*, &c., and not *Curcúlio*, *Buprèstis*, *E'later*, &c.? The reason is plain enough, because modern authors have neglected a necessary principle.

Of the particular illustration of this principle in the genus *Pemphrèdon*, in which I have been charged with inaccuracies

where the course was *exceedingly clear*, I think your readers will, by this time, be inclined to think the case one of "botheration," instead of exceeding clearness. Even Mr. Shuckard, after "laboriously working" out the entire group, and admitting that the original type of *Pemphrèdon* was *P. minùtus*, now tells his readers that he is prepared to say that it most certainly is not that species. Notwithstanding all Mr. Shuckard's laborious arguments, I maintain that it is, and that my view of the subject, and my sketch of the genera, are correct, and the only way which will insure justice both to Latreille and Jurine. Mr. Shuckard's paper gives me a new light upon the rights of authors, of which I hope Mr. Hood will make due mention in his next article upon copyright and copywrong, although I fear he will rank it as an illustration of the latter principle. It is this: having "laboriously worked" out a subject, an author obtains such an entire right over the objects of his enquiry, that no future author is to be permitted to approach them, but must have the "civility" to allow the worked-out author to do so, equipped in the new garb of the subsequent investigator.

My views and arguments are before your readers, who will balance them against Mr. Shuckard's. I shall, therefore, content myself with investigating the six charges of inaccuracy brought against me, and which were contained in a paragraph of twelve lines only; "consequently, a very small space to contain so many *inaccuracies*!"

1st. I have always admitted the troubled synonyme of *Psén pallipes*; but this cannot be called an inaccuracy of mine, nor do I admit it as such.

2d. The citation of one work before another is, in this case, not of the least importance, the argument is not in the least prejudiced, and the passage, as it stands, is as correct as though I had said, "The genus *Pemphrèdon* was established by Latreille in the *Précis* (1796); and in the *Hist. Nat.*, vol. iii. (1802), he states the mandibles to be unidentate, expressly referring in his *Genera* (1809) to the *Pemphrèdon minùtus* as constituting the type of *Pemphrèdon* in the *Précis*."

3d. Latreille says, "Mandibules unidentées au côté interne," by way of opposition to those genera which have them toothed "au côté externe." If these are therefore left out of the question (as they are in this case), the mandibles must be said to be unidentate. How, by Latreille's description, the mandibles can be transformed into bidentate mandibles, is beyond my comprehension. If Mr. Shuckard had recollected

Burmeister's description of the mandibles (*Handbuch*, Shuckard's translation, p. 52.), namely, "two strong, corneous, somewhat bent hooks, their *inner margin* being more or less dentate," and had compared this description with the figure, pl. 4. fig. 8. *a*, he would never have fallen into such an error. It will also be advantageous for him to consult the definitions of mandibles given by Fabricius (*Philosophia Entomologica*, p. 44.), and Kirby and Spence (*Introd.*, vol. iii. p. 43. pl. 6. fig. 12. *b*). He will then, perhaps, think it necessary to withdraw this charge of inaccuracy.

4th. Inaccuracy of omission. How it was possible in so very short a summary of the points in question to introduce more than I have introduced, I cannot determine. I have completely answered the chief charge of omission of the observation as to *lûgubris* being "l'espèce la mieux déterminée" of the genus *Pemphrèdon* in my former article.

5th. I have *not* cited Fabricius's characters of *Pemphrèdon*. Latreille's chief character of *Pemphrèdon* was "mandibules unidentées"; and Fabricius says "mandibula unidentata," which looks somewhat like confirmation.

6th. I admit this charge. Misled not only by Jurine's figure of the mandible of *Pemphrèdon lûgubris* (of which fig. 26. *a* is a copy), but by my own actual dissection (made years ago), I stated the mandibles to be bidentate. Mr. Curtis having, however, figured them with an additional tooth, I more carefully examined my dissections, and discovered that, although when viewed from above they exhibit the appearance of being only bidentate (as represented at *b*), yet, when seen laterally, they are constructed as represented at *c*. Mr. Shuckard's own description of these mandibles (*Indig. Foss. Hym.*, p. 193.) is erroneous; for, I presume, he will not endeavour to maintain his theory of dentition in opposition to the authorities cited in objection 3d.



26

In taking final leave of the subject, I must apologise to your readers for having occupied so much of their time. Had my opinions merely been questioned, I might have remained silent. Sincerely do I hope that inaccuracies of a more serious kind than those with which I have been charged, and, as I trust, so satisfactorily answered, may never be adduced against me.

ART. VI. *On the Wading Birds of Devonshire.* By E. MOORE, M.D. F.L.S., Secretary to the Plymouth Institution.

I AGAIN transmit an addition to my catalogue of Devonshire birds, which includes some that are exceedingly rare. The arid granitic character of some parts of Dartmoor and Exmoor would lead us to expect the appearance of the dotterel and great plover, and we are not surprised at meeting with them; but those spots are not so well calculated for the abode of the bustard as the grassy plains of Wiltshire; and it is very probable, from other causes, that we shall seldom again have an opportunity of obtaining this fine bird in Devonshire. We consider ourselves fortunate in the possession of, I believe, the only modern specimens of the crane and black stork; while the occurrence of the spoonbill, ibis, and avocette, together with the phalaropes, and rare stints and rails, points out the facilities which our fine county affords for the pursuit of ornithological investigation. Most of the shore birds breed about the swamps of the Moor, together with the lapwings and plovers, from whence they spread over the county on the approach of winter, and it is probably to this trackless waste that we are chiefly indebted for so large a collection of the birds of this order.

ORDER V. GRA'LLÆ.

Fam. i. *Pressirôstres.*

Gen. O'TIS.

1. O'tis târda, Great bustard. Montagu states that a specimen was shot near Plymouth, in the winter of 1798, and two others the following year.
2. O'tis Têtrax, Little bustard. Very rare. Montagu speaks of one being shot in December 1804, and taken to Plymouth market, where it was sold as a heath fowl. He saw one in a turnip field in October, 1810, in Devonshire; and, in 1820, another was shot on Creacombe Moor, near Exmoor.

Gen. CHARA'DRIUS. — Subgen. 1. *Ædicnêmus.*

1. *Ædicnêmus* crêpitans, Great plover, or Thick-kneed bustard. Although Montagu thought them scarce in Devon, and mentions only two, shot in February 1837, near the Start, yet we not unfrequently meet with them. In the winter of 1826, Mr. Drew obtained a specimen near Plymouth; others are in Mr. Rowe's, and Bolitho's, and Pincombe's collections; and also at Ham, the seat of Mrs. Collyns; and Mr. Charles Prideaux of Hatch Arundel, near Kingsbridge, informs me that occasionally specimens are obtained in that neighbourhood.

Subgen. 2. *Charâdrius.*

1. *Charâdrius* pluvialis, Golden plover. Common. Flocks, in winter, are found on the borders of Dartmoor; they breed here, as I have specimens, with the black breast and neck. A brood of six was obtained on the banks of the Tamar, in 1827; and two young were caught at Roborough Down, in 1829, and are now in possession of Mr. Whipple, surgeon, Plymouth.

2. *Charadrius Morinellus*, the Dotterel, or Little plover. Scarce. Frequents the moors in spring, and September, but I am uncertain if it breeds here: the Rev. S. Rowe saw several on Dartmoor, in September, 1828, and a specimen is in Mr. Rowe's collection.
3. *Charadrius Hiaticula*, the Ringed dotterel. Common. Frequents our estuaries all the year. I shot several, young and old, in company with the purres, on Plymouth Breakwater, in July, 1828.

Gen. *VANELLUS*.— Subgen. 1. *Squatarola*.

1. *Squatarola cinerea*, Grey plover. Not so common as the golden plover, but probably they breed here, as Mr. Drew, Pincombe, Bolitho, and myself, possess specimens in summer and winter plumage.

Subgen. 2. *Vanellus*.

1. *Vanellus cristatus*, Lapwing, Peewit, or Green plover. Common. Breeds on the moors; descends in flocks to the lower grounds in winter, whence numbers are obtained for the markets.

Gen. *HÆMATOPUS*.

1. *Hæmatopus Ostrægus*, Oyster-catcher. Occasionally seen in small flocks on the shores in winter. I possess one with the white ring round the neck.

Fam. ii. *Cultirostres*.

Gen. *GRUS*'s.

1. *Grus cinerea*, the Crane. Ray, in his *Synopsis*, mentions the flocks of cranes which frequented the marshes of Lincolnshire and Cambridgeshire in his time, since which they have become scarce; however, in September, 1826, a fine specimen was shot in the parish of Buckland Monachorum, near Plymouth, which is now in Mr. Drew's collection; it was wounded in the wing, and made a most desperate resistance.

Gen. *ARDEA*.— Subgen. 1. *Ardea*.

1. *Ardea cinerea*, Common heron. These are common. Heronries still exist in several parts of the county, as at Sharpham on the Dart; and at Warleigh, the seat of the Rev. W. Radcliff, on the Tamar.
2. *Ardea alba*, Great white heron. Although considered doubtful by Eyton, yet was seen on the Avon, as stated by Montagu; by the Rev. Kerr Vaughan, who is a good judge, and has a fine British collection.
3. *Ardea purpurea*, Purple heron. Rare. Temminck says that the *A. cáspica*, *variegata*, and *africana*, are the young of this bird; if so, a specimen was observed by T. E. Gosling, Esq., on the Plym, in April, 1824. Another was noticed by several persons in December, 1836, at Fleet, the seat of J. Bulteel, Esq.

Subgen. 2. *Egrætta*.

1. *Egrætta russata*, Little white heron, or Red-billed heron. Montagu describes one, shot near Kingsbridge, in 1805, which is now in the British Museum; and I add it to the list, although Temminck says, "Mais l'oiseau est échappé d'une ménagerie." — *Manuel*, p. 565.

Subgen. 3. *Botaurus*.

1. *Botaurus stellaris*, Bittern. Considered uncommon by Montagu, yet there is scarcely a winter but we obtain specimens.
2. *Botaurus lentiginosus*, Freckled heron. (See Montagu.) I have been so fortunate as to obtain a specimen, shot at Mothecombe, near Plymouth, December 22. 1829.

3. *Botaúrus minútus*, Little bittern. Three of these birds, killed near Crediton, Devon, are in the collection of W. Comyns, Esq., near Dawlish; and, two years since, a male was obtained by Bolitho from North Devon.

Subgen. 4. *Nycticorax*.

1. *Nycticorax europæus*, Night heron. A specimen was some time ago shot at Leigham, near Plymouth. (Mr. T. E. Gosling).

Gen. *CICÓNIA*.

1. *Cicónia álba*, the White stork. Three specimens have, within the last fifteen years, been obtained on Slapton Lay, according to Mr. Gosling.
2. *Cicónia nígra*, the Black stork. A beautiful specimen of this very rare bird was shot on the Tamar, November 5. 1831, and is now in Mr. Drew's collection; I saw the bird while warm, and took note of it. In addition to the usual description, the bill was a pale greenish horn colour, darker at the tip; irides hazel; legs pale yellow, varying to greenish, toes clay colour: I notice this because these parts change by time.

Gen. *PLATÁLEA*.

1. *Platálea leucoródia*, the Spoonbill. Montagu mentions Devon specimens; in addition to which Mr. Comyns has one, shot on the Exe; another, shot on Kenton Warren, in December, 1829, by Mr. W. Tucker. Another, shot on the Tamar, is in the collection of C. Tripe, Esq., Devonport.

Fam. iii. *Longiróstrés*.

Gen. *I'bis*. — Subgen. 1. *I'bis*.

1. *I'bis Falcinellus*, Glossy Ibis. Three specimens are mentioned by Montagu, from Devonshire; another, shot near Warleigh, on the Tamar, was sent to the British Museum by the Rev. W. Radcliffe; and Mr. Charles Prideaux has a fine pair, male and female, killed at that prolific source of rare birds, Slapton Ley, near Dartmouth.

Subgen. 2. *Numenius*.

1. *Numenius arquàta*, the Curlew. Common.
2. *Numenius phæopus*, the Whimbrel. Common.

Gen. *SCÓLOPAX*. — Subgen. 1. *Scólopax*.

1. *Scólopax rustícòla*, the Woodcock. A young bird was shot in Bickleigh Vale, by the Earl of Morley's keeper, in May, 1830, which is now in Lord Boringdon's collection at Saltram.
2. *Scólopax mājor*, Great snipe. Rare. See Montagu's *Dictionary*, *Suppl.*
3. *Scólopax Gallinàgo*, the Snipe. Common.
4. *Scólopax Gallínula*, Jack Snipe. Common.

Subgen. 2. *Macrorámphus*.

1. *Macrorámphus gríseus*, Brown or Red breasted snipe. Noticed by Montagu; and a bird, answering his description, is in Mr. Drew's collection.

Gen. *LIMÓSA*.

1. *Limòsa melanúra*, the Red godwit, or Black-tailed godwit. Rather scarce. Mr. Drew has a specimen; Mr. Comyns has one, shot on Kenton Warren near Exmouth, in 1829; and I have the authority of Mr. Charles Prideaux, a zealous naturalist, that they are not unfrequently killed in his neighbourhood.
2. *Limòsa rúfa*, Common or grey godwit. The breast of the male changes in spring from grey to rusty red. A brood of seven was

seen on the Tamar, in June, 1828, and four shot; Mr. Drew has specimens in both states of plumage.

Gen. MACHETES.

1. *Machetes pugnax*, the Ruff. Scarce. Mr. Comyns, Mr. Rowe, and Mr. Drew, have specimens; the latter is in winter plumage (without the ruff).

Gen. TRINGA.

1. *Tringa Canutus*, the Knot, or Ash-coloured sandpiper. Winter. Not uncommon. Mr. Drew has specimens in summer and winter plumage; and I saw a brood on the Breakwater, September 2. 1835, and shot one, which is in my collection.
4. *Tringa subarquata*, Pygmy curlew. Rare. A specimen in Mr. Rowe's, and another in Drew's collection; and two at Bolitho's.
5. *Tringa alpina*, Dunlin, or Purre. Common. They breed on our moors, and flock in winter; great numbers are at that time found on the Breakwater at night.
6. *Tringa maritima*, Purple sandpiper. Common, among the purre, in winter; I have also shot them in May.
7. *Tringa Temminckii*, Temminck's sandpiper. Two of these birds were shot near Stonehouse Bridge, on coronation day; and are now in Bolitho's collection.
8. *Tringa minuta*, Little stint. We have several specimens of this bird: one was shot by Lord Boringdon, on the Lary, in 1831, where small flocks of five or six are occasionally observed. Mr. Tripe and Mr. Drew have specimens, as, also, Pincombe and Bolitho.

Gen. ARENARIA.

1. *Arenaria Calidris*, the Sanderling. Rather rare on the south, more frequent on the north, of Devon. Mr. Drew and Bolitho have specimens, and I have seen several in the collection of Mr. Torr, surgeon, of Barnstaple.

Gen. PHALAROPUS.

1. *Phalaropus lobatus*, Grey phalarope. This bird has been considered as very scarce in Britain; and with us it might also be so esteemed, as we only occasionally obtained a specimen, and all the collections of Plymouth did not contain above five. However, in October, 1831, a large dead whale* (*Rorqualis borealis*) was discovered by our trawlers off the harbour, which was towed by them into the Sound, and stranded on the beach: when first noticed, it was swarming with sea birds, among which the phalaropes were most conspicuous; they frequented the rivers for two or three weeks, and during that time great numbers were shot. Mr. Drew had above ninety specimens, Pincombe thirty or forty, Bolitho as many: of these, several had the ends of the feathers on the neck, breast, and belly, rust colour: also similar

* This was the Balæna Bòops of Linnæus; *Rorqualis borealis* of Cuvier; the northern rorqual, or razor-back whale. It measured 74 ft. in length; had a dorsal fin, and numerous folds in the skin of the under part, reaching from the chin to the commencement of the tail. Its colour was black, verging to grey on the back, with the abdomen white. It was in a tolerably fresh state, and did not appear to have any wound; it was shortly afterwards cut up, and the oil extracted. The skeleton being put together, was for some time exhibited to the public in the town of Plymouth.

spots on the back, and the centre under tail coverts were wholly of that colour. Thus corresponding, in some measure, to Temminck's description of the "plumage d'été," of the old birds.

Gen. *STRÉPSILAS*.

1. *Strépsilas intérpres*, the Turnstone. Occasionally found on the Breakwater, where I have shot them in May and August. We have specimens of old and young.

Gen. *TÓTANUS*.

1. *Tótanus Glóttis*, the Greenshank. Visits us sparingly in winter. I have one specimen; others are at Drew's and Bolitho's.
2. *Tótanus fuscus*, Spotted Redshank. Rare. I have a specimen shot in Hamoaze, November, 1829.
3. *Tótanus Cálidris*, Redshank. Not uncommon. Probably breeds here, as I have specimens shot in June, 1828, on Kenton Warren, near Exmouth.
4. *Tótanus óchropus*, Green sandpiper. Not very rare. Montagu speaks of one shot in August. We have obtained specimens in January and September.
5. *Tótanus Glarèola*, Wood sandpiper. Very rare. (See Montagu's *Dictionary*.)
6. *Tótanus hypoleùcos*, Common sandpiper. I witnessed the fact of this bird diving when wounded; I waited half an hour at the spot, which was clear of weeds, but I did not see it rise again.

Gen. *HIMÁNTOPUS*.

1. *Himántopus melanópterus*, Long-legged plover. Very rare. Mr. Comyns has a specimen killed in Devon; and Mr. Gosling informs me of another, shot on Slapton Ley, near Dartmouth.

Gen. *RECURVIRO'STRA*.

1. *Recurviróstra Avocétta*, the Avocet. Rare: Mr. Comyns has two specimens from the Exe; Mr. Tripe has one from the Tamar, and Bolitho another shot on the Tavy.

Fam. iii. *Macroductyla*.

Gen. *RA'LLUS*. — Subgen. 1. *Rállus*.

1. *Rállus aquáticus*, the Water rail. Obtained all the year.

Subgen. 2. *Crér*.

1. *Crér praténsis*, the Land rail. Common in summer.
2. *Crér Porzàna*, the Spotted rail. Rather rare. Mostly obtained in autumn. We have five or six specimens.
3. *Crér Foljámbei*, Olivaceous Gallinule. Very rare. One specimen was seen fluttering against a house in Devonport, May 13. 1829, was caught by some boys, and is now in Mr. Drew's collection.
4. *Crér pusilla*, Dwarf rail, or Little craker. The only specimen known to Montagu was in possession of Dr. Tucker of Ashburton; but another was obtained by Drew, in August, 1831, which is now in his collection.

Gen. *GALÍNULA*.

1. *Gallínula chlóropus*, the Water hen. Common. Brought to the markets in winter.

Gen. *FU'LICA*.

1. *Fùlica àtra*, the Coot. Common.

Plymouth, May, 1837.

(To be continued.)

REVIEWS.

- ART. I. 1. *Naturalist's Library. Ornithology. Vol. VII. Birds of Western Africa.* By W. Swainson, Esq. Small 8vo, pp. 286, 34 coloured plates. Edinburgh, Lizars; London, Highley; 1837.
 2. *Ornithological Illustrations.* By Sir William Jardine and P. S. Selby, Esq. New Series. Edinburgh, Lizars; London, Highley; 1837.

SOME of the valuable ornithological publications undertaken during the last few years appear to have met with a degree of public encouragement more nearly commensurate with the labour and cost attendant upon their production, than is but too frequently the case with expensive works of a scientific character; and, at the present time, there is no branch of natural history to the elucidation of which so much original talent and comprehensive acquirement is being directed as ornithology. Mr. Gould, now on the eve of completing his splendid work on the birds of Europe, has just commenced an illustrated synopsis of the birds of Australia, which will present us with a vast accession of new species, on a scale very different to that of his former publications, since it combines the three desirable features of utility, convenience, and economy; and will, therefore, come within the reach of many who may not be familiar with his previous contributions to science.

Sir William Jardine and Mr. Selby, having finished the third volume of their *Illustrations in Ornithology*, are now engaged upon a new series having the same object in view, that of delineating new and interesting species*: in addition to which there is the forthcoming work of Mr. Yarrell; and, if ever the art of woodcutting has been exhibited in perfection, as adapted to the illustration of zoological subjects, it is in the exquisite representations of raptorial birds which are to appear in his first number.

Before us lies a volume on the birds of Western Africa, by Mr. Swainson, whose pen, we all well know, has not been idle of late; so that, without attempting to enumerate the various important Continental works now in progress, it is plain that, at least in one department of zoology, there is no deficiency of labourers.

Most of our readers, we presume, are familiar with the delightful series of volumes forming the *Naturalist's Library*; and we think they will not be disappointed with the perusal of

* The first number of this series contains the following species: — *Pernis apivorus*, *Hypsipetes ganeesa* *Brachypus entiledus*, *Ianthocincla squamata*, *Columba princeps*, *Crax Yarréllii*. The size of the work is imperial quarto, and the plates are to be principally executed by Mr. Lear.

the one under notice, if, from an acquaintance with any part of the series, they have derived amusement or instruction.

Mr. Swainson has executed his task in a manner that indicates no superficial acquaintance with the subject of his treatise, whilst he possesses the power of communicating his information in a manner that cannot be otherwise than attractive, even to those who may not yet have advanced one foot upon the threshold of scientific enquiry. He tells us that it has been his object not only to make the volume popular, but of some permanent value and scientific authority; and a glance at the numerous and beautiful delineations which adorn the work, will amply testify that his attempt has not been a failure. The elegant forms, and rich hues, exhibited by many of the birds here figured, owe nothing to the touch of imagination. The drawings have all been taken from original specimens; and, though but few of the species can be said to be entirely new, yet many of them have been hitherto but slightly known, or imperfectly described. In his introductory remarks, Mr. Swainson has touched upon that most intensely interesting field for philosophical investigation, the geographical distribution of species: first, with reference to the whole globe; and, secondly, with regard to that portion of it more immediately connected with the subject of his volume; and, though his views upon this subject in some degree involve the consideration of those peculiar laws which are thought by him to obtain throughout the whole animate world, and to the demonstration of which his energies have been so unceasingly directed; yet their discussion is by no means forced upon the reader's attention to a greater extent than is necessary, simply to explain the author's principle of arrangement.

At p. 156. we have a description and plate of the crimson nut-cracker (*Lóxia ostrina Vieil.*, *Pyrenestes sanguineus Swain.*), both of which we should like to place before our readers, could we only transfer to our pages the result of Mr. Swainson's pencil as readily as we now do that of his pen:—

“ It may safely be affirmed that this extraordinary bird has the thickest and most massive bill in the feathered creation. Both mandibles, indeed, are of an enormous size; but, contrary to what we find in the generality of birds, the under one is even still more powerful than the upper. What are the nuts or seeds, the breaking of which requires such an amazing strength of bill, is perfectly unknown; but they must be of a stone-like hardness. This is proved by another circumstance, which further shews that, however uncommon, this amazing development is not in the least degree superfluous. In the two specimens we have examined, one in the Paris museum, the other in our own, the edges of the upper mandible are chipped and broken, obviously from the difficulty which the bird has experienced in breaking some nuts of unusual hardness, and which it has not

been able to accomplish without injuring the bill. The sharp tooth at the base of the upper mandible is, no doubt, highly useful in this operation, probably performing the office of a canine tooth by making a first indentation in the nut, whereby to procure a hold upon it; the injuries to the bill are also more conspicuous close to this tooth than further towards the tip.

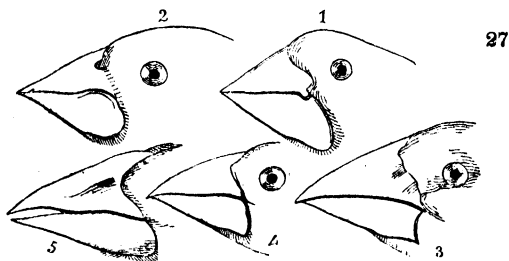
"The form of this bird constitutes its sub-generic character. The bill resembles a perfect cone, the sides of which are quite straight, and in no-wise curved outwards. The upper mandible does not project at its tip beyond the under; it is quite entire, excepting a short and rather acute tooth-like process close to its base, while the commissure or line formed by the joining of the two mandibles is nearly straight; the nostrils are vertical, pierced behind the substance of the bill, but completely covered with the frontal feathers, thus very much resembling those of the toucans. The wings are rather short and much rounded; the first quill is short, narrow, and spurious, about six-tenths of an inch in length; the second is half an inch shorter than the third, and this latter is equally long with the fourth and fifth. The feet, without being robust, are large and slender; the middle toe very long, and exceeds, with its claw, the length of the tarsus; the hind-claw is as long as its toe, as in many of the scansorial birds, and only falls short of the tarsus by about the tenth of an inch. The tail is broad and much rounded.

"The colouring of the plumage is rich and yet simple. The feathers of the whole head, neck, breast, upper tail-covers, and half way down the flanks, are of a bright crimson, and appear glossy, as if polished, but without any coloured reflections. The tail is of a dull red, but the inner half of the lateral feathers are black; the quills are nearly so. All the rest of the plumage is a deep uniform sepia brown. Bill, deep black; legs, brown; claws, long, slender, and but little curved.

"Total length, $5\frac{3}{4}$ inches; bill from the gape, $\frac{6}{10}$; wings, $2\frac{2}{10}$; tail beyond, $1\frac{1}{2}$; from the base, $2\frac{1}{2}$; tarsus, $\frac{3}{4}$."

Our author takes this opportunity of giving his readers a brief exposition of the principles of quinary classification:—

"If, as naturalists conceive, the typical character of the finches is in the strength and conic form of the bill, then the bird before us, possessing both in the most eminent degree of perfection (*fig. 1.*), must stand at the



head of the entire family. And this is the view we have taken of its station, resulting from the analysis of that division of the finches to which it unquestionably belongs. Of all the forms in other countries we yet know of, it comes nearest to the South American hard-bills, forming the subgenus *Coccothorus*; while, on the other hand, there can be no question, we think, of its close relationship to the subgenus *Dertrioides*: from this we pass to

Spermophaga, from which nature seems to return again to her first or most pre-eminent type, by means of the haw-finches of temperate climates (*Coccothraustes*) and the hard-bills of South America, *Coccyborus*. It is among these latter birds, indeed, that we have the nearest approach to that now before us. The gradual developement and diminution of the strength and form of the bill in this circular group will be made intelligible by the following outlines of the bills of the subgenera which compose the circle.

“It is obvious that those bills are the strongest whose mandibles are of equal thickness and of unusual shortness: we consequently find that it is the pre-eminent distinction of the two typical genera, *Pyrenestes*, fig. 1; and *Coccothraustes*, fig. 2.; all the others having the bill either more lengthened, or the under mandible much weaker than the upper. But this change is nevertheless gradual. *Pyrenestes*, fig. 1., for instance, has the most conic bill of all, for it has no notch at the tip. Then comes *Dertroides*, fig. 5, putting on the appearance of a hornbill or a bucceros, not only on the knobbed front, but in the situation of the nostrils; its bill is something like the last, but it is less conic and more lengthened. From this form we pass to *Spermophaga*, fig. 4., where the bill has less of the conic form than any of those now represented; its shape, in fact, is intermediate between that of *Dertroides* and *Coccothraustes* to which it leads. *Coccothraustes*, again, fig. 3., has a remarkably strong upper, but comparatively a weak under mandible, and the commissure is regularly and gradually arched from the base. Some of the species, however, of *Coccothraustes* have the under mandible rather the smallest, so that by these birds a passage is formed from one to the other. *Coccothraustes* is nevertheless very different; for in the greater part of the species the two mandibles are perfectly equal, fig. 2., and the margins, instead of being curved, are sinuated; the upper one, moreover, has a very small but obvious tooth, which none of the other genera possess. Now, to unite this genus (which is strictly confined to the warm parts of America) with that of *Pyrenestes*, there should be a species with an unusually large bill, yet furnished with a notch; such a bird would obviously unite in itself the characters of both genera, and such a bird we accordingly have in the *Loxia Angolensis* of Linnæus, erroneously supposed to inhabit Africa, but which we ourselves shot in the forests of America. We have chosen to illustrate this progression by the form of the bill only, because this organ is the most obvious to the generality of students, and will admit of more accurate delineation; but this chain of connexion is equally apparent in the variation of the wings and feet. We have thus presumptive evidence of a circular group. Let us now see whether this group is natural; that is, whether it will bear the test of comparison with the orders of birds and the tribes of the *Insectores*. The usual mode we have always adopted for this purpose is to place the genera in a column which corresponds to those which contain the groups represented, thus:—

SUB-FAMILY COCCOTHRRAUSTINÆ.

1. TYPICAL.

Pyrenestes - The most perfectly conic bills. - - *Conirostres*.

2. SUB-TYPICAL.

Coccyzus - Bill notched at the tip. - - - - *Dentirostris*

3. ABERRANT.

Coccothraustes - Wings long, tail forked, feet very short. *Fissirostris*.

Spermophaga - Bill most lengthened. - - - *Tenuirostris*.

Deritoides { Wings short, feet large, very strong,
upper mandible curved above } *Scansores*.

Each of these columns are circles ; because *Pyrenestes* passes into *Detroides*, just as the tribe of *Conirostres* passes into that of *Scansores*. Thus we find that the chief distinctions of each of the tribes of the perchers turn out to be the same as those of the group of Finches before us ; that is, they possess the same characters *in addition* to others which constitute them finches. It is only upon these principles, in fact, that we can account for the glossy plumage, for instance, of the haw-finches ; their very shot feet, — their broad, although conic bills, — their pointed wings, — their forked tail, — and their migratory habits ; all which, as every one knows, are also the characteristics of the swallow family, and of all *Fissirostral* birds. Those, on the other hand, which represent the *Tenuirostres* have the longest bills ; and those, again, which typify the gallinaceous tribe, have the strongest feet and the shortest wings. All the species of *Coccothorus*, however diversified in other respects, have a distinct notch (although small, and the tip not hooked, as in the tanagers) in the upper mandible ; and this, we all know, is the great distinction which separates the *Dentirostres* from the *Conirostres*. Numerous other analogies might be here pointed out, strengthening the accuracy of the above arrangement ; but it is quite needless to proceed further. The clue being now given, the experienced ornithologist will be at no loss in following it up ; while the student will thus have an example he can comprehend, of that *systematic order of variation* in all animals which the discoveries of every year more and more demonstrate as the fundamental principle of the great plan of creation."

Strange as it may appear, it does sometimes happen that the *experienced* ornithologist, having obtained the clue, finds himself suddenly put to the right about whilst following it up ; and, in the identification of columns with circles, the student will find an order of variation, the comprehension of which, if it does nothing more, will at any rate have a tendency to strengthen his conceptive faculties.

Through the entire range of human investigation into the laws of nature, we shall probably not succeed in meeting with so singular an anomaly as the opposite opinions entertained upon those views of natural arrangement first made public by MacLeay, and subsequently sustained by the observations of other naturalists.

We are told, on the one hand, by men distinguished for zoological attainments of the most solid and comprehensive nature, the greater part of whose lives has been devoted to the investigation of the affinities existing between the subjects of that science ; men whose competency to decide upon the identity or relations of species would never have been questioned, if no system were involved in their decisions, that the quinary distribution is displayed from the highest to the lowest groups of animated beings, and stamped in characters so legible, that little less than wilful blindness is the barrier opposed to its admission as the only true basis of natural systematic arrangement.

On the other hand, we see individuals who have had

equally extensive opportunities for observation, possessing, apparently, the same mental powers for enabling them to draw legitimate inferences from the facts brought before them; men whose general attainments are in no respect inferior to those above mentioned, who can only trace this said quinary principle in the diseased or perverted imaginations of those who uphold it.

Whether facts have really evolved the theory, or the theory elicited the facts, is quite immaterial, provided it can be shown that the one is consistent with the other. It appears to us somewhat surprising, considering the general bearing of the question in connexion with the advancement of science, that so little should have been done by those who deny that these principles of classification have any foundation in nature. If some competent naturalist would give a general summary of all that has been urged in support of the quinary system, and all that has been and can be brought to bear against it, limiting the evidence on either side, as much as possible, to matters of fact, many there are who would gladly avail themselves of the information which might thus be afforded; and, in the present posture of affairs, such a volume would be no insignificant contribution to science.

As we are upon the subject of classification, in connexion with quinary groups, it may not be out of place to notice a communication published in the last number of the *Naturalist* (certainly the best article that has appeared in that periodical), from the pen of Mr. Thomas Allis, curator of the York Museum, upon the claim which the Colúmbidæ have to rank with the Pavónidæ, Tetraónidæ, and other families in the order Rasores; and, as we know that the writer has ample materials to aid him in this enquiry, and having a high opinion of his powers of accurate observation, we consider his remarks especially worthy of notice. After pointing out in detail the wide distinctions in habits and anatomical characters between the Colúmbidæ and other families, he observes:—

“I now come to the points of agreement between the *Rasores* and the *Columbidæ*. Here I find myself quite at fault, and shall be glad of the friendly assistance of my readers; for I find a total absence of that kind of resemblance, either in habit, function, form, or internal structure, which I think ought invariably to accompany the different families of one order. Indeed, the only points of similarity I can discover between them are, that the one is principally, and the other entirely, a vegetable feeder; and that they each

have a membranous crop as well as a cartilaginous one, and a gizzard. Even these are shared by several other families of birds; and the membranous crop of the *Rasores* and the *Columbidæ* differs in shape: in the former it is globular; in the latter, composed of two lobes.

"*Pavonidæ* and *Tetraonidæ* are said by Selby to constitute the typical forms of the *Rasores*; *Cracidæ*, *Struthionidæ*, and *Columbidæ*, to be aberrant families of the same group. To show in how unequal a degree they are entitled to the term aberrant, I would observe, that out of seventeen distinct points of agreement existing between the *Pavonidæ* and the *Tetraonidæ*, the *Cracidæ* agree with them in fourteen, the *Struthionidæ* in seven, and the *Columbidæ* in only one.

"To make the order *Rasores* consist of these five families appears to me very incongruous, and to arise more from a desire of adapting them to the exigences of a preconceived theory, than from any natural affinities observable between them. A circle, composed of families differing so greatly in the amount of their aberrations, presents, according to my ideas, chasms so extensive and frightful between the different families of which it is composed, as not at all to accord with the beautiful order of Nature."

In closing our remarks upon the *Birds of Western Africa*, we cannot help regretting that the term "natural," as applied to the quinary system, should not have been avoided in a work intended in some measure to be elementary. We say this without meaning to express any opinion as to the merits or demerits of Mr. Swainson's views, but simply from a conviction that the first steps of the student in natural history should, if possible, be divested of ideas which are not in strict accordance with established facts. At any rate he should be told, that the system called *natural* by some, is deemed *unnatural* by others, and not receive an unjust bias in favour of those principles of classification which may or may not be found to have a real existence in nature.

ART. II. *Beauties of the Country; or, Descriptions of Rural Customs, Objects, and Scenery.* By Thomas Miller, Author of "A Day in the Woods." London, Van Voorst.

IN opening this book, we do not find plates or descriptions of either new animals or plants. The author dwells upon the trees and flowers that beautify the earth, and the creatures that sport upon its surface; but he does not deem

himself bound to treat of them in the order of their natural affinities. For aught that we can gather from what he has written, he may be in happy ignorance of the circular system or the quinary distribution of animals. The natural or artificial classification of the vegetable world may never have been the subject of this enquiry; and the volume may not, therefore, engage the attention of scientific naturalists; but it embodies the sentiments and emotions of a mind capable of appreciating in the most exalted degree those sources of enjoyment that spring from the contemplation of natural objects, when associated with the acknowledgment of that power by which they have been created and are upheld. We could say much in praise of this volume, did our limits permit us; and think we could show that, indirectly, it is as valuable a contribution to science as some works that come before us with a definite quantum of new information: but we must not extend our notice further than by a short extract:—

“Some have wrongly fancied that a life passed in the country must be devoid of interest. Such would be the case with those whose days had been spent in a constant state of excitement; but how happily and usefully life may be passed even in apparent solitude, let the works of Gilbert White and Bewick testify. To watch the progress of flowers, their periods of appearing, their different forms and qualities, the numerous insect tribes that hover around and within them; the habits of birds, the various forms of their nests, their departure and return; the different customs of animals, and the variety of trees,—are, in my estimation, far more continual sources of amusement and delight than either criticising an actor or applauding an opera-dancer. The latter grow irksome,—they are always or nearly the same—if they vary it is but in attitude or voice; while the former are daily revealing some new wonder—something is discovered that adds to our knowledge—we gain another triumph over Nature—we progress in wisdom, and are led to admire and understand more the productions of the Omnipotent. We bring a bird into a city, imprison it in a cage—it sings—we are delighted with its music; and what more should we know respecting its habits, had there not been men who, having watched it in its secret haunts, can tell us its food, how it builds, what time it visits our country, and when it departs? But, even in spite of all this close investigation, we are in ignorance, and volumes have been written, and wise men puzzled, to discover the hiding-place of the swallow, a bird that resides with us during the summer, and then departs we know not whither, even now. What is it but an acquaintance with Nature that has prevented us from worshipping the forms of animals, and kneeling down to the sun, moon, and stars, like the heathen of old? Even in England our ancestors offered up adoration to the oak, and paid reverence to the mistletoe. I believe that religion is strengthened by contemplating Nature; that an investigation of its wonders, and a knowledge of the order and harmony which reign throughout the whole, have done much to prove the great goodness and wisdom of God—and that, when we have once begun to admire this wonderful creation, we shall not fail to reverence the Creator.”

ART. III. *Zur Naturgeschichte, &c. On the Natural History of the Genus Calandra, with the Description of a new Species, Calandra Sommeri.* By Dr. Hermann Burmeister. 4to, 24 pages, with one coloured plate. Berlin, 1837.

THE writings of Dr. Burmeister, as a first-rate entomologist, are already so well known in this country from his *Handbuch der Entomologie*, translated by Mr. Shuckard, and by his admirable memoir upon the anatomy of the larva of *Calosoma sycophanta*, published in the *Transactions of the Entomological Society*, that a new work from his pen and pencil will be welcomed by entomologists. The genus *Calandra* is the subject of this new memoir; and, when it is remembered that those destructive insects the corn weevil (*Cal. palmærum*), the rice weevil (*Cal. oryzae*), the palm weevil (*Cal. palmærum*), and the tamarind weevil (*Cal. Tamarandi Christy* in *Trans. Ent. Soc.*), are all referable to this genus, it may be well presumed that the subject will lose none of its interest in the hands of Dr. Burmeister, who has entered very fully into the natural history and other peculiarities of the genus, accompanied by several interesting tables, exhibiting the geographical range of the different species, on a plan which, if applied to other large groups, would furnish some admirable results in this too much neglected part of the science.

The new species of *Calandra* described by Dr. Burmeister resides in the trunks of *Encephalárctus Altensteini*, at the Cape of Good Hope, and is thus characterised: — *Calandra Sommeri*: nigra, pronotovittato; elytris punctato-striatis; stria secunda et tertia puncto post medium luteo-fusco. Long. lin. 10.

This insect, brought from the Cape by M. Thorey (who has large collections of insects for sale at Hamburg), is described by Dr. Burmeister in all its states. The larva is remarkable for having the extremity of the body terminated by a furcate appendage. The internal anatomy of the larva is figured with great care; highly magnified representations of the nervous system, and of the digestive organs, being given in the plate.

SHORT MISCELLANEOUS COMMUNICATIONS.

ZOOLOGY of Central Africa. — Our readers will be gratified to hear that the splendid collection of objects, illustrative of the zoology of Central Africa, formed during the progress of the late exploring expedition, has just arrived in this country,

under the charge of Dr. Andrew Smith, and will shortly be open to the inspection of the public. In our notice of Dr. Smith's report (Vol. I. p. 98. n. s.), we stated that this expedition was sent out by a Society formed at Cape Town, in 1833, for the purpose of adding to the scanty information extant upon the geography, natural history, and interior resources of Southern Africa; and the present collection, thus obtained, has been sent to this country, in the hope of raising a fund, by its public exhibition in London, that will enable the Society to carry its object still further into effect, by fitting out another expedition. The fact of there being three species of rhinoceros would alone render the exhibition very attractive to all who are interested in natural history; but, considering the circumstances under which the collection was obtained, and the sole purpose for which it is now exhibited, we are sure that every one having the advancement of science at heart must feel an interest in visiting it, and in that way contributing to the promotion of those objects contemplated by the Society to which it belongs.*

Zoological Society of London. — The Council of the Zoological Society of London, in the course of last year, determined upon offering annual medals, or an equivalent sum in money, as premiums for the introduction into this country of scarce animals, and for other subjects connected with zoology. It was resolved that, in 1837, the premiums should be given to the importer of a pair of musk oxen; or a specimen of the hippopotamus, male or female; or a pair of the *Ornithorhynchus paradoxus*. To the breeder of the greatest number of curassows in the year 1837. To the importer of a male and female Indian pheasant, of a species not already alive in this country. To the breeder of the best specimens of Indian fowls in the year 1837. To the breeder of the most rare or most interesting foreign quadruped in the year 1837. To the writer of the best essay on the care and treatment of the species of the genus *Felis* in confinement.

The first week in July is fixed for the distribution of this year's premiums; and the regulations under which candidates will be entitled to claim them may be had on application at the Society's office in Leicester Square. — *Ed.*

Editorial Note relative to Papilio Podalirius. — In the last volume of the *Magazine of Natural History*, p. 599., there is a communication from Mr. Dale, respecting the occurrence of *Papilio Podalirius* in Britain. He remarks, "at p. 333. Vol. III., I gave the different authorities for considering P.

* It is intended to exhibit the collection at the Egyptian Hall, Piccadilly.

Podalirius as British. Mr. Stephens chose to consider this 'absurd,' giving, as a reason, that it was a geographical impossibility." Mr. Stephens, in the succeeding Number of the Magazine, p. 643., stated that the opinion given by him upon the indigenous nature of the above insect, and referred to by Mr. Dale, was published two years prior to the paper of the latter gentleman in the *Magazine of Natural History*, vol. iii. p. 333. It appeared, therefore, that Mr. Dale had been guilty of "a gross misstatement" and "palpable absurdity."

In commencing the new series of the Magazine at the beginning of the present year, among the manuscript communications was a letter of Mr. Dale's, in answer to Mr. Stephens, which we were led to put on one side, from an apprehension that its publication would not settle the point in dispute, and from a wish to exclude any matter involving a personal re-creminatory discussion. Upon a reconsideration of the subject, we feel that, as Mr. Stephens animadverted upon Mr. Dale in very severe terms, the present letter ought not to have been withheld; and we therefore now publish it entire. It is clear that Mr. Dale committed an error with regard to dates; but, as it was one which did not affect the real question at issue, we think that there was no occasion for the comments which accompanied Mr. Stephens's correction. — *Ed.*

"INSECTS. *Papilio Podalirius is a British Insect.* — As the colour which Mr. Stephens has given to my observations may lead those who are unacquainted with me to believe that I have not the high regard for *truth* which he pretends to, I trust I shall be excused for clearing away the mist which he, *as usual*, has so disingenuously introduced in the place of argument. It is true that Mr. Stephens's volume was published before your Vol. III., where I gave the different authorities for *P. Podalirius* being British; but it is *equally true* that those authorities, or most of them, had been *printed* at various times elsewhere, and that Mr. Stephens had the free and unlimited use of my MSS., which contained the dates and localities above alluded to, long *prior* to the publication of his first volume. This quibble, therefore, of the learned author of the *Illustrations* no more affects the question than his having quoted Ray* incorrectly, nor having omitted *part* of his own words.† It was the imputation cast upon myself, and those who had avowed the belief that *P. Podalirius* was British, that I disdained; and I now ask, whether he has proved the *truth* of his assertions, and the *absurdity* of those

* It is 'Prope Libernum portum in Etruria, invenimus atque,' &c. — Ray."

† It is 'any longer as a British species.' (*Illust.*)"

who, guided by reason and facts, differed from him? The *truth* is, 1st. That, with regard to its northern range, Mr. Stephens, as heretofore, is incorrect in his assumption; as it extends in Prussia to the parallel of York, and in Russia to that of Edinburgh. 2dly. That those who were *personally* acquainted with the late Dr. Abbot do not entertain a doubt of the truth of his having taken the specimen that I possess, as stated in the preface to *Lepidoptera Britannica* (1803); and, 3rdly. It is presumed that Mr. Stephens is too wary to doubt the integrity of the gentleman who *took* the specimen figured by Mr. Curtis. — J. C. Dale. Dec. 12. 1836.

“P.S.—From ‘a slip of Mr. Stephens’s pen’ (?), *his answer* (No. 68. p. 643.) to mine (p. 599.) is dated Oct. 31. 1836; whereas No. 67. (containing my notice) is *posterior* to that; viz. Nov. 1836. Another proof of *his* usual correctness.”

Mr. Gray’s Genera of Máctradæ. — It is always desirable to publish the characters of new species and genera as soon as they are determined; since the time of their appearance in print is referred to as deciding the right of priority when different naturalists have described the same things. We have therefore given below the genera into which Mr. Gray divides the Máctradæ, being obliged to postpone his paper on that family owing to the cuts, with which it will be illustrated, not being finished. — *Ed.*

- | | |
|-----------------------|---|
| 1. SCISSODE'SMA Gray. | Ligament external, in a slit. |
| 2. MA'CTRA - - | Ligament external, in a marginal groove.
Ligament subexternal, marginal, not separated from the cartilage. |
| 3. SPI'SULA Gray - | a. Hinder lateral teeth double and single. |
| 4. LUTRA'RIA - - | b. Hinder lateral teeth single or wanting.
Ligament internal, in the same cavity as the cartilage. |
| 5. MULI'NIA Gray - | a. Lateral teeth simple. |
| 6. GNA'THODON Gray | b. Front lateral tooth hatchet-shaped. |

Entomological Instruction in France. — M. Victor Audouin, professor of entomology at the Jardin des Plantes, commenced a course of lectures upon the natural history of insects on April 10. last, continuing it three times each week; in which he particularly illustrated the natural history of those insects which are obnoxious to agricultural productions, to forest trees, and to horticulture: he also described the habits of the various species which attack domestic animals, and man himself; closing his lectures with those species which are useful on account of the various products which they yield in medicine, agriculture, or the arts. This course of lectures, so much more interesting than the ordinary routine of entomological lectures, attracted a great number of persons engaged in horticultural and other similar pursuits, as well as many

amateurs of insects, who were delighted at finding that the subject was capable of being made so full of instruction and interest. — *J. O. W.*

Suggestion of Improvement in Hooker's Icones Plantarum. — As a subscriber to Sir W. J. Hooker's *Icones Plantarum*, now in course of publication, I am induced to suggest an improvement. Is it not a pity that the plates are *uncoloured*? The value and utility of the work would be incalculably advanced if this was the case; and, to render it still what it was intended (a *cheap* work, within the reach of all), I would propose that the plates should be *partially coloured*, like those in the *Companion to the Botanical Magazine*. This, I presume, would not increase the expense very materially; and surely no one would object to pay an additional *price* for such a great acquisition to the value and utility of the work. — *C. May* 18. 1837.

Preservation of Sheppey Fruits. — Several questions have been brought forward, in former Numbers of the *Mag. Nat. Hist.*, by some of your correspondents, as to the best method of preserving from decomposition the fossil fruits and wood of the London clay found at Sheppey; and various methods have been proposed with a view of attaining that object (Vol. VI. p. 280., and Vol. IX. p. 550.). At p. 490., Vol. IX., it is suggested, that, after washing with turpentine and lamp-oil, a thin coating of isinglass in solution may be advantageously employed. On the 20th of last September, a friend brought me some of these fossils from Sheppey in pyrites, of which one specimen in particular was more affected by decomposition than the others. I immediately, after cleaning, gave them a dressing of turpentine and lamp-oil, recommended by Mr. Hill (Vol. IX. p. 380.), and laid them in the open air to dry; but, in only two days after this, I found decomposition beginning afresh, the sulphate of iron forming upon them. I removed them into the house, wiped the lamp-oil clean off, and then gave them a coating of dissolved isinglass and spirits of wine; and, at the end of seven months after this simple process, I find that they are perfectly free from the slightest appearance of decomposition; and have every reason to conclude that, for the purposes of the cabinet at least, this process for their preservation will be found sufficient. On applying the lamp-oil, I found it of little or no use in this instance: it will not dry, it fills up the fibrous appearance on the outside of the fossils, and almost destroys their beauty. The quality of the isinglass obviates this completely; and it dries almost instantaneously. — *John Brown. Stanway, near Colchester, April* 19. 1837.

THE MAGAZINE

OF

NATURAL HISTORY.

JULY, 1837.

ORIGINAL COMMUNICATIONS.

ART. I. *Observations on Woodcocks and Fieldfares breeding in Scotland.* By GEORGE FAIRHOLME, Esq.

IN a paper signed W. L., in the Number for March last, of your instructive Magazine, I find some remarks upon the breeding of woodcocks in Selkirkshire, and in other parts of Scotland. Having had an opportunity of occasionally making some observations on the habits of these birds during the breeding season, I beg to place at your disposal the following notes upon the subject.

It seems very certain, that some change has taken place within the last twenty years, either in the countries towards the north, where woodcocks usually breed, or in our own climate; as we can now no longer, as we used to do, attribute a summer woodcock to the accidental circumstance of its having been disabled at the usual season of migration, and having been thus forced to act contrary to its natural migratory instinct; for in some parts of Scotland they are becoming not at all uncommon in summer.

I spent the greater part of 1835 in Aberdeenshire, where occasional instances have long been known of woodcocks in summer, but not in such numbers as may now be seen. In the woods of Moneymusk and Castle Forbes, nests have from time to time been found. It was at the latter place, and during a late evening walk in an extensive oak wood, with hazel and other brushwood, that my attention was first particularly called to this subject. It was quite in the dusk when I heard, at intervals, a low *croaking* so much like that of frogs, that, attributing it to that cause, I took no further notice of it: but on a subsequent evening I found that, instead of on the ground, this croaking was over head, and proceeded from a bird on the wing. The flight was so heavy and slow, that

I at first imagined it was an owl or a goatsucker, the former being commonly, and the latter occasionally, seen in that wood. I afterwards found, however, on seeing several of these birds at an earlier hour in the evening, that they were woodcocks, and that four or five couple of them circled the wood every evening, being on the wing for an hour or two at a time, with a varied flight; sometimes rapid and pursuing each other, uttering a sharp, but not very loud, whistling note; and sometimes slow and flapping, when an incessant low croaking was kept up by each individual, often not unlike the purring of a cat, or the noise of a spinning wheel. From this time, throughout the summer, I could on any evening, between five and nine o'clock, see several cocks rise, generally from the lower and moister parts of a large wooded hill, of which a high peak in the centre overlooks the whole. The notes gradually ceased, as the season advanced; and I rather imagine that these circular flights also gradually ceased, though, in the course of our walks, cocks were often flushed, until the more usual season arrived, when they no longer excited so much attention. I have often seen these woodcocks approaching me, in low covered walks, and so little alarmed as almost to brush my hat with their wings, as they quietly passed over my head. This seemed to me to be the hour of feeding on the wing, at least their flight so much resembled that of night birds which feed on moths, &c., that the probability of this occurred to me, although I am aware that their usual food is found upon the ground, amongst damp leaves and moist grass. It is by the knowledge of this low flight of the woodcock in the covered alleys and walks of the forest, that the foreign poacher takes such numbers of them in nets set for the purpose; and I could often have caught them in a common hoop-net, as they passed me.

I have long been acquainted, as a sportsman, with the usual peaceful habits of the woodcock, during its winter residence in our climate; but I never, at that season, heard any sound but that of its wings on being flushed. I imagine, therefore, that the low croaking and the occasional whistle are peculiar to the period of incubation, like that singular noise made by the snipe in spring, as it descends rapidly in the air, during its circuitous flight over its native morass.

With regard to the nests of the woodcocks to which I have alluded, I never took any trouble to search for them, not wishing to disturb them, and because I had already more than once seen both eggs and young ones. I have no doubt whatever of the fact mentioned by your correspondent W. L., of the old birds occasionally carrying their young *in their claws*. I once flushed an old woodcock and three young ones, in the

woods at Dunkeld ; and, observing the old one carrying something in its claws, I gave a shout, supposing that it was a hawk, for the purpose of making it drop what I then took for its prey. It had the desired effect: the object fell, and I immediately ran and picked up a young and ill-fledged woodcock, which, like some poor sickly infant, had become but the more anxious mother's more anxious care. She alighted and rose repeatedly around me, with that wonderful and admirable instinct (so like the *reasoning* power) which is displayed by wild ducks, partridges, and some other birds, pretending to be wounded, to withdraw my attention from her young.

It is highly probable, that woodcocks may thus gradually become naturalised to our summer climate, especially if, like salmon, swallows, and many other creatures, they form a predilection for their native districts, and return to them at the breeding season.

While upon this subject, I may add that the woodcock is not the only migratory bird that now occasionally breeds in this kingdom. For several years past fieldfares have bred in Scotland, a circumstance, I believe, altogether unheard of amongst old observers of nature. In the spring of 1835, while walking in the park of Mr. Scott of Gala, in Selkirkshire, I was surprised on seeing, so late in the season, a large flock of fieldfares chattering from tree to tree ; when a gentleman who was with me, and who is remarkable for his acute observations on the habits of birds, asked me if I had ever seen their nests ; offering to show me several within a very short distance. I gladly availed myself of this opportunity of seeing what was to me a new object, but which my friend had observed in that district for two or three years preceding. The nests were all placed in the clefts of trees, often at a considerable height from the ground, and very different from the situation spoken of by the poet who, in describing the blanched bones of the battle field, makes the human skull a fitting hollow for the fieldfare's nest.

It is a fine object, to observe the female of this large bird seated fearlessly on her nest, her long tail projecting upwards, and her large and mild black eye watching confidently the movements of those at hand. We stood for several minutes, in admiration of one in the cleft of a low dwarf apple tree in the garden ; and, being desirous of seeing the nest and eggs, it was not without almost pushing her off her nest, that I could induce her to quit it for a few minutes, to gratify my curiosity.

I have, since, seen a nest of the same bird in Kent : but, in districts where the large mistletoe thrush is found, it requires some care to distinguish between the two ; for both birds

build, in the same situations, a grassy nest; and it is only on the wing, or in the hand, that the female can be readily distinguished. The plumage of the male birds, as well as their mode of flight and note, is sufficiently distinct.

In concluding these cursory remarks, which, probably, present nothing new to you, or worthy of insertion in your excellent periodical, I must correct one mistake into which your correspondent W. L. has fallen, in the beginning of his paper. He says, without any reservation: — “There are no perch north of Perth, *and no minnows*, but plenty of sticklebacks. No pike are to be found in the streams that fall into the west sea, nor in the lochs from which they flow.” (p. 118.) This appears rather a startling and sweeping assertion, and would require more conclusive evidence than I have heard of to support it. With respect to the perch, the sticklebacks, and pike, I am not, at this moment, prepared to advance anything in opposition to the assertion: but, as to *minnows*, I can assure him that the fishers on the Don, in Aberdeenshire, would be very sorry to be so summarily deprived of them, as they abound in that river, and, as elsewhere, form the best source of successful fishing for both young and old; for he that is at first ambitious of no higher game, will find it the best bait for both trout and salmon; and though frequently despised as too insignificant for the table, yet they might compete with *white bait* if procured in sufficient numbers.

As pike abound in Ireland, in lochs and rivers which empty themselves *on all hands* into the sea, it would be a very singular and remarkable circumstance, if their existence in Scotland depended on the flow of the waters being *to the eastward*.

May 23. 1837.

[In a postscript to the above communication, Mr. Fairholme alludes to the initials only of correspondents being often attached to articles, and remarks: — “In the statements of *facts*, it would be well if names were always given. In theoretical discussions the contrary may not be without its use, as a change of opinion may be more easily adopted.” We entirely coincide with the justness of this observation; and though it rarely happens that statements appear in this Magazine, authenticated by the initials only of parties unknown to us, yet we most sincerely wish that correspondents would always allow their names to appear, unless there be some ostensible reason for concealment. — *Ed.*]

ART. II. On the Structure of the Fossil Saurians. (From the "Palæologica zur Geschichte der Erde und ihrer Geschöpfe; von Hermann von Meyer. Frankfort, 1832.) Translated by G. F. RICHARDSON, Esq., Curator of the Sussex Royal Institution, and Mantellian Museum, Brighton. Communicated by GIDEON MANTELL, Esq., LL.D. F.R.S.

(Concluded from p. 293.)

B. Saurians with Limbs similar to those of the large terrestrial Mammalia.

1. MEGALOSAURUS.

UNDER this name Professor Buckland of Oxford has made known the remains of one of the most gigantic of animals. In all probability, its length must have been from 30 to 45 French feet. The teeth are very like those of the *Geosaurus*; flat, pointed, bent backwards, and furnished with two finely serrated edges, of which the foremost is somewhat stronger than the other. The teeth appear to stand in tolerably well-closed alveoli, and the replacing tooth breaks through the jaw and the alveoli on the inner side. The teeth, indeed, are not united to the jaw; in which respect the animal bears a resemblance to the Monitor. Yet, notwithstanding this similarity of the teeth with those of the *Geosaurus*, the structure of the rest of the skeleton differs very considerably. Among the bones yet found, some remind us of the *Crocodylus*, others of the Monitor, while others have not yet been sufficiently determined. The beak appears to have been straight and elongated. The width of the vertebræ, at present discovered, exceeds their length by a third; they are contracted in the middle, as in *Streptospondylus*. Both surfaces are plane: the spinous process is moderately high, and somewhat quadrangular, and the transverse processes are tolerably long. The ribs have a head, and a tubercle similar to that of the *Crocodylus*. The metacarpal and metatarsal bones remind us, at the first view, rather of the large terrestrial *Mammalia* (for instance, the *Hippopotamus*) than of the *Saurians*.

2. IGUANODON Mantell.

Still more remarkable than the animal just mentioned, and even more dissimilar to the existing *Saurians*, is the *Iguanodon* described by Mantell. Its teeth bear marks of detrition, like some of those of the herbivorous *Mammalia*. Cuvier thought some of them similar to the incisors of the *Rhinoceros*. The largest tooth is 20 times larger than the tooth of the living *Iguana*. The teeth are variously formed, according to their situation and their degree of use. In the young animal they are

hollow, but become solid and fill out with age. They usually possess two edges, which are serrated, and united in a sharp point. Teeth of this creature were also found with the edge worn smooth; these are similar to the canine teeth, or lateral incisor teeth, of the Tapir, or other animals with short canine teeth. The formation of the teeth appears to have proceeded laterally. When the new tooth was sufficiently developed, it forced the old one out, and took its place. Of the jaws or the skull no part has yet been found.* A horn, however, similar in form to the smaller horn of the Rhinoceros, but without being connected by a bony attachment like the horns in the Mammalia, is referred to this Saurus. This part is analogous to the horn, or protuberance, of the Iguàna of St. Domingo. The vertebræ which are believed to belong to this animal are furnished with strong and stout processes: the one surface is almost flat, the other somewhat depressed; both are indistinctly quadrangular. A sacral vertebra resembles the first sacral of the Monitor, except that both surfaces are somewhat concave; an inferior spinous process, or chevron bone, and a clavicle, more nearly resemble these bones in the living Iguàna than in the fossil *Megalosaurus*. The limbs of this animal were of enormous size: the animal itself must have been colossal. The bones subsequently found in the Isle of Wight satisfactorily confirm these suppositions. A metacarpal bone is twice as broad as that of the Elephant, being 6 in. long, and weighing 6 lb. †

C. Saurians with Limbs adapted for swimming.

1. *ICHTHYOSAURUS* König.

The head most resembles that of the *Lacértæ*. The beak, however, is elongated, and is almost wholly formed of the intermaxillary bones. The nasal orifices are placed, not as in the Gavial at the point of the beak, but at its commencement. The mechanism of hearing was simple and similar to that of the Salamander, Sirene, and Proteus. The most striking features are the enormous eyes, the sclerotica of which was strengthened by a circle of bony plates. This arrangement is more perfect in the *Lacértæ* than in the Birds. The disposition of the different bones of the lower jaw approaches partly to that of the *Lacértæ*, partly to that of the

* A fragment of the jaw, with rudiments of several teeth, has lately been discovered by Dr. Mantell, and confirms his opinion as to the analogy of the dentation of the *Iguánodon* with that of the *Iguàna*. — *Ed.*

† It is evident that the learned author had not seen Dr. Mantell's last work, the *Geology of the South-East of England*, in which many new and important facts, relating to the osteology of the *Iguánodon*, are stated. — *Ed.*

Crocodile. The long beak is armed with numerous teeth which stand in a common channel. The teeth are conical and pointed, and differ remarkably from each other in the different species. There were, probably, no palatal teeth. The apparatus of breathing was adapted for elastic air, since nothing similar to gills has been observed. The number of vertebræ occasionally exceeds 100. The form of the vertebræ is striking, considered as belonging to a Saurian animal, being similar to those of fish. Both surfaces are comparatively very concave, and the length of the vertebræ is small in proportion to their diameter. The ribs are inserted with a head, and an elevation in the vertebral processes adapted to this purpose. All the vertebræ from the head to the pelvis are furnished with ribs. The ribs are long, and united oppositely by ribs of the abdomen, probably in a similar mode to the Cameleon and Anolis. The sternum and the scapula are essentially those of the Monitor and Ornithorhynchus; more broadly and more strongly, and I might say more pelvis-like, developed, since the pelvis itself is neither so strong nor so large. The single parts of the latter have not yet been sufficiently investigated: the hinder limbs were smaller and weaker than the anterior. The swimming apparatus consists, both in the hands and feet, of rows of small and flat bones, similar to those of the Dolphin: these, however, were more numerous, and placed nearer each other. The Ichthyosauri were no better enabled to creep about on land, than Mammalia with limbs adapted for swimming can now do. The tail is about a fourth part shorter than the length of the trunk; and the head consists of about the fourth part of the total length. The structure of the cervical vertebræ gives this creature the appearance of having no neck.

As yet the following species only of the *Ichthyosaurus* have been distinguished, the differences of which chiefly relate to the bones of the head, the teeth, the form and dimensions of the vertebræ, the number of the caudal vertebræ, &c.

a. ICHTHYOSAURUS COMMUNIS De la Beche et Conyb.

According to Conybeare, the length of this species is from 5 to 15 feet. The teeth have a crown, which is conical and moderately pointed, somewhat bent and deeply striated.

b. ICHTHYOSAURUS TENUIROSTRIS De la Beche et Conyb.

The teeth are more slender, and the beak is longer and thinner. This species does not attain one half the size to which the following arrive. In one individual of $3\frac{1}{2}$ French feet, the head and tail occupy each a foot. The neck is so short, that it can scarcely be observed. The fore

paddle is, with the humerus, $7\frac{1}{2}$ in. long, and 3 in. broad; the hind paddle, in length and breadth, somewhat less.

c. *ICHTHYOSAURUS PLATY'ODON* *De la Beche et Conyb.*

According to Conybeare, this species is the most colossal, and to it belong the gigantic individuals. The crown of the teeth is flattened, and possesses on each side a cutting edge. These crowns are borne on a round and expanded shank or root. Dr. Davis has found in the neighbourhood of Bath a vertebra of this species, which measures 7 in. in diameter. There are jaws 8 ft. long.

d. *ICHTHYOSAURUS INTERME'DIUS* *De la Beche et Conyb.*

The teeth are more pointed, and less deeply striated, than in the *I. communis*, and less long than in the *I. tenuirostris*. This species does not attain half the size to which *I. platyodon* may arrive.

e. *ICHTHYOSAURUS Conybeare.*

Conybeare observes that the cervical vertebræ of the *Ichthyosaurus* from the Kimmeridge clay differ from those already mentioned, and therefore belong to another species.

f. *ICHTHYOSAURUS Cuvier.*

Cuvier mentions a ridge-shaped bone, which is very thick, and formed almost like a half moon, and whose two canals unite behind in a single transverse opening. He therefore conceives it to have belonged to none of the first four species.

g. *ICHTHYOSAURUS Harlan.*

Harlan describes remains which differ from those of the four *Ichthyosauri* established by Conybeare, in the greater relative thickness of the dental bones: this species most nearly approached the *I. communis*. The largest teeth are two thirds of an inch long, and elevated about three tenths above the jaw; the protruding part is thickly striated lengthwise; and in the concealed portion of the tooth are farther observed longitudinal lines. The tooth, from the basis to the point, is of a conical shape.*

h. *ICHTHYOSAURUS GRA'NDIPES* *Sharpe.*

On the 16th of April, 1830, Sharpe read to the Geological Society of London the description of a new species, which was found in the lias, 4 miles from Stratford upon Avon.

* Harlan calls this species *I. coniformis*. The fragment from which he described it came from Bristol. May it not be the *Thecodontosaurus* of Dr. Riley and Mr. Stutchbury? — *Ed.*

The animal measured 7 ft. From the atlas to the tail were reckoned 52 vertebræ. A portion of the head, a scapula, and a fore paddle have been found; but none of the teeth. The length of the vertebræ is three fifths of its breadth. The paddle is very large, and, with the humerus, occupied one fifth of the length of the whole animal. The bones of the paddle are almost circular: characters which neither the *I. communis*, *I. tenuirostris*, nor *I. intermedius*, possesses.

2. PLESIOSAU'RUS *Conybeare*.

In this animal the extreme length of the neck must surprise us more than any other part of the structure: it is composed of upwards of 30 vertebræ; a number far surpassing any cervical vertebræ yet known, even among birds. In the structure of its single parts this animal is somewhat nearer to the Saurians than the foregoing. From what is known of the head, it resembles that of the *Lacértæ*, with characters of the *Ichthyosaurus* and *Crocodile*. The beak is of moderate length; the nasal orifices are situated, probably, as in the *Ichthyosaurus*; the teeth are placed in distinct alveoli; they are also hollow below, and, like the *Crocodile's*, contain within themselves the replacing teeth. Among the teeth of the lower jaw the fore-teeth, among those of the upper jaw the hind teeth, are stronger and longer than the rest. Twenty-seven alveoli have been reckoned on each side of the lower jaw. The general form of the teeth is long, pointed, somewhat bent, and grooved longitudinally. The teeth are probably different in the different species: no satisfactory decisions, however, have yet been established, as regards this point. The vertebræ resemble those of other Saurians more than do those of the *Ichthyosaurus*. They are longer, and the surfaces are both slightly concave, and in the middle again a little convex. Many of the vertebræ possess two oval pits, or fossæ, on their lower side; but the whole are not, as was first supposed, distinguished by this peculiarity. The form of the vertebræ somewhat approaches that of the *Teleosaurus* and *Metriorhynchus*. About 90 vertebræ have been reckoned in the whole, of which 23 belong to the tail, and about 35 to the neck. The insertion of the ribs was effected nearly as in the *Crocodiles*. The neck measured 5, the trunk probably 4, and the tail 3, times the length of the head. The opposite ribs were probably, like those of the *Cameleon* and *Anolis*, united by means of abdominal ribs. The sternum is formed differently from that of Saurians, and even of the *Ichthyosaurus*. The pelvis is more plainly developed than in the foregoing animal, and in part resembles, in a slight degree, that of the Land Tortoise,

and of most of the Mammalia. The limbs were longer, and were provided with more pointed paddles, and were certainly more flexible than those of the Ichthyosaurus. The tail, from its shortness, does not remind us of a Saurian. The thin and long neck resembles the body of a snake. The structure of this animal is one of the most peculiar in the whole creation. It is probable, that, on more extensive investigation, one or more species of the Plesiosaurus will be established, in addition to those now described.

a. PLESIOSAU'RUS DOLICHODEIRUS Conybeare.

To this species belong the more complete skeletons which are chiefly found in England, and from which the characteristics of the genus were derived.

b. PLESIOSAU'RUS RECENTIOR Conybeare.

The vertebræ which gave occasion to this species are, throughout, shorter than those of the *P. dolichodeirus*, and as flat as the vertebræ of the Ichthyosaurus; their surfaces, however, are not so concave: on the lower side of the vertebræ the small holes already mentioned are seen. These vertebræ were found in the Kimmeridge clay.

c. PLESIOSAU'RUS CARINATUS Cuvier.

A cervical vertebra, found, probably, in the oolite of Boulogne, is distinguished on its lower side, between the two holes, by a blunt longitudinal edge, and has given occasion to this species.

d. PLESIOSAU'RUS PENTAGONUS Cuvier.

Cuvier possessed caudal vertebræ from Auxois, the body of which, instead of being cylindrical, was completely pentagonal, from which he named this species.

e. PLESIOSAU'RUS TRIGONUS Cuvier.

A vertebra, from the coast of Calvador, is triangular, like some of those of the Mososaurus, that is, it is flat and broad below, and decreases above. On the sides of the lower surface lie its transverse processes.

f. PLESIOSAU'RUS MACROCEPHALUS Conybeare.

Of this species, which was discovered by De la Beche in the lias of Lyme Regis, no description is known to me.

g. PLESIOSAU'RUS Cuvier.

Puillon-Boblaye discovered, in the lower part of the blue marls of Stenay, which lie between the Oxford clay and the cornbrash, a considerable portion of the skeleton of a Plesiosaurus, which Cuvier conceives to belong to a new species.

3. *MOSASAU'RUS Conybeare.*

The remains of this colossal animal, which was long known by the name of the Crocodile of Maestricht, have employed several of the most distinguished anatomists in various ways. The teeth of this animal are hollow only during their period of growth: they fill out at a later period, and become quite solid. The crowns of the teeth are pyramidal, and somewhat bent; their outer side is even, and possesses two sharp edges, by which it is distinguished from the inner side, which is round, or, at least, semiconical. The crowns of the teeth are placed on a basis of a peculiar substance, with which they are intimately connected; and with these bones the teeth are placed in actual alveoli. The replacing tooth arises in a peculiar alveolus, and presses, now aside, now across, through the bony substance which bears the tooth. The existing tooth thus became loosened, and fell out by a kind of necrosis. The structure of the teeth is therefore similar to that of the osseous Fishes, Monitors, other Saurians, and Ophidians: that of the Crocodiles and Cetacea, is different. In the lower jaw are 14 teeth, and the creature may have had as many in the upper. In the arrangement of the lower jaw it closely resembles the Monitor; from which, however, it is distinguished by other peculiarities. The palate bone has, it appears, borne 8 teeth. By means of this provision, the animal approaches the actual Lizards or Iguanas. These teeth are formed like those of the jaw, but are smaller. As regards the resemblance of the head, the animal is placed between the Monitor and Iguana. As respects the vertebræ, the posterior surface is evidently convex, and the anterior only concave*; in which particular it resembles those of the Crocodile. But the other arrangements of the vertebræ differ considerably from those which have been discovered in the Saurians hitherto known. Five different kinds of vertebræ, characterised by their processes, are distinguished in the spinal column. The last caudal vertebræ have no processes, and their length is one half less than their height. The animal must have possessed a very broad vertical tail, which it could only move sidewise right

* In his *Discours sur les Révolutions, &c.*, as well as in the previous 4to edition of his *Ossemens Fossiles* (p. 152.), as also in the 8vo editions, and even in the last, the 6th, 1830 (p. 320.), Cuvier says that the vertebræ of this animal are anteriorly convex and posteriorly concave; which directly contradicts what he states in describing the single parts of the animal (*Oss. Foss.*, tom. ii. p. 326.), where he expressly remarks, "All the vertebræ, like those of the living Crocodiles, Monitors, and most of the Saurians and Ophidians, are anteriorly concave, and posteriorly convex." As yet, the former statements have passed into the translations.

and left. The chevron bone is ankylosed to the vertebræ *, which is referable to no existing reptile, but rather to fishes. The question might here be asked, Does this chevron bone present anything of that fish-like character which is found particularly in the hinder surface of the inferior spinous process of some other fossil Saurians? In the middle of the back the vertebræ want those processes which this creature has in common with the Dolphin. The ribs are inserted only by means of the head. The total amount of the vertebræ is 133; and the whole length of the animal (without the atlas and the axis) measures 6.59 mètres. It is further peculiar to this creature, that many of the caudal vertebræ are entirely destitute of any inferior process at their base. Hence, it is probable that the tail in this part was cylindrical, and was only extended to an oar-like shape at some distance from its base. The ribs are round, similar to those of the *Lacértæ*; and the scapula appears to have possessed some similarity to that of the *Lacértæ*. The os pubis very much resembles that of the Monitor. Of the long bones of the limbs none have yet been found. The hands and feet appear to have been adapted for swimming more or less, like those of the Dolphin or *Plesiosaurus*. The head measures nearly one sixth, and the tail about one half, of the total length.

PHYTOSAURUS Jaeger.†

Dr. Jaeger, in his work on the fossil reptiles of Wirtemberg, describes several fragments of jaws, which, according to him, belong to a peculiar division of Saurians, named *Phytosaurus*. He divides these farther into *Ph. cubicodon* and *Ph. cylindricodon*. This animal possessed an elongated beak, similar to that of a Gavial. I therefore assign the nasal orifices to the end of its beak, as in the Gavial. The teeth, with their whole apparatus, appear to him peculiar. The crown of the tooth was, in my opinion, conical. Several teeth so constructed have, indeed, been found. They are long, and their surfaces appear as if they had been occasioned by grinding. This supposition is rendered very probable by the compressed situation of the teeth in the jaw. The teeth are not placed like pegs in an alveolus, but stand on bases which were probably hollow, or filled with a softer animal substance, which formed the bones of the teeth. In this particular, they re-

* Two large Saurian vertebræ, from Tilgate Forest, in which the chevron bones proceed from the body of the vertebræ, are in the Mantellian Museum at Brighton. — Ed.

† Of this animal, as of others which follow, the limbs have either not yet been found, or have not been satisfactorily made known; on which account this place has only been assigned to them on supposition.

semble the teeth of the *Mosasaúrus*, which, however, are placed in actual alveoli. I conceive that I have established in this *Phytosaúrus*, that the fangs of the teeth were free, and stood in a channel in the jaw, and were attached to it in the strongest manner. On the inner side, the row of teeth was probably first surrounded by a lamella, and then by the bone of the jaw. On the outer side, the jaw-bone only appears to have been recognised: nothing of a lamella has yet been discovered. In some places, it is not to be disputed, that the change of teeth was effected as in the *Crocodiles*; that is, inside of the existing teeth, and growing up from the basis to the points. The names of *cylindrícodon* and *cubícodon* are derived by Dr. Jaeger from the cylindrical and cubical form of those parts which I consider to be the remains of the teeth. The *Ph. cylindrícodon* had not less than 30 teeth in one half of the jaw; and yet its beak appears to have been shorter than that of the *Gavial*. Of the *Ph. cubícodon*, some connected portions of teeth are all that have been found.

SAUROCE'PHALUS • Harlan.

Harlan describes remains of a fossil Saurian under the name of the *Saurocéphalus lancifórmis*, of which portions of the jaw only have yet been found; these, Lewis and Clarke, in their journey to the Missouri, discovered, and presented to the Philosophical Society of Philadelphia, in the museum of which they are preserved. The place of their discovery is a cave, some miles south of Soldier's River Bay: they were, however, undoubtedly, originally deposited in a marine bed of stone at this locality. Judging from those portions of the jaw, the animal must have been 6 or 8 feet long. The longest teeth measure seven tenths of an inch, of which two tenths protrude above the jaw; and this portion is covered with enamel, smooth, polished, lancet-formed, and provided with very sharp edges.† The bodies of the teeth are all hollow, and stand in a long channel, not in separate alveoli, but close to each other. Through the body of the bone proceeds a canal for the lower maxillary nerve, in the place of which is perceived a channel along the whole of the teeth under the alveolar portion. The bottom of this channel is penetrated by as many holes as there are teeth, through which the nerves

* Jaws and teeth of this kind occur in the chalk of Sussex, and are figured in Mantell's *Fossils of the South Downs*, tab. xxxiii. figs. 7. 9. M. Agassiz has shown that they belonged to fishes: he retains the name *Saurocéphalus*, for the genus. — *Ed.*

† These remind us of the teeth of a fragment of the jaw which Buckland (*Geol. Trans.*, ii. iii. t. 27. f. 3.) attributes to the *Pterodáctylus*; which, however, certainly belonged to another animal.

and blood-vessels were distributed. The developement of the teeth took place within; and not by means of a lateral, but a vertical, penetration of the middle. The compressed situation, and the sharp attrition of the sides of the teeth, indicate that, when the mouth was closed, the teeth of the upper jaw did not pass in between those of the lower jaw, but that one row overlapped the other. All these characters distinguish the *Saurocéphalus* from the *Ichthyosaurus* and *Plesiosaurus*: in many respects, this animal would rather resemble the *Ichthyosaurus*.

*SAU'RODON Hays.**

Dr. Isaac Hays describes a portion of the head and lower jaw of a fossil reptile which belongs to Isaac Lea. It is from a marl-pit near Moorstown (New Jersey). In form, the animal has some similarity to the *Saurocéphalus* of Harlan. The teeth, however, characterise it as a new genus. The teeth touch each other throughout; and within every alveolar socket is a series of apertures for the passage of the vessels and nerves of the teeth; besides which, the lower row of teeth go completely within the upper. As yet, one species only has been found, which is named *S. Leànus*; the teeth are sharp, pressed, and not bent at the point.

TELEOSAU'RUS Geoff.

The separation of Cuvier's *Gavial* of Caen had already been undertaken by Geoffroy St. Hilaire.† Recently, however, this writer has pursued some fresh investigations respecting this animal, with the advantage of possessing more extensive knowledge of the structure of the Saurians in general. The bones which Geoffroy names the pterygoid are smaller in this animal than in the *Crocodile*, and therefore present much similarity to the *Mammàlia*. This is the reason why the canal of the palate in these animals is not so very much elongated as in the *Crocodiles*, and opens at a point of the basis of the skull placed much farther back; while it is only the shortness of the canal of the nose which, in the *Teleosaurus*, reminds us of the organisation of the *Mammàlia*: yet the posterior region of the skull is of the *Crocodilian* type; and, in the structure of the ear, the creature approaches not only to most of the oviparous quadrupeds, but even to the *Birds*. The *os jugale*, in its form and situation, approaches more nearly to the *Mammàlia* than to any reptile whatever. The temporal bone, as well as the *os jugale*, lay

* This is also a fish, the *Saurocéphalus Leànus* of M. Agassiz. — *Ed.*

† *Mém. du Mus.*, tom. xii. p. 124, with better plates than in the work of Cuvier.

not on the outer superior surface of the skull, but on its side. With regard to the apparatus of hearing, as Cuvier had already remarked, the stapes is more cylindrical and stronger than in any other reptile. The general form of the head is similar to that of the Gavial; the beak, however, is still longer and sharper, and the number of the teeth greater, than in the Gavial. The first tooth appears to be particularly long; the others are alternately longer and shorter. Geoffroy considers the teeth more similar to those of the Mammalia than had previously been imagined, and doubts not that they were also covered by soft lips. The head measures 3 ft. 4 in. The hinder surface of the vertebræ is concave; and the processes show here and there considerable departures from the vertebral processes of Crocodiles; while, as is the case among many other fossil Saurians, the spinous process of the caudal vertebræ is broader. The form of the vertebræ of the pelvis differs essentially from the Crocodile. The skin was covered by scales, which, however, are thicker and broader than in the Crocodile, and, as in the scaly animals, overlay each other in such a manner that the skin of the fossil animal was stronger than that which covers the Crocodile. For the rest, the scales of the *Teleosaurus* are not to be mistaken, owing to their rectangular form, and their half-spherical cavities, of the size of a pea or a lentil, existing over the whole exterior surface. Free from elevations in the middle, they possess a depression similar to the scales of fish; and they led Geoffroy to imagine that the animal was more addicted to the water than the Crocodile; that it was probably a marine animal; and that its feet were more adapted for swimming than for walking. The recent investigations of Geoffroy will appear in the next volume of the *Transactions of the Academy of Paris*. He has, he states, now made himself acquainted with almost all the organs of the animal. The fore foot is about half as large as the hind; and the animal, which in this respect reminds us of the type of the Kangaroo, could walk but with difficulty; and its stiff motions, occasioned by its hard scales, prove that it moved with facility only in the water. The belly possessed a breast-plate, formed of a series of six scales. Both portions are unbending, as in the turtles; while in the Crocodile the lower alone is so. A hard plate, with two hollows, lies under the neck, in order to permit the lateral motions of the head. Lamouroux had previously proposed to distinguish this species more determinately as *cadomensis*.

STREPTOSPO'NDYLUS.

Cuvier's first Gavial of Honfleur, the separation of which

from the Gavial, Geoffroy also proposed, and to which he assigned the name of *Steneosaurus róstro-màjor*, exhibits little in common with the Gavial, except the general similarity of the form of the head. The teeth stand in separate alveoli, and are replaced in a vertical direction from within. A more complete investigation of the teeth would be extremely desirable. The beak is absolutely smaller than that of the Gavial, and passes gradually into the skull; in which respect the forms of both differ very materially. The lower jaw possesses 22 teeth, 14 of which are placed on the diverging rami, while the Gavial has but four teeth in this situation (two on each side). The rami also diverge at a much smaller angle than in the latter animal. The skull presents, in the occiput and in the frontal bones, differences no less striking. The eye was excessively large in comparison with that of the Gavial; and was placed not above in the skull, but laterally, as in the *Lacértæ*. The openings of the nasal orifices lie, as in the Gavial, at the end of the beak. The vertebral column is more contracted in the middle than in Crocodiles. The vertebræ are distinguished by the very remarkable peculiarity, that their anterior surface is convex, and their hinder concave; consequently, the reverse of those of the Crocodiles, and formed like the cervical vertebræ of the whole order of terrestrial Mammàlia; for instance, the Ruminants and the Solipedes, in which, however, the processes are different. The convexity of the anterior surfaces soon decreases in the fossil animal, and both surfaces become smooth. Instead of the simple inferior spinous process, we perceive two edges. I name this animal (whose structure is not adapted to form a subgenus of the Crocodile), from the peculiar character of its vertebræ, *Streptospondylus*. In the collection of the town of Caen, according to Geoffroy, the impression of a complete skeleton is preserved. One there perceives a phalanx of the hind foot, which is very similar to that of the Dugong. Hence, these animals effected their locomotion in a similar manner. It appears to have possessed only a moderately sized middle claw; and rudiments of lateral phalanges are to be observed.

METRIORHY'NCHUS.

Cuvier's second Gavial of Honfleur ought no more to be associated with the Crocodiles than the animal just described. Geoffroy considers it as a species allied to the foregoing, and names it *Steneosaurus róstro-mìnor*. The few remains of this creature which have yet been made known are sufficient to convince us of the generic difference. The length of its beak preserves the medium between that of the Gavial of the

Ganges and the Crocodile of St. Domingo. The body of the vertebræ is not strikingly contracted in the middle; and the anterior and posterior surfaces are concave. Some of the spinous processes would, at first sight, resemble the analogous portions of the Crocodiles; but the cervical and dorsal vertebræ possess no inferior spinous process. This fossil Saurian exhibits, in this respect, a sufficient dissimilarity from the foregoing. I have named it, from the moderate length of its beak, *Metriorhynchus*. It were to be wished that the characteristic portions of the skeletons of this, as well as of the previous, animal could be recovered.

ART. III. *Observations on the Phenomenon termed Ignis Fatuus.*

By RICHARD CHAMBERS, Esq., F.L.S. F.Z.S. Read before the Linnæan Society in 1830. Communicated by the Author.

It has been the opinion of many naturalists, that the luminous appearance known by the names of *Ignis Fatuus*, *Will-with-the-wisp*, and *Jack-o'-lantern*, is not a meteor, as generally supposed, but a luminous insect; and, in confirmation of this hypothesis, I have collected, not merely the opinions, but the experience, of many persons who have had repeated opportunities of observing this singular phenomenon.

In the year 1814, I had a conversation on this subject with my esteemed friend the late Mr. James Dickson, the celebrated botanist, whose name will never be mentioned without exciting those sentiments of respect and veneration due to the great talents and persevering industry of that indefatigable observer of nature.

The individual just mentioned informed me that he felt confident the *Ignis Fatuus* was not a meteor, but a luminous insect, for he had seen it settle on a plant and fly off again. The same, he stated, had been witnessed by his friend Mr. Curtis, author of the *Flora Londinensis*. My curiosity being greatly excited by these remarks, I went immediately to my father, the late Mr. Anthony Chambers, who, having lived for many years in the neighbourhood of Lincoln, where the *Ignes Fatui* are frequently seen, was likely to afford me information on the subject. He told me that, when a lad, returning in the dusk of the evening through Bultham Wood, he observed behind him a *Jack-o'-lantern*, which followed him through the wood; and when this luminous appearance came to the gate, at the end of the path, it rose to clear the upper bar, and flew into the adjoining meadow. At another time, he observed, in the same neighbourhood, two of these

Will-with-the-wisps flying about each other, apparently at play, which they did for a considerable time, and at last settled on a furze bush.

These remarks corroborated the opinion of Messrs. Dickson and Curtis; and, on referring to the *Transactions of the Royal Society*, vol. v., there is a communication on the same subject by Derham, who says, —

“It being the opinion of divers skilful naturalists, particularly Mr. Francis Willughby and Mr. Ray, that the *Ignes Fatui* are only the shining of a great number of the male glowworms, in England, or of the *Pyraústæ* in Italy, flying together.

“My own observations I made at a place that lay in a valley between rocky hills, which, I suspect, might contain minerals, in some boggy ground near the bottom of those hills. When seeing one in a calm dead night, with gentle approaches I got up by degrees, within two or three yards of it, and viewed it with all the care I possibly could. I found it frisking about a dead thistle, growing in the field, until a small motion of the air (even such as was caused by the approximation of myself) made it skip to another place, and thence to another and another.”

It is generally allowed that the male glowworm (*Lampyris noctilùca*) is slightly luminous, yet not sufficiently so to put on the appearance mentioned by Derham. The following remarks by Mr. Arthur Aikin, in his *Tour through Wales*, p. 60., will somewhat elucidate the subject: —

“I was not a little surprised to see the glowworms, at our approach, darting over the hedges into the fields. Knowing the female alone to be luminous, and, at the same time, destitute of wings, this phenomenon puzzled me a good deal; nor can I account for it, except upon the supposition of the male bearing the female through the air when in the act of their amours.”

Wishing to obtain all the information I could on a subject so interesting, I spoke of it to my kind and intelligent friend, Thomas Stothard, Esq., R.A., who, besides possessing talents of the highest order in every department of art, is an excellent practical entomologist. From this gentleman I received the following letter: —

“June 16. 1823. Newman Street.

“MY GOOD SIR, — Agreeably to your request, I send you the best account my recollection will supply of the *Ignis Fatuus* we conversed about when last together.

“As I was returning from Plymouth early in June, 1821, having travelled all the preceding day and night, and had

passed Blandford early in the morning, considerably before sunrise, when objects were just distinguishable, I saw what was new to me, and which fixed all my attention, for the short time allowed to observe it while mounted on the outside of the coach, passing at the usual rate of 7 or 8 miles an hour. On my right hand, and the side on which I was placed, at the distance of 40 or 50 paces, appeared an irregular light, bounding or rising to the height of 3 or 4 ft. over some heathy shrubs, which covered the high and marshy ground spreading to a great extent: amongst these it sank and reappeared with a motion somewhat between flying and leaping. A friend, who was with me, observed it, and exclaimed that it was the third appearance of the like phenomenon; and, requesting him to give me more information, he answered, that, when travelling the Bath road on a similar conveyance, at the same time in the morning and season of the year, he observed one, though not so distant from the road as the one we had passed: its flight was in the same direction with the coach; and several times it alighted on the shrubs or high grass on the border of a wet ditch near the road side. The experienced coachman pronounced it to be a Will-with-the-wisp.

“Yours, dear Sir, very truly,

“T. STOTHARD.”

Mr. Stothard was of opinion that the supposed *Ignis Fatuus*, from its motion being between flying and leaping, is the mole-cricket. He brought one from his cabinet, and pointed to the structure of its wings, in proof of this conclusion; for it could not fly high, nor long together; and the habitat of the *Gryllotalpa* being the same as where this luminous appearance is usually seen, is another coincidence. In the second volume of Mr. Kirby's *Introduction to Entomology*, he relates a circumstance corroborative of the above hypothesis: — “The Rev. Dr. Sutton of Norwich, when he was curate of Tikleton, Cambridgeshire, in 1780, a farmer of that place of the name of Simpringham brought to him a mole-cricket, and told him that one of his people, seeing a Jack-o'-lantern, pursued and knocked it down, when it proved to be this insect, and the identical specimen shown to him.”

In the admirable work just noticed, its learned author, who strongly advocates the opinion of these supposed meteoric appearances being luminous insects, gives the following interesting fact: — “Mr. Sheppard, travelling one night, between Stamford and Grantham, on the top of the stage, observed for more than ten minutes a very large *Ignis Fatuus* in the low

marshy grounds, which had every appearance of being an insect. The wind was very high; consequently, had it been a vapour, it must have been carried forward in a direct line; but this was not the case. It had the same motions as a tipula, flying upwards and downwards, backwards and forwards; sometimes appearing as settled, and sometimes as hovering in the air."

In the summer of 1826, I went into the fens of Lincolnshire, hoping to see an *Ignis Fatuus*; but in this I was disappointed. From Joseph Simpson, an intelligent fisherman at Frieston Shore, near Boston, I obtained the following information:— That, before the fens were drained, his father had seen a dozen *Ignes Fatui*, apparently playing with each other like insects, the highest not more than eight or ten feet above the ground. He told me that, since the draining of the fens, they were not so common; yet he and several others had seen one settle on a hedge, and on a post, and fly off again; and that it appeared to him to have a voluntary motion, for he noticed one flying towards a hedge, then rise and pass over it.

My friend Mr. Cole, surgeon, of Charlotte Street, Bedford Square, has favoured me with the following particulars on this interesting but obscure subject:—

"In October, 1823, I went to Worcester, and was met by a young man, in the service of my father, who came there with a gig to drive me to Leigh, near Malvern. Having heard that he had seen a Will-with-the-wisp, I took the opportunity the drive afforded, to enquire about what he had seen, when he stated as follows:—

" 'I was coming home with the boy from looking after the sheep, at the further side of the farm. Our path lay near a hedge; and on a sudden there appeared at a distance a ball of fire about as big as my head. We stopped; and it came directly towards us. The boy asked me what it was: I told him I supposed it must be what they called a Jack-o'-lantern. It had a dancing kind of motion, and advanced under the hedge side, till it came quite near to us; it then divided into a dozen or twenty parts, forming so many balls of fire, about the size of my fist, which flew apart from each other, and played about for a short time. They then joined together again into one large ball, as at first, and turned over the hedge into the next field. It passed between two oak trees that stood at some distance from the hedge, and then went straight across the fields, rising over the hedges, until it disappeared in the distance.' In reply to my questions, he stated that it was in the spring of the year, and that the night was about as dark as it was at the time he was speaking, a clear moonless night

in the beginning of October, about ten o'clock. To an enquiry whether he thought the motion of the object he saw, especially when it divided, and played about, and then united again, was like anything he had seen before, he replied that he did not know; but, when afterwards asked if he thought it like the playing of flies or gnats in the sun, he said it was precisely similar. The spot where he saw it was shown to me. The soil is dry, and the situation is slightly elevated above the surrounding country: there is no marshy or swampy ground in the neighbourhood. The man's name is William Day. He was brought up in my father's family, and resides there still.

I have questioned many persons who have seen the Ignis Fatuus, besides those whom I have mentioned, and they invariably concur in its having a voluntary motion, flying backwards and forwards, rising to clear hedges, resting on gates, pales, and other objects that lie in its route. From the facts I have been able to collect, I think we may infer that many more insects are luminous than naturalists have imagined; and, should these observations not be sufficient to convince naturalists that the supposed Ignis Fatui are really and truly insects, yet I anxiously hope that the remarks I have made may be the means of leading gentlemen, who reside in favourable situations, to investigate this curious phenomenon.

[There undoubtedly appear considerable grounds for supposing that the history of many cases of Ignis Fatui may be connected with the light emitted by certain insects; but, at the same time, there is strong evidence opposed to the universal adoption of this explanation. For observations on this subject, see Jameson's *Edinburgh Journal* for January, 1833, and *Entomological Magazine*, vol. i. p. 350. — *Ed.*]

ART. IV. *Some Remarks upon the Theory of Hybridity.* By THOMAS C. EYTON, Esq., F.Z.S.

AT the last meeting of the British Association, held at Bristol, I mentioned, during a discussion on the subject, that a hybrid male and female, derived from the Chinese and common goose*, had been productive *inter se*.

This fact appeared, at the time, to be doubted by some gen-

* It has been conjectured that the common goose of our farm-yards may have been derived from the snow goose (*A. hyperboreus* Lin.), chiefly on account of the old males being white. There is also a white variety of the Chinese, with the red eyes of the albino. The bill of the snow goose differs, also, much in form from that of our common sort; on which account I think this not likely.

tllemen present. To place it, therefore, beyond all suspicion, I sent, a little after Christmas, a pair of hybrids, bred as above, to a cottage, in the neighbourhood of which no geese were kept. The male, soon after the female began to lay, was, unfortunately, destroyed. He was, however, in a few days replaced by another, bred in the same manner. To this fact, of the goose having been without a mate for nearly a week, may be attributed that of many of the eggs having been unproductive. Three fine goslings were, however, hatched, and are now alive and doing well, precisely (as far as being intermediate in external character between the Chinese and common goose) similar to their parents, and may be seen any day swimming in the pool with them.

Not the slightest repugnance is exhibited between the male Chinese and female common goose: they become attached (if I may use the expression) at sight, even if the male has one, or even two, females of his own species at the time with him.

All my experiments have been made between the female common and male Chinese. Whether the converse will be equally successful, I hope, in the course of next year, to be able to prove, and also to try many other experiments of a similar nature.

The deduction to be drawn from what I have stated, according to John Hunter's theory, is self-evident; namely, that the above-mentioned birds are one and the same species. They differ, it is true, materially in form and external character: but why should we suppose that local circumstances should have a less effect upon animals than upon man himself? The differences between the two supposed species of geese are not greater than those existing between the races of man, or, rather, between those varieties* of the human species found in the two countries from which the two species of geese come. This appears to be in favour of Hunter's theory; and that the two species are one, altered by climate.

The number of the vertebræ has not, that I am aware of, been found to differ in any of the races of man. Whether this is the case, or not, in the two species, or supposed species, of geese, I cannot at present say; but in three varieties (or species) of the genus *Sûs* they differ most materially (see the *Zoological Society's Proceedings* for 1837); and this difference is not only in the caudal, but in the lumbar and sacral ones: yet these species breed together, and their offspring are prolific. We must therefore either reject this character, as one determining species; or the theory of John Hunter: unless, indeed, do-

* Circassian and Mongolian.

mestication has the effect of diminishing or increasing the number of vertebræ. This most probably, however, is the case with regard to the caudal vertebræ, but not with regard to the others; as we find in dogs that, although, among those that have not been mutilated, the caudal ones differ, the remainder do not, in any at least that I have had opportunities of examining. But this will require further investigation, upon which, should it still appear that domestication has not the effect of altering the number of any of the vertebræ except the caudal ones, and, consequently, that John Hunter's theory is not the true one; in fact, that animals, nearly allied in their organisation, will breed together, and their offspring be productive; then the now supposed varieties of the genus *Sûs* will become true species.

It will, however, probably be some years before these points are set at rest; and it will require much patient investigation, either to prove or disprove them.

I cannot here help hazarding the conjecture, that the theory of Hunter will be partially disproved; and that it will be found that animals of different species, nearly allied in their organisation, will breed together when in a state of domestication, confined together, or occasionally in a wild state, under peculiar circumstances; such as has been the case among black game in various parts of the country; single grey hens having, in several instances, bred with the common pheasant, not being able to find a male of her own species: and that the hybrids the produced will be productive, under any circumstances, when parents are nearly allied, of the same genus, and not otherwise.

All true hybrids that have been productive have been produced from species brought from remote countries, and in (or partially) a state of domestication. May we not, therefore, suppose that it is a provision of Providence, to enable man to improve the breeds of those animals almost necessary to his existence; and that it is almost a necessary provision, as it is universally found that breeding in, as it is called, among those animals that we have the opportunity of observing, tends to diminish and dwindle the race which has been subjected to it?

The above communication may, perhaps, seem unconnected; but this must necessarily be the case when the links are wanting. My object has been to offer a few suggestions relative to a subject so vitally connected with zoological, as well as with geological, science.

Being, however, desirous not to trespass too long upon my reader's patience, I conclude with hoping, that those who have it in their power will make public any information they possess relative to the subject.

ART. V. *On the Web-footed Birds of Devonshire.* By EDWARD MOORE, M.D. F.L.S., Secretary to the Plymouth Institution.

THIS paper will terminate my list of Devonshire birds; which, as might have been expected, from the extensive line of sea coast on both sides of our county, includes a very large number of species, and many rare specimens. I may especially direct attention to the great auk, little auk, fork-tailed petrel, arctic jager, glaucous gull, and little gull, as well as to many of the goose and duck tribe. Possibly, the great auk cannot well be claimed for us, as the circumstances of its capture may very probably be explained in the manner hinted at by Professor Jameson; but we can certainly authenticate eleven Devon specimens of the fork-tailed petrel, three of the glaucous gull, six of the little gull, and two of the red-breasted goose. The gulls are chiefly obtained here in winter, when, leaving their breeding-places, they spread over the sea coast, and our harbour is full of them; but in spring and summer we are deserted by all except the herring gull, which is the only one that breeds near Plymouth. The rare species of ducks are only obtained in winter, when the season is more severe than usual. It is, however, during storms that we make the principal addition of rarities to our collections; at which time it is supposed that sea birds become starved, by being blown inland at a distance from their natural element. But this seems uncertain, as the two specimens of fork-tailed petrel obtained in Plymouth were caught not 500 yards from the sea: and I think it more probable that their seeking land arises from their weakness; for, during storms, in which the agitation of the water lasts three or four days, I believe it will be found that even the petrels, although very active, are unable to procure food at sea; and it is under such circumstances that I have, at different times, obtained the following birds, viz., the fork-tailed petrel, common tern, black-toed gull, and young gannet; all being in an exhausted state, free from wounds, and the stomach, on dissection, found empty.

It will, I think, be admitted, on inspecting the entire catalogue, that, out of the general list of British birds, Devonshire furnishes a very large proportion, of which many are so rare as to be denominated stragglers, or foreigners, and, therefore, thought not proper to be admitted as British (see *British Animals*, p. 94.); but, when it is remarked that, in many instances, where one specimen is obtained, perhaps ten escape capture, I consider, with all due respect to Dr. Fleming, it would be impossible to omit them in a list professing to illustrate British ornithology.

ORDER VI. PALMÍPEDES.

Fam. i. *Brachýptera*.

Gen. PO'DICEPS.

1. *Pódiceps cristatus*, the Crested grebe, or Tippet grebe. Occasionally obtained. Mr. Comyns has a male and female; as also Mr. Drew and Dr. Isbell.
2. *Pódiceps cornutus*, Horned, or dusky, grebe. The young bird is often obtained, and is in most of our collections.
3. *Pódiceps rubricollis*, Red-necked grebe. Rare. A specimen was shot at Teignmouth, in January (*Latham's Supplement*); four were killed at Slapton Lay (*Montagu*); and one is in Drew's collection, which was killed at Plymouth, in June.
4. *Pódiceps minor*, Little grebe, or Dobchick. Common all the year.

Gen. COLYMBUS.

1. *Colymbus glacialis*, Northern diver, or Imber. I have heard only of one specimen, in mature plumage, being obtained in Devon, which was shot on the Exe, in May, 1829. In the state of the female, or young (*viz.* the Imber), it is not uncommon. A flock of seven was seen on the Tamar, in December, 1828, and one shot. I have another, killed on the Plym in December, 1829; others are in the collections of Sir G. Magrath, Mr. Rowe, and Mr. Drew.
2. *Colymbus árticus*, Black-throated diver. Mr. Drew had a specimen of this bird to prepare, a few years since, which was shot on the Tamar.
3. *Colymbus septentrionalis*, Red-throated, or speckled, diver. Not unfrequent on our southern coasts, according to Montagu. Mr. Drew has one, shot in August; and, in the plumage of the young, we have many specimens, killed in winter.

Gen. URIA.

1. *Uria Troile*, Foolish and Lesser guillemot. The old birds are abundant here in summer. Temminck considers that the lesser guillemot is the same in winter dress; but, in that case, it is difficult to account for the occasional appearance of the bird in its summer plumage at that season. Montagu speaks of one shot in Devon, in January; and I have a specimen, killed Feb. 20. 1830. It may be the young which abounds here in winter.
2. *Uria Grýlle*, Black and Spotted guillemot. Rare. One specimen (black) is in Pincombe's collection, and a spotted one in Drew's.

Gen. MÉRGULUS.

1. *Mérgulus melanoleucos*, the Little auk. Rare. Two Devon specimens are mentioned by Montagu.

Gen. FRATÉRCULA.

1. *Fratércula ártica*, the Puffin. These birds are not frequently found in the south of Devon, but abound in the north, as they breed on Lundy Island. I only know of one specimen obtained in Plymouth Harbour, though they are sometimes seen in the Channel. Drew and Bolitho have specimens.

Gen. A'LCA.

1. *A'lca Tórda*, the Razor-billed and Black-billed auk. Often obtained, though more rarely in the adult plumage; yet I possess one, killed in February. The young are numerous here in winter; and I have frequently seen them teased by the gulls, on which occasions they dive.
2. *A'lca impénnis*, Great auk, or Penguin. Mr. Gosling of Leigham informed me that a specimen of this bird was picked up, dead,

near Lundy Island, in the year 1829; and Professor Jameson suggests that it might have been one which had been obtained by Mr. Stevenson in St. Kilda, and escaped from the light-house keeper of Pladda, about that time, when on its way to Edinburgh. (See *Edinburgh New Philosophical Journal*, Oct., 1831.)

Fam. ii. *Longipennata*.

Gen. PROCELLARIA. — Subgen. 1. *Puffinus*.

1. *Puffinus Anglorum*, the Shearwater. This bird is often met with by our fishermen in the vicinity of the Eddystone. In October, 1832, seven were obtained in the Sound by Mr. Drew: two were brought alive to Sir G. Magrath, in the summer of 1833; and two others are in the collection of Bartlett, a bookseller in Plymouth. They breed on Lundy Island.
2. *Puffinus cinerea*, Cinereous shearwater. On obtaining Eyton's *History of Rarer British Birds*, I searched our collections for this bird, and found that Drew and Pincombe had several specimens, which they had not distinguished from the former species, but merely considered as a larger specimen than usual. Is it the female of *P. anglorum*?

Subgen. 2. *Fulmarus*. Wanting.

Subgen. 3. *Thalassidroma*.

1. *Thalassidroma pelagica*, the Stormy petrel. Stated by Montagu to be scarce in Devon; but great numbers are killed every winter by flying against the lanterns of the Eddystone light, from whence I have obtained several specimens. They often come into the Sound, where five were caught alive, June 15. 1830: we have many specimens. It is known to breed in Cornwall.
2. *Thalassidroma Bullcockii*, the Fork-tailed petrel; Leach's petrel. This bird has been considered very rare. Montagu mentions one Devon specimen, in 1823: however, from Dec. 10. to Dec. 20. 1831, according to the newspapers, several were obtained in different parts of the kingdom. About this time, two were caught alive in the streets of Plymouth; one by Mr. Whipple, the other by Mr. Gosling: the latter is in my possession. The birds seemed exhausted, and made several fruitless attempts to rise. At the same period, another was sent to me from South Milton. A specimen was also obtained here in November, 1835. Bolitho has four, and Mr. Drew two, specimens.

Gen. LÉSTRIS.

1. *Léstris Cataractes*, the Skua gull. This used to be considered very rare here, but, I suspect, has been confounded with the wagel; as a little attention in preserving specimens has furnished several instances. It frequently accompanies the fishing-boats; and on Feb. 16. 1835, a fine specimen was brought to me alive, by a trawl-boy, who caught it with a boat-hook, after it had gorged itself, while the whale was here. (See *Phalaropus lobatus*, p. 322.) A great many were obtained by Drew, Pincombe, and others.
3. *Léstris Richardsonii*, Arctic gull. If the black-toed gull of Bewick is the young, I possess a specimen, which was caught in an exhausted state, after a storm, in Catwater, Plymouth, Oct. 9. 1828. Two others were obtained by Drew at the same time; and another was killed at Mothecombe, by Mr. Tonkins, gamekeeper, and sent to R. Julian, Esq., of Estover.
4. *Léstris parasiticus*, Arctic jager. A bird corresponding to the account in Eyton, except that the neck is mottled with black,

was shot at the Mewstone, Oct., 1833, and is now in my collection.

Gen. *LA'RUS*. — Subgen. 1. *Rissa*.

1. *Rissa cinerea*, the Kittiwake and Tarrock. Montagu considers this scarce; but it is frequently seen in our harbour. I shot an old bird in July, 1829, and young ones in August and November. We have many specimens in both states of plumage. The name is doubtless derived from the cry of the bird when alarmed at its breeding-place, as it pronounces the word "kittiwake" quite distinctly, as I have experienced.

Subgen. 2. *Larus*.

1. *Larus canus*, Common gull and Winter mew. Common on our shores: specimens in many collections.
2. *Larus argentatus*, Herring gull and Silvery gull. This is the most common of the gulls with us at Plymouth, especially in the summer, when most others desert us. It breeds at the cliffs of Wembury, near Plymouth. We have specimens in every collection.
3. *Larus fuscus*, Lesser black-backed gull. Not uncommon: we have specimens, shot in April and August, 1830.
4. *Larus marinus*, Black-backed gull and Wagel. Sometimes obtained here: I have one, shot on the Mewstone, January, 1830; Drew has another; and I saw several off Berry Head, Sept. 15. 1831.
6. *Larus glaucus*, Glaucous gull, or Burgomaster. The only adult Devon specimen of this bird which I know of is in my possession: it was observed by a farmer's boy, feeding on some carrion, in a field at Mutley, near Plymouth, about $1\frac{1}{2}$ mile from the sea, May 21. 1832. It corresponds to Temminck's description of the adult; all the plumage being white, except the back, which is pale bluish ash: its length is 29 in., bill 3 in., tarsus 3 in., and middle toe $2\frac{2}{10}$ in. Mr. Drew has a male and female (young, corresponding to the representation in Bewick's *Supplement*, p. 28.), shot on the Mewstone, Plymouth, Dec. 25. 1829.

Subgen. 3. *Chroicocéphalus* Eyton.

2. *Chroicocéphalus ridibundus*, Black-headed and Red-legged gull. This bird is very scarce here in its summer plumage; and Mr. Drew is the only person who has a specimen; but in the winter plumage it abounds; and I have seen flocks of them on the Lary and in the Sound, especially about October and November; at which time I have obtained many.
3. *Chroicocéphalus minutus*, Little gull. This is considered a scarce British bird. Montagu mentions two specimens, one of which was shot by Mr. C. Prideaux, at Brent, Devon, and is now in the British Museum; and Dr. Fleming mentions another, shot on the Solway Frith. We have four Devon specimens: one, corresponding to Montagu's description, was shot on the Tamar, Sept. 28. 1828, by Mr. Whipple, surgeon, who still has it; another is in Pincombe's collection, shot on the Tamar, October, 1831; and Mr. Drew has two others.

Subgen. 4. *Xema*. Wanting.

Gen. *STERNA*.

2. *Sterna cantiaca*, Sandwich tern. Rare. One of these birds, shot on the Tamar, in April, 1831, is at Mr. Drew's. I saw two others, in 1829, which were shot in the Sound, and sold to Borton, an itinerant collector.
4. *Sterna arctica*, Arctic tern. One specimen, at Mr. Drew's, shot in autumn, in Plymouth Harbour.

5. *Sterna marina*, Common, or greater, tern. Mr. Rowe and Mr. Drew have specimens of the old birds. About September and October, flocks of young ones generally frequent the harbour and rivers. In October, 1828, after a strong gale, many were driven inland, and some picked up, starved, of which I obtained one, which is in my collection.
7. *Sterna minuta*, Lesser tern. Not so frequent as the former. Mr. Drew has two specimens, shot in the Sound.
8. *Sterna nigra*, Black tern. Bolitho has two specimens. The brown tern is the young, of which Mr. Comyns has a specimen, and Mr. Drew two others.

Gen. A'NOUS. Wanting.

Fam. iii. *Totipalmata*.

Gen. PHALACRÓCORAX.

1. *Phalacrocorax Carbo*, Cormorant and Crested cormorant. These are common on all our coasts all the year. I have a fine specimen of the crested kind, shot in Catwater, Plymouth.
2. *Phalacrocorax Graculus*, the Shag. Common all the year.

Gen. SU'LA.

1. *Sula bassana*, the Gannet. Frequents our coasts in winter, as late as April, when it retires to Lundy Island to breed; one spot of which is termed Gannet cove, from the numbers which resort there. In January, 1829, great numbers were seen in Plymouth Sound; and one person shot nine in a morning. On Oct. 10. 1831, after a storm, a fine male was run down by a man in Saltram Marsh, and brought to me. About the same time, a young bird, of the second year's plumage (black, with white spots), was caught in Hooe Lake, which is in my possession. Mr. Tripe and Mr. Drew have specimens.

Fam. iv. *Lamellirostres*.

Gen. MÉR'GUS.

1. *Mergus Merganser*, Goosander and Dun-diver. Rare. Mr. Drew has a male and female, and I have a male, shot on the Taw, near Barnstaple. In the winter of 1830, I obtained a specimen, which I considered to be the dun-diver; but it resembles the drawing of the *Mergus cucullatus* in Eyton's work (p. 74.), except that the crest is not quite so long, and it had the double enlargement of the trachea; which, as I dissected it and prepared it myself, I can vouch for; and that part is still in my possession. This structure, according to Temminck, also occurs in the dun-diver; so that I am doubtful of Mr. Eyton's bird being distinct.
2. *Mergus serrator*, Red-breasted merganser. Rare. Mr. Comyns bought one in Exeter market, in 1808. In November of the same year, one was shot on Slapton Ley, by Mr. Holdsworth: another was obtained at Leigham. There is a fine male in the collection at Ham, killed on the Tamar; and Mr. Rowe and Mr. Drew have specimens also.
3. *Mergus albellus*, Smew, Red-headed smew, and Lough-diver. Sometimes obtained in winter. Mr. Comyns has a male and female, shot at Exmouth: Mr. Drew, Bolitho, and myself have specimens, killed on the Tamar.

Gen. MERGÓI'DES. Wanting.

Gen. FULÍGULA.

1. *Fuligula ferina*, the Pochard. Not uncommon in hard winters, when they are brought to market with widgeon.
2. *Fuligula Nyroca*, Ferruginous duck. A specimen at Drew's.

3. *Fulígula cristàta*, Tufted duck. Frequently shot on Slapton Ley, and found in the markets in winter.
4. *Fulígula Gésneri*, the Scaup duck and White-faced duck. Found here in winter: we have several specimens.

Gen. POLYSTICTA *Eyton*. Wanting.

Gen. SOMATERIA.

1. *Somateria* St. Cuthbérty, the Eider duck. Very rare. Montagu mentions one shot on our coast, in 1807: Mr. Drew has another, killed, in January, 1830, near Plymouth.

Gen. OIDE'MIA.

1. *Oidemia nigra*, the Scoter, or Black diver. Sometimes obtained here. I have the male and female, killed in January, 1829; and I saw a female, June 10. 1831, on the Tamar; so that I suspect they occasionally breed here with the common wild duck. Mr. Whipple and Mr. Drew have specimens.
2. *Oidemia fúsca*, Great black duck, or Velvet duck. Stated by Polwhele (*History of Devon*) to have been found in Devonshire; and Mr. Drew has a specimen of the female.

Gen. CLA'NGULA.

1. *Clángula chrysophthalmos*, the Golden eye and Morillon. Obtained in severe winters. Mr. Tripe, Mr. Rowe, Mr. Drew, and myself have specimens.
2. *Clángula histriónica*, the Harlequin duck. Mr. Tripe has a specimen of the female, shot in Hamoaze, in the winter of 1830.

Gen. HARE'IDA.

1. *Harélda glaciális*, Long-tailed duck. Montagu obtained one specimen in South Devon; another has this winter been procured by Bolitho in St. John's Lake, Plymouth Harbour.

Gen. A'NAS. — Subgen. 1. *Marèca*.

1. *Marèca Penélope*, the Widgeon. Common in winter.

Subgen. 2. *Querquédula*.

2. *Querquédula Créèca*, Teal. Common in winter.
3. *Querquédula círcia*, the Garganey. Rare. Mr. Comyns has one, killed on the Exe; Mr. Tripe, and Bolitho, and Pincombe each a specimen, from the Tamar.

Subgen. 3. *Dafíla*.

1. *Dafíla acúta*, the Pintail. Obtained in hard winters. In January, 1829, great numbers were brought to market. We have many specimens.

Subgen. 4. *Chauliódus*.

1. *Chauliódus strépera*, the Gadwell, or Grey. Rare. Mr. Drew has a specimen, as also Bolitho and Pincombe.

Subgen. 5. *Rhyncháspis*.

1. *Rhyncháspis clypeàta*, the Shoveller. Rare. One is at Drew's, and another in the collection at Ham.

Subgen. 6. *A'nas*.

1. *A'nas Bóschas*, the Wild duck. Common: some of them (being protected) breed in this neighbourhood.

Gen. TADO'RNA.

2. *Tadórna Bellónii*, the Shieldrake. Not uncommon. It breeds in Braunton Burrows, North Devon, and is brought to market in winter.

Gen. A'NSER. — Subgen. 1. *A'nsér*.

1. *A'nsér ségetum*, the Bean goose. Scarce. In the severe winter of 1830, many were obtained here.
2. *A'nas palústris*, the Wild goose. Visits us in winter.
3. *A'nas erýthropus*, the White-fronted goose. Flocks of these were

brought to market in January, 1830, from which we obtained many specimens.

Subgen. 2. *Bérnicla*.

1. *Bérnicla ruficollis*, Red-breasted goose. Rare. One was shot on Kenton Warren, in 1828, and is now in possession of Mr. W. Russell, Dawlish: a second was killed on Teign Marshes, Feb. 21. 1837, by Rendell of Buckland, and is now in preparation by Mr. Drew.
2. *Bérnicla leucópsis*, the Bernacle goose. Rare. Mr. Comyns has two from the Exe.
3. *Bérnicla Brénta*, Brent goose. One is at Drew's, and I have another, killed here January, 1830.

Gen. *CYGNUS*.

1. *Cýgnus fêrus*, the Wild swan, or Whistling swan. Rare; but obtained in hard winters. A specimen, shot on the Tamar, is in the collection of J. Newton, Esq., at Bridestow, near Okchampton. In the winter of 1830, several visited our rivers. I saw thirteen in the Plymouth and Devonport markets; and many were shot in the North, of which I obtained one from Torrington.

Plymouth, June 20. 1837.

ART. VI. *Some Observations on Mr. Stutchbury's proposed new Genus of Univalve Shells, Cypræacássis.* By G. B. SOWERBY, Esq., F.L.S., &c.

THE following observations have suggested themselves to my mind upon a perusal of Mr. Samuel Stutchbury's paper, published in your fourth Number, p. 214. As I think they are calculated in a great degree to invalidate Mr. Stutchbury's conclusions (with which, by the way, he commences his paper), I deem it necessary to trouble you with them: not that it is my intention here to draw any positive inferences, but with a view to enable the scientific world to form its own opinion as fully as possible upon the case as it at present stands, and also to excite attention to the subject, so as to obtain, if possible, further information of such quantity and quality as will enable us to arrive at a decisive opinion upon the matter.

In making these observations I intend, for the convenience of reference, to follow, as closely as possible, the line marked out by Mr. Stutchbury. In the first place, then, let me remark, that he tells us that the animal of *Cypræacássis* has its *mantle* bilobed. Now, Gray says that it is the *foot*, and not the *mantle*, which is *bilobate*, and which deposits the testaceous matter, forming, in these remarkable shells, the very much thickened outer and columellar lips. I do not, however, at present insist upon this point; because, whichever it be, there can be no reason to doubt that it is the same in the true *Cássides*, as in Mr. Stutchbury's *Cypræacássides*.

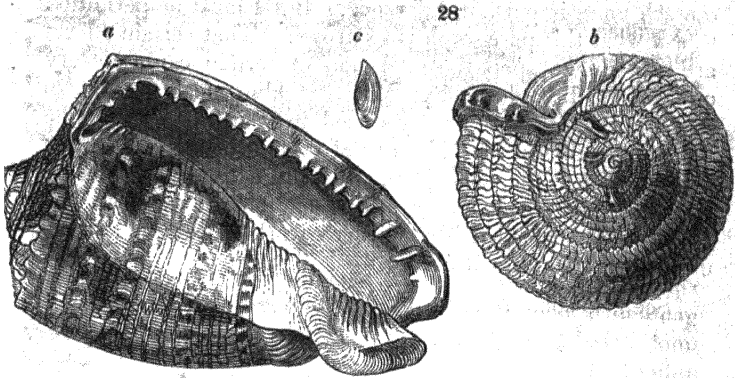
The next point to which I solicit your attention is Mr. Stutchbury's assertion, that "the animal of the true *Cássid*es completes the mouth in the young shells, at each separate period of growth, as perfectly as in the most mature; while, *on the contrary*, the genus before us (namely, *Cypræcassis*) never forms or completes its outer lip *but once* during its life; consequently, *it is destitute of varices*." Here I would observe, that, supposing this statement to be correct, the circumstance cannot be taken as of sufficient value to constitute a *specific*, much less a *generic*, character: the reasons for which I will now endeavour to explain. In the *first* place, then, I possess three specimens of a common species of *Cássid* (the *glauca* of *Lam.*), all of which appear to have arrived at the same period of growth, having each formed exactly seven volutions. Now, one of these three individuals has formed *one* varix, a second has formed *two*, and the third *four*, varices; consequently, if Mr. Stutchbury's observation be true, these three specimens form as many distinct genera, and yet I am quite certain that no naturalist would venture to consider them other than variations of the same species. *Secondly*, among four or five specimens of what Mr. Stutchbury calls *Cypræcassis Testiculus*, which I possess, one has *four distinct varices*, all having the dark-coloured spots usually so conspicuous on the reflected edge of the varix in this species. This specimen, then, must belong to *Cássid*, and not to *Cypræcassis*; although no one will venture to doubt its being truly a variation of *C. Testiculus*; or, Mr. Stutchbury's distinction is ill-founded. *Thirdly*, I possess several specimens of what Mr. Stutchbury names *Cypræcassis coarctata*, giving as a synonyme *Cássid coarctata Valenciennes*. In connexion with this species, there are two facts of which Mr. Stutchbury does not seem to be aware: one (which is really unimportant) is, that the specific name was given to it in 1825, by myself, in the *Tankerville Catalogue*, Appendix, p. xxi. (I suppose he has been misled by Kiener); the other (a fact of some moment) is, that the outer lip of this is never reflected, as it is in *rufa*, *Testiculus*, &c. Among my specimens is one which has formed *two* varices; but, since the outer lip is never reflected in this species, the first formed varix is not prominent, though easily distinguishable by the light colour and raised edge. *Fourthly*, I have an operculum, given me by Mr. Cuming, soon after his arrival in England from South America, which Mr. Cuming told me he had himself detached from the posterior part of the foot of the animal of *C. coarctata*. Here are, therefore, two facts opposed to Mr. Stutchbury's conclusions as regards this species. This leads to my next observation, which relates to the existence, or non-

existence, of an operculum in those species which Mr. Stutchbury separates from what he calls the true *Cássides*, and unites under his generic appellation of *Cypræcássis*. It is evident, from the above observations, that Mr. Stutchbury has not been aware of several important facts, all of which, as far as they go, are opposed to the separation of the one from the other. Perhaps I may be allowed to suggest that, possibly, Mr. Stutchbury, and his friend Dr. Cutting, may accidentally *not* have observed the operculum in their examination of *C. rufa* and *C. Testiculus*. I mean not to assert that these gentlemen have, from want of giving sufficient attention, left unobserved that which really existed; but, as Mr. Stutchbury unhesitatingly includes *C. coarctata* and *C. Testiculus*, one of which we find has an operculum, and occasionally two varices, and the other of which has sometimes several varices, it appears possible he may have passed over the operculum of *C. rufa*.

Observe, next, Mr. Stutchbury expresses his surprise "that an examination of the shell alone should not have attracted the attention of conchologists to the necessity of making the separation." Upon this part of the subject I have two words to say. *First*, Lamarck, in his *Hist. Nat. des Animaux sans Vertébrés*, tom. vii. p. 225., under the article *Cássis Testiculus*, has this observation:—"Ce casque a un peu l'aspect de certains *Cypræa*, tant par sa forme oblongue que par celle de son ouverture, qui est étroite:" from which it is evident that Lamarck had observed a degree of resemblance between this *Cássis* and certain cowries; though it does not appear that he was possessed of sufficient facts to warrant him in separating it from the other *Cássides*. *Secondly*, an examination of the shell alone would not, in my opinion, warrant such a separation; for, if we were to take the narrow * aperture as the separating character, we should include several which we know to possess opercula, and which have also commonly several varices; and, if we regard those as distinct which seldom or never form varices, we should separate from *Cássis*, and unite as *Cypræcássides*, some with wide, and others with narrow, apertures.

I must now call your attention to a fact which Mr. Stutchbury, in describing the young state of what he calls *Cypræcássis*, taking the *C. rufa* as the typical species, has omitted to notice: it is this, that, *at various periods* of its growth, although it does not *reflect* the outer lip, as it does in its mature state, so as to form varices, it nevertheless, like several other *Cássides*, completes the lip on the inner side by form-

* Which Mr. Stutchbury calls straight, though it really is not so.



ing a row of strong teeth, before it proceeds to continue the volution, by which means the various periods of growth are as distinctly marked *within* the outer lip, in this species, as they are *externally* in many others. In this point, Mr. Stutchbury's *Cypræcassides* differ very materially from the *cowries*; for no one ever yet met with a cowry which had once formed the *inflected* margin of the outer lip, and which afterwards continued to increase either the number or size of its volutions, except by additions of testaceous matter to the *external* surface.

Of the epidermis, or *epidermal covering*, as Mr. Stutchbury calls it, I have as yet said nothing, mainly because I have but little to say, never having, within my recollection, seen any specimens of the various species of Mr. Stutchbury's *Cypræcassis* in their natural state. Most of the shells that come to the London market are *dépourvues de leurs épidermes* before they reach the British shores: some of the remaining few are neatly shorn of it by the dealers, in order that they may prepare them to receive an unnatural beauty and polish; and we are moreover informed by a certain *conchological author*, whose lucubrations are to be found in the *Zoological Journal*, that the epidermis is naturally a *very loose habit*.

I have thought it necessary to illustrate this paper with the following representations, viz: — *Fig. 28. a*, *Cassis rufa* in a young state, showing the row of teeth within the outer lip; *b*, *Cassis Testiculus*, showing the formation of four varices at various periods of growth; and *c*, operculum of *Cassis coarctata*.

In the fourth paragraph of Mr. Stutchbury's paper, he tells us what he considers to be the principal distinction between his *Cypræcassis* and *Cypræa*. I think I have already shown

a much more important difference. But I must be permitted to ask what this paragraph is to prove? That certain effects are consequent upon the operation of certain causes, every one will readily admit; but Mr. Stutchbury has not shown that any certain cause has produced any particular effect: he has only supposed the existence of certain causes, which, *not* having existed, the consequent effect has *not* been produced.

I will now conclude, by asking one more question. Mr. Stutchbury has called Mr. Kiener's work "beautiful:" why did he not also term it correct?

[See also some remarks by Mr. Lewis, p. 387. — *Ed.*]

ART. VII. *A Synoptical Catalogue of the Species of certain Tribes or Genera of Shells contained in the Collection of the British Museum and the Author's Cabinet; with Descriptions of the new Species.* By JOHN EDWARD GRAY, F.R.S., &c., President of the Botanical Society of London.

Family MA'CTRADÆ Gray.

THE *mantle's lobes* free on the lower front edge, united before and behind, and extended into two united retractile siphons; the foot lanceolate subanterior. The *cartilage* internal, placed in a triangular cavity behind the cardinal teeth. *Cardinal teeth* two in each valve; the hinder one small, compressed, often rudimentary; the front one triangular, more or less deeply nicked beneath. The *lateral teeth* of the left valve simple, and fitting between the two on the right valves. The *siphonal inflection* distinct.

The genera are easily distinguished by the modifications of the ligament; thus:—

1. *SCISSODE'SMA* Gray. Ligament external, in a slit.
2. *MA'CTRA* Linn. - Ligament external, in a marginal groove.
Ligament subexternal, marginal, not separated from the cartilage.
3. *SPI'SULA* Gray - a. Hinder lateral teeth double and single.
4. *LUTRA'RIA* Lam. - b. Hinder lateral teeth single or wanting.
Ligament internal, in the same cavity as the cartilage.
5. *MUL'NIA* Gray - a. Lateral teeth simple.
6. *GNA'THODON* Gray b. Front lateral tooth hatchet-shaped.

I. *SCISSODE'SMA* Gray.

Shell ovate, trigonal, subangular at each end. *Hinge* and *lateral teeth* like *Máctra*. *Siphonal inflection* ovate, distinct. *Ligament* external, in an oblique triangular groove, open into the upper edge of the cartilage pit.

1. *Scissodésma Spéngleri* (fig. 29.); *Máctra Spéngleri* Linn. *Gmel.*; Spengler Cat., t. 3. f. 1—3.; Chemn., vi. f. 199—201.; Ency. Méth., t. 252. f. 3.; Sow. Gen., f. 1.

Inhabits the Cape of Good Hope. B. M.

2. *Scissodésma nitida*; *Máctra nitida* Schroet. *Enl.*, t. 8. f. 2.; *Máctra corallina* Chemn.

Inhabits African seas. British Museum.



II. MÁCTRA Linn.

Shell ovate trigonal, subangular at each end. Cardinal teeth two in each valve; the front tooth of the left valve, and both of the right valve, thin, compressed; hinder of the left valve trigonal, folded. The lateral teeth



distinct, anterior and posterior. Siphonal inflection ovate, distinct. Ligament external, in a more or less oblique triangular groove, separated from the cartilage pit by a distinct shelly septa.

A. The lateral Teeth subequal, laminar, thin, moderately distant from the Umbones and the Hinge Teeth. Hinge marginal, double-edged.

* Lunule and Lozenge smooth.

1. *Máctra glauca*; *M. helvæa* Chemn.
2. *Máctra stultorum* Linn., var. white.
3. *Máctra maculata* Lam.

** Lunules concentrically grooved. Lozenge smooth.

4. *Máctra discors* Gray. Shell ovate, trigonal, rather solid, ventricose, white. Umbones nearly close, with two diverging reddish lines. Lozenge rather flattened, rugulose, margined by slightly raised lines, with two or three raised concentric lines. Ligament very small.

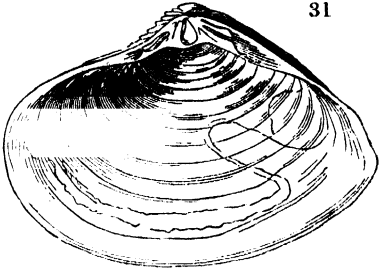
Inhabits ———.

Much the habit of a *Mulinia*, but grooved in front.

*** Lunule and Lozenge concentrically grooved.

§ Shell thin. Umbones rather separate. Ligament diverging.

5. *Máctra tumida* Chemn.; *M. túrgida* Lam. The anterior tooth T-shaped; the anterior part arising from the middle of the front side of the hinder part.
6. *Máctra grándis* Lam. (fig. 30.)
7. *Máctra ornata* Gray. Reddish, pale-rayed, and white-dotted. Umbones bright red.
Inhabits China.

8. *Máctra Chemnitzii* Gray.; *M. violácea australis* Chemn., f. 1954.
 9. *Máctra púlchra* Gray.
 10. *Máctra abbreviáta* Gray, King, Voy. N. H.
 §§ *Shell solid. Umbones close. Ligament very oblique, submarginal. Lateral Teeth smooth.*
 11. *Máctra cygnea* ? Chemn.
 Inhabits China.
 12. *Máctra rufescens* Lam. Hinder lateral teeth rather the shortest.
 B. *The hinder lateral Tooth very small, close; the anterior one elongate. Shell trigonal.*
 13. *Máctra striátula* Linn.; *M. carináta* Lam.
 14. *Máctra exoléta* n. s. *Shell trigonal, white, thin, pellucid, slightly concentrically striated; covered with a thin pale periostraca; the anterior slope compressed, produced; the hinder slope ventricose, flattened, edged, with a slightly raised keel.*
 Inhabits ———.
 C. *The lateral Teeth subequal, rather long, very close to the cardinal Teeth (the front ones from near the umbo, and furnished with a thickened process at its upper part). Shell thin, trigonal. Hinge-margin 2-edged.*
 15. *Máctra plicatária* Chemn. (fig. 31.), vi. f. 202. 204., Gmel.; *M. subplicata* Wood. Supp., t. 1. f. 6.
 16. *Máctra Reevesii* Gray. *Shell wedge-shaped, thin, white, pellucid, striated; concentric curved near the umbo.*
 Inhabits China. (*J. R. Reeve, Esq.*)
 17. *Máctra subplicata* Lam., not Wood.

 D. *The hinder lateral Tooth short, close to the cardinal ones; the anterior one elongate, compressed, thin, considerably below the Hinge Teeth. Shell thin. Hinge-margin double.*
 18. *Máctra violácea* Chemn., vi. f. 213, 214.; *Ency. Méthod.*, t. 254. f. 1.
 Inhabits Tranquebar.
 E. *The lateral Teeth very small, short, quite close up to the Hinge Teeth, and scarcely separated from them. Hinge-margin double. Shell very thin; hinder slope keeled.*
 19. *Máctra elegans* Sow. Tank. Cat. f.
 Inhabits Florida.
 20. *Máctra vitrea* Gray. *Shell oblong trigonal, thin, white, pellucid. Umbones incurved, subposterior. Anterior slope flattened; edge waved. Lunule depressed, lanceolate. Hinder slope compressed. Lozenge elongate, with a slight rib-like raised edge. The cavity in the front of the hinge-margins very long and deep.*
 Some affinity to *M. recurva* and to *M. subplicata* Lam.
 Inhabits ———. British Museum.

III. SPI'SULA Gray.

Shell ovate, trigonal, subangular at each end. Hinge and lateral teeth as in Máctra; but hinge tooth of left valve small. Siphonal inflection ovate,

distinct. *Ligament* just within the cardinal edge, over the top of the cartilage, and not separated from it by any shelly plate; and partly hid from view by the upper edge of the hinge margin.

A. *Lateral Teeth* short, smooth.

a. *Shell thickened. Hinder Slope slightly indicated.*

1. *Spisula striatella*; *Máctra striatella* Lam.
2. *Spisula fragilis*; *Máctra fragilis* Chemn., vi. f. 235.; *M. brasiliàna* Lam., No. 27.
3. *Spisula similis*; *Máctra similis* Gray, *Wood Cat. Sup.*, t. 1. f. 5. *Shell* oblong-ovate, rather thin, pale reddish white, covered with a thin olive periostraca. The lateral teeth short, triangular, close.
Inhabits Van Dieman's Land.

- b. *Shell thin. Hinder Slope slightly rugulose. The lateral Teeth oblique; and the anterior Hinge Tooth of the left Valve double.*

* *Shell smooth.*

4. *Spisula ténera*; *Máctra ténera* Humph., *Wood Cat. Sup.*, t. 1. f. 4.; *M. áspera* Sow. *Tank. Cat.*, No. 117. *Shell* compressed, rather solid; white, dark-speckled, front part concentrically grooved.
Inhabits ———.
5. *Spisula elongata*; *Máctra elongata* Quoy Voy. *Astrol. Shell* oblong-ovate, rather solid, pale brown, covered with a rather thin olive periostraca. The lateral teeth close, rather short; the front one notched; hinder rather triangular.
Inhabits New Zealand.
6. *Spisula pellúcida*; *Máctra pellúcida* Chemn., vi. f. 234.; *M. depréssa* Lamk., No. 29., not Desh.; *M. dealbata* Montag., T. B. t. 5. f. 1.
Inhabits Brazil.

** *Shell radiately ribbed.*

7. *Spisula nicobárica*; *Máctra nicobárica* Gmel.; *M. rugosa* var. Chemn., vi. f. 237.; Dillwyn, 145.
8. *Spisula Solánderi*; *Máctra Solánderi* Gr.; *M. carinata* Solander MSS. *Hinder slope* strongly keeled.
9. *Spisula ægyptiaca*; *Máctra ægyptiaca* Chemn.; xi. f. 1955, 1956.; Dillwyn, 145. No. 35.
- c. *The Shell thick, solid. Hinder Slope rugulose, very like former, but the anterior lateral Tooth is nearly perpendicular. The anterior Hinge Tooth of the left Valve compressed, niched.*
10. *Spisula rugosa*; *Lutrària rugosa* Lamk., No. 3.; *Máctra rugosa* Gmel., Chemn., vi. f. 236, 237.; *Encyc. Méth.*, 254.
11. *Spisula Lamarckii*; *Lutrària rugosa* var. b. Lamk.
Inhabits St. Domingo.

B. *Lateral Teeth* cross-ribbed, elongate.

a. *Front and hinder Slope smooth.*

12. *Spisula solidissima*; *Máctra solidissima* Chemn., x. f. 1656., Dillw.; *M. gigantèa* Lamk., No. 1.; *Encyc. Méth.*, t. 259. f. 1.
Inhabits North America. Called the *Clam*. Is found washed on shore alive on the Long Island, New York. Is considered a delicacy; and the shells are employed by the dairy-women as skimmers. They are said to be found in the stomach of the Balæna. Mitchell in Silliman's *Journal*, x. 288.
13. *Spisula Sayii*; *Máctra Sayii* Gray. *Shell* smooth, rather compressed.
Inhabits Florida.

C. Front and hinder Slope grooved.

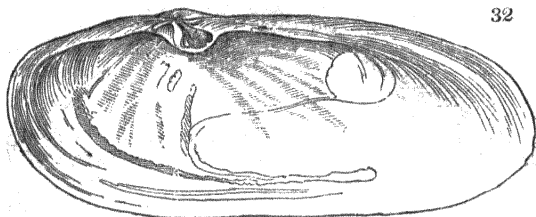
14. *Spisula sólida*; *Máctra sólida* Montague.
15. *Spisula crássa*; *Máctra crássa* Turton.
16. *Spisula subtruncàta*; *Máctra subtruncàta* Montague.
17. *Spisula triangulàris*; *Máctra triangulàris* Lam., E. M., t. 253. f. 3.

IV. LUTRÀRIA Lam. LUTRÍCOLA Blainv.

Shell oblong, longitudinal, rounded, and gaping at each end. *Cardinal teeth* two in each valve; the anterior ones of the left valve trigonal, nicked beneath; the hinder ones often wanting. *Lateral teeth* small; the anterior one simple, short, nearly perpendicular close to the hinge teeth, often wanting in the right valve; the hinder one oblique, very thin, rudimentary, often absorbed as the shell enlarges in growth. *Siphonal inflection* very deep, ovate. *Animal* like *Máctra*. *Siphons* united, large.

At first sight, one might consider *L. hyans* as forming a distinct genus; but the young have as distinct lateral teeth as any of the other species; but this tooth, and the space that it occupied, is absorbed into the cartilaginous pit as the shell grows.

A. Shell ovate, rather gaping behind.



1. *Lutrària elliptica* Lamk. (fig. 32.), Sow. Gen.; *Máctra Lutrària* Linn., Lister, C. t. 415. f. 259.; *Chemn.*, C. vi. f. 240, 241.

Inhabits sandy coast of Europe; Fossil, Italy.

2. *Lutrària senegalensis* n. s. Shell narrower.

Inhabits coast of Africa.

See, also, *Lutrària elliptica* var. b. Lamk., and *L. énsis* Quoy Voy. Astrol. t. 83. f. 36.

3. *Lutrària planàta*; *Máctra planàta* Chemn., vi. f. 238, 239. *Hinder lateral teeth* very distinct, simple in each valve.

- a. Shell slightly gaping behind, with a distinct Lozenge, edged with a raised Line. *Hinder lateral Teeth* wanting in the Adults.

4. *Lutrària elongàta* n. s. Shell elongate, ovato-lanceolate, solid, white, tapering behind, oblique.

Inhabits Prince of Wales's Island.

5. *Lutrària compréssa* Lamk., No. 4.; *Lígula compréssa* Leach, Dacosta, t. 13. f. 1.; *Encyc. Méthod.*, t. 257. f. 4., *Lister Conch.*, t. 253. f. 88., *Ang.*, t. 4. f. 23.; *Máctra piperàta* Gmel., *Chemn.*, vi. f. 21.; *Lutrícola compréssa* Blm., *Man.*, t. 77. f. 2.; *Carinélla Adanson Sénég.*, t. 17. f. 18.

Inhabits North Sea, Africa, Senegal, Mediterranean.

- * Shell widely gaping behind. Lozenge without any posterior Ridge. *Lateral Teeth* distinct.

6. *Lutrària solenòides* Lamk., No. 1., Sow. Gen., f. 1.; *Mýa oblóna* Gmel., *Chemn.*, vi. f. 12.; *Máctra hyans* Dillwyn; *Lutrícola solenòides* Blan.

Malac. *Lateral teeth* none in the adult. Young with a distinct hinder lateral tooth.

Inhabits coast of Europe; and Fossil near Rome.

7. *Lutrària zealándica* Gray. *Shell* compressed, smooth, high, rather truncated at each end beneath. *Hinder lateral teeth* wanting in the adults.

Inhabits New Zealand.

** *Shell* oblong, very gaping and reflexed behind, and marked with an oblique posterior Ridge. *Lateral Teeth* distinct.

8. *Lutrària recúrva*; *Máctra recúrva* Gray, *Wood Sup.*, t. 1. f. 2.; *Máctra papyràcea* Lam. (not *Syn.*), *Sow. Gen.*, t. 1.

9. *Lutrària Cýprinus*; *Máctra Cýprinus* Gray, *Wood Sup.*, t. 1. f. 1.

*** *Shell* thin, gaping behind, with a Ridge. *Hinder lateral Teeth* distinct.

10. *Lutrària campechénsis*; *Máctra campechénsis* Gray, *List.*, t. 308. f. 141.; *Wood Sup.*, t. 1. f. 3.

V. MULI'NIA.



Shell ovate, trigonal, subangular at each end. *Cardinal and lateral teeth* like *Máctra*. *Siphonal inflection* ovate, distinct. *Ligament* internal! in a triangular groove in the upper surface of the deep oblique cartilage; it, quite hid from view.

This genus, and *Gnáthodon*, are the only bivalves that I am acquainted with which have the *ligament* internal. In all the other shells, even those which have internal cartilages, the ligament is external, and placed on the outer part of the cardinal edge of the shell. The hinge margins of the adult shell of this genus are sometimes much enlarged, the umbones being separated at a considerable distance from one another by a distinct area, as in the genus *Arca*. This area, instead of showing the groove of the ligament, as in that genus, is only marked with a slight oblique line, indicating its position; and this line is often so obscure as scarcely to be distinguished. This shell may be regarded as a specimen of the last form in which the upper surface of the ligament has been covered with a shelly plate.

a. *Hinder Slope* circumscribed with a raised Line.

1. *Mulinia typicus* n. s. *Shell* ovate, suborbicular, convex, solid. *Umbones* wide apart. *Area* lozenge-shaped. *Lateral teeth* very short, high, thick, round. The *cartilage pit* prominent into the cavity of the shell.

Inhabits ———.

2. *Mulinia bicolor* n. s. *Shell* ovate, rather convex, solid, white. *Umbones* and *hinder slope* orange, varied. *Lateral teeth* short, compressed, triangular. *Cartilage pit* prominent into the cavity of the shell. *Young*

hinder slope reddish brown, separated by a distinct line. *Umbones* brownish.

Var. ? ovate, trigonal. The *anterior lateral tooth* rather larger and thicker.

Inhabits ———.

* *Shell trigonal. Hinder Slope flattened.*

3. *Mulinia lateralis*; *Mactra lateralis* Say. (Fide Spec. Say.)

Inhabits North America.

4. *Mulinia donaciformis* n. s. *Shell* trigonal, ventricose, white; covered with a thin periostraca. *Hinder slope* flattened, keeled on the edge.

Inhabits South Sea. — Capt. Beechey's Expedition.

5. *Mulinia edulis*; *Mactra edulis* King, in *Zool. Journ.*, v. 335. *Shell* (? young) ovate, thin, white, smooth; covered with a thin olive or reddish periostraca, forming two raised edges on the hinder slope. *Hinder slope* white. *Lateral teeth* short, triangular.

Inhabits Port Famine. — Capt. King.

** *Hinder Slope simple.*

6. *Mulinia Byronensis* n. s. f. 5. *Shell* ovate, slightly triangular, white, rather solid. *Lateral teeth* thick, rounded. *Young lateral teeth* thinner.

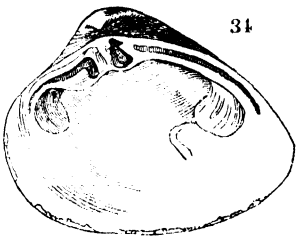
Inhabits South America. — Capt. Lord Byron.

7. *Mulinia exalbida*. *Shell* ovate-oblong, white, rather thick. *Umbones* subanterior. The *lateral teeth* short, thick. *Anterior one* subtubercular.

Inhabits South America. — Capt. P. P. King.

VI. GNA'THODON Gray, Rang, Sow. RA'NGIA Desmoulins.

Shell ovate, trigonal, solid, white; covered with a brown cartilaginous periostraca. *Margin* acute, simple. *Umbones* often eroded. *Hinge teeth* two in each valve; the front of the left valve larger, bifid; the hinder of left, and those of right, valve, equal, small, simple. *Hinder lateral teeth* very long, compressed, transversely grooved; the front one shorter, rugulose; dilated, and subtrigonal above. *Siphonal inflection* short, half-ovate. *Cartilage* internal. *Ligament* internal in the upper edge of the very deep cartilage pit, which is often open at the top by the abrasion of the apex. *Animal*, *siphons* short, separate. *Mantle's lobes* united in front. It resembles *Cyrena* Cor. in the form of the anterior lateral teeth, and agrees with *Mulinia* in having an internal ligament.



1. *Gna'thodon cuneata* Gray (fig. 34.) Sow. Gen.; *Rangia cyrenoides* Desmoulins Act. Lin. Soc. Bord., iv. 58.; *Clathrodon cuneata* Conrad in Silliman's Journal, from my MSS.

The city of Mobile, in North America, Mr. Conrad informs us, is built on vast beds of this shell, and it exists on all of the alluvial coast of the Gulf of Mexico, between Pensacola and Franklin, in Louisiana. Desmoulins says his specimen was brought from Lake Vonchartraen, in East Florida, near New Orleans, which is, probably, saltish water. I described my specimen from two single valves, picked from a ballast heap in Canada, to which it was, probably, brought from the Gulf. The description was sent to America many years ago, but it was not published, because the American conchologists considered it as a *Cyrena*! and call it *Cyrena truncata* of Lamarck! in their cabinets.

REVIEWS.

ART. I. *Histoire Naturelle des Insectes Hyménoptères*. Par M. Le Comte A. Lepéletier de Saint Fargeau. 8vo. With a fasciculus of plates. Paris, 1836.

2. *Clavis novi Hymenopterorum Systematis, adjecta Synopsis Larvarum ejusdem ordinis Scandinavicarum Eruciformium*. A Gustavo Dahlbom. 4to. With one coloured plate. Lund, 1835.

3. *Prodromus Hymenopterologiæ Scandinaviæ*. A Gustavo Dahlbom. 8vo. With two plates. Lund, 1836.

4. *Essay on the indigenous fossorial Hymenoptera, comprising a Description of all the British Species of burrowing Sand-Wasps contained in the Metropolitan Collections, with their Habits, as far as they have been observed*. By W. E. Shuckard, M.E.S. London, 1837.

5. *Pompilidarum Danicæ Dispositio Systematica*. Scripsit Georgius Schiodte. 8vo. With one plate. Copenhagen, 1837.

OF all the tribes of insects, or, indeed, we may safely say, of animated nature in general, there are none which surpass in point of interest, the very extensive group to which Linnæus applied the ordinal name of Hyménoptera. The bee, the wasp, and the ant are too well known, as creatures possessing in the highest degree that principle which is ordinarily termed instinct, and which prompts them, in proportion to their size, to undertake labours far beyond those of any of the higher animals. It is true that much has been ascertained and made known relative to these creatures; but there still remain so many interesting points of enquiry, even in the history of the best known species, the common hive-bee, that it may safely be said, that it would require the entire attention not of a single, but of many, lives, before we should be able to assert that we had made ourselves perfectly acquainted with the subject in all its bearings. The singular and anomalous structures, which are of such frequent occurrence in the insects of which the order is composed, the beauty and brilliancy of colours of many, and above all, the diversity in their natural economy, combine to render them general favourites with entomologists. It is true, indeed, that in this respect they cannot bear comparison with the Coleóptera; but the works at the head of our article will show that the study of this tribe is fast gaining ground.

The veteran Saint Fargeau, long known almost exclusively as a hymenopterologist, has given us, in the first of the works in our list, a portion of the results of a long series of observations upon this order, following up the principle which he has in numerous other works laid down; namely, the superiority of

economical over structural details, as the groundwork of classification of these insects. A very succinct analysis of the contents of this the first volume of his work will be sufficient to indicate its value.

The first 33 pages are occupied by a revision of the characters of the family groups instituted by Latreille. This is succeeded by some general observations upon the senses of insects, and a sketch of the distribution of insects into orders. Nearly 30 pages are devoted to an exposition of the characters obtainable from the structure of the veins or wing-bones of the wings. The order is then characterised in its Linnæan extent, and observations made as to the characters to be employed in the distribution of its contents into tribes and families. Amongst these, it will be readily supposed that those particular organs which influence the habits of the perfect insect are most particularly noticed.

The Hymenóptera are divided into two suborders: 1st, Ovitithers; and 2d, Oviscaptors; corresponding with the Latreillean divisions *Aculeàta* and *Terebrántia*.

The Ovitithers are divided into two divisions: 1st, those which feed, in the larva state, upon saccharine vegetable fluids (Ovitithers Phytiphages); and, 2d (Ovitithers Zoophages), those which feed, in the larva state, upon other insects. The Phytiphages are divided according to their nest-making or parasitic habits; the nest-makers, into social and solitary species; and the social, into those which are perennial or only annual. The consequence of the adoption of these principles, as a primary means of distribution of the order, is apparent in its results. The perennial, social, nest-making species comprise the families of the ants (*Heterogýnides*) and the hive-bees (*Apiárides*). The annual social species comprise the humble bees (*Bómbides*) and the social wasps (*Polístides*: why not *Véspides*?). Thus the solitary and the parasitic bees and wasps are entirely removed from the social species. The four families above mentioned are treated upon at great length in the volume before us: their history detailed, their genera defined (including various new ones), and the species described; the great collections of the Jardin des Plantes, Baron Dejean, Serville, &c., have been laid under contribution; and the result is the first volume of a work which promises to be of the highest interest. Dahlbom, in the second work on our list, has given us another classification of the order, founded both upon structure and economy. From a consideration of the affinities and structural peculiarities of the various groups, he considers that "*Satis apparet insecta hymenoptera in quatuor series, ut ita dicam principales, abire, scil. rapt-*

toria, parasitica, ædificatoria, plantivora, et singulam harum serierum (ad habitum) cum proxima per series subditas minores connecti sive cohærere." He, however, does not object to the insertion of the parasitic bees, sand-wasps, &c., amongst the working species of those tribes; thus, *Dolichurus* and *Cerópales* are arranged amongst the *Pómpili*, *Nýsson* with *Mellinus*, *Figites* with *Cýnips*, and *Hylæus* and *Psithýrus* amongst the *Mellifica*, &c. The classification here proposed is evidently the result of much study, and will amply repay investigation. The second part of the work gives us a detailed tabular view of the structure and habits of the eruciform hymenopterous larvæ found in Scandinavia; and the third part is occupied by very copious descriptions of these larvæ, and is a most valuable addition to our knowledge of the order.

The second work of Dr. Dahlbom may be considered as supplementary to the preceding. It is devoted to the illustration of the *Hymenóptera Plantívora*, comprising the families *Tenthredínides*, *Xiphiùrides*, *Sirícides*, *Oryssini*, and *Cynipseæ*. A very elaborate and useful historical revision of the *Tenthredínidæ* is given, together with the characters, natural history, geographical distribution, &c., of that family (a portion of which is illustrated in the present fascicle), together with a tabular view of its genera, which are 15 in number; *Cimbex*, *Athàlia*, *Hylótoma*, *Cyphóna*, *Lophýrus*, *Monóctenus*, *Cládus*, *Prióphorus*, *Nématus*, *Tenthredo*, *Dineura*, *E'mphytus*, *Dolèrus*, *Phyllótoma*, and *Lýda*. Many new species are described; but the author is not acquainted with the uncompleted volume of Mr. Stephens's *Illustrations* containing this family.

Mr. Shuckard's Essay is one of the most valuable works which have appeared in this country since the *Monographia Apum Angliæ* and the *Horæ Entomologicæ*. Personally acquainted with the author, we can bear ample testimony to the unwearied zeal with which he got together his materials, not only of insects, but of careful examination of the works of his predecessors. In an introduction, of 25 pages, the author gives us some general observations upon the structure and economy of the insects in question, from which we extract the following passage, as bearing upon the principle of classification noticed above, in the works of Saint Fargeau and Dahlbom: — "With respect to the apparent anomaly of parasites being of the same order, or perhaps of the same genus [as the working species], it may be remarked that these are not internal parasites, and that, perhaps, a greater resemblance was necessary between the individuals than in the case of internal parasites, which, I believe, are destroyers of eggs and larvæ exclusively;

or, at least, they are deposited within the insect in those stages of its existence, and, consequently, in an indefensive state. But here, where the food only (which is stored up as a provision for the young) is the object of attack, and the maternal solicitude of the parent insect for the nurture of her offspring is rendered fruitless by the presence of an interpolator secretly deposited, it required all the sagacity of the insect introducing her intrusive progeny to evade the instinctive apprehension of the laborious mother; and nature has furnished additional means to foil the latter, in the parasite's resemblance to herself."

The work comprises that portion of the aculeated Hymenoptera which Latreille termed Fossòres; to which Mr. Shuckard has judiciously added the Mutillidæ of Leach, which he thus virtually separates from the Heterógyna of Latreille, of which the ants formed the remaining portion. The descriptions, both of the genera and species, are carefully worked out; the latter generally occupying, with its synonymes, a page for each species. The recent works of Saint Fargeau and Vander Linden, &c., have been consulted; but the author does not cite the memoirs of Dahlbom upon the Swedish Fossòres. We could have wished that, in the mode of printing the specific characters, synonymes, &c., the oldfashioned method had been adopted: there is no better guide in such matters than Fabricius, or Kirby's *Monograph*. Three new genera are introduced: Cèlia (*Stigmus troglodytes* V. D. L.), Passalæcus (*Diodontus gracilis* Curtis, &c.), and Minèsa (*Psén equestris*, &c.). It will be necessary, however, to change the first of these names, Cèlia being employed by Zimmerman for a genus of Harpálidæ. The generic name Liris must also be substituted for Tachytes, having been imposed two years previously by Fabricius.

Many new species of sand-wasps are described, the author having had access to all the metropolitan cabinets, including that of Mr. Stephens. Hence, it is to be regretted that we find in the catalogue of the latter many species indicated under old Fabrician and Panzerian names, which Mr. Shuckard has entirely omitted. For instance, under Apòrus Mr. Stephens gives 2 species; 1st, A. bicolor, described by Mr. Shuckard, and, 2d, A. unicolor of Spinola, which is stated to be in the British Museum, but which Mr. Shuckard entirely omits, unless it be the female of A. bicolor, which the latter says is in the cabinets of Stephens and the British Museum: but in this case we think Mr. Shuckard was bound to have shown that this was Mr. Stephens's, although not Spinola's, A. unicolor.

The work of Schiodte is confined to one of the groups of sand-wasps (*Pompilidæ*), and is a very carefully executed memoir. The genera introduced into the family by the author are, *Cerópales*, *Agènia* Sch. (*variegata* Linn., and *bifasciata* Fabr.), *Priocnèmis* Sch. (*hyalinatus* Fabr., &c., 7 species), *Pómpilus* (10 species), and *Epýsiron* Sch. (*rufipes* Linn.). These genera and species are described in detail; the genera being chiefly established upon variations in the structure of the trophi and legs. A plate, full of details, represents these generic variations.

ART. II. *An Analysis of the British Ferns and their Allies, with Copperplate Engravings of every Species and Variety.* By George W. Francis, Author of a "Catalogue of British Flowering Plants and Ferns." London.

THIS elegant little volume on the British ferns we can most heartily recommend, having seldom met with a scientific work, on the same scale, which has altogether pleased us so much. The author has evidently collected his materials with the greatest care; and the engravings are complete models of neatness and accuracy. We are also especially pleased with the frank independence and straightforward manner with which the writer introduces the results of his labours to the public. There is none of the cant, and affected consciousness of incompetency and want of ability for the task he has undertaken, which so often garnishes the first attempts of letterpress aspirants. He does not come forward at the "solicitation of numerous friends," but because he knows that the information he has to offer upon the subject of which he writes is really worth printing and publishing; and he has therefore ventured to bring out his work in a style, and at a price, which an extensive sale can only repay. An extract from the preface will give our readers a better idea of the contents of the book than any summary of our own.

"Should the reader ask why I write at all, I answer, because the only book ever published upon this subject (*Bolton's Filices Britannicæ*) has long been out of print, and so much difference of opinion exists as to the identity of some species, and the arrangement of others, that I thought a plain and practical synopsis like the present would be useful to the tyro at least, if not to the practical botanist.

"The materials from which it has been compiled are these: I inspected all the Herbaria to which I had access, gathered wild and cultivated fronds wherever I could procure them, and wrote to most of our first-rate botanists for specimens, remarks, and habitats: all these being collected, arranged, and studied, they were described and engraved without reference to any

series of plates or descriptions whatever. I then collated these with the works of Linnæus, Willdenow, Sprengel, Swartz, Pursh, Withering, Smith, Hooker, Lightfoot, Hudson, &c.; and, wherever there was a difference between myself and others, I searched again for the truth; and, if still in doubt, have been careful to record the disparity.

"The manner in which the object has been accomplished, it is necessary to explain more in detail; and, first, as to the illustrative plates. They are small, for the sake of economy, and are intended chiefly to indicate the habit of the plants, while the magnified parts show their detail. They might have been finer as works of art; but, had they been executed by an engraver, minute as they are, they would, perhaps, have been less botanically accurate, as the smallest variation in many of them would materially have altered their character; and, therefore, although a first and an untutored attempt at etching, I have preferred executing them myself, especially as by so doing I should save a large expense, perhaps not to be refunded by the sale of the work. The plate of Genera is a new feature in illustration, and, it is hoped, a useful one.

"In the record and detail of species, the following order is observed:—First, the Latin and English name, and reference to figure; secondly, those essential characters which alone are necessary for discriminating the species, and which alone the true botanist will find it convenient to consult. The Synonymes and references to figures in other works, which follow, give a history of the plant, and enable the student to refer elsewhere if in doubt. The description may be considered collateral evidence, while the remaining parts will show him the varieties to which his plant is subject, the cause of them, its particular and general distribution, and the peculiarities attached to it.

"In the part of the work which treats of the Genera, the reader will find, first, the derivation of the Genus, and a concise account of its general characteristics, and under it the arrangement of the species, according to their obvious distinctions.

"In the Essential Characters of the different species, as few words as possible have been used, and those few pure and scientific. In the Synonymes, which go back to the time of Linnæus (or in some few instances a little before), the names of authors only are given, unless they have called a plant by different names in different of their works, when the works themselves are also specified. In the descriptive part, and discriminating remarks which follow it, pure scientific detail has not been so much aimed at as obvious differences and popular observations. The habitats have been collected from every authentic source which was attainable by me: a vast number will be found which have not been recorded before; and those few which are contained in previous publications have most of them been lately authenticated."

When we state that this work, containing 70 pages of letterpress, and copperplates of all the British ferns, is to be had for 4s., we think there are few botanists in whose library it will not find a place.

MISCELLANEOUS INTELLIGENCE.

ART. I. *Short Communications.*

REMARKABLE Fact in the Habits of the Viper.—Observing in your Number for April some remarks upon vipers, and the different colours which they occasionally present, you may,

perhaps, think the following statement worth recording, which I send as a mere matter of personal observation, without professing to have paid any attention to the study of natural history.

About sixteen years since, I hired part of an enclosed heath in the parish of Belton, by the side of Fritton Lake, and about 4 miles from Yarmouth, in Suffolk; a spot unrivalled for picturesque scenery, but notorious for vipers, snakes, and slowworms. My attention was led to these reptiles merely with the view of destroying them, a favourite horse of mine having been bitten by a viper whilst grazing on the heath.

The longest viper I ever killed, and the largest in circumference, was of so dark a hue, that the black bands upon its skin could scarcely be perceived. Possibly its size might have depended upon its containing young; but, being only anxious to effect its destruction, I did not trouble myself with any further examination. I remarked that these creatures come from their holes about eleven o'clock, and bask in the sun till two, when they begin to move about.

On one occasion, I observed a viper travelling in haste along a path near me; and, though it made a vigorous attempt to get away, I succeeded in killing it. It was of an unusually reddish hue, with very dark bands. Passing by the spot about half an hour afterwards, to my astonishment, I saw three other vipers about the one which I had killed, and one of them in immediate connexion with it. These three I destroyed; and, having the curiosity to return a second time, I found two more vipers, apparently making the same attempt; and, in about the lapse of an hour, another came. These three shared the same fate as the former, so that I killed seven altogether. The last six, all of which I may naturally presume to have been males, were of a brilliant ash-colour, and the dark bands of a far brighter black than I had ever before seen. Whether these peculiarities depended upon a particular condition of the sexual organs, is a question which I must leave to more competent persons to discuss. If these few lines are worthy of your notice, you can make what use of them you please. — *George W. Manby. Royal Barracks, Yarmouth, April 10. 1837.*

[The above curious and interesting fact is communicated by the celebrated naval philanthropist, Capt. Manby, F.R.S. — *Ed.*]

On the Swimming of Snakes. — That snakes should swim, is not surprising, consider the extent and character of the lungs in these reptiles. Of elongated form, they are carried throughout, or nearly throughout, the general cavity of the body; at their commencement, and for a short distance, their

cellular tissue presents, when cut into, a series of close, delicate, and beautiful reticulations. These meshes gradually enlarge, till the whole of the lower part of the lungs consists of large *cancelli*, the membrane being extremely thin, and semi-transparent. It is, most probably, only in the upper portion of the lungs that the blood undergoes the change resulting from its contact with atmospheric air; and it is to be observed, that the vascular system of this upper and finely reticulated part is such as to favour this idea, which, if correct, would lead to the conclusion that the lower portion of these organs served exclusively as a reservoir for air. I have often, on inflating the lungs of a snake, been surprised at the volume of the lower portion, and the quantity of air it is capable of receiving; and I am inclined to believe that the lungs, when filled, are capable of containing a volume of air which will serve the system for a considerable time, the necessity of taking in a fresh supply every instant, as do Mammalia and birds, being obviated. Snakes have often been seen in such a situation as to prevent, for a certain period, the power of respiration. We know that they swallow their prey whole; and that a portion of their victim, too large to be gorged at once, distending their jaws to the utmost, and compressing the larynx, often projects out of their mouth, and so remains, till, as the part in the stomach digests, the remainder passes gradually down. Our common snake will swallow a large frog or rat; a boa of moderate size will swallow a goat or antelope; and I do not see how the *larynx* and *trachea* can avoid being compressed during the act of gorging the bodies truded, the tube of the *trachea* will suffer, and respiration be thus of animals of such disproportionate bulk. If the *larynx* be pro-effectually prevented: consequently, the supposition that the protrusion of the larynx suffices to this operation, is nugatory. Besides, *is* the larynx protruded? this is a point in abeyance. Without pretending to settle this question, it may be remarked, that the unvitiated air, contained in what I regard as the reservoir portion of the lungs, will suffice for some time at least (and the length of time is yet to be determined) to oxygenise the blood in the upper or true portion of the lungs, while respiration is interrupted; and as, in the case alluded to, respiration must, I think, be admitted to suffer interruption, the necessity of this reservoir becomes apparent. The following fact seems to confirm these views:—Some years since, passing by a small sheet of water, near Bakewell, on the Buxton road, I observed a snake quietly swimming towards the bank. I hastened to the spot for which he was making. On seeing me he stopped, and allowed himself to sink gently

to the bottom, a few yards distant from the water's edge. The water was very clear, and I could see him distinctly. He lay with his head slightly elevated, and his body partially concealed by a stone, earnestly watching my movements. I tried to reach him with a stick, but he was too far off; I therefore determined to cease annoying him in this manner, and to see what he would do. I watched him, still keeping his unaltered attitude, for more than five minutes, probably nearer ten (I had not a watch with me); at last, with a stealthy cautious movement, I saw him turn, and, rising to the surface with his head scarcely above it (not elevated as I have seen), silyly make his way towards a thick bed of water-weeds (flags, &c.), at some distance from where I stood. In these I lost all trace of him. At that time I had never dissected a snake; and when, for the first time, I examined the lungs of one of this tribe, and contemplated the extensive membranous sac in which they terminate, I felt assured that I had the clue to the animal's power of enduring suspended respiration for a length of time, which, in the instance of the snake I watched in the water, greatly surprised me; an instance that has often been the subject of my consideration. Perhaps some of the readers of this Magazine may have seen similar instances: to them I submit my theory, that, if erroneous, it may be corrected, observing that it is, at all events, a point well worthy of investigation. — *Wm. Martin. Hammersmith, May 25. 1837.*

Note from Sir W. J. Hooker, respecting the Plates in his "Icones Plantarum." — I should be extremely happy to meet the wishes of your correspondent C., in the last Number of your Journal, respecting the partial colouring of the plates of the *Icones Plantarum*, if it were practicable: but that gentleman is not, perhaps, aware of the heavy cost that such an alteration would incur; such an additional outlay, indeed, as, I am confident, from my own experience in these matters, the very limited sale of the work would not warrant. In the first place, the execution of the plates would take double the time, because the *shading* of the foliage, &c., now omitted, would require to be inserted: the paper, to bear colouring, must be of a superior quality, and, consequently, of a higher price: add to these the cost of the colouring, and the greater value of the *dead stock*, or, in other words, of the numerous copies lying for years, or perhaps for ever, on hand, unless the author is disposed to sell them as waste paper; and your correspondent will, I think, agree with me in the assurance that the colouring *would* increase the expense *very materially*.

* See Vol. I. p. 279. n. s.

There is a more serious objection still, in the fact that the drawings are made, as stated in the prospectus, from herbarium specimens (the instances to the contrary are few and far between); and, though I am well aware it is a common custom, especially upon the Continent, to make *coloured* figures from such subjects, yet no one who reflects on the different hues of living and dried specimens can, for a moment, suppose that such are capable of representing the natural tints; and it is a practice which, in my opinion, cannot be too strongly condemned. The Cryptogamia, generally speaking, however, offer a remarkable exception to this rule; so that few, if any, *dried* plants exhibit softer or more agreeable colours for the exercise of the artist's pencil; and I would gladly publish the whole of that portion of the book *coloured*, were I not satisfied, by sad experience, that, done in the most economical way, the sale would *not* cover the additional expenditure.

No coloured botanical work ever was, or perhaps ever can be, published at a cheaper rate than Mr. Curtis's *Botanical Magazine*; and it is only the much more extensive sale of it (as compared with that of the *Icones Plantarum*) which can justify the proprietor in offering it at so very low a price.

I still flatter myself, from the favourable notice that has been taken of the *Icones Plantarum*, both privately and in several of the public scientific journals, that, notwithstanding its deficiency (of which none can be more sensible than myself), it will yet be found to answer the purpose intended, — that of giving faithful representations of many new and rare plants; and that it will meet with such success as to encourage me to continue it beyond the second volume, which is now nearly completed. — *W. J. Hooker. Glasgow, June 9. 1837.*

Practical Distinctions in Minerals. — On March 31. 1836, I discovered that the finest particles of mica and quartz in stone may be readily distinguished without the aid of glasses; and, conceiving that this simple method of knowing the difference in some of our most common minerals may be serviceable to geologists, I beg the insertion of it in your most useful Magazine.

With this view, therefore, without attempting any philosophical explanation of the phenomenon, I merely relate the circumstances of its practical application: first observing, with pleasure, that the eye, which gives us the power of knowing so much, and of knowing one thing from another so distinctly, without our being able to explain how we make the distinctions, is happily receiving from Sir David Brewster,

and other philosophers eminent in optical science, that attention it is entitled to.

My sight has been particularly good, having been able to distinguish objects very clearly, near and at a great distance; and now, in my 69th year, I can distinguish a small speck of mica, in a brown-red sandstone, at the distance of 4 yards; and, *in the full bright light of the sun*, the brilliant reflections from facets of much smaller crystals of quartz. I was led to this experiment by finding amongst our Scarborough gravel a brown-red sandstone pebble, the crystals of which brilliantly reflected the full light of the sun. Viewing it in the house, on a table before my window, with my spectacles on, and the addition of a small pocket lens, the glistening specks appeared too small for me to decide whether they consisted of quartz or mica; but, as I had lately selected from the same gravel specimens of mica slate, and mica sandstones, of all degrees of fineness, it occurred to me that small specks of mica were always visible without the sun's full bright light. I found them so; and, by collating the sandstone with the finest grained micaceous specimen, both on one piece of paper, shifted alternately into the bright and shady light of the sun, we have a clear and ready distinction between the finest grains of mica and quartz, without the aid of glasses, and that even at the distance of 4 yards.

In my practical observations on the different kinds of land, I had long observed, by the glistening in footpaths, how we may readily distinguish the finest sand in soil; and, at Harrogate, I have often amused myself, on the nicely sanded footpaths about the Swan Hotel, by fixing my eye upon any detached crystal (of mill-stone grit) which brilliantly reflected the light of the sun, and not without speculating on the application of such brilliant reflections to some useful purpose: but, in geology, the brilliancy of those facets of quartz crystals in our coarsest sandstone seems to render doubtful the "theory of sandstones being derivative rocks." — *William Smith, LL. D. Scarborough, May 10. 1827.*

Objection to Mr. Stutchbury's Genus Cyprædssis (p. 214). — The absence of varices is not a character sufficiently distinctive to form a genus, since the *Nassa incrassata* of Fleming, though usually without, sometimes assumes varices, and puts on the appearance of a miniature Triton. I have also in my collection more than one Triton without varices. As to the natural polish of those shells without varices enumerated as species of the proposed genus, and, as said, occasioned from their being covered by the lobes of their mantle, I should be glad to learn what else occasions the superior polish of *Cássis*

strigatum (pl. 22. f. 21. of Wood's *Index*), of *Cássis gláuca* and others with varices. The *Cássis ríngens*, or *Cássis pòmum*, might with more reason have been elevated into a type for a genus, and named *Dòlium cássis*, than the *Cássis rùfa* named *Cypræ-cássis*. It is to be hoped the general verdict will suffer both to remain as they are, at least until a new Lamarck shall supersede the present arrangement by one more consonant with the gradations of nature, so different from the genera of collections and authors. Nature, by small modifications, passes from one group of beings to another: this S. Stutchbury, Esq., as a naturalist, sees, and instances the similarity of the *Cypræa* and *Cássis rùfa* in many particulars in which they certainly do agree: but, unfortunately for his proposition, many other genera also agree in the same particulars; for instance, the *Yet* of Adanson. (See *l'Histoire Naturelle du Sénégal*, pl. 3., for a figure of the animal; pl. 4., for a figure of the *Marginélla*; and pl. 5., for the *Cypræa*. All these cover the shell with the mantle, and have, like the *Cássis*, no operculum; so that, if the principle of raising intermediate species were once admitted, instead of a harmonious system, we should soon have one of shreds and patches, contributed in piecemeal by each observer; and each patch might bear a compound name, such as *Búccina púrpura*; type, *Búccina púrpura pátula*. *Púrpura planáxis*; type, *Púrpura planáxis pèrsica*, &c. The genus never can be established. — E. Lewis. Kennington.

ART. II. Obituary.*

(From the *London and Edinburgh Philosophical Magazine* for June, 1837.)

EDWARD Turner Bennett, Esq., Sec. Zoological Society. — In alluding to the death of Mr. Bennett, I am strongly reminded of those painful feelings with which the intelligence was first received; for, though his illness had excited alarm for a day or two in the minds of some of his friends, and especially of those who were immediately around him, it was generally unknown, so that the first intimation which most of us received of it was that it had terminated fatally. It was but a few days before that we had seen him in the enjoyment of his usual health; and, notwithstanding the apparent delicacy of his constitution, from our having been accustomed to witness his untiring devotion to his favourite pursuits, we had naturally been disarmed of all idea that his useful life was so soon to be brought to a close. I had not the honour of knowing him intimately, but it was impossible for any one who enjoyed even his casual acquaintance not to be impressed with his intelligence, the gentleness of his manners, and the unobtrusiveness of his character. The cordial interest he took in his zoological studies, the kindness and the intelligence he displayed in answering the enquiries of others, his ardour in the promotion of zoology, the animated sense he had of the moral and intellectual enjoyment to be

* Read by Dr. Boot, Secretary to the Linnæan Society, at the Anniversary, May 24th, 1837.

derived from it, the absence of all unworthy rivalry in his character, and the affectionate esteem he was held in by those who were intimately associated with him in his pursuits, were ample proofs of his excellence, and of how serious a loss we have sustained in him as the friend and the naturalist. One of his intimate friends *, to whom I applied for some information respecting his writings, says to me, — “I can scarcely trust myself to speak of him in the terms that naturally present themselves upon the recollection of all that was so good, so kind, and so talented in his character. I believe I never knew a man in whom was combined so much that was admirable and endearing. His duties, as Secretary to the Zoological Society, were performed with such zeal, talent, and extensive information as can never be forgotten by those who had the opportunity of watching his labours and of acting with him. His published works are not, perhaps, equivalent in importance to his deservedly high character as a naturalist. His knowledge of zoological literature was, perhaps, more extensive than that of any other person in this country.” The only paper which Mr. Bennett communicated to the *Transactions of the Linnæan Society* was “A Notice of a peculiar Property in a Species of Echinus,” which forms a nidus for itself by effecting a cavity in rocks off the coast of Clare, in Ireland. His contributions to the *Zoological Journal* were numerous, and nearly all the analyses of zoological works contained in it were made by him. The *Proceedings of the Zoological Society* from their commencement, and the first volume, and the first part of the second volume, of its *Transactions*, were edited by him; and he contributed a great number of scattered notices, and many very valuable papers, to them. Of his separate works, *The Tower Menagerie* appeared in 1829, and *The Gardens and Menagerie of the Zoological Society*, in 1830 and 1831; and an edition of White’s *Natural History of Selbourne*, to which he added many interesting notes and illustrations, was published soon after his death. These publications, the zealous discharge of the duties of secretary, first of the Zoological Club of the Linnæan Society, and afterwards of the Zoological Society, with the more unobtrusive, but not less useful, services which he rendered to zoology by the advice and assistance which he afforded to all its cultivators who asked them at his hands, were his chief contributions to natural history. His intimate friends are fully aware how large a portion of his time, and how much pains and labour, he bestowed to the furtherance of the objects of others; and there are few of the zoologists of this country who would not bear testimony to the fact, that by means of the assistance thus afforded, he contributed to facilitate the progress of zoology in Great Britain, and to give it its proper direction. He died in his 40th year, and has left behind him an enviable remembrance in the minds of many amongst us whose scientific attainments and moral worth deservedly place them high in our esteem.

Mr. Edward Donovan, — author of various splendidly illustrated works on the zoology of this country, and on the Insects of India and New Holland. He wrote the articles “Conchology” and “Entomology” in Rees’s *Cyclopædia*. His works perhaps exhibit more of the splendour of art than of any enlarged views of science. He added some species to the previously existing knowledge of detailed zoology; and it is painful to reflect that one who had laboured so much in the cause of science should not have escaped the penalty that too often waits on age.

John Latham, M.D., F.R.S., &c., — one of the original members of this Society, who for nearly half a century took the liveliest pleasure in its prosperity and advancement. This venerable man devoted himself to his favourite science of ornithology, with undiminished interest, to the close of his long life, which was extended to his ninety-sixth year. His writings

* Thos. Bell, Esq., F.R.S., F.L.S.

on ornithology were very voluminous, and are essential to every student; for, though his views are perhaps limited in some respects, compared to those of more modern authorities, he made important use of the labours of previous naturalists, and added many species to those formerly known. His great works are: *Index Ornithologicus*, in 2 vols. 4to, 1790; and *A General History of Birds*, in 10 vols. 4to, 1821—1824. He contributed three papers to our *Transactions*:—"On the various Species of Sawfish," in 1793; "Observations on the Spinning Limax," 1797; "Essay on the Tracheæ of Birds," 1797. It was a privilege of no ordinary kind, to one who had not attained by several years even the moiety of the age of this venerable man, to see him a few years ago, at our anniversary dinner, triumphant in body and mind over the assaults of time; and I remember looking upon him with reverence: not exclusively that becoming respect ever due from youth to age, whatever may be its intellectual characteristics; but that mingled feeling which partly arose from the impressive consciousness that a life so protracted, and exhibiting so much calm assurance of happiness, such serenity and cheerfulness of feeling, in a scene from which so many of his early friends had gone for ever, bespoke a mind at peace with itself and the world, and afforded a lesson of what true enjoyment lies beyond even the Psalmist's limit to the age of man, when time appears to have forgotten the good man's claim to a better state of existence; and it was impossible not to feel that his pursuits of natural history had, perhaps, contributed largely to the complacency and the elasticity of his almost patriarchal age.

William Elford Leach, M.D., F.R.S.—Few men have ever devoted themselves to zoology with greater zeal than Dr. Leach, or attained at an early period of life a higher reputation, at home and abroad, as a profound naturalist. He was one of the most laborious and successful, as well as one of the most universal, cultivators of zoology which this country has ever produced. His discoveries in the different classes of the Vertebrata, especially birds, were extensive; but it was in entomology and malacology that his labours have been most known, and his improvements of the greatest importance. His knowledge of the Crustacea was superior to that of any other naturalist of his time, and his arrangement the best, until the work of Dr. Milne Edwards appeared, two years ago. After a long suspension of his studies from ill health, during which, and up to the period of his death, he was attended by the most devoted of sisters, he returned to his favourite occupation with his habitual ardour; and the letters he wrote to his scientific friends in this country exhibited the same devotion to the study of nature which distinguished the brighter years of his life. His principal work, *The Natural History of the Mollusca of Great Britain*, in the possession of his friend Mr. Bell, is not yet published. His other works were: *Malacostraca Podophthalma Britannicæ*, 4to, 1815 and 1816, not finished; *Zoological Miscellany*, 3 vols. 8vo, 1817; *On the Genera and Species of Proboscideous Insects*, 8vo, 1817. He described the animals taken by Cranch in the expedition of Capt. Tuckey to the Congo; and was the author of valuable articles in the *Encyclopædia Britannica*, *Edinburgh Encyclopædia*, *Philosophical Transactions*, *Zoological Journal*, *Memoirs of the Wernerian Society*, *Dictionnaire des Sciences Naturelles*. Between 1810 and 1820, he contributed seven papers to the *Transactions of the Linnæan Society*: three on Insects; a general arrangement of the Crustacea, Myriapoda, and Arachnides, a very laborious work; two descriptive of ten new genera of Bats; one on three new species of Gla-reola. He died in Italy, last year, of cholera.

Joseph Sabine, Esq., F.R.S., &c.—Mr. Sabine, at the time of his death, had been a Fellow of this Society for nearly forty years; and, as one of its friends who throughout his life devoted himself to the pursuit of

natural history, there is a claim for justice due to his memory. He was the intimate associate of many of the oldest and most distinguished of our members; and there are some around me who unquestionably must have looked on the unkindly feelings cherished towards him of late years with deep regret, and who, without being blind to the errors of judgment he may have committed, still feel that those errors did not implicate his integrity, and that, considering his contributions to the stock of our knowledge in horticulture, botany, and zoology, and the kindliness of his nature in promoting the interests of those whom he had it in his power to serve, the obligations of charity were lost sight of in the prejudices by which he was assailed. But his exertions in the cause of science should not be overlooked nor undervalued; and any one who follows the progression in the development of a more scientific system of horticulture in this country, and an improved taste for the general cultivation of plants, will find that his labours were productive of the best interests in this department of science. His zoological studies were principally directed to British ornithology, in which he was considered an excellent authority. He had paid much attention to the changes of plumage in birds, to the time of arrival and departure in the migratory species, and also to the breeding and habits of domestic animals. He published, in the *Transactions of the Linnæan Society*, a paper on a new species of Gull from Greenland; and an account of the Marmots of North America, with a description of three new species; and he wrote the Zoological Appendix to Capt. Franklin's *Journey* of 1819—1822. He also contributed two papers on the *Chrysanthemum indicum* of Linnæus, which he distinguished from what he has named the *C. sinense*, the common plant of our gardens, imported into Europe in 1789; and there is a paper to appear in the forthcoming Part on the Rose found by Sherard, a genus to which he had paid great attention. A friend of his has furnished me with a list of forty papers which he contributed to the *Transactions of the Horticultural Society*; and these may surely be regarded as proofs of the interest he took in its objects and welfare. I allude to his connexion with that Society with hesitation, because I am ignorant on the subject; but I feel that the claims for justice to the memory of Mr. Sabine will have greater weight, if there be no disposition to conceal the acknowledged evils which arose from his want of method in the management of its finances. Those evils, their causes and effects, I unaffectedly regret, and I rejoice that they have been remedied by the well-directed efforts of others; and, with these acknowledgments, I hope I may without impropriety quote the charitable sentiments of one who has not been at all times sparing of the literary deficiencies of his contemporaries. Lord Jeffrey, in his notice of Rogers's poem of *Human Life*, has this admirable passage, which I think suited to the present occasion:—"When the inordinate hopes of youth, which provoke their own disappointment, have been sobered down by longer experience and more extended views; when the keen contentions and eager rivalries which employed our riper years have expired or been abandoned; when we have seen, year after year, the objects of our fiercest hostility and of our fondest affections lie down together in the hallowed peace of the grave; when ordinary pleasures and amusements begin to be insipid, and the gay derision which seasoned them to appear flat and importunate; when we reflect how often we have mourned and been comforted, what opposite opinions we have successively maintained and abandoned, to what inconsistent habits we have gradually been formed, and how frequently the objects of our pride have proved the sources of our shame; we are naturally led to recur to the days of our childhood, and to retrace the whole of our career, and that of our contemporaries, with feelings of far greater humility and indulgence than those by which it had been accompanied; to think all vain but affection and honour, the simplest and

cheapest pleasures the truest and most precious, and generosity of sentiment the only mental superiority which ought either to be wished for or admired."

Adam Afzelius, Professor of Botany at Upsal, — was, I believe, the last of the pupils of Linnæus, and distinguished, like all the pupils of that great man, for his exact botanical knowledge. He contributed two papers to our *Transactions*: "On the Botanical History of *Trifolium alpestre*, medium, and pratense," in 1790; and "Observations on the Genus *Pausus*," in 1798. He resided in Sierra Leone for several years, and published his principal work, *Genera Plantarum Guineensium*, in 1804; and several Dissertations on the medicinal plants of that country, and some other works.

Antoine Laurent De Jussieu, Professor of Botany, Paris, — one of the original foreign members of this Society, author of the *Genera Plantarum secundum ordines naturales disposita*, and many papers in the *Annales* and *Mémoires du Muséum d'Histoire Naturelle*, in further illustrations of his views of the natural system. The date of the publication of the *Genera Plantarum*, in 1789, with the fact that the life of this illustrious man terminated at a very advanced age, without a second edition of that great work, are proofs of the great acquisitions made in botany within the last forty-five years, and of the hopelessness, save from one individual, of the labours of Jussieu being equalled by any single botanist. I do not affect to speak of the merits or reputation of this eminent man; but, if there were any that can be claimed for him above even the superiority of his intellect and learning, they were those of his modesty and his entire freedom from undervaluing the labours of others; and it is delightful to turn to a letter of his to Sir J. E. Smith, and to those of Bernard De Jussieu to Linnæus, to observe how purely these distinguished men regarded their mutual efforts to advance their favourite science.

Christian Henry Persoon, A.M. — The name of Persoon will live as one of the highest classical authorities on the Fungi; for his *Synopsis Plantarum*, published at Paris in 1805, and well characterised by its motto, "In parvo copia," though highly useful in its day, was naturally doomed to be superseded by later works of a similar kind. He contributed to our *Transactions*, in 1799, a brief notice of a variety of the beech found near Göttingen, which he has termed *Quercoides*, from the resemblance of its bark to that of the oak. He published, between 1796 and 1800, some of his earlier works on Fungi at Leipsic; and his *Synopsis Methodica Fungorum* appeared at Göttingen in 1801. This was followed by his *Icones pictæ rariorum Fungorum*, at Paris, in 1803, and the *Novæ Species Lichenum*, in 1811. His collections were purchased by the King of Holland, and the annuity he received for them contributed essentially to the comfort of the later years of his life.

Henry Adolph Schrader, Professor of Botany at Göttingen, — author of the *Spicilegium Floræ Germanicæ*, in 1794, and *Flora Germanica*, vol. 1st, 1806, and various essays on exotic plants. His *Flora Germanica* has a high reputation, but it only extends through the class Triándria. There is a very useful elaborate list of the botanical writers of Germany at the commencement. The *Flora Britannica* of Smith is spoken of in Germany as inferior only to the *Flora Germanica* of Schrader.

[*Rev. Sackville Bale of Withyham, Sussex. The Very Rev. Henry Becke, D.D., Dean of Bristol. Thomas Marquess of Bath, K.G., &c. Henry Thomas Colebrooke, Esq., F.R.S., &c. Alexander Collie, Esq., Surgeon, R.N. General Joaquim Oliveira. The Right Hon. Sir John Sinclair, Bart., F.R.S. Rev. George Henry Storie, M.A., of Camberwell. Mr. White Watson of Bakewell.* Deceased members of the Linnæan Society, whose names we have only room to enumerate. — *Ed. M. N. H.*]

THE MAGAZINE

OF

NATURAL HISTORY.

AUGUST, 1837.

ART. I. *Report of a Notice, by M. Rang, respecting the Inhabitant of the Argonaut.* By MM. DUMERIL and DE BLAINVILLE.

(Translated from the *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences* for April 24. 1837.)

SINCE one of us published the reasons upon which we grounded the opinion, that the animal found in the Argonaut is a parasite, inhabiting, like the Pagùrus, a shell which does not belong to it* (reasons to which, we must frankly say, only trivial objections, and such as are easy to refute, have yet been opposed), many persons, placed in favourable circumstances, have sought to determine the question. Among the observations which have come under our notice on this subject, we shall cite those of Mrs. Power, published by Professor Maravigno, in a Messenian journal; those of Mr. Gray, one of the officers in the zoological department of the British Museum; and, finally, those of Captain Rang, which he has sent to the Academy, and upon which M. Duméril and myself have been requested to report.

Before examining the accounts of M. Rang, with the permission of the Academy, we will give an extract from M. Maravigno's pamphlet, upon Mrs. Power's experiments; since it was these experiments which led M. Rang to the observations which he has detailed in his note.

Mrs. Power, says M. Maravigno, aware of Poli's observations, published after the death of that distinguished malacologist, in the last volume of his *Testacea of the Two Sicilies*, and being at the localities in which the Argonaut abounds, it occurred to her to look out for some new proofs of the non-parasitic nature of the animal inhabiting this shell. Knowing that the conchyliferous Mollúsca have the power of reproducing pieces of their shell which have been accidentally removed, she broke in more than one place an Argonaut shell, containing a Cephalopod, and had the satisfaction to see that these pieces,

* Contained in the *Journal de Physique, &c.*, vol. lxxxvi. p. 386., and vol. lxxxvii. p. 47. — *Ed.*

which had been broken off and taken away with the greatest care so as not to injure the skin of the animal, were reproduced."

A long paper, upon the subject of these observations and experiments, has been written by Mrs. Power, and sent by her to M. Maravigno to be laid before the Genoese Society, of which he is the secretary, and which was brought forward at their sitting in September, 1835. Unfortunately, M. Maravigno does not enter into any detail respecting the manner in which Mrs. Power performed her experiments. He confines himself to adding, that, in support of her observations (from which we have just given an extract, in employing the words of M. Maravigno), this lady has sent two Argonaut shells, showing the reproduced portions, and even one of the Cephalopods, which had effected the reparation, besides another shell with its animal preserved in spirits of wine, and in which we see clearly, continues M. Maravigno, the recent work of the Cephalopod in repairing the broken place.

But Mrs. Power has not confined herself to this fact; she has resumed the investigation, begun by Poli, of the eggs of the animal inhabiting the Argonaut. Having in her possession a great number of these creatures filled with eggs, she has satisfied herself that the mollusc is never, at any period of its existence in the ovum, provided with a shell; but that it quits the egg entirely naked; its shell being subsequently formed; a new observation, and quite contrary, adds the secretary of the Genoese Society, to all which the great Neapolitan naturalist has written on this subject.

Astonished at this result, M. Maravigno thought it advisable to write to Mrs. Power, and declare to her his doubts as to the correctness of these facts, alluding to the difficulty of microscopic observations, and the deceptions and errors which may arise in the use of this instrument. Mrs. Power, being induced thus to repeat her observations, arrived at the same results as at first; and she added to her former paper, not only a supplement, relating the facts that she had newly observed, but she sent, at the same time, to the Genoese Society, and also to its secretary, the eggs of the Cephalopod inhabiting the Argonaut, and the young just hatched, with other specimens, which were some days old, and some provided with shells of different ages, all of which had been developed, and had attained their various stages of growth, under her immediate inspection. M. Maravigno affirms, that he particularly observed among the young Cephalopods which had been sent to him, one in the act of coming out of the egg to which it was still attached; and that it was entirely destitute of a shell. "Thus," he adds, "the facts observed by Mrs. Power lead to the conclusion, not only that the inhabitant of the

Argonaut is the *true* constructor of its shell, and that it does not construct it in the egg, but after its birth; but, also, that the small mollusc, at its quitting the ovum, does not entirely resemble what it will be in the adult state: it is then a kind of small worm (vermicello), provided with two longitudinal rows of vent-holes (ventouses), with a filiform appendage at one extremity, and a slight enlargement towards the other, where its organs of digestion appear to be situate;" so that, according to M. Maravigno, we might suppose that this was at first but an extremely small brachial appendage, from which would ultimately be developed the parts necessary to its completion.

M. Maravigno terminates his extracts from Mrs. Power's Memoir by expressing a wish that this lady may continue her researches upon this subject; that is to say, upon the progressive developement of the animal of the Argonaut; thinking that, perhaps, as Spallanzani and Trembley have shown, the latter with respect to the green hydra, and the former concerning the terrestrial Limàces that have been deprived of their heads, the developement of the organs belonging to the mollusc of the Argonaut may be by an animal germ or budding, something like that of a plant; the organisation of these animals, according to him, bearing much analogy to each other.

Thus, as the result of these new observations, such as M. Maravigno reports them in his extracts from Mrs. Power's Memoir, which extracts we have translated almost verbatim; and even without passing over his remarks with regard to the first stage of developement in the young Ocýthõe, which is at least very remarkable, we find, as a fact invalidated*,—

* As there appears to us considerable obscurity in this part of the paper, we have thought it better to insert the passage as it originally stands. — *Ed.*

"Ainsi comme résultat des nouvelles observations, telles que les rapporte M. Maravigno dans l'extrait du mémoire de madame Power, extrait que nous avons presque traduit mot à mot, et même sans oublier les réflexions de M. Maravigno, au sujet du premier degré de développement du jeune poulpe, qui serait au moins bien singulier; on trouve, comme fait infirmé :

"1°. La coquille du poulpe de l'argonaute n'existe pas dans l'œuf et même après quelques jours de la naissance, fait confirmé par M. Maravigno, et qui détruit l'argument le plus fort apporté contre l'opinion du parasitisme du poulpe dans la coquille, et qu'on avait tiré plus spécialement de l'observation de Poli ;

"Et comme faits nouveaux contre cette même opinion :

"2°. Les morceaux de la coquille préalablement enlevés sont reproduits, fait affirmé aussi par M. Maravigno, mais sans détails sur la place où le morceau a été enlevé, sur le temps de la reproduction, et sur la structure comparée de la partie reproduite ;

"3°. La coquille se forme, se produit hors de l'œuf et par conséquent après la naissance; également sans détails à l'appui d'une assertion en contradiction avec tout ce que l'on sait jusqu'ici sur le développement des animaux mollusques conchyliifères, et qui par cela même avait plus besoin d'être appuyée de détails circonstanciés."

1st, That the shell of the *Ocýthœ* does not exist in the egg, and even not for some days after its birth; a fact confirmed by M. Maravigno, and which destroys the strongest argument brought against the opinion of the parasitic nature of the animal in the shell, and which had been drawn more particularly from Poli's observations.

And, as new facts *against* this same opinion, —

2dly, That pieces of the shell, previously taken away, are reproduced; a fact affirmed also by M. Maravigno, but without any details as to the place from which the pieces had been taken, or the time of reproduction, or the comparative structure of the portions thus reproduced.

3dly, The shell is not formed within the egg, consequently, after the birth of the animal; an assertion equally unsupported by details, though contradicting all that we at present know with respect to the developement of conchyliferous Mollúsca, on which account alone it ought to have been accompanied by circumstantial detail.

At the same time, and in the same seas, where Mrs. Power made her observations, Mr. Smith made some which have conducted him to an opposite conclusion. In a note read at the scientific meeting of the London Zoological Society, on the 8th of September, 1835, upon the question of the parasitic nature of the Octopod of the *Argonaut*, Mr. Smith considers that this parasitic character was sufficiently evident; because, in the market at Naples, where this animal is very abundant, the shell is seldom found; whilst the mollusc, which serves as food to the inhabitants, is extremely common and very cheap there.* But may not Mr. Smith have confounded other species of Octopods with the true *Ocýthœ*, or Cephalopod with palmated arms? a circumstance which does not seem to us improbable, notwithstanding that M. Rafinesque has some time since described these remarkable Mollúsca in the seas of Sicily, without speaking of any shell.

Although Mr. E. Gray has not had such favourable opportunities as some of his countrymen for advancing the

* "A note by Mr. William Smith, relative to the animal of the *Argonauta* *Argo* Linn., and forwarded through Mr. Gray, was read. The most important statement adduced in it, with reference to the question of the parasitic nature of the *Cephalopod* so frequently found in the shell, is thus expressed: 'It seems pretty evident that the animal found in the *Argonauta* is a parasite, because, in the Bay of Naples, where it is very abundant, the shell is but rarely found; whereas the *Octopus* itself is constantly to be met with, and, indeed, is daily to be seen in the common market as an article of food. To give some idea of its comparative scarcity in union with the shell, I shall merely mention that the usual price of the animal alone is about fourpence; while a specimen inhabiting the shell cannot be obtained under five shillings.'" (*Proceedings of the Zoological Society of London*, 1835, p. 125.) — *Ed.*

solution of this question, yet he has presented a new argument in favour of the parasitic nature of the *Océthoë*. It consists in this : — All conchologists know that in the testaceous Mollusca the shell of the young animal, when it is still contained in the egg, frequently differs greatly from the shell in the adult state, and of which it forms the nucleus. Now, Mr. Gray has remarked that, in the shell of the Argonaut, the nucleus, which is very different in shape from the shell, properly so called, is nearly 4 lines in diameter, and, consequently, is many times larger than the largest eggs which have been found in the shell of the Argonaut; whence he concludes, and with much reason, that the true animal of the Argonaut is, when hatched, much larger than, and consequently very different from, these young Molluscs; and that this latter cannot, therefore, have been the true constructor of the shell which it inhabits; it not being possible that its nucleus (supposing, with Poli, that it is provided with it while in the egg state) should be many times larger than the egg.* Besides which, Mr. Gray confirms, by reiterated observations, that in all the conchyliferous Mollusca the shell is developed in the egg, and even before the developement of the other organs; and he opposes the argument drawn from the apparent absence of muscular impression, by the example of that of the *Carinaria*, in which nothing more is visible than in the Argonaut, and which yet evidently adheres to the animal during its life.

It was under these circumstances, communicated to him by Mrs. Power, that M. Rang, an officer in the Royal Marines, who has for some time devoted himself to the study of malacology, and is fully acquainted with the state of this question, made the observations which he has addressed to the Academy. Placed as a Port-Captain at Algiers, he has had frequent opportunities of seeing the Octopod of the Argonaut, both swimming on the open sea, and walking at the bottom of the water: he has even been able to put some of them alive into a tub of sea-water, and thus to observe them more at his leisure.

Being acquainted with Mrs. Power's first experiments, the details of which had been furnished him by that lady, he was eager to repeat them. He therefore removed some pieces of the shell from a living specimen (unfortunately, he does not say from what part they were taken); and he perceived that, at the end of six days, the breach made in the shell was completely closed up, and so repaired; "but," he adds, "in truth, notwithstanding our inclination to consider the *Cepha-*

* Mr. Gray has since withdrawn this argument, in a communication to this Magazine. (See p. 247. of the present Volume.) — *Ed.*

lopod with palmated arms as the true constructor of the shell which it inhabits, we cannot, like Mrs. Power, consider this discovery as conclusive; for, in reality, the part reproduced is but a thin plate (lame); transparent, and but a mere diaphragm, which has neither the texture, nor the solidity, nor the whiteness, of the rest of the shell; and having an irregular form, as if it had not been secreted by the same means and the same organs as the original shell. In a word, according to M. Rang, it just recalls what is done by snails, when their testaceous covering is broken; and we know that, in this case, the collar of the animal, which alone produces the shell, has nothing to do with this work of reparation.

Thus, even supposing that the reparation of the breach made in the shell of the Argonaut, whilst it inhabits it, be really similar to that which takes place amongst snails, and be produced by means of a solid calcareous substance (which we are far from thinking), and be anything else but a mucous plate (lame muqueuse), the result of the solidified excretion (sueur coagulée) of the skin of the animals, we can evidently draw nothing from it to sustain the theory that the Cephalopod inhabiting the shell of the Argonaut is its true constructor; since, as M. Rang allows, the plate which stops up the breach that has been made has neither the texture, nor the solidity, nor the whiteness, of the shell itself.

As to the new assertion of Mrs. Power, that the young animal contained in the egg offers no trace of a shell, this being developed at a subsequent period, M. Rang, unfortunately, has had no opportunity of verifying it; the living specimens which he has had in his possession being but few in number, and in circumstances that were unnatural to them: a great tub, or cask, filled with sea-water, in which they died at the end of a few days.

But a newer and much less questionable fact, which M. Rang had an opportunity of observing, is the use made by these animals of the palmated arms, with which all the species of *Ocýthœ* are provided, to hold their shells; and the manner in which these animals propel themselves, whether floating upon the surface, or entirely immersed, or, finally, upon the solid bottom of the sea.

In the first condition, M. Rang makes the remark, that naturalists have been wrong in representing the Cephalopod in the shell of the Argonaut as sometimes having its back (that is to say, the side upon which are its palmated arms) turned towards the back of the shell, and sometimes towards its lower part (ventre). He affirms that, in reality, it is always in the same position, so that the palmated arms are behind

the stomach, or the side of the tube, towards the back of the shell, and the back towards the ventral part; that is to say, in a word, that the animal is reversed in the shell.

It is thus, indeed, that one of us saw it, and caused it to be drawn, in a specimen carefully selected by M. Bertrand Geslin. Nevertheless, it is difficult to conceive how M. De Férussac could have had the animal represented in the two contrary positions, if he had not found it thus; he, who knew very well that a powerful argument had been drawn from this difference of position in favour of the parasitic nature of the *Ocýthœ*.

M. Rang adds, that the two great palmated arms, the use of which we were really ignorant of, for that of serving for sails or oars, as had been supposed, was altogether fictitious; and which, in the reversed position of the animal in its shell, become inferior; pass at first behind, leaning against the auricles of the shell; then, bending from behind forwards (that is to say, from the summit to the base of the shell), they spread themselves laterally, so as to embrace it on each side, and absolutely so as not to leave any part of it visible; a little like, according to M. Rang, the way in which the lateral lobes at the foot of the *Cyprææ* (Porcelains) envelop the shell of these animals when they crawl.

The following is the manner in which the *Ocýthœ*, carrying its shell, walks upon a solid surface (*sol résistant*) at the bottom of the sea: — The shell, being in a normal position, the back upwards, and the opening downwards, it is held by the two palmated arms, which are turned upwards, or towards its back; the three other pairs of arms have a lateral motion (*s'agitent latéralement*); the funnel-shaped disc, at the bottom of which is the mouth, is brought close to the ground; and the excretory tube is uppermost, corresponding to the back of the shell; so that M. Rang sees in this mollusc, thus situated, a kind of siphonobranchiate gasteropode, of which that which all zoologists and anatomists have looked upon as the back will be the stomach, and *vice versa*. This opinion, which young Meiranx, who was too soon taken away from the scientific pursuits which he cultivated with so much ardour and acuteness, advocated on anatomical grounds some years ago, is carried out (*developpe*) by M. Rang, by considering the infundibulum as a kind of foot; the lower pair of arms become upper ones, as tentacula, properly so called; the two other intermediate pairs, as analogous to the tentaculiform appendages upon the sides of the *Monodóntæ*, and the palmated arms as, without doubt, a kind of lobes of the mantle.

In order to invalidate, in some measure at least, this view

of the case advocated by M. Rang, deduced from the certain and incontestable fact of the position of the Octopod with long palmated arms in the shell of the Argonaut, and from the manner in which it advances along a resisting surface, it will suffice, perhaps, to observe, that it is no less certain, from the observations of one of us, that the Poulp, with one row of suckers*, so common in the Mediterranean (and, probably, all the other common species of Octopods), walk, not in this way, but with the back upwards, and the stomach, or tube, below.

We have observed this in a great number of specimens caught in the nets of a tartane, belonging to the port of Buch, at the entrance of the Pool of Berre, in the Mediterranean Sea. Being thrown, with a number of other live creatures, upon the bridge, they moved very nimbly in all directions, a little after the manner of crabs, at the same time elevating their backs so that the tube might not touch the ground; that is to say, raising the point of junction of the head and trunk, crawling backward upon the lower surface of the mantle, or sack, and forwards with the help of the four arms on each side, the upper ones before, and the lower ones behind, a little like the *Ophiuræ*. Our draughtsman (M. Prestre), who accompanied us, had the same opportunity of seeing and sketching it.

Now as, from this double observation, it appears to me allowable to admit that the manner of creeping observed in the Octopod of the Argonaut ought to be looked upon as the anomaly, and that of the animal at liberty as the normal state, we see that the curious fact related by M. Rang, of the palmated arms embracing the shell, furnish a new proof that this animal does not belong to it, and that it is parasitic there. In effect, the other conchyliferous Mollúsca have no need thus to hold their shell when they creep or swim, since an organic union exists between them: they crawl or swim, without troubling themselves about it. It could not be thus with the *Ocythoe*, or Octopod with palmated arms. As the animal does not adhere in any organic manner to its shell, which no one can dispute, and as its body even bears no resemblance to it in shape, the opening of the shell being much larger than its lower surface, so that it would be with difficulty held there mechanically, a voluntary means of fixing the shell round itself was very necessary to the mollusc; and the animal employs for this purpose its long and spreading arms, as the *Cáncer Pagurus* (Bernard l'Hermite) shows a particular adaptation, in a pair of claws converted into hooks, to the columella of the shell which serves it for a dwelling.

* *Octopus vulgaris* Cuv. — *Ed.*

M. Rang has at the same time observed, that the Octopod with palmated arms, provided with a shell, does not swim, as the imagination of poets, more than the observation of naturalists, has delighted to recount to us, from the highest antiquity, and is too often repeated in our days; that is to say, by the help of its palmated arms, raised above the water and serving for sails, or descending into it and acting as oars. Like all the swimming conchyliferous Malacostraca the Octopod places itself with its shell undermost; but its arms quit the shell still less than in creeping, because, being turned upside down, it would the more easily be separated from it; and thus locomotion takes place, as in the other animals of this class, by the alternate dilatation and contraction of the mantle, or covering, drawing in and throwing out the water in which the animal is immersed: it then swims backwards, like the cuttle-fish and calamaries (*seiches et les calmars*).

From these recorded facts, of which the authenticity cannot be denied, M. Rang sees, in the employments of these palmated arms to envelope the shell (*tet*); or, to use his own expressions, —

1st, In the relation that is so well established between the animal and its shell;

2dly, In the form of these lobes, which are found in all the species of *Océthœ*, and only among them;

3dly, In the use of these lobes, as a covering surrounding the shell (*tet*), in the same manner as in so many other *Mollusca* (lobes which would be useless, if the animal had not had a shell from its birth);

A new argument in favour of the opinion which admits that the *Océthœ* is the constructor of its shell. But is not this rather in favour of a contrary opinion? Indeed, to conclude, as M. Rang has done, from the peculiar provision which an animal has in its organisation for sheltering itself under or within a foreign body, that this body really belongs to the animal, and consequently makes a part of it, would be to use an argument applying evidently just as well to the *Pagurus* and the *Dròmia* as to the *Océthœ*, and which really is of no weight.

The long palmated arms of the *Océthœ*, perhaps belonging only to the females*, are in the place of the last pair of appendages of the *Pagurus* and the *Dròmias*, which are organs

* We throw out this doubt, because, since one of us suggested it fifteen years ago, Mr. Gray, having examined ten or twelve individuals preserved in the British Museum, has found them all, if I do not mistake (for I quote from memory), to be females; at least, all those which were still accompanied by a shell

intended to hold, so as to retain, in the first-mentioned, a more or less spiral shell; in the latter, the valve of a bivalve, or an alcyonite, or a sponge; that is to say, it is a simple relation of cause and effect, by means of a preestablished harmony. The great membraniform expansion of the arms of the *Ocýthœe* was a provision necessary to secure the power of prehension, the holding firmly a patulate or open-mouthed shell, which, without that, would be liable to fall by the slightest movements, and that by a soft animal, not at all resembling in its state that which exists, for example, in the *Cyprææ*. In these latter, indeed, it is not the lateral lobes of the body which produce the shell, but they merely modify it, by thickening it, in a gradual manner, more or less irregularly, and by leaving in the medio-dorsal line an indication of the more or less immediate approach of the two lobes. We see absolutely nothing similar to it in the shell of the *Argonaut*, which is always extremely thin, every where of equal thickness, with very finely marked lines of growth, without any deposit of shelly matter, unless it be upon the auricles at the extremity of the columella; nor is its form, either generally or in part, explained, in any probable manner, by the *Octopod* which inhabits it.

As to the argument drawn, by M. Rang, from the deeper colouring of the base of the palmated arms of the *Ocýthœe*, showing itself, also, upon the corresponding part of the shell, we may easily look upon it as only an imbibed colour, without exceeding the bounds of analogy, since all the *Nautilus* shells do not exhibit this colour. But this argument is much too slight (the colour not being even similar) for us to be able to find in it an argument of any weight in a question so important, scientifically speaking.

Notwithstanding that we put a construction so different from M. Rang, as to the use of the observations which he has communicated to the Academy, in the solution of the problem respecting the parasitic nature of the *Cephalopods* with palmated arms, we do not the less appreciate his very interesting communication; at the same time that we would request him to continue employing in the service of natural history the leisure which the duties of his station may allow him.

We shall take the liberty of proposing to him the following observations, if he should again be placed in a position favourable for elucidating the point of natural history in question : —

1st, To make the animal quit its shell, as Cranch has done, and note that which results from it.

2dly, To make this experiment not only on dry land, but

also in a confined space of water; and especially in a shallow part of the sea coast.

3dly, To ascertain the sex of all the specimens observed provided with shells; and whether or not they contain eggs in the bottom of their cavity.

4thly, To examine anew, and with great care, the position of all the specimens in the shell; and especially with reference to whether they have been taken from the bottom of the sea, or from its surface; for it is possible that the position would not be always the same.

5thly, Repeating the first of Mrs. Power's experiments, to ascertain if the supposed reparation of the removed piece takes place equally at the edge of the shell with any other part of its surface; and carefully to note the time occupied in this experiment.

6thly, To examine with a magnifier, and by the means of chemical tests, the structure and nature of the reproduced pieces, and comparatively with a piece of the shell.

7thly, Finally, to repeat, if he possibly can, Mrs. Power's second experiment; and to verify the facts, if it be possible that, against every kind of analogy, the shell, not existing in the egg, should not appear upon the animal until some days after its birth; noticing all the circumstances of its appearance and developement.

ART. II. *Irish Vertebrate Animals: selected from the Papers of the late John Templeton, Esq., Cranmore.* By ROBERT TEMPLETON, Esq.*

MAMMA'LIA.

FE'RÆ.

Mèles (Cuv.) Táxus Flem. Nearly extinct.

Mustela (Linn., Cuv.) Mártes Linn. Common.

Putorius Cuv.

vulgaris Gmel. Common.

Ermínea Linn. Rare.

Lutra (Cuv.) vulgaris Desm. Occasionally.

Cànis (Linn., Flem.) Lùpus Linn. Extinct.

Vúlpes (Flem.) vulgaris Flem. Not uncommon.

Phoca (Linn.) vitulina Linn. Common.

Sorex (Linn.) Aràneus Linn. Common.

Erinaceus (Linn.) europæus Linn. Common.

PRIMA'TES.

Vespertilio (Linn., Geoff.) pipistréllus † Gmel. (Sub nomine "V. murini" in Temp. MSS.) Common.

Plecotus (Geoff.) auritus Linn. Common.

* This catalogue is a continuation of papers, by Mr. Templeton, which have appeared in former Volumes.

† See Mr. Thompson in *Lond. and Edin. Phil. Mag.*, vol. v. p. 298.

GLIRES.

Mūs Linn.

sylvaticus Linn. Common.

Músculus Linn. Common.

Ráttus Linn. Occasionally : nearly extinct.

decumanus Pall. Common : naturalised.

Lèpus Linn.

timidus Linn. var. hibernicus. Common.

Cuniculus Linn. Common.

UNGUICULATA.

Cervus (Linn.) E'laphus Linn. Wild in the south and west of Ireland.

CETA'CEA.

Delphinus (Linn., Cuv.) Délphis Linn. Common.

Phocæ'na Cuv.

communis. Common.

O'rca Fab. Common.

Hypérodon (Lacép.) bidens Flem. Occasionally.

Physeter (Linn., Lacép.) Túrsio Linn. Thrown ashore on the western coast occasionally.

Balæ'na (Linn., Lacép.) Mysticétus. On the north-western coast, thrown on shore.

A'VES.

RAPTO'RES.

A'quila Briss.

Chrysætos Vig. Occasionally in the mountainous districts.

albicilla Briss. Common on the bold coasts.

Haliæ'tus Meyer. Occasionally met with.

Fálcó Linn.

islándicus Lath. In 1803, I received a skin of this bird, which had been shot at Randalstown, county Antrim.

peregrinus Gmel. Common.

Subbúteo Linn. A rare species. I have only observed a few specimens : one was seen during the breeding season, at the rocks of Ballynascreen Mountains, in 1800 : it was noisy and bold. Another was seen in 1802, at Lough Bray Rocks, county Wicklow.

E'salon Gmel. Common.

Finnúnculus Linn. Common.

A'stur (Cuv.) palumbarius Will. A specimen in Dublin Museum. Breed occasionally on the rocks at Magilligan.

Nisus (Cuv.) fringillarius Will. Falco Nisus Linn. Occasionally.

Búteo (Bechst.) vulgaris Will. Not rare.

Árcus Bechst.

rufus Briss. Occasionally met with.

cyaneus Flem. Occasionally.

B'tus Cuv.

vulgaris Flem. Common.

brachyotus Flem. Occasionally met with.

Strix (Linn.) flammæa Linn. Common.

INSESSO'RES.

Lanius (Linn.) excubitor Linn. I have met with two specimens : one, was shot in the county Down, and received from R. Maxwell, Esq.; the other in the county Antrim, in 1802.

Muscicapa (Linn.) grísola Linn. A summer visitant : a pair built in the lime trees at Cranmore, during the months of July, 1801 and 1802.

Anclus (Bechst.) aquaticus Bechst. Common.

Turdus Linn.

- viscivorus Linn. Common.
- philis Linn. Common.
- musculus Linn. Common.
- illiacus Linn. Common.
- Mérula Linn. Common.
- torquatus Linn. Summer visitant.

Oriolus (Linn.) Gálbula Linn. A pair shot at Donaghadre, in 1824, by Mr. J. Russell.

Accéntor (Bechst.) modulàris Cuv. Common.

Sylvia Lath.

- Rubécula Lath. Common.
- Locustélla Lath. Not very uncommon during spring and summer.
- Phragmitis Bechst. A summer visitant.
- arundinàcea Lath. I once saw in the neighbourhood of Belfast.
- Atricapílla Lath. Rare: was seen at Cranmore, June 17. 1818, and twice since then.
- horténsis Lath. Bred at Cranmore, May 1820.
- cinèrea Lath. A summer visitant.
- Tróchilus Lath. Common in summer.

Régulus (Cuv.) aurocapíllus Selb. Common.

Motacilla Linn.

- álba Linn. Common.
- Boárula Linn. Common.
- flàva Ray. A rare summer visitant, appearing commoner about Lough Neagh than elsewhere.

A'nthus (Bechst.) praténsis Bechst. Common.

Saxicola Bechst.

- Enánthe Bechst. A common summer visitant.
- Rubètra Bechst. Less common than the preceding
- Rubíscola Bechst. Common.

Parus Linn.

- màior Linn. Common.
- cærùleus Linn. Common.
- àter Linn. Common.
- caudatus Linn. Seldom met with in the north.

Bombycilla (Bris.) gárrula Bonap. Sometimes seen about Belfast, but more common in Tullamore Park, county Down: has been several times shot in the county Derry.

Alaúda Linn.

- arvénsis Linn. Common.
- arbòrea Linn. In particular districts, not uncommon.

Emberiza Linn.

- nivàlis Linn. Tolerably common.
- miliària Linn. Common.
- Schœnículus Linn. Common.
- Citrinèlla Linn. Common.

Fringilla Cuv.

- Cœlebs Linn. Common.
- montifringilla Linn. An occasional visitant.

Pyrgita Cuv.

- doméstica Linn. Common.
- montàna Linn. A doubtful native.

Coccothraustes (Temm.) Chlòris Temm. Common.

Carduëlis Briss.

- commùnis. Not common.
- Spinus Linn. Rare visitant.

Linària Steph.

- rùbra minor Will. (Fringilla Linària Linn.) Common

Linària (Steph.) cannábina Linn. Common.
móntium Gmel. A winter visitant.

Pyrhùla Briss.
vulgàris Temm. Occasionally.
enucleàtor Temm. A doubtful native.

Lóxia Briss.
curviróstra Linn. An occasional visitant. Several were observed at Cranmore, varying much in colour from reddish-brown to dark olive.

pityopsittacus Bechst. Received from Rainey Maxwell, Esq., Grenville, where it was shot, May 1802.

leucóptera Gmel. Shot at Grenville, near Belfast, January 11. 1802.

Stúrnus (Linn.) vulgàris Linn. Common.

Pástor (Temm.) róseus Temm. An occasional visitant.

Frégilus (Cuv.) Gráculus Selb. Common on the rocky coasts.

Córvus Linn., Cuv.

Córax Linn. Common.

Córnix Linn. Common.

frugilegus Linn. Common.

Monédula Linn. Common.

Pìca (Cuv.) caudàta Flem. Common.

Gárrulus (Briss.) glandàrius Flem. Exceedingly common in the midland and southern counties.

SCANSO'RES.

Pìcus (Linn.) màjor Linn. One specimen, sent to Dr. M'Donnell from C. Derry, in August, 1802; another met with since.

Cérthia (Linn.) familiàris Linn. Not uncommon.

Troglódytes (Cuv.) europæus Selb. Common.

U'pupa (Linn.) E'pops Linn. One shot near Carrickfergus, in 1818.

Cùculus (Linn.) canòrus Linn. Common.

Alcèdo (Linn.) Íspida Linn. Not uncommon.

Hirúndo Linn.

rústica Linn. Common.

úrbica Linn. Common.

ripària Linn. Common.

Cýpselus (Illig.) A'pus Flem. Common.

Caprimúlgus (Linn.) europæus Linn. Rare about Belfast, but uncommon at Mourne, county Down.

RASO'RES.

Colúmba Linn.

Palúmbus Linn. Common.

Lívia Briss. (Rock Dove.) Common.

Túrtur Linn. Rare. Seen at Cranmore and Shane's Castle.

Lagòpus (Vicill.) scóticus Temm. Common.*

Pérdix (Briss.) cinèrea Briss. Common.

Cotúrnix (Briss.) vulgàris Flem. Common.

GRALLATO'RES.

Charàdrius Linn.

pluviàlis Linn. Common.

Hiaticula Linn. Common.

Squataròla (Cuv.) grísea Briss. Not uncommon.

Vanéllus (Cuv.) cristàtus Mey. Common.

* I have been informed by Rainey Maxwell, Esq., that black game is mentioned in old leases in the county Down.

Strépsilas (Illig.) intérpres Leach. An occasional visitant.

Cálidris (Illig.) arenária Illig. Occasional visitant.

Hæmátopus (Linn.) ostrálegus Linn. Common about the shores.

Note.—*Grús cinèrea Bechst.* In Smith's *History of Cork*, it is stated that this bird was seen in the remarkable frost of 1789.

A'rdea Linn.

cinèrea Lath. Common.

Garzéttá Linn. There is a specimen in the Dublin Museum, which was shot in the harbour of Cork, in 1792.

stellàris Linn. Occasionally met with.

Platàlea (Linn.) Leucoròdia Linn. An individual of this species was shot, some years since, at Ballydrain Lake, county Antrim.

I'bis (Lacép.) Falcinélus Temm. Shot in the bog meadows near Belfast, Sept. 30. 1819, by Mr. J. Dinnon.

Numenius Briss.

arquàta Lath. Common.

phæ'opus Lath. Common.

Tótanus Bechst.

Cálidris Bechst. Common.

óchropus Temm. Seen four times at Cranmore.

Hypoleùicos Temm. Common summer visitant.

Glóttis Bechst. An occasional visitant.

Limòsa Briss.

rùfa Briss. Tolerably common.

melanùra Leisl. Rare: a winter visitant.

Scólopax Linn.

Rustícola Linn. Common.

Sabini Vigors. Rare.

màjor Gmel. A doubtful native.

Gallinàgo Linn. Common.

Gallínula Linn. Common.

Trínga Briss.

púgnax Linn. An occasional visitant. One, in the collection of the late John Montgomery, was shot at Castledawson.

subarquàta Temm. Occasionally seen.

variàbilis Mey. Common.

nígricans Montig. An occasional visitant: a rare specimen in the possession of the late John Montgomery, Esq.

Canùtus Linn. A rare winter visitant.

Phaláropus (Briss.) lobàtus Flem. A rare winter visitant.

Rállus (Linn.) aquáticus Linn. Common.

Créx Bechst.

praténsis Bechst. Common.

Porzàna Selb. A few specimens have been met with.

Gallínula (Lath.) chlóropus Lath. Common.

Fùlica (Linn.) àtra Linn. Common.

NATATO'RES.

A'nsér Briss.

ségetum Steph. Shot in the bog meadows near Belfast in the winter of 1801.

álbifrons Steph. In large flocks during our very severe winters.

leucópsis Bechst. Common.

torquátus Frisch. Common.

Cýgnus (Mey.) fèrus Ray. Met with occasionally about the Lough.

Tadórna (Leach.) Bellònni Steph. Occasionally met with.

A'nas Linn.

elypeàta Linn. Occasionally.

acùta Linn. Occasionally.

- A`nas** (*Linn.*) **Bóschas** *Linn.* Common.
 Crécca Linn. Common.
Marèca (*Steph.*) **Penélope** *Selb.* Common.
Oidèmia (*Flem.*) **nigra** *Flem.* An occasional visitant. In the Dublin Museum, there is a specimen from Waterford.
Fulígula *Ray.*
 ferina Steph. Occasionally.
 marila Steph. Common.
 cristàta Steph. Not uncommon.
Clángula (*Flem.*) **chrysophthálmus** *Steph.* Not uncommon.
Mérgus *Linn.*
 Mergánsér Linn. Common.
 Serrátor Linn. Not rare.
Pódiceps *Lath.*
 rubricóllis Lath. A specimen caught in the spring of 1797 at Bears-bridge, county Down.
 auritus Lath. Not very common.
 minor Lath. Common.
Colýmbus (*Linn.*) **glaciális** *Linn.* Not uncommon.
U`ria *Briss.*
 Troíle Lath. Common in Belfast Lough.
 Grýlle Lath. Common.
 ratércula (Briss.) ártica Steph. Not uncommon.
F`ica (*Linn.*) **Tórda** *Linn.* Common.
A alacrócorax (*Briss.*) **Cárbo** *Steph.* Common.
Pha (*Briss.*) **Bassàna** *Briss.* Common.
Sùl na *Linn.*
Stér Dougállí *Mont.* A specimen shot in Belfast Lough.
 Hirúndo Linn. Common.
 minùta Linn. Several years ago, I observed a single pair in Belfast Lough, in a tour round the shores, at Lecale, on the 5th and 6th of June, 1810. They appeared on the shore as common as *S. hirúndo*; their note sharper and more tremulous than that of the latter.
Làrus *Linn.*
 *Sabini * Sab.,* sub nomine "minutus" in *Temp. MSS.*
 ridibúndus Linn. Common.
 tridáctylus Lath. Common.
 cànus Linn. Common.
 argentàtus Brunn. Common.
 fúscus Linn. Not so common as the preceding.
 marinus Linn. Occasionally.
Léstris (*Illig.*) **parasíticus** *Tem.* Occasionally.
Procellària (*Linn.*) **pelágica** *Linn.* Common.

REPTÍLIA.

SAURIA.

- Lacérta** (*Cuv.*) **ágilis** *Flem.* Common.

BATRA`CHIA.

- Ràna** (*Laurent*) **temporària** *Linn.* Common.
Triton *Laurent.*
 palústris Flem. Common.
 aquáticus Flem. Common.
 vulgàris Flem. Not uncommon.

* See Mr. Thompson in *Lond. and Edin. Phil. Mag.*, vol. v. p. 299.

PI'SCES.

O'SSEI.

ACANTHOPTERY'GII.

Pérca (Linn., Cuv.) *fluviátilis* Linn. Common.

Làbrax (Cuv.) *Lùpus* Cuv. First noticed as Irish by Dr. Brown. It is caught in Belfast Bay.

Trigla Linn.

Hirúndo Bl., sub nomine "lævis." Not uncommon along the coast, and brought to the markets along with haddock.

Lýra Linn. Taken with the hook on our coast, but in no great numbers.

Gurnárdus Linn. Very numerous during the summer and autumnal months.

Cùculus Bl. Occasionally.

Cóttus (Linn.) *Scórpius* Bl. Not uncommon in small bays, where much fucus abounds; but not exceeding 9 in. or 10 in. They are very wary, permitting the hand to approach them within a couple of inches, before they quit their station on the rock, but then darting away with inconceivable velocity.

Aspidóphorus (Lacép.) *cataphráctus* Linn. The only specimen which I have known of this, caught on our shores, was received by Dr. M'Donnell of Belfast, from Carnallog Bay, and presented by him to Dr. James Drummond.

Gasterósteus Linn., Cuv.

aculéatus Linn. Common.

pungítius Linn. Rare.

Spináchia (Flem.) *vulgàris* Flem. Not uncommon.

Spàrus (Linn., Cuv.) *aurátus* Linn. Often taken during the summer and autumnal months, principally when currents sweep along the rocky shore.

Scómber (Linn., Cuv.) *Scómbrus* Linn. Common.

Càranx (Cuv.) *trachùrus* Lacép. Not common on the coast.

Zèus (Linn.) *Fàber* Linn. A few individuals are caught, from time to time, on our coasts.

Lámpris (Retz.) *lùna* Risso. Only one specimen of this fish has been noticed as occurring on our shores at Magilligan, county Derry.

Mùgil (Linn.) *céphalus* Cuv. Common.

Atherína (Linn.) *Présbyter* Cuv. On the coast of Ireland, it is caught in abundance during the spring months. It is brought from Portaferry into Belfast market.

Blénnius Linn., Cuv.

gattorùgine Mont. On the 22d of June, 1811, I received this little fish from Mr. M'Skimmin, who informed me he had procured it from the lobster traps by the Carrickfergus fishermen, who declared it was never taken but when the traps laid in 12 or 14 fathoms water.

Phòlis Linn. Very common in the little pools in the rocks along the shores.

Gunnéllus (Flem.) *vulgàris* Flem. Occasionally.

Zoárces (Cuv.) *vivíparus* Linn. One specimen found on the coast of Down, near Donaghadee.

Anarhichas (Linn.) *Lùpus* Linn. On the coast of Ireland, this fish does not seem to be common, as it is not mentioned by Drs. Brown or Smith, in their county histories; it is, however, sometimes met with in Belfast market, most probably caught by the Carrickfergus fishermen in the bay.

Göblius Linn.

niger Linn. A mutilated specimen on the shore of Belfast Lough, near Rockport.

minutus Pall. Several specimens, but not of greater length than 2 in.; stated to be common on the sandy shores, lodging under large shells when the tide is out.

Calliónymus (Linn.) Lÿra Linn. A fine specimen was caught in the bay by the Carrickfergus fishermen, and was in possession of the late J. Miller, Esq. A female was found in the belly of a cod-fish, in 1821.

Lòphius (Linn.) piscatòrius Linn. Seldom found of greater length than 4 ft.; not uncommon on the coast.

Làbrus Linn.

maculatus ? Bl., the *L. Tinca* of Shaw, is common, and considered of the same species as the *L. Bálanus* of Pennant, which occurs along with it, but not in the same numbers. They haunt the rocky parts of the coast, and live on the smaller Crustàcea and Mollúsca. *variegatus Gmel.* Both the specimens of this beautiful fish were caught in Strangford Lough.

MALACOPTERY'GII.

Cýprinus (Linn., Cuv.) Cárpio Linn. Naturalised.

Göbio (Cuv.) fluviátilis Will., Flem. These fish first appeared in the river Lagan in 1801, having ascended the canal from Lough Neagh, where they have been inhabitants perhaps for centuries.

Tínca (Cuv.) vulgàris Flem. Although sometimes taken in our rivers, I have every reason to believe it a naturalised species.

Abràmis (Cuv.) Bràma Linn. A great number of the Irish lakes produce this fish. In Lough Erne they are particularly abundant.*

Leucíscus (Klein.) crythrophálmus Linn. Exceedingly common in the north of Ireland, where it is mistaken for the roach.

E'sox (Cuv.) Lúcius Linn. Common.

Belòne (Cuv.) vulgàris Flem. Common.

Scomberèsox (Lacép.) Sáurus Bl., Flem. This curious and rare fish appears to visit the coast of Ireland very seldom; for, notwithstanding all my enquiries about the natives of our coast, I was never able to procure a specimen, until one was caught near the Long Bridge, Belfast, and brought to me in 1820.

Sálmò Linn., Cuv.

Sàlar Linn. Common.

Trúttà Linn. Common.

Fàrio Linn. Common.

Sálmulus Ray. Not uncommon.

alpinus Don. Char. Lough Neagh. See Dubourdieu's *Antrim*, where this fish is figured and described by Mr. Templeton.—*W. T.* In a lake in the county Donegal, near Dunfanaghy, I observed some boys catching small char with lines and hooks, baited with common earth-worms. In Lough Neagh, however, where they are found in the greatest plenty, and of the largest size (sometimes reaching to the length of 15 in.), I have never heard of any being taken with a hook; and, indeed, in this lake the manners of these fish correspond exactly with those of the gilt char of Winandermere.† The Lough Neagh whiting (the name by which it is there known) is taken from the end of September to the middle of November. In

* The *Cobitis barbátula* is asserted by Drs. Brown and Rutty to be a native of Ireland; and Mr. Martin Kelly, it appears, has found it in the county Dublin.

† Brit. Zool.

Lough Esk, in the county Monaghan, I have known them caught agreeing exactly in their colour with those of Lough Neagh.
O'smerus (*Arted.*) *Eperlanus Flem.*, the smelt, is sometimes taken on our coasts in considerable abundance; but, often, several years intervene during which they are rarely to be met with.

Corrëgonus (*Cuv.*) Pollan * *Thomps.* Sub nomine "*Lavaretus*" in *Temp. MSS.*

Clupea Linn., Cuv.

Harëngus Linn. Native.

Spráttus Bl. They appear, during the autumnal months, in the bays, and as far up the rivers as the tide flows, in considerable quantities.

Pilchárdus Bl. Seems very local, being nearly confined to the south coast, especially about Cork, where the principal fishery is.

Gádus Linn.

Moórhua Linn. Plentiful.

Oëglefinus Linn. Common.

lúscus Linn. The first specimen of this fish was found in Belfast market, by Dr. M'Gee, March 20. 1812. A great number were taken by the Carrickfergus fishermen in the autumn of 1822.

Merlángus Cuv.

vulgáris Flem. Common.

Pollàchius Linn. Not uncommon.

carbonárius Linn. In every bay along the northern coast the young of this species are caught during the summer months. The mature, in the market, usually above 2 ft. long, are only bought by the poor.

Merlúccius (*Cuv.*) *vulgáris Flem.* Not uncommon.

Lòta (*Cuv.*) *Mólva Linn.* Very common.

Motëlla Cuv.

Mustëla Linn. The first specimen I met with was shown to me by Mr. M'Skimmin of Carrickfergus. Several have been met with since.

trícirrhatús Don. The largest specimen I have seen was in Belfast market, November, 1801, about 18 in. long: it is very rare.

Phýcis (*Artedi*) *furcátus Flem.* On the 24th of January, 1812, I found a specimen of this rare fish among haddock: it was one of the largest size, being about 20 in. long.

Platëssa Cuv.

vulgáris Flem. Extremely common.

flësus Flem. Common.

Limánda Flem. A rare fish in Ireland.

microcéphala Flem. The specimens which have been seen by me agree exactly with the figure and description of Pennant, but in no respect with that given by Donovan. It is rare on the coast.

Hippoglóssus (*Cuv.*) *vulgáris Flem.* This is generally taken on our coast on the hooks which are set for cod-fish, baited with the animal of *Búccinum undátum*; but they never appeared to be caught on the coast of Ireland in such abundance as to induce the establishment of a regular fishery.

Pleuronéctes Flem.

máximus Linn. Plentifully along the northern coast.

Rhómbus Linn. More common than the preceding; on the sandy banks all round the coast.

megástoma Don. Although not common, several specimens have been met with.

* See Mr. Thompson in *Proceedings of Zoological Society of London* for 1835, p. 77.

Sòlea (Cuv.) vulgàris Flem. Common.

Lepadogàster (Gouan) bimaculatus Flem. Two specimens found in a dredge, August, 1811.

Cyclopterus (Linn.) lúmpus Linn. Not very common.

Liparis (Artedi) Montaguì Don. Of this I found an individual adhering to a plant of *Fucus serratus* in a pool on the shore of Carrickfergus Bay, about two miles below the castle, on the 1st of April, 1807." (*Temp. MSS.*) This note appears at the foot of the page containing a drawing, made by the late Mr. Templeton, of the fish it alludes to, which was considered by him as distinct from *L. vulgàris*, though he had not determined its species. The drawing having been submitted to me by my friend Robert Templeton, Esq., I have no hesitation in considering it the *L. Montaguì*. — *W. Thompson. Belfast, Nov. 1836.*

Anguilla (Cuv.) acutirostris Yarr. is the common eel of the rivers about Belfast. From the observations I have been able to make, I am led to conclude that the eel deviates not from the mode by which fishes in general produce their young. Towards the month of October, both the milk and the roe may be found in eels; and why should it, therefore, be supposed that this spawn is not deposited as the spawn of other fishes?

. . . Great numbers of eels, inhabiting the shallow watery mud on the shore of Belfast Lough, were killed during a severe winter. . .

. . . Eels may be caught at all seasons in the fresh water, though not, perhaps, with a bait. On the 14th of January, 1803, the Lagan Canal, at Lambeg Bridge, having the water nearly run off, and ice half an inch thick, and perfectly transparent, covering the surface, I observed many eels, which had been disturbed by the falling of the water, moving about, both under the ice and when its breaking had uncovered the water: some were 2 ft. long, others 18 in., and many smaller. . . The largest eel I have known to be caught was got at a lough near Ballygowan, county Down. Judging from its skin, which I saw on the 5th of August, 1807, I think that this eel must have been about 5 ft. long.

. . . In the time of watering flax, I have often observed eels leave their watery residence, and run through the grass, in all probability in search of purer water. . . There are three varieties of the eel: one sharp-nosed, brownish yellow, with yellowish white belly; one blunt-nosed, black, with silvery white belly; and one more like the last, but differing from both, found occasionally in the Bann.

Conger Cuv. vulgàris. Common. Several years ago, a vessel was wrecked on the coast of Rathlin, laden with salt herrings. The congers ate voraciously of the salt fish, and great numbers died, and were washed on shore, after this unlucky feast, for several days.

Ophidium imberbe. The only specimen I have observed was thrown on the shore of Belfast Lough, near Whitehouse Point, on January 9. 1809. It was a large specimen, not less than 1 ft. long, and agreed so exactly with the figure in the *British Zoology*, and differed so much from that of Mr. Montagu (*Wern. Trans.*, p. 95. pl. 4. § 2.), that I am led to believe there are two distinct species, of which Pennant has described the one, and Montagu the other.

Ammodytes (Linn.) lancea Cuv. Inhabits all our sandy shores over which the tide flows with a swift current.

LOPHOBRA'NCHII.

Syngnathus Cuv.

A'cus Linn. Rather a scarce fish, although found on both the southern and northern extremities of the island. Seem to breed in spring, as those caught at that time have the ovaries exposed to view.

Sýngnathus bárbarus Linn., Penn. I have seen three specimens.
Ophídion Linn. Caught in Belfast Lough.

PLECTOGNA'THII.

Tétrodon (Linn.) *stellátus* Don. The only specimen I have known to be found on the shores of Ireland was seen on the Tramore Strand, county Waterford, by Dr. Gabriel Stokes; and it appears only two have been detected in England, so that this fish can hardly be considered a native of our seas.

Orthagoriscus (Schn.) *Mòla Flem.* A very doubtful native.

CARTILAGI'NEI.

ELEUTHEROPO'MI.

Accipénser (Linn.) *Stùrio* Linn. Occasionally, in the rivers of Ireland, a few are taken.

PLAGIO'STOMI.

Scýllium Cuv.

Cátulus Linn. Not uncommon.

stellàre Linn. Occasionally.

Carchàrias (Cuv.) *Vúlpes Gmel.** Rare on the coast, but occasionally seen about the Copeland Isles.

Lámna (Cuv.) *cornúbica Gmel., Don.* A specimen caught in Belfast Lough.

Gàleus (Cuv.) *vulgàris Flem.* A specimen, 5 ft. long, caught in Belfast Lough.

Mustélus (Cuv.) *læ'vis Will., Flem.* Sometimes caught in Carrickfergus Bay, by the fishermen, who denominate it stinkard, from its unpleasant effluvium.

Selàche (Cuv.) *máximus Linn.* Taken in considerable numbers off the coast of Cunnemara.

Spinax (Cuv.) *Acánthias Linn.* Eaten by the poorest fishermen, when other fish are scarce.

Squatina (Dum.) *Ángelus Cuv.* Often taken by the fishermen.

Torpèdo (Dum.) *vulgàris Flem.* First noticed by Dr. Smith as Irish. I have known of a few specimens caught since his time. (*Temp. MSS.*)

Ràia Cuv.

Bàtis Linn. Common.

rùbus Bl. Not uncommon in Belfast Lough.

clavàta Linn. In almost every sandy bay on our coast

Pastinàca Linn. Occasionally on the coast.

CYCLO'STOMI.

Petromýzon Linn.

marinus Linn. Found in many Irish rivers of 4 or 5 lb. weight.

fluviátilis Linn. Not plentiful in Irish rivers.

Ammocœ'tes (Dum.) *branchiàlis Flem.* An inhabitant of the rivulets of Ireland; often observed, about the month of May, in the small rivers about Belfast, on the gravelly fords, where five or six appear to unite their efforts to excavate a place wherein to deposit their eggs.

Myxine (Linn.) *glutinòsa Linn.* Has been found at Carrickfergus.

* *Squàlus glàucus* is asserted to be native by Drs. Brown and Rutty. None known to have been detected on the northern coast.

ART. III. *Illustrations of the Geology of the South-East of Dorsetshire.* By the Rev. W. B. CLARKE, A.M. F.G.S.

NO. 1. THE VERTICAL AND CURVED CHALK STRATA OF BALLARD HEAD, NEAR SWANWICH.

IT is well known to the geological student, that an elevated ridge of chalk runs through the peninsula of Purbeck, from the vicinity of Weymouth on the west, to the high land of Ballard Down on the east; and that, passing through the Isle of Wight, it finally makes its appearance on the coast of France, between Dieppe and Boulogne. It is interrupted at Ballard Head, the Needles, and Culver Cliff, by sections, which disclose either vertical or highly inclined strata, containing broken and fragmentary flints, embedded in hard compact chalk, of the nature of marble.

This ridge is evidently a portion of the Isle of Wight chalk basin, from which it has been separated by a crack, longitudinally produced, and thence upheaved by some vast action from below.

The junction of the vertical and other portions of the chalk basin are seen admirably displayed at Ballard Head under circumstances of extreme interest. Thence the chalk passes under the sea and the plastic clay series of the trough of Poole, making its appearance again between Wimborne and Hinton Martell, at the distance of from twelve to fifteen miles; whence, ranging past the British station of Badbury Camp, which forms a lofty eminence on the north of the Stour, the connexion is kept up with the western boundary of the basin at Blandford, and thence with the vicinity of Dorchester; occasional pits of chalk occurring at Lytchett, &c., on the south of the Stour. From Hinton Martell to Purbeck, the surface of the chalk appears to be excavated into such hollows as generally form the surface of that rock; but, from circumstances to be considered hereafter, it also appears that movements have taken place in this district as well as in the vertical Purbeck range, which have dislocated the overlying deposits of the plastic clay. It may suffice to mention, that the river Stour has found a passage at Blandford through the chalk, and that at Spetsbury and Sturminster it flows immediately at the foot of a cliff formed by a section of the chalk; and as, at the former place, there appears to be a series of gentle terraces, rising one above the other, in the chalk above the river, on the side of the hill from which the cliff is formed, as there is also at Arlett Mill, near Corfe Castle, it would seem that the chalk has been raised by successive impulses of elevation, and that in the strain consequent upon

them the transverse crack through which the Stour flows was formed. At Corfe Castle, the strain which raised Purbeck has also cracked the chalk in two places; and it is on the portion left between them that the castle is built; two small streams finding their way from Purbeck to Poole harbour, in the same way as the Stour flows through the chalk at Blandford. There are other indications of convulsion in the chalk, as exhibited in the pits at Sturminster, Lytchett, Hinton, Witchampton, &c. At the latter place, it is fractured into a variety of small angular pieces, and so completely saturated with ferruginous matter, that it partakes of the character of a soft yellow marl, as it does also near the junction of the chalk and plastic clay in Studland Bay.

From the presence of a bed of rolled siliceous pebbles, extending from one end of the Purbeck range to the other, and from the occurrence of the same at Hinton Martell, where there is a considerable accumulation of them, it would seem that the intermediate space formerly formed the bed of a gulf in the tertiary sea, the beach of which is indicated by these pebbles. It is probable that the summit of Badbury, and some other points of chalk, formed islands in that gulf; and these, together with the bottom of it, and all the accumulated deposits of sand and clay, &c., now forming the present surface of the plastic clay series, were elevated *en masse*; during which occurrence some portions of the chalk were heaved higher than others, lifting up and throwing down the superjacent tertiary beds on either side of certain lines, which are parallel to Purbeck, and which indicate, no less than the phenomena of the drainage of the whole country between Poole harbour and the river Avon (which enters the sea at Christchurch harbour, where the London clay deposit commences), that these minor derangements were produced by similar forces, acting similarly to those to which we are indebted for the interesting circumstances disclosed by the Purbeck range.

The line of strain appears to be, in all these cases, from east to west; and this strain, so acting, has necessarily induced, either, in its own longitudinal direction, a series of longitudinal fissures, such as those in which Poole harbour, Christchurch harbour, &c., have been excavated, and the feeding waters of drainage flow; or transverse cracks, of which two examples have been quoted at Corfe Castle and Blandford, and of which others may be found in the terminal sections forming the cliffs at Ballard Head, at the Needles, Culver Cliff, &c., and in the cracks in the Purbeck chalk at Three-

forked Down, and in the Isle of Wight, near Newport, and at Yabridge.

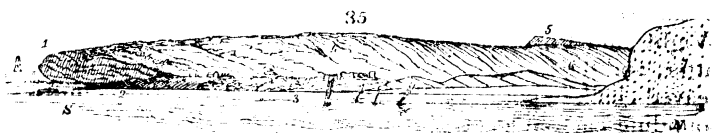
That such must have been the case is further evidenced by the circumstances of the Wealden formations thrust up from under the Purbeck chalk, and by which the chalk elevation has arisen; for the longitudinal and transverse cracks and fissures have taken place there, as well as in the chalk and plastic clay; and it would not be difficult to show, that the same longitudinal and transverse cracks occur not only in the Purbeck line at Dartmoor, Quantock, and in the Weald of Sussex, but in the Boulonnais, in Calvados, and Britany; in all which places the respective deposits of which those countries are formed have been elevated and fissured in the same directions as Purbeck and the Isle of Wight. Thus, the series is from the granite and slate of Dartmoor, through the slate and quartz rock of Calvados, Britany, &c., the transition rocks of the Quantock hills, to the mountain lime and oolites of the Boulonnais, the Wealden rocks of Sussex, the Isle of Wight, and Purbeck, to the chalk ridge traversing the two latter, and the tertiary beds that lie upon the edges of the upheaved chalk in both. So that, as we here see, in the countries bounding each side of the British Channel, the whole geological series has been subjected to the same process, and exhibits exactly similar results. Comparing the lines of coast also, the headlands and bays, the discharging rivers, and the valleys that on either side afford trough-like openings into the sea, such as the deep valleys of Charmouth, Sidmouth, &c., and the *chines* of the back of the Isle of Wight and of the coast from Poole to Christchurch (lines which equally correspond with the before-mentioned longitudinal and transverse cracks and fissures), it would seem that the Channel has resulted from a wide excavation, not deep as affects the sea, but very deep as affects the level of the land; caused by the action of the sea in the longitudinal line, assisted by the elevatory forces, and producing the transverse lines of coast, as those of Calvados, for instance; which lines extend across the Channel to similar coast-lines on the English side.

I have alluded to the valleys of the Char, Sid, &c., described by Dr. Buckland as diluvial (*Trans. Geol. Soc.*, N. S., vol. i. p. 97.), because, although there is no doubt that their excavation has been effected by the action of powerful currents of water hollowing out the successive beds downwards, still, as they occur in a north and south direction (the transverse direction of cracks elsewhere), it is almost certain that the original separation of the particles, or, at any rate, the direction of the waters that insinuated themselves between those parti-

cles, and finally tore away the solid masses themselves, and hurled them into the sea, was occasioned by the same general causes as have produced the results before alluded to, on so large a scale, and over so large a space. I shall have an opportunity, further on, of showing that the same agencies appear to have been at work in modifying the present surface of the highly varied and deeply excavated deposits of the plastic clay series in the vicinity of Poole and Christchurch.

In illustrating the particular phenomena presented by the section of the vertical chalk at Ballard Head, near Swanwich, it will be necessary to represent, by woodcuts, the general features of the locality. On approaching from the sea the eastern termination of Purbeck, the coast appears as represented in *figs. 35. and 36.*; the latter being merely a continuation of the former.

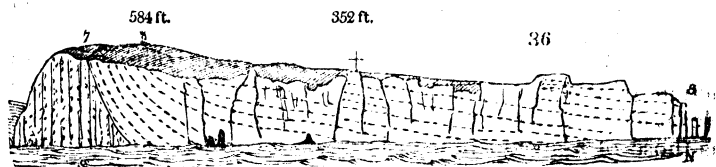
In *fig. 35.* the overhanging, dark, curved strata and breccia of Purbeck stone at Durlstone Head, the highly



Swanwich Bay.

- 1, Durlstone Head. 2, Peveril Point. 3, Swanwich town. 4, Quarries in the Purbeck strata. 5, Top of St. Aldhelm's Head. 6, Inclined cliffs of Hastings sand. 7, Vertical strata in cliffs of hard chalk, Ballard Head.

inclined red cliffs of Hastings sand in Swanwich Bay, and the commencement of the chalk cliffs ranging from Ballard Head, are sufficiently represented to show the order of succession and inclination of the separate formations. *Fig. 36.*



Chalk Cliffs from Ballard Head to Old Harry.

- 7, Junction of vertical and curved strata. 8, Old Harry Point.

represents the chalk from Ballard Head to Old Harry Point, forming the southern horn of Studland Bay.

It will be seen that the older formations rise from under each other at an angle continually increasing, till it becomes 90° under Ballard Down; and that at Ballard Head the vertical strata are in contact with curved strata; which latter gradually approach towards a horizontal direction, as repre-

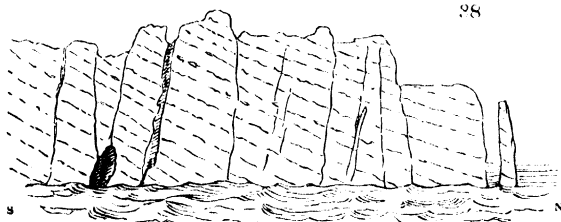
37



Junction of vertical and contorted Strata at Ballard Head.

The cliff is 352 ft. high ; the down, 584 ft.

sented in *fig. 37.* (taken from Mr. Webster's drawing in Sir H. Englefield's splendid work on the Isle of Wight); and in *fig. 38.*, which represents the inclination at Old Harry on a

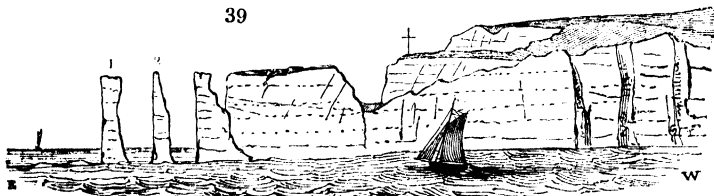


Inclination of Strata at Old Harry Rocks, 19° N.

larger scale, showing that the beds there dip under the sea at about 19° to the north ; so that the range of the curve from Ballard Head to Old Harry is about 71°. The cliff at Ballard Head is about 352 ft. ; at Old Harry, about 100 ft. high.

It will be seen, also, that the cliffs towards the north are buttressed, as it were, by a number of perpendicular masses, which the action of the sea and the atmosphere have worn out of the chalk ; and that at the extremity, as represented in *fig. 39.*, there are four insulated masses, two of which are

39



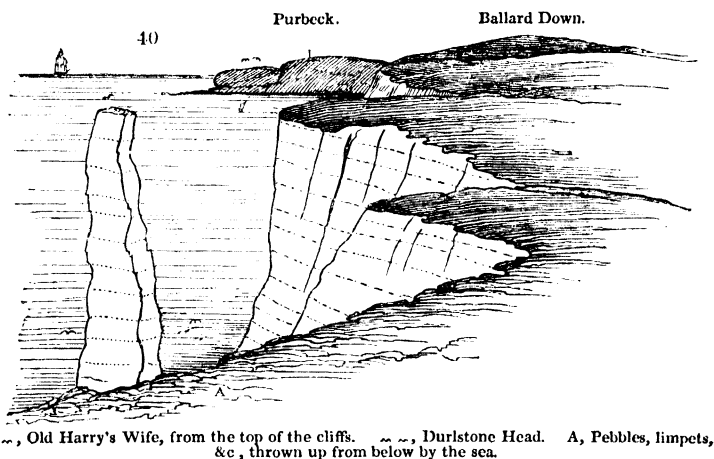
Old Harry Cliffs, Studland Bay, from the North.

1, Old Harry. 2, Old Harry's Wife.

designated the Pinnacles, or, in a nautical phrase, Old Harry and his Wife. The elemental agencies have nearly produced

two other and larger pinnacles, which cannot remain many years uncompleted. The beds in Studland Bay appear nearly horizontal, which they must do, being merely the ends of those which are along the eastern section, represented as curved; but it will instantly occur, that these horizontal beds, in the upper part of the cliffs, are the remains of beds whose continuation on the top of the down has been partly destroyed. It is also clear that the termination of the beds in junction with the vertical ones does not appear in Studland Bay.

To give some idea of the appearance of the Pinnacles from the top of the down, we give the woodcut *fig. 40.*, which

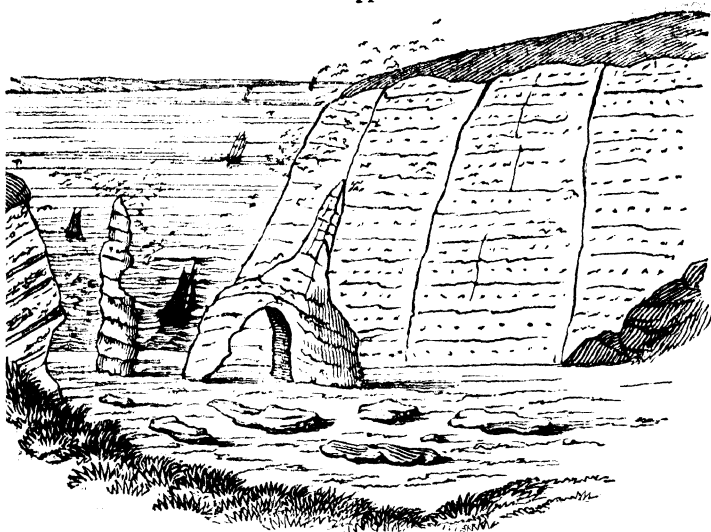


points out the projection of Durlstone Head beyond the softer beds of Hastings sand in the cliffs of Swanwich Bay.

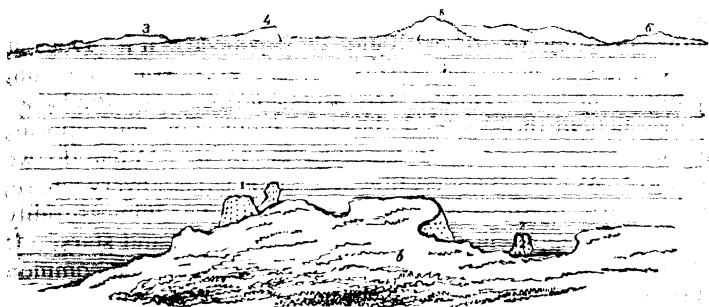
The tendency of the chalk to form insulated masses, when exposed to the sea; is further illustrated by *fig. 41.*, which represents a sketch of two similar pinnacles off Flamborough Head, taken by me in 1823, and which are there called the King and Queen Rocks.

Similar examples occur off the Dorset and Devon coasts, near White Nose, and off the French coast, between Dieppe and Havre.

Fig. 42. represents the appearance of the Old Harry Rocks from the very extremity of the cliff of the mainland, and the position of the Needles in the Isle of Wight directly opposite, at the distance of sixteen miles. The action of the sea upon these insulated pillars, and on the whole of the chalky cliffs, is continually changing their size and shape, and modifying the surface. It is not improbable that the effects

*The King and Queen Rocks at Flamborough Head.*

of the violent gales of wind which now prevail in these latitudes, and the rush of water in the tideway, will, before

*Extremity of Old Harry Cliffs.*

- 1, Old Harry. 2, Old Harry's Wife. 3, Hampshire and Dorset coast. 4, Christchurch Head. 5, Needle Cliffs, Isle of Wight. 6, St. Catharine's Down.

many years, produce considerable alterations, and such as may be directly appreciated by the geologist; for, in proportion as the chalk barrier crumbles away, and the fragments are removed by the waves at its base, the flow of the tide will be in some degree altered, and accumulations and removal of sands, now spread along the entrance to Poole harbour, will take place. Some instances will be quoted further on. At present, I will only add, that so violent is the force of water

occasionally beating against these cliffs, that, in September, 1832, I found limpets and pebbles on the top of the cliff at *a*, in *fig.* 40., which had been thrown up in the spray of the sea from the bottom!

(To be continued.)

ART. IV. On Nomenclature. By ZETETES.

IF we could find a reason for every name, that reason would involve an explanation of every thing named; at least, as far as the knowledge of the thing existed in the mind of the user of the name.

Very few names of things apply to any single thing, or single object of thought: sky, air, water, land, sea, space, fire, life, death, — each of these names stands for an object contemplated, by millions of animated beings, under very different relations.* A definition of each name ought to describe the prominent characters of the thing named, and especially that by which the thing may be distinguished from every other.

Let us try the name “sky.” It is defined by Dr. Johnson, “The region which surrounds the earth, above the atmosphere.” What do we know of this region? Are we acquainted with it by any of our senses? Could the blind know anything of it, or could they conceive it? Does it present to our sight any objects whatsoever? When the sun, or moon, or stars, shine clear, and there are no clouds, we say we behold the sky, and the sun, moon, and stars appear, at successive portions of time, to be in it. What do we behold? Wide expanded blueness or blackness every where, in all parts of the earth and sea, above us, immeasurably distant, the apparent place of sun, and moon, and stars. If all nations were possessed only of one language, what common idea or notion would all attach to the word sky, — that portion of the aggregate of the objects of sense which is always and every where above us; above all, to which we can ascend?

* These words are used by poets in the plural, as well as in the singular, number, according to their convenience.

“To him whose temple is all space;
Whose altar earth, sea, skies.” POPE.

“Cœli convexa.” — VIRG. *Æneid*, iv. 451.

“Secat æthera.” — *Georg.* i. 406.

“Maria omnia.” — *Æneid*. i. 36.

Heavens, for heaven, occurs often in the Psalms. “The earth shook, and the heavens dropped.” — Ps. lxxviii. v. 5. “The Heavens declare,” — Ps. xix., &c.

The word sky is sometimes used for heaven ; a name, likewise, of various meaning ; sometimes for air, and for climate ; but the name itself suggests no relation to the *senses of those who view it*. The boundless-blue-above, or the sun-moon-and-stars-place, would be compound names, suggesting their definitive objects. No inconvenience, however, arises from the indefiniteness and inexpressiveness of names of things constantly before us. An elevation of the eyes, and a pointing finger, teach a child or a stranger the meaning of the word sky, as well as a definition. But names of things, which can rarely or never be submitted to the senses, are useless, unless they express some relations to other names which are more familiar. If a traveller tells of his delight in procuring Hoffmannàna, or Villàrsia, or Borreriàna, he adds to Villàrsia a synonyme, Menyánthes nymphæöides ; and, if he is previously known to be talking of water plants, he may thus be understood by a botanist : so he adds Sàlix to Hoffmannàna, to show that he means, 1. a plant ; 2. a species of willow ; 3. possessing a character noticed by Hoffmann, &c. The name Rafflèsia Arnóldi expresses no relation to plants, or to tribe, or division, or family, or class, or genus, or species. It is not, like John or Thomas, the name of an individual of a *known* genus. When first discovered, it was a mere individual. Other species have been since described,—Fátma and Brugmánsia. It may be well, to do honour to discoverers, to add their names after significant names in catalogues of plants ; but, if it be desirable that language should be readily and clearly understood, it is certainly desirable that names should, as far as possible, suggest the kind or class of things to which their objects have most resemblance or affinity. Ranúnculus is the familiar name of a genus of plants, or of many plants, agreeing in almost all properties which are not found to vary by mere change of soil or temperature. Of these, however, there are many species, all of which agree in some important characteristic or characteristics of the genus by which it is distinguished from other genera. All so agreeing may be called Píántæ Ranunculàcææ ; but what common property connects larkspur, columbine, or monk's-hood with Ranúnculus ? None distinguishable before the formation of the seed-vessel. Then, indeed, it appears that these plants agree *in this* ; viz. that their ovaria are either in more than one row ; or, if solitary, then the stamens are *opposite* to the petals. These characters connect together in classification plants widely dissimilar in trunk, and leaf, and blossom, and exterior form of seed-vessel, and in general habits of growth, &c. Yet

they agree in one peculiarity of seed-vessel; but with an exception, dependent on the relative position of stamina and petals.

Linnæus, who died at the age of seventy-one, did not live long enough to complete an arrangement which should embrace all possible divisions or affinities; but he directed the attention of his pupils to this object. He laboured to effect it; but life was too short for such extent of investigation and description. He gave a scheme of easy reference, which is not opposed to that of Jussieu or De Candolle, but rather an easy and pleasing preface or index to their more extended enquiries. Linnæus, primarily looking to the first natal appearance of plants, divides them according to their manifestation, or non-manifestation, of cotyledons. Some are monocotyledonous, &c. This division is the second of De Candolle's, who founds his first division upon an anatomical and microscopical distinction, which merely points out a peculiarity in the acotyledonous plants, not found in the other two primary divisions. Microscopic investigators may discover cellulæ to be only peculiar forms of vascula, and prove that no difference can be shown which can warrant a definition of one which will not apply to the other.

Linnæus having divided vegetables into three tribes from these primary differential characters, proposes a rather fanciful division of his tribes into races, according to their importance to the well-being of the animated world. He places the Monocotyledons foremost; instancing, 1. the Palms, as princes among plants, as dignified in loftiness, and beauty, and usefulness, chiefly to man, in every portion of their structure and composition; 2. the Grámina, yielding food not only to man, but to beasts of the field, birds of the air, insects, &c., to all, either directly or indirectly, as supplying food to the graminivorous, which yield food to the carnivorous (these he calls plebeians); 3. the Lília, whom he calls patricians, or gentry, as being dignified in beauty, often salutary, but not equally subservient to ordinary uses. He divides his Dicotyledons in like manner: 1. Prôceres, chieftain forest and fruit trees; 2. Militâres, thorn-bearers, &c.; 3. Nóbiles, gentry, almost all flowers.

He left, however, an outline of natural arrangement, which was published, after his death, by his son. His plan he is said to have communicated to De Jussieu, who greatly enlarged and improved it, as De Candolle has done since. But the system of arrangement by seed-vessels groups together plants which differ in almost every other respect, at least as arbitrarily or artificially as the system which arranges them

by stamina and pistilla. Both point out real natural distinctions; the characters of both ought to be stated in a description of a new plant; but neither will serve as an index or mark of affinity, or exact similarity and agreement in most other respects. For example, all the British Ranunculaceæ belong to the Linnæan class Polyándria. They differ in their number of pistilla, and are placed, accordingly, in different subclasses or orders. All agree, indeed, in yielding a more or less acrid juice, but differ remarkably in their modes of growth; as larkspur and Clématis, in their form of leaves and of corollas; and their localities, as larkspur and Cáltha, or marsh marigold. The arrangements of De Jussieu and De Candolle, in their numerous subdivisions, exhibit in fuller detail the peculiarities of orders and genera and species than that of Linnæus, and, therefore, have much extended botanical knowledge. The object, however, of this essay is not to enquire into the general merits of each, but, with a much more humble aim, to consider whether the latter might not be improved by the adoption of names for all groups or divisions of classes expressive of the differential or distinctive character of each division.

The first division of dicotyledonous plants is called Dichlamýdeæ. Perhaps *Dichlamydata* would be more correct. The name duly suggests the presence of both calyx and corolla.

Of these there are two sections, clearly expressed by the names polypetalous and monopetalous.

Subsection 1. Some of the polypetalous have stamens hypogynous, and ovaria more than one.

Subsection 2. Some have but one ovarium to each blossom.

To subsection 1. belong some which possess stamens indefinite in number, which might be named order, or genus, polyandrous or multistaminous. Some have stamina limited in number, or make an oligandrous or paucistaminous order, having many or few stamens. To the first belong the genus *Ranúnculus*, &c.; to the second, in *English Botany*, the genus *Bérberis* and genus *Epimèdium*.

The specific name is like the patronymic name of a family. The generic name suggests either the position in society, as nobleman, labourer, lawyer, &c.; or the local connexion, as Swedish, English, or a name of wider comprehension, or more strict definition; adding some farther description, as Linnæus, or Charles von Linné, Knight of Sweden, Universal Naturalist; or Edward Smith, F.R.S., London Botanist.

To name an order, or any other division, from the trivial

name of any one individual or family which may be included in such division, resembles the distinction of a company or regiment, by the name of any individual in such division of a brigade or army, which may be composed of troops of different nations, and may be generally considered as containing horse and foot; light infantry, artillery, &c. descriptive names of military classes, orders, genera, &c.

It will occur to those accustomed to think on the connexion of words with ideas, that all, or nearly all, noun substantives, or names of things (viz. of all objects of the senses or of consciousness), are generic names, including in their extent of applicability and relation many species, the specific names of which add, or should add, to the generic name an adjective, or word expressive of a difference between the relative parts of the genus, and designating the species to which the generic name, duly defined, will be found to extend, e. g. the generic name horse, includes cart-horse, race-horse, Arabian horse. *E'quus* among naturalists includes *E'quus Hemionus* or *Dshiggety*, Ass or *E'quus A'sinus*, E. *Zèbra*, and E. *Quágga*, as well as *E'quus Cabállus*.

Sometimes a familiar name is added instead of a descriptive adjective, as in the above instances, and that of the well known genus *Fèlis*. The lion is *Fèlis Lèo*, the tiger *Fèlis Tigris*, the domestic cat, *Fèlis Cattu*: and but some species of *Fèlis* are distinguished by adjectives, as *Fèlis jubàta*, *Fèlis minùta*, &c.

The name of a genus implies both relation of agreement and of diversity; for without both no distinction between genus and species can be conceived. If a country be imagined where there should be only one kind of tree, one kind of herb, one of beast, one of bird, &c. generic or specific names would not be there devised. A plant or animal which seems to have no resemblance in the most important characteristics to any known individual of any genus or species, as the first discovered *Ornithorhynchus*, or *Rafflèsia Arnoldi*, receives from the discoverer a proper or individual name, peculiar to itself. An *Ornithorhynchus* which should differ from that singular family of animals only in having a beak like a hawk, instead of a beak like a duck, would be a new species. *Ornithorhynchus* would be the generic name, the specific name of the first would be *anatiróstris*, of the second *falconiróstris*, &c.* But

* Du Cange, verbo *Falco*.

Julius Firmicus seems to have been the first user of this word, lib. v. c. 7. *Capitula Caroli Magni*, A. D. 769. "Omnibus servis Dei interdiximus ut venationes et accipitres et *Falcones* non habeant." Here it applies to hawks trained for sport.

Ornithorhynchus being a descriptive name would conveniently apply to, and serve to suggest either species. The discoverer of a plant in all respects similar to the *Rafflèsia*, except in the possession of a tall branching stem, might call it *Rafflèsia erécta*, or *racemòsa*, but the name *Rafflèsia* could not aptly apply to or suggest both species. Two nearly allied plants have, in fact, been found.

Several naturalists have set down in their systems *Dìdus*, or *Dronté*, or *Dodo*, as a genus of the order *Gallinæ*. One devises a new order, *Inértes*, of which he reckons it as a genus. Cuvier rejects it from his arrangement as a lost family of which no individual, and of course no species or genus or order, is known now to exist.

The term species is distinguished from its relative genus, by suggesting a single peculiarity in which the object or objects called a species differ from some other species, with which there is a perfect agreement in all other respects. To speak of a genus with but one species is therefore an absurdity.

The first finder of *Ornithorhynchus* might have given this name to the single animal or brood. The name would have no reference to the notion of species or of genus. But when another brood was found similar in all respects excepting only one permanent peculiarity or difference, then a term expressive of the two points of difference would designate species; a term expressive of the general agreement of the two species would designate genus. Order and class are merely more extended genera, genus being to order in the same relation as species to genus; class is a name for a higher, kingdom a name for the highest genus.

Now, very many names have become generic, which were probably once applied only to an individual or species. A little shell-covered quadruped, quite new to a European eye, was called by a Spaniard *Armadillo*. Its body was covered with a dozen scaly bands. A similar animal was afterwards found with fewer bands, another with one band, &c. each scaly quadruped with a slight but permanent difference was distinguished by a peculiar local name which now designates a species. The name *Armadillo* thus became a title common to all so covered with scales. The name has been since discarded, and others successively substituted, as *Dásypus* *Linn.* (an inconvenient name, because it had been in Greek writers given already to a hare and rabbit); *Cataphráctus* (covered with armour) *Brisson*; *Tatùsia* (from a Brazilian name *Tatu*) *Cuvier*.

In a perfect arrangement the name of the genus or first group beginning from species or family, should express the

particular circumstance in which the several species agree. An adjective attending each name of species should express the difference of one species from another.

But familiarity with names of the species first known has caused the retention of such names to designate genera; and hence perhaps has arisen the practice of selecting an individual or a species as a *type*, or generic term or standard, by reference to which the difference of others from the *type* may be discovered. The name does not in this case indicate the thing sought, but the mode of finding it.

To expect so great a revolution in scientific nomenclature, as a universal substitution of descriptive for trivial names of genera, would be vain; but for higher divisions, for genera of genera, orders, and classes, it may be expected that such fitting of names to meanings may be adopted, as science advances towards completion, e. g., Mammàlia, order Pinnàta, instead of Cetàcea. Illiger makes two families of the order Natántia: Fam. 1., Sirènia, mermen or maids, with three genera, Mánatus, Halícore, and Rytína. Fam. 2., Cète, six genera. It is not of much importance to settle the question, whether genus or families be the better designation of the larger or smaller division. In speaking of social distribution, we should certainly regard the species as more extended than a family, the latter term implying the least division of society. Perhaps Spiraculo-caréntia would be preferable to Sirènia: and Spiraculifera to Cète: or Unguiàta and Exunguiàta might express another decisive distinction.

The want of some generally admitted rule for the adaptation of names, to various divisions above species, is obvious, from this circumstance, that hardly any two naturalists divide or name their objects, on the same plan; while descriptions are overladen with synonymes.

Perhaps the British Association, which has met during the two last years at Dublin and at Bristol, may be induced to attempt the establishment of a few plain laws, and the rectification of nomenclature on such a foundation.

Illiger lays down from Linnæus, in the introduction to his *Prodromus*, some rules of good general application. His division is into orders, families, genera, and species. He states thus:—

In distinguishing families I have preferred Latin easy names to Greek, which are, to the generality, more difficult. Yet, the first family of order Bisúlca is named Tylópoda! Many readers of Greek may have never met with the word *τυλα*, or *τυλη*, or *τυλος*, a callus or callosity. The first family

of order Prensiculántia is named Macrópoda. Families of Volitántia are named, 1. Dermóptera, 2. Chiróptera.

2. No one in his senses will adopt primitive or local names (as being barbarous, and conveying no meaning even to those who are generally learned) for generic distinctions. Yet he retains Tàpir Tapirus, Càvia, and Mànis; the latter word, if of Greek derivation, should be Mànìax or Manìakes, twisted or involved as a necklace or bracelet. The name may, perhaps, have, as well as Pángolin, an African or East Indian origin.

3. Generic names, not derived from the Greek and Latin languages, are to be rejected. Yet see the note above. His genera have all Greek names.

4. Hybrid names, composed partly of Greek and partly of Latin terms, should not be admitted; as Hydro-Gallina, and formerly Monóculus.

5. It is generally convenient to adopt one alphabet, and give Latin orthography; even in names of Greek origin, as Chìromys, &c.

6. Names composed of maimed words, or where half of one word is tacked to another preserved entire, are to be rejected: as Gallo-pàvo (*Brisson*); Melúrsus (*Meyer*), a badger-like bear, called by Shaw Brádypus ursinus, in *Manuel de Mammalogie* U'rsus labiàtus.

7. A generic name is a bad one, which merely adds a syllable to another generic or specific name, or takes away a syllable in the like manner: as Antilo-càpra, Antilochèvre *Blainville*, Peramèles (probably from *pera*, a pouch, quasi, peratus, or peram gerens; and *meles*, Lat., a badger), Promèrops (*merops* Gr., with divided mouth; *pro*, *præ*, before or beyond others), Túrnix (slightly distinguished from Cotúrnix the Latin specific name for the quail of Europe), the Co being removed without any etymological authority.

8. Generic names are to be condemned which are composed of other generic names with arbitrary change of the last syllable of either; as Balænoptera, for Balæna and aptera (wanting the dorsal fin); Delphinápterus, non pinnatus Delphinus; Picathártès, Pica and Cathartes, a species of vulture.

9. Names with terminations in oïdes should be discarded. They refer to general undefined similitude, which may not be apparent to all observers; and the names commonly begin with one language and end with another, e. g., Pelicanoïdes, Picoïdes, Talpoïdes.

10. Where one and the same generic name shall be found

to have been given to two different genera, it must be excluded from one.

11. Generic names, already occupied by ichthyologists, entomologists, or botanists, &c., should be left in their prior possession, as, 1, *Arenària*; 2, *Dìodon*; 3, *Ichneúmon*; 4, *Myrmecóphaga*; 5, *Pìca*; 6, *Táxus*. 1, a plant and a bird; 2, a whale, a sunfish, and a shell; 3, a beast and an insect; 4, a beast and an insect; 5, *Pika* a beast, *Pica* a bird; 6, a beast and a plant.

12. It seems scarcely necessary to suggest the rejection of manifestly inappropriate names, as *Echídna*, Greek for a viper, given to the Porcupine anteater: *Cèbus*, the name of a species of monkey, should not be both genus and species. *Molóssus*, a species or variety of dog, has been given to a bat.

13. Generic names, common to anatomists or physicians, to pharmacy, chemistry, manufactures, agriculture, or the detail of common life, should be avoided and discarded; as *Arvícola*, *Cárloo*, *Catarrháctes*, *Cochleàrius*, *Fregátta*, *Ic-terus*, *Lòtor*, *Saxícola*, *Secretàrius*, *Serpentàrius*, *Spéctrum*, *Stercoràrius*. He therefore substitutes *Hypudæus* (*ὑπουδαίος*, subterraneous) for *Mús arvàlis* of Linnæus, and *Arvícola* of La Cèpede.

14. Substantives are preferable to adjectives for generic denominations. The correctness of this aphorism is at least doubtful: 1st, because the relation of any word to another, to a proposition, or a sentence, makes the same word, sometimes, an adjective, sometimes a substantive; e. g. *Flaminia* is a proper name, *Via Flaminia*, a Roman highway; *Fèlis*, applied to *Lèo*, is used elliptically for *felinus*, or *generis felini*; or, in correspondence with Mr. Vigers's arrangement, *Lèo* would be of the family *Félidæ*. Now, though the name is of Latin origin and the termination Greek, yet the plural termination marks a reference to a plural substantive. Take, for example, family *Fringillidæ*; tribe *Coniróstres*; order *Insessòres*; class *À ves*. Secondly, because it is obviously convenient that the generic name should express, if possible, the generic characteristic: allowing exceptions in favour of very familiar names, as horse, dog, cat, camel, *E`quus*, *Cànis*, *Fèlis*, *Camèlus*. Thirdly, because it is not easy to guess why some modern names, should be feminine, as *Auchènia* for a genus allied to *Camèlus*, of the family *Tylópoda*; and others masculine, as *Rhinólophus* and *Phyllóstomus*, two genera of Illiger's order *Volitántia*, family *Chiróptera*. Illiger instances the words *Caudivólvlus* (to which there may be objection, because it is indefinite, as applicable to several very different animals),

Hians, Mellívora, Sétifer, Vaginàlis, Baleárica; all equally applicable to different animals, and good epithets to discriminate species.

15. Names of extravagant length, of harsh and difficult pronunciation, or otherwise odious, from offensive association of ideas, should, as far as possible, be avoided. E. g. Hyperòodon, pestle or pounding-tooth; Phalacró-corax, bald-crow; Lonchères, a species of porcupine (the unlearned are entrapped into mispronunciation of this name, and many others, as Trichechus, from *τριξ* and *εχω*, to have hair, or bristles above the mouth); Hypsiprýmnus, high-rump; Dasyprócta, hirsute or shaggy-rump; Mephites, a word said by Scaliger to be of Etruscan origin, and to signify the deity of foul and stinking air; the term, however, is characteristic of the polecat. There is more objection to some botanical names which I will not enumerate, and some to nicknames; as Mórmon, from *μορμων*, a mask, goblin, or scarecrow.

16. The names of art should not be given to genera, viz. names by which a painter or sculptor would describe the objects; as A`pus, without feet, or Mícropus, because they are small. This rule has several other instances, to all of which I would apply the concluding remark in No. 14.

17. Names of genera to which all or any of the species are contradictory are to be rejected; as Mónodon monóceros, for the narwhal has two tusks, and so has ancýlodon (curved tooth) or the Mónodon spùrius *Fabricii*. The name A`pus is also contrary to fact.*

18. Names devised in behalf of a particular theory tend to bias the judgment and preclude investigation.

19. I will only add, it is desirable for the sake of the greater number of readers, that naturalists would generally give the etymon or origin of names not very familiar, whether single or compound, belonging to species or to genera; and note likewise the accentuation or length of syllables, especially, the penultimate. A vocabulary of zoological, botanical, mineralogical, and chemical names, so explained, would much benefit students. The Rev. J. Burrows has duly observed this rule in his *Elements of Conchology*. Illiger applies it to the names derived from the Greek introduced by himself. In the very interesting entomology of Kirby and Spence is a letter styled Orismology or explanation of terms of the science, which, however, does not include names of genera and species.

19. Finally: it would be useful to adopt some rule for the

* Also anátifera, as the Lèpas does not produce ducks. Dìpus and Didélphys are liable to similar censure.

uniform orthography and pronunciation of words derived from the Greek and Latin languages, and proposed for naturalisation into our own. We sometimes borrow directly from the ancient languages; sometimes through a French medium; sometimes adopt anomalous transmutations of words. The word chronology is from the Greek; but the final *y* is a substitute for the French *ie*, which displaces the Greek *ia*. The French, indeed, substitute their *e* mute for the Greek *ος* and the Latin *us* and *ius*: as in Chrysostome which we write Chrysostom; and Tite Live, which we change to Livy. What shall we say of oxigene and hidrogene? are they not abbreviations of oxygenetes and hydrogenetes, or οξεογενετης and υδρογενετης, or υδατογενετης, generators of acid and of water? But *gene* or *gion* might stand for geneion, a beard or chin; or for γεντα, viscera. In the word deut-oxid, *deut* stands for deuterios; but might as well stand for deutatos *the last*, or for δευτε, *come hither*. Students of geology are puzzled with the new words Eocene, Miocene, and Pliocene. Why should not Mio and Plio be spelled Meio and Pleio, as in Greek, and cene be spelled cæne, from καινος, new. The French write cenobites for cœnobites. So *cene* represents καινος and κοινος, the new and the common. To avoid such confusion it seems desirable to adopt this rule, viz., —

That words borrowed from the Greek and Latin languages should retain their original forms; or be compounded in strict analogy with precedents found in those languages.

[Although, in the present condition of science, no immediate benefit may result from the publication of articles discussing the principles which ought to regulate nomenclature, yet if ever a total revision be undertaken by general consent, some valuable hints may be gathered from the perusal of the preceding, and other papers of a similar character. — *Ed.*]

ART. V. *Additional Remarks on Mr. Stutchbury's proposed Genus, Cypræcássis.* By G. B. SOWERBY, Esq., F.L.S.

IN my observations on Mr. Samuel Stutchbury's proposed new genus *Cypræcássis*, published by you lately, I purposely avoided saying any thing about the construction of the name, although I considered it faulty. I thought it advisable to ask the opinion of a classical friend. He tells me that *Cypræcássis* is a *vicious* formation, and adds that the terminal *a* of *Cypræa* should not have been elided, and therefore if the genus had been named *Cypræacássis*, such name ought not to give offence to a purely classical ear.

I have since met with a specimen, the *only perfect one* I ever saw, of *C. rufa*, having *some remains* of epidermis; for it is only partially covered with it, still it is quite sufficient to prove that, although unobserved by Mr. S. Stutchbury, the shell is not destitute of epidermis in its natural state; the epidermis is, however, very thin, and remains only in those parts that are least exposed to external accident. In the same collection there are also *two* specimens, in a young state, of *Cassis rufa*, which show very distinct *external* varices; not so strongly marked as at the adult period, but nevertheless sufficiently so to be *properly* termed *varices*: in one instance, being accompanied by a row of teeth *within* the lip; in the other, without such a mark.

An opportunity occurred to me lately of inspecting a collection of shells, in which there are seven or eight specimens of *C. coarctata*, several of which have formed three or four *varices*, all as distinct as those formed by this species in its adult state.

After making these trifling additions, it was my purpose to have concluded my observations upon this subject. It appears, however, to be my duty to add the positive declaration that the observations I have made are merely the statement of facts which can at all times be proved by the production of the specimens cited, and not in any manner or degree the effect of personal feeling; for as regards Mr. Stutchbury, I entertain no personal feeling whatever, save that of respect. I consider myself obliged to make this declaration because *two* persons have expressed to me the opinion that my observations had the appearance of having been elicited by *personally irritated feeling*.

I have now only to add, by way of recapitulation, that the characters upon which Mr. S. Stutchbury endeavours to establish his genus *Cypræcassis*, are found to be insufficient. Does he depend upon the absence of epidermis? — his typical species is proved to have an epidermis. Is he more inclined to consider his genus as established upon the character of its never forming varices except at its adult state? — three of his species, including the typical one, are shown frequently to form varices, or what is equivalent to varices. Or is he satisfied that his genus is distinct because it has not an operculum? — an instance is given of the existence of an operculum in at least *one* of his species. I assume not to myself to say that Mr. Stutchbury's genus cannot, or may not eventually be established; but I may say that if ever it be, it must be by other characters than those he has pointed to.

July 20. 1837.

MISCELLANEOUS INTELLIGENCE.

ART. I. *Short Communications, Extracts, &c.*

SOUTH African Museum.—The zoological collection formed during the late exploring expedition into central Africa, to which we directed the attention of our readers in a recent Number, is now open to the public, at the Egyptian Hall, Piccadilly, under the title of the South African Museum; and we take this opportunity of again appealing on behalf of the objects to which the fund is to be applied, that it is hoped may be raised by the present exhibition. An opportunity has perhaps never been presented in which so much might be effected by a little exertion on the part of those who feel interested in extending our knowledge of the unexplored portions of Africa, as in the present instance. A few hundred pounds is all that the Association at Cape Town requires, so as to enable them again to send out the same parties, by whose exertions so much has been already achieved, and who are impatient a second time to embark on this field of discovery, notwithstanding the dangers with which the enterprise is necessarily beset.

There surely must be resident in this metropolis 500 individuals fully capable of estimating the important results attached to expeditions of this nature, and who would willingly lend their aid in seconding the efforts of the Association at Cape Town. Now, if each of these 500 could only induce 8 or 10 friends to visit the collection, the sum received in this way, in addition to the amount arising from casual visitors, would afford all the means required. The colonists at the Cape have raised among themselves 1000*l.*; and though the whole of this has been expended, yet a considerable portion of it will be refunded by the sale of the collection, thus furnishing perhaps nearly half the means for defraying the expenses attendant upon a second expedition.

If it be desirable at all to penetrate still farther into the interior of Africa, the advantages must be apparent to every one of sending out an expedition at a time when it can be conducted by parties who are familiar with the country, and with the precise nature of the difficulties to be surmounted in their route up to a certain point, and with whom, therefore, the probabilities of success must be immeasurably greater than if undertaken under a less favourable combination of circumstances.

Most deeply shall we regret it if a society fall to the ground which has commenced its career so prosperously and promises so fairly, for the want of a sum which appears paltry when

compared with the object to be obtained, and which could be so readily raised by a little activity on the part of the friends of science in this country.* — *Ed.*

Additions to the Menagerie of the Zoological Society. — The Zoological Society has just been presented by the Hon. Sir Frederic Adam with a fine tiger, and one of the immense Indian land tortoises, *Testudo indicus Shaw*, both of which were safely transported from the docks to the Regent's Park, on Saturday last. The collection of the larger Carnívora now at the Regent's Park, of the feline tribe, includes three tigers, one lion, five leopards, and four pumas. Within the last few days a female rhinoceros has been placed in the gardens, an extremely fine young animal, though not more than half the size of the male, which has been several years in the Society's possession, and is now attaining enormous dimensions. This we believe is the first instance on record of a pair of rhinoceroses (male and female) having been exhibited in Europe. — *Ed.*

Robbery of an Armadillo at the Zoological Gardens. — The attempt lately made by one of the visitors to purloin an armadillo from the collection of the Zoological Society, Regent's Park, noticed in the police reports of the London papers, is so unprecedented an occurrence that we are induced to advert to it, principally for the purpose of expressing our decided opinion of the insanity of the convicted party. The individual who committed the theft, having captured the animal, which must have been no very easy matter, instead of going out of the gardens through one of the turnstile-gates, and conveying the prize to his chaise, returned to the public entrance, and actually applied for a whip which he had left in charge of the gate-keeper, carrying his hat in his hand, with the armadillo in it, secured by his handkerchief spread over the opening. Under these circumstances, to escape detection was all but impossible. We think the bench of magistrates were perfectly right in the penalty of 10*l.* which they imposed for the offence; because the public should be protected from persons whether sane or insane, who have a *penchant* for pilfering, and we merely allude to the occurrence from a feeling of justice towards the accused party, and to remove the impression

* Since writing the above, we had an opportunity of conversing with one of the party, an officer of the 92d regiment, who accompanied Dr. Smith, and who, upon an alarm being given that a lion had attacked the camp, incautiously placed his right hand over the muzzle of a loaded gun, which exploded, sending a two-ounce ball directly through the palm of the hand, carrying away a great part of two metacarpal bones. This severe accident, however, does not appear in the least to have damped his ardour. — *Ed.*

that any one should have visited the gardens with a premeditated intention of stealing the animals. — *Ed.*

Capture of an immense Specimen of the Blue Skate (Raia Bâtis Linn.).—Captain Herreman, commander of the fishing sloop Eliza, coming from the cod fishery off Ferroe, has brought ashore here, in a live state, a monstrous ray, 8 ft. 8 in. in length from the head to the end of the tail, and 6 ft. 2 in. in width; its thickness is 13 in.; its mouth, furnished with 8 rows of teeth, displays an opening of $6\frac{1}{4}$ in. No one in the town has ever seen one so gigantic; it was exposed to the view of the public, and attracted many observers.

From the specific marks that we have been able to recognise in this animal, we think that we may refer its species to the *Raia Bâtis*; although its characters are, in a great measure common to the *Raia oxyrhynchus* (Alène), its single row of spines upon the tail has decided us in favour of the *Raia Bâtis*, a ray which is found in the seas of Europe, and is frequently taken in fishing in the Mediterranean, where it is known under the names of Flossade, Coliard, Sea Cow, and Couverture; it is also known under the name of the *Raie cendrée*.

The owner of this fish has assured us, that it weighs 192 kilogrammes [423 lb. 6 oz.]; the greatest weight cited by the naturalist Rose, in the article Ray of the new *Dictionary of Natural History*, is of the species *Bâtis*, and is only 200 livres [220 lb. 8 oz. 2 dr.]. (*Précurseur d'Anvers*, for July, 1837.)

Multiplication of Generic Synonymes quoted in *L'Hermès*.—We have often taken occasion to protest against the number of names given to the same objects in natural history; greater and greater confusion is arising from it, without the least benefit to science; there results from it also, and that may suit some nomenclators, that he whose studies date many years back, is already exposed to the danger of passing for an ignoramus, if he has not kept in the track of all the new denominations which are daily created, so as either to adopt them, or at least to include them as synonymous with the older denominations, repeating at the same time the name of the inventor.

These reflections naturally find a place in connection with the observations which have lately been bestowed upon the acephalous mollusc with a bivalve shell, described at first by Pallas under the name of the *Mýtillus polymórphus*. This mollusc, which is very curious, on account of its inhabiting fresh water, had been found at first in the Volga, and has since been discovered in the canals of Holland, and in the Meuse. It seems at first sight, to differ from the *Mýtilli*

only in the membrane, which is found near the hook supporting the anterior muscles ; so that many naturalists, to the present day, persist in classing it with the genus *Mýtilus*. This appears to be the opinion of M. Deshayes, from the notes which he has inserted in the new edition of Lamarck's *Histoire des Animaux sans Vertèbres*.

M. Van Beneden of Louvain first made it the object of attentive study ; and thinking that he had discovered in the disposition of the mantle and of the nervous system marks sufficiently characteristic, he made it the representative of a new genus, called by him *Dreissèna*. To this same genus he refers some other species, particularly that which he has lately described in the bulletin of the Brussels Academy, under the name of *Dreissèna cyànea*. M. Partsch of Vienna, almost at the same time, described, under the name of *Congèria*, a genus of fossil shells in the environs of the Lake of Platen, and referred to this same genus shells which were quite analogous with the *Mýtilus polymórphus*.

M. Rossmaller, another German conchologist, positively created a new genus for the *Mýtilus polymórphus*, and called it *Tichogònia Chemnitzii*. This denomination has been adopted by his countrymen, and we have in Wiegmann's *Archives d'Histoire Naturelle*, No. 1. 1837, some anatomical researches of M. A. Muller, who, in contradiction to the observations of M. Van Beneden, pretends that the nervous system of this mollusc is quite analogous to that of the *Ánodon*.

In this same Journal, M. Wiegmann has given, from some specimens in the Berlin museum, a description of 5 species of *Tichogònia* :—

1. *Tichogònia biloculàris* (*Mýtilus biloculàris* of Lamarck);
2. *T. excisa*, a new species brought from the Indian Ocean by M. Lamarc-Piquot ;
3. *T. virgàta*, a new species from the South Sea ;
4. *Chemnitzii*, which is the *Mýtilus polymórphus* of Pallas ;
- T. africàna*, which is the *Dreissèna africàna* of M. Van Beneden.

Finally, a very short time since, (in the month of March last) M. Cantraine read to the Brussels Academy, a memoir, in which he combats the opinion of his countryman M. Van Beneden, contending that he only repeats what Pallas had said ; and on his side, having adopted as a constant characteristic the fortuitous existence of many membranes in the *Mýtilus polymórphus*, he thinks himself sufficiently authorised to form from it a new genus under the name of *Mytilina*.

M. Van Beneden in the scientific meeting of the 8th of April, has replied to his attacks by maintaining the accuracy of his observations, and his specific determinations.

We have here then, for a single shell, 5 generic names, among which we must choose *Mýtilus*, *Dreissena*, *Congèria*, *Tichogònia*, or *Mytilàna*. Must we not fear, if such differences were often to take place, that nomenclature, instead of being a uniform language for scientific men all over the world, would become as various as the countries, and even as the opinions of the scientific in each quarter of the globe? (*L. Hermes*, July, 1837.)

Notice respecting the Fossil Remains of Apes.—M. de Blainville has reported to the academy in his own name and in that of MM. Duméril and Flourens, some observations upon the fossil bones discovered in the commune of Sausan, near Auch, by M. Lartet

After having discussed all the facts relative to the discovery of the fossil bones of apes, he goes on to say:—

“Thus, till quite lately, it was certain that no trace had been discovered left by any animal of the ape tribe, in even those beds which lay nearest the surface of the earth, nor even in the alluvial strata, when M. Lartet announced to the academy, in a letter read at the scientific meeting of the 17th of last January, that he had just found in the numerous and curious assemblage of fossil bones, discovered by him in the environs of Auch, the lower jaw of an ape, properly so called, one of the grinders of a marmoset (*sapajou*), and the anterior extremity of the lower jaw of an animal of the family of makis.”

The singular interest of so unexpected a discovery, the coexistence in the same deposit, on the one hand of the bones of the rhinoceros, the dinotherium, the mastodon, the stag, and the antelope; and on the other, bones of the *Quadrùmana* of Asia, America, and Madagascar, caused the correctness of his determinations to be questioned. The sending a second letter containing a detailed description of the lower jaw of the ape, accompanied by a figure, might have established beyond doubt the truth of a part of M. Lartet's announcement. Nevertheless to prove not only that it was certainly an ape which was under consideration, but, moreover, a gibbon (a group of quadrumanous animals which are scarcely known, except in the large islands of the Indian Archipelago), more than a representation was necessary. M. Lartet, in consequence, has sent the bone itself, and all those which he has thought might be referred to the *Quadrùmana*.

The jaw attributed to the gibbon is an almost complete lower one, in which only the terminal parts of the rami are wanting, and it is provided with all its teeth. The total number of teeth is 16, that is to say 4 incisive, 2 canine,

4 false grinders, and 6 true ones; it is the dentary formula of man, and of all the apes of the old continent.

The incisive teeth are equal in size, they are almost vertical, and ranged in a transverse line; the canine teeth are short, vertical, and would meet without going beyond each other; the first false grinder is not at all inclined backward from the pressure of the upper canine, and is on the contrary quite vertical as in man; the grinders have their crown armed with blunt tubercles disposed in oblique pairs. By all these characters it is easy to recognise the jaw in question, as belonging to one of the *Quadrumana*, to an ape properly so called, and to an ape elevated in the series.

“Now, says M. de Blainville, as the gibbons are certainly the group of apes which ought to follow immediately after that of the oranges, if indeed they be distinct from each other, we see that M. Lartet is very near the truth, so much the more as the true grinders have, tolerably distinct, the 5th tubercle characteristic of these teeth among the gibbons. Nevertheless as this disposition is not certainly so well indicated in the fossil ape, as in the living gibbons that we are acquainted with, and that besides this it offers a much more evident peculiarity in the proportion of the last grinder, which comes very near to that existing in the *Semnopithèci*, and even in the baboons, it seems decisive that the fossil ape should form a small separate section, unless we can refer it to the *Cólobi*, which in South Africa seem to represent the *Semnopithèci* of India. The other fragments, which M. Lartet supposes, it is true, to have belonged to *Quadrumana*, have appeared to the secretaries as referable rather to other groups.”

To resume our subject, says M. de Blainville, though we are at present unable by any possibility to admit the extraordinary fact of the assemblage in one locality of fossil remains belonging to animals so rigorously limited in their geological boundaries as the true apes, the marmosets, and the makis; yet the discovery of fossil bones belonging indubitably, as M. Lartet has clearly seen and pointed out, to an ape nearly related to the gibbons, apes limited to the farthest parts of Asia, than to any other living species, does not the less remain to be considered as one of the most fortunate and unlooked for discoveries which has been made in palæontology of late years, and we propose in consequence, that the academy should continue to M. Lartet the encouragements which it has begun to afford him, in order to facilitate his researches, and render them more extended, and consequently more fruitful. (*L. Hermes*, July, 1837.)

Lamium intermedium.—Of this plant I have this year gathered three specimens amongst the weeds of my garden

at Shrewsbury, which correspond with specimens received as this species from Edinburgh. I had observed a few individuals occasionally springing up for the last three years, but always passed them by as only luxuriant plants of *Làmium amplexicaule*. Assuredly, to the best of my knowledge, the seeds have not been introduced. — *W. A. Leighton. Shrewsbury, July 4. 1837.*

Fèdia carinata. — On the 29th of June last, in company with my inestimable friend, Mr. J. E. Bowman, I collected this plant in a situation which could leave no doubt on any one's mind of its being truly wild. It covered a space of about 100 yards, along a dry hedge bank, in a wild and retired lane, close to the Long-lane Quarries, near Cheney Longville, Shropshire. The adjoining corn fields were passed over with moderate attention, and not a single specimen of any *Fèdia* observed. — *Id.*

On Woodcocks, Fieldfares, and Redwings building within the British Islands. — In reference to the extremely interesting communication of Mr. Fairholme (p. 337.), I am fully disposed to concur in ascribing the undeniable fact of the increasing number of woodcocks which now breed in this country to the circumstance of the young returning to the place of their nativity, and also the old birds to their former building haunts. That woodcocks repair every season to the same winter station, is sufficiently attested by the facts recorded by Bewick: and it is only in conformity with what is noticeable in other species, and more prominently in the razor-billed awk and common guillemot, for individuals from more northern latitudes to replace our native birds during the winter months. It is not improbable, also, that the progenitors of a large proportion of our indigenous woodcocks were wounded birds, the descendants of which have returned to the localities where they were reared.

I have known many instances of this species breeding in Surrey, within a few years. In 1836, I obtained a young one, about a third grown, which had been killed and mangled by a cat, so early as April 23., notwithstanding the extreme backwardness of the season; and, several days subsequently, I saw many of the adults, together with snipes and jack-snipes, exposed for sale in Leadenhall market. I know of one pair, which I suppose have bred, during the present season, within a distance of six miles from London Bridge; and, four years ago, of a brood that was reared safely in a very populous neighbourhood, but of the existence of which only myself and two other persons were aware; at least, so far as I have been able to learn. These birds used, early of a morning, to haunt a brook beside the public road, above

which the latter had been raised several feet. This instance sufficiently shows that the greater attention which is now bestowed on natural history, and the circumstance of deviations from ordinary rule being more habitually recorded, require also to be taken into consideration by those who would explain phenomena, which have hitherto been accounted rare, or quite overlooked.

In a Volume of the old series, I inserted, on the authority of a friend, on the accuracy of whose observation I place strict reliance, that the fieldfare thrush had been noticed to reside the summer through in a particular wood in Aberdeenshire. A correspondent also writes me from Yorkshire, that he has watched this bird, with the assistance of a glass, in July; but was unsuccessful in the endeavour to ascertain whether it had a nest near. Mr. Hewitson, who discovered it breeding abundantly in Norway, relates: — “ We were surprised to find them (so contrary to the habits of other species of this genus with which we are acquainted) breeding in society. Their nests were at various heights from the ground, from 4 to 30 or 40 feet or upwards, mixed with old ones of the preceding year. They were, for the most part, placed against the trunk of the spruce fir: some were, however, at a considerable distance from it, upon the upper surface, and towards the smaller end of the thicker branches. They resemble most nearly those of the ring ousel.” Of the young, in immature plumage, we yet require a description; which it is wished that some one, who may now possess the opportunity, will soon supply.

A dealer in birds, who annually raises a considerable number of young thrushes and blackbirds, assures me that, a few seasons ago, he purchased of a boy a nest of young redwings, near Barnet, in Middlesex; and, as I am quite certain that he could not have mistaken the species, from his thorough acquaintance with the smaller British land birds, I see no reason to doubt his assertion; the more especially, as other information, which he furnished me with at the same time, I knew, of my own experience, to be scrupulously correct. As this person rears every summer a great variety of young birds from the nest (of every species which he can obtain), I had asked him questions relative to those species which ordinarily winter only in the south of England. The fieldfare and Brambling he had never known to breed, the redpoll very seldom; and he had occasionally obtained skins in their moulting plumage; which latter I have seen: as regards the redwing thrushes he was quite positive.*

* As the redwing, during its stay in this country, flies in looser and more straggling flocks than the fieldfare, and of which the members depart

Here I may mention, that, during the present spring, great numbers of live ortolan buntings have been brought to the London markets from Prussia. It is not unlikely, therefore, that, from time to time, some of these may escape from captivity and be retaken in the southern counties. For this reason, it will be necessary to scrutinise very narrowly any specimen that may occur, and not only as regards the appearance of its quill and tail feathers (which may have been moulted), but more particularly that of its feet and claws, which are almost certain to retain traces of protracted captivity: should the upper mandible be found to grow over, also, this would be a suspicious character. I have known more than one instance of small birds escaping from the market-people, which, having been newly caught, could not have been afterwards recognised as cage specimens. The bearded reedling is brought in immense numbers to the London markets; and I once received a specimen of this bird which was knocked down in Surrey with a stone, several miles from any haunts to which it could naturally have resorted. I could also enumerate two or three species of tropical finches which have been captured at large in the same county. Specimens, however, that have been once confined, will always be found to be more at home in the cage, when first caught, than others.

There is a fine male ortolan, now alive and doing well, in the Zoological Gardens, which was taken last winter in a bird-catcher's net, near the metropolis, along with yellow buntings. This bird was exceedingly wild when first caught, and exhibited no sign whatever of previous captivity. That it came over of its own accord is, also, the more likely, as I cannot learn that, before the present season, any live specimens have been imported. — *Edward Blyth. July 10. 1837.*

Habits of the Viper. — The curious fact stated, at p. 383., by Capt. Manby, I am in so far able to corroborate, as that I have twice received information of it from different persons, one of whom was a regular viper-catcher, who spoke of it as a common occurrence; the other, a man who had killed one of these reptiles, and, returning by the place some hours afterwards, found another in contact with it, as described, which he also destroyed.

Many persons doubt that the young vipers retire, upon alarm, within the mouth of their parent; but I have been informed of this by so many credible eye-witnesses, that I can-

gradually in spring, and not altogether, as in that species, it is probable that they never breed in society.

not hesitate in yielding implicit credence to the fact. One man particularly, on whose word I fully rely, tells me that he has himself seen as many as thirteen young vipers thus enter the mouth of their parent, which he afterwards killed and opened, for the purpose of counting them. The following extract shows that the habit is common to other *venomous* Serpéntidæ; all which, I believe, are, without exception, ovo-viviparous. It is stated of the rattlesnake, in Hunter's *Memoirs of a Captivity among the North American Indians*, that, "when, alarmed, the young ones, which are generally eight or ten in number, retreat into the mouth of the parent, and reappear on its giving a contractile muscular token that the danger is past." The same writer says, of the fascinating power of the rattlesnake, that, "whenever they fix their piercing eyes on a bird, squirrel, &c., they commence and keep up an incessant rattling noise, until the animal, convulsed by fear, approaches within the reach of its formidable enemy. This, however, is not always the result; for I have repeatedly seen animals thus agitated, and in imminent danger, make their escape without any intervention in their favour, except the recovery of their own powers."

I have dissected a female viper, of which the ground colour was rather darker than in the male, that was found to contain excluded young, three only in number. The parent was of moderate, but not particularly small, size, though I cannot now state its exact dimensions. I believe that they become darker towards the time of parturition. The largest specimen which I have ever yet obtained was a ^{male} ~~sealy~~ one, measuring 2 ft. 3 in. — *Id.*

On certain alleged Tokens of Affinity which have been held to connect the Pigeons with the Poultry. — It has been stated, that the large Nicobar pigeon, and its immediate allies, resemble the true poultry in the circumstance of producing numerous eggs upon the ground; the young following their parent upon exclusion, and picking up their own food, like young partridges. In what degree, however, the following fact tends to cast a doubt upon all this, I leave the reader to determine. I learned, the other day, at the Zoological Gardens, that an unimpregnated female produced two eggs (mark the number), and not on the ground, but in a box at the elevation of several feet!

On the other hand, it has been held that the *Ptérocles* genus, with their long pointed wings, manifest also a further approximation to the pigeons, in the fact of their producing but few young at a time, which are hatched helpless, and fed for some time by their parents. Now, if it can be shown

that this is a manifest adaptation to their indigenous locality, I think the supposition that it implies a relationship to the pigeon family becomes gratuitous. The gougas (*Pterocles*) are well known to inhabit arid sandy deserts, where their sustenance is very widely scattered; in accordance with which they are provided with powerful means of flight, in order to be enabled to traverse a sufficient area. It is very clear, therefore, that, under these circumstances, a departure from the mode of rearing progeny prevalent among the other poultry becomes necessary, as a numerous brood could only obtain subsistence by following their parents on the wing; for which reason it has been wisely provided that the young should continue helpless till their wings are developed, requiring to be supplied with food by their parents; and their number is accordingly reduced to three or four only, more than which it is not likely that the old birds would be able to rear. I can perceive in this no sort of approach to the *Colúmbidæ*, which it is preposterous to mingle promiscuously with the other *Rasores*: in other words, to adopt no higher distinction between them and the poultry tribes, than has been assigned to the leading divisions of the latter. — *Id.*

Eagle's Nest in Loch Skene. — The conductor of the *Edinburgh Journal of Natural History*, in a paragraph on "Eagles' Nests," No. 19., gives a citation from an article by an old contributor in your Magazine for March last (Vol. I. p. 118., n. s.), signed W. L., on the breeding of woodcocks in Scotland, &c. This citation, with the appended remarks, W. L. begs to repeat. "The eagle had its nest annually in two places on the borders of the counties of Dumfries and Selkirk; one was on a precipice in Eskdale. The other situation was chosen with much of that touch of reflection that we sometimes observe among birds, as well as others of the lower animals. There is a small rocky islet, almost even with the water, in Loch Skene, which is surrounded with the highest mountains south of the Forth; and, although the side of one of these mountains that overhangs the lake is rocky and seemingly inaccessible, the eagles choose to have their nest on the islet in the loch; because, forsooth, the Loch Craig could be approached by ropes from above, while it is almost impossible to convey a boat to the loch, and there never was one there. W. L." — The conductor of the *Edinburgh Journal* thinks it behoves him to observe, — 'Now, we would have naturalists to think a little before they state a fact, and be sparing of theory. A boat *has been* conveyed to the loch, and the eagles of the district are extinct. The side of the mountain that over-

hangs the lake is a rocky slope of less than 40 degrees, and certainly does not afford a spot to which a person without a rope might not approach to within 10 yards. Eagles often make their nests in very insecure places," &c.

W. L., the afore-mentioned old correspondent of Loudon's Magazine, acknowledges that he has not seen Loch Skene, the *Loch Craig*, or the *White Coome*, these many years; but he has, however, been many times there along with various companions, and with various views. He has angled around the loch, been on the top of the Loch Craig, and at the foot of it, and seen it from the brow of the neighbouring mountain of *White Coome*, and from the *Mirk-side-edge*, that dark ridge that separates the *glen* of the Ettrick from Moffatdale; and always considered the *Loch Craig* of *Polmoody* as the most precipitous rocky mountain he knew of in the south of Scotland. He uses the word "overhangs" the loch; but, surely, Mr. Macgillivray's conscientiousness is not so strait-laced as to be unable to tolerate a figurative expression almost commonplace, when applied to scenery. Mr. Macgillivray says, that a boat *has been* conveyed to the loch. W. L. cannot doubt it; but no boat had ever been conveyed to Loch Skene, that ever he heard of, before he left the country. But W. L. believes that the Earl of Traquair, either the late Lord Charles, or his uncle, his predecessor, sent his gamekeeper and other servants, one of whom was an expert swimmer, who swam to the islet, and with much difficulty, owing to the opposition from the old birds, brought off the eaglets; and from that time the eagles made their nests in Loch Skene no more.

W. L. has contributed to the *Magazine of Natural History* almost from its commencement, and never stated a fact that he did not believe to be true. He has continued to write anonymously, no doubt; but his name and address he took care to make known to the conductor, that reference might be given if required.

The only instance where he afterwards found he was incorrect, was in asserting that the thrushes that frequent the shores of the Hebrides, and which feed much upon shell-fish were a different species from that common to the valleys of the mainland, and a small dark brown thrush that migrates in flocks. W. L. came to understand that there were plenty in the Lewes, and sent to an intelligent person for specimens. These he found to be the *Turdus musicus*, and learned that they made their nests on the top of the turf walls, and on the dry edges of the peat-pits, and generally fed upon whelks, which they break by giving them a sharp blow upon the stones of the shore. W. L. being otherwise busily engaged at the

time, omitted to send a notice of this to the conductor of this Magazine, and came to consider it as too well known for further notice afterwards. — *May* 24. 1837.

Ventriloquism in Birds. — In your number for May, you seem to consider ventriloquism in the robin, (*S. Rubecula*) as of very rare occurrence; or, at least, not much noticed by naturalists. In the last, I think, you are correct, though most certainly not as to the rarity of its occurrence: it is not confined to the robin alone, as your notice seems to imply, but occurs more or less in a great many of our singing birds; as in the blackbird, thrush, wren, and many others I could name, had I my notes by me; but former vols. of your work offers quite sufficient testimony. Now, although I know but little of natural history, yet, what I do know, is derived from the fields; and I will, therefore, with your permission, add my mite, by one or two notes towards elucidating the *natural* history of our general favourite, beginning with its ventriloquism. The first time I ever noticed it in the robin, was some years since, in the west of England, on a calm and beautiful autumnal evening, after the breeding season had passed. I was amusing myself with working in the garden, when, just before sunset, I heard two birds singing as if endeavouring to excel each other, which I knew to be the robin from its full, yet clear and soft notes; although they appeared to be at some distance I still worked on, but was much surprised at hearing the notes suddenly alter, and appear as if just above where I was then standing; on looking up, I saw two perched on the uppermost bough of an elm, opposite to each other. At first I doubted whether the sound proceeded from them or not, as it seemed to come from some distance, and their bills were quite closed; but the alternate contraction and dilatation of the chest soon convinced me that they were the songsters. They seemed at first to be taking not the least notice of each other; but in this I was mistaken, for, as if actuated by one impulse, they flew towards each other and commenced a most desperate battle, parting every now and then as if nothing had occurred, and again perching themselves on the uppermost branches, commenced their songs afresh, but though apparently taking no notice of each other, they were evidently trying to excel, and which to admire most I could not tell, they acquitted themselves so admirably; one, however, soon left; and the other, which had now full possession of the field, seemed to triumph. He continued to sing sometimes with open mouth, pouring it forth to the winds, and again confining it, as it were, in his chest, changing from one to the other without apparent effort; and this was continued

long after the sun had set, and during the stillness of the night it seemed still more beautiful, being interrupted now and then by a pause of from five to ten minutes: if nightingales had frequented that part of the country, I should have thought it had been one, instead of a robin as it certainly was. Indeed, I never either saw or heard a nightingale in Devon or Cornwall, nor ever saw one who had; but as to their never visiting those places, I may be mistaken. About a quarter past ten the singing ceased, and where he flew I cannot say, but I thought he remained on the same tree during the night: but during the autumnal months many birds are very fond of singing in the night. I have repeatedly heard the blackbird (*T. Mérula*), willow-wren (*S. Tróchilus*), wren (*S. Troglódytes*), and several others during the night, and I recollect hearing the blackbird two evenings following, at between half-past eleven and twelve, whence I am inclined to think it is of not unfrequent occurrence, particularly during the breeding season. The pugnacious qualities of the robin appears only to exist after the breeding season is past, or is then to be found most fully marked; those encounters do not always terminate so well as in the above instance. In one case I recollect one was killed, and the little murderer enjoyed his triumph with a merry song, but did not cover him with leaves, as did his ancestor by the children in the wood; and though this may be considered a very extreme case, yet I have frequently seen the feathers fly. So fond are they of fighting, after the season of incubation, that two cannot cross a garden or a lane without an encounter; it is soon over, and each goes his way as if nothing had occurred. They appear to be vexed that the season is over. It is always observed in the autumn that these fights invariably occur between males, while in spring, although it does occur between males, yet is of most frequent occurrence between a male and a female, and may, I think, be considered as their courtship; and so engaged are they, that you may even capture them, by placing your hat on them; and this I know has been done frequently with the wren, but they will not allow you to do this towards the latter end of autumn. They do not, I believe, sing much during the summer, but begin about the latter end of August; and in this I am confirmed by the old adage, "When the robin sings look out for winter." Now I am not certain as to the time at which they cease singing, but I should not be inclined to think very early in the spring. I heard one singing very finely at Richmond on the 16th of May; be this as it may they certainly do not sing *much* during the summer.

— *Junius.* May 27. 1837.

Note respecting Alyssum calycinum L. (Vol. V. p. 196., and VIII. p. 392—3.) — The Swiss Federal School of Artillery has its annual exercise on Thun common, in August and September. Some years since, a quantity of turf was pared to repair the glacis of a polygon, and the next spring, the spot from which the turf had been removed was completely covered with *Alyssum calycinum* L. This plant, as far as I can learn, had not been before seen in this neighbourhood, nor within many leagues. It still inhabits the same part of the common, in much smaller quantity, and has scarcely migrated fifty yards.

In Curtis's *Botanical Magazine*, No. 1993., it is observed that the one-flowered variety of *Leucòjum vernum* L., has the spots at the apex of the laciniae of the corolla *always green*. This plant is abundant in orchards and pastures about Thun; in some places, until means were adopted to lessen it, the fields were as white with its blossoms as those in England are with daisies or the common chrysanthemum. In consequence of the above remark, in the *Botanic Magazine*, I have, during several successive years, searched for the plant with green tipped flowers, and, although it is not too much to say that my eye must have glanced over tens of thousands of the blossoms, I have not yet found one, the spots on which were green. Here they are invariably yellow, as in the two-flowered variety figured in this magazine. Sometimes, but very rarely, our plant bears two flowers, but in that case there is no difference in the spots. Whence does this arise? Are all the plants in the English gardens descended by off-sets from one individual which had green spots? How are the wild plants in other situations?

Can I record (or enable some one else better qualified to do so) a plant as new to the British Flora? Amongst some British specimens recently come to my hands, is one which appears, from the ticket, to have been from the herbarium of Dr. J. H. Balfour of Edinburgh, and marked "*Betula alba*, Clova, Aug. 1834." It differs from any specimen I have of *B. álba* L., or *B. pubéscens Ehrh.* (which Sir J. E. Smith considers as the same species) and I have placed it in my collection as *B. intermédia Thom.*, a rare plant on the Jura and with which it seems to agree perfectly, so far as the specimens I have received enable me to judge; it is, however, not sufficiently advanced to afford me the inspection of mature seeds. I would, therefore, point out the plant to the attention of those who may have the opportunity of comparing more abundant and perfect specimens of the Clova individuals with authentic ones from the Jura, which will serve much better

than the description in Gaudin's *Flora Helvetica*; it not being so satisfactory as the generality of his others. — *P. J. Brown. Eichenbühl, near Thun.*

Meteorological Error in Vol. VIII. — What have you been about in Vol. VIII. p. 446.? making the barometer, at Berne, fall from 21.10 in. to 25.6 in. I thought none but Irish barometers fell in that direction, the more modern Bernese ones certainly do not. Again, the thermometer suddenly fell from $8\frac{3}{4}$ above zero to zero (difference 51 *Fahr.*); the difference is merely $19\frac{3}{4}$ *Fahr.*, from $8\frac{3}{4}$ above zero of *Reaumur* to zero of *Fahr.*, would be 51 *Fahr.*; but of course the fall refers to the same scale, *i. e.* to that of *Reaumur*. In the note it is said that on the 2d of February, 1830, the thermometer was $8\frac{1}{2}$ *Fahr.* below zero, at *Berne*; this was the cold at *Thun during the night*. It will be seen by the first part of p. 247, that at eight o'clock in the morning of the 3d of February, when the cold at *Thun* was 4 below zero of *Fahr.*, it was still 22 *F.* below zero at *Berne*; and in some parts of that neighbourhood, *i. e.* near *Worb* and *Wyl* it was 5 *F.* still lower. — *P. J. Brown.*

ART. III. *Literary Notices.*

PREPARING for Publication, the *Journal of the late exploring Expedition into Central Africa*, with numerous engravings illustrative of African scenery, dresses, costumes, &c., of the natives. By Dr. Andrew Smith. Smith and Elder, Cornhill.

The Hon. and Rev. Charles Bathurst, LL.D., late Fellow of All Souls College Oxford, has in the press, *Notes on Nets and other Matters*, to be published by Van Voorst.

In order to render the *Zoological Journal* as complete as possible, Mr. G. B. Sowerby has printed a Table of Contents for the First and Second Parts of the Supplementary Plates, which may be had *gratis*, by the subscribers to the work and possessors of the copies of the Supplementary Plates, upon application at Mr. Sowerby's, 50. Great Russell Street, Bloomsbury.

The editors of the *Entomological Magazine* have, in their last number, contradicted the report of the non-continuation of that periodical.

THE MAGAZINE

OF

NATURAL HISTORY.

SEPTEMBER, 1837.

ART. I. *Observations on the opposable Power of the Thumb in certain Mammals, considered as a zoological Character; and on the natural Affinities which subsist between the Bimana, Quadrumana, and Pedimana.* By W. OGILBY, Esq., M.A., F.L.S., F.G.S., F.Z.S., &c. &c.*

It was whilst employed in watching the habits of two fine specimens of *Mycètes seniculus* in the summer of 1829, that I had occasion, for the first time, to make an observation which greatly surprised me at the moment, and which I afterwards found to be of much greater importance than I had at first imagined. Upon presenting these *Mycètes* with a few nuts which I had taken for that purpose, I remarked with some surprise that they did not hold them between the finger and thumb, as I had seen other *Quadrumana* do. This induced me to examine them more closely; and it was with increased surprise and astonishment that I perceived the cause of the phenomenon which had first attracted my attention: the thumb, in fact, though perfectly developed, and, comparatively speaking, much longer than in the ordinary *Simiæ*, was not opposable to the other fingers, but originated in the same line with them; was of the same long slender form, and acted in the same direction. At first, I was disposed to regard the specimens before me as the type of a new and undescribed genus; for at that time I had not the slightest suspicion of this character being common to the other *Mycètes*, much less to the whole of the American *Simiæ*; since, though I had formerly seen, and, as I fancied, examined, many of these animals, the observation had

* This memoir was read before the Zoological Society, March 8. 1836, and an abstract from it published in the *Proceedings* under that date. It is here given verbatim, as it was written, without any alteration or addition, except the foot notes.—W. O. August 10. 1837.

never occurred to me before; and I was aware, moreover, that no zoologist, with whose works I was acquainted, had recorded a similar fact. Baron Cuvier, indeed, had previously separated the *Ouistitis* (*Hápale*) from the other American *Simi*-*adæ*, partly on this account; but, in so doing, he had expressly recognised the rest of these mammals as true *Quadrúmana*, in the strict and legitimate sense of the term, and actually included them in the same group with the common *Símiæ* of Asia and Africa, a group of which the zoological character depended entirely upon this circumstance of the thumb being opposable on the anterior as well as on the posterior extremities. In this respect Baron Cuvier was only following the example which had been set him by Ray and Linnæus; nor did contemporary zoologists dissent from his opinion upon this point.

I was, consequently, aware that the observation which I had made with regard to these two *Mycètes* had not been previously recorded by systematic writers; I therefore resolved to prosecute the enquiry, by extending my examination to other genera and species of American *Simi*-*adæ*: but such is our natural veneration for authority, that I confess it was not without very great caution and frequent misgivings, that I persevered in an enquiry where I found my own observations, at every step, directly opposed to the express declaration of the most illustrious masters of zoological science. It required a considerable time, indeed, to familiarise my mind with the new ideas and new views which these observations suggested; to persuade myself, in short, that the American *Simi*-*adæ* were not *Quadrúmana*: in fact, so strongly was I impressed with the weight of authority, that it was actually some time before I could give its due weight to the evidence of my own senses. This state of mind, whilst it did not deter me from pursuing my observations, armed me with additional caution; and, though the authority of Nature soon asserted her preeminence over that of system, I guarded scrupulously against admitting, as conclusive evidence, such facts as rested only on the examination of preserved specimens, and resolved to wait patiently till I should have an opportunity of examining at least one species of each genus in the living state, where the observation of the organ in action, and in connexion with its proper function, would remove all possibility of deception.

During the last six years, I have been engaged in prosecuting this interesting enquiry, from time to time, whenever an occasion presented itself; and, as I have, during this period, enjoyed frequent opportunities of examining many different species of American *Simi*-*adæ*, including examples

of all the natural genera, I am now able to announce with confidence that the American Simiadae have not the thumb of the anterior extremities opposable to the other fingers; in short, that they are not Quadrumana, and, consequently, that any zoological system which includes them in the same group with the Simiæ of Asia and Africa is founded upon arbitrary principles, and opposed to the observed phenomena of their structure and economy.

When I first made the observation which led to this important conclusion, I was anxious, as may be readily supposed, to examine strictly the works of the most original and trustworthy writers upon this subject, for the purpose of ascertaining whether the fact might not have been already recorded, though it had been overlooked by subsequent authors. A strict and attentive search, however, convinced me that the observation had not been made by Linnæus, Buffon, Pennant, Erxleben, Illiger, Geoffroy St. Hilaire, the Cuviers, Desmarest, Humboldt, nor even by the accurate and minute Daubenton. So close, indeed, is the approximation of the American to the Asiatic and African animals in general form and manners, that these illustrious naturalists seem never to have thought of comparing them in the more minute details of their conformation; nor, for that matter, should I have myself ever dreamed of the American Simiadae differing in this respect from the Simiæ of the Old World, had not chance thrown the observation in my way, in the manner already mentioned. At that time I did not possess Azara's admirable *Essais sur l'Histoire Naturelle des Quadrupèdes de la Province du Paraguay*; nor, for long after I procured it, did I think of consulting it upon this subject. When I did so at length (and it was only when about to prepare the present memoir), it was with the greatest pleasure I discovered that that acute and original observer had long since made the very same remarks which formerly struck me with so much surprise; and I hailed the circumstance as a complete confirmation of the correctness of my own observations. Since, then, the credit of having been the first to make this important observation is due to the Spanish naturalist alone, I shall transcribe the following short extracts from his work, in order at once to establish his claim to the original discovery, and to bring forward his authority in support of the observation itself.

Speaking of the caraya (*Mycètes niger*), Azara says: —“La main a cinq doigts, dans lesquels celui qui par sa position doit être le pouce ne semble pas tel, attendu qu'il naît sur la même ligne que les autres, qu'il a la même direction, et qu'il est le

plus foible. Les pieds ont les mêmes doigts, mais l'interne a la forme de pouce." * Again, in describing the cay (*Cebus capucinus*), he observes: — "Il y a cinq doigts à chaque pied, presque de la même forme que ceux de la main de l'homme, quoique le pouce de devant soit moins séparé que dans celui-ci, et qu'il ne soit pas plus gros que les autres doigts†:" and again, of the mariquoina (*Pithècia Mariquoïna*): — "Dans la main il y a cinq doigts; l'extrême et l'interne naissent parallèlement entre eux, quoique celui-ci soit plus court: il n'a ni la séparation ni la forme d'un pouce, et il est le plus mince de tous. Les trois autres doigts sont plus longs que les deux précédens; ils naissent un peu plus en avant, et leur longueur suit l'ordre des doigts de la main de l'homme." ‡

These passages clearly establish Azara's title to be considered the original observer of this important fact; and it is not a little surprising that they should have remained so long buried in his admirable *Essais*, without having attracted that attention to which they are so justly entitled. Such, however, has hitherto been their fate: subsequent writers seem to have entirely overlooked them, or, if noticed at all, their real value was not appreciated; nor am I aware of the observation itself having been made by any other naturalist, with the exception of Mr. Martin, an able and zealous officer of the Zoological Society, to whose merit I am happy to have this opportunity of bearing witness. So far as I know, however, Mr. Martin has not followed up the ideas suggested by this observation, nor deduced from it the consequences to which it necessarily leads, and which it is the principal object of the present memoir to develop. §

I have thought it necessary to enter into this circumstantial history of the observation in question, in justice to all those whom I know to be connected with a discovery which I cannot avoid considering as one of the most important that has been made of late years in mammalogy, more especially in regard to its connexion with the principles of natural classification in this department of zoology. I shall only remark further, that the present memoir, though commenced last November ||, immediately after examining a specimen of

* Azara, *Quad. du Parag.*, ii. 213. † *Id.* ii. 233. ‡ *Id.*, ii. 244.

§ When this passage was written, I had entirely forgotten that I had myself previously published the observation in question, in an article on the "Zoology of America," inserted in the *Penny Cyclopædia*, vol. i. p. 442. That article was published in 1833, and Mr. Martin's observations upon the subject did not appear till December, 1835. They may be found in the volume of the *Penny Magazine* for that year. — *W. O.* August 10. 1837.

|| 1833.

the doursucouli (*Aotus trivirgatus*), the only generic type which I had not previously seen alive, has been delayed from various causes; and that I was not aware that the primary observation which it records had been previously and originally made by Azara, till the moment of commencing it.

It will have been remarked, no doubt, in the second extract which I have given from the work of Azara, that this acute zoologist speaks in more qualified terms of the unopposable power of the anterior thumb in the cay, than in either of the other two species which he has described; and in this respect his observations are in perfect accordance with my own. Of the eight natural genera which include all the known *Simiadae* of the Western Hemisphere, and of which I have examined many living species, besides the skins of a much greater number, five have the anterior thumbs placed absolutely on the same line with the other fingers, of the same form, acting invariably in the same direction, and totally incapable of being opposed to them: these are, *Mycetes*, *Lagotherix*, *Aotus*, *Pithècia*, and *Hapale*. It is scarcely necessary to observe, that the thumb is entirely wanting in *Ateles*, or exists only in a rudimentary form beneath the skin; and there remain only the genera *Cebus* and *Callithrix*, in which I shall now proceed to explain the modifications of form and function presented by this organ.

In describing the *Cebus capucinus*, Azara observes: — “Il y a cinq doigts à chaque pied, presque de la même forme que ceux de la main de l'homme, quoique le pouce de devant soit moins séparé que dans celui-ci, et qu'il ne soit pas plus gros que les autres doigts.” This passage exactly describes the appearance of the organ in question, both in the genera *Cebus* and *Callithrix*. The thumb of these animals is, in fact, placed farther back than the general line of the other fingers, and, on that account, when superficially noticed, has the semblance of being opposed to them; but, as Azara very correctly observes, it is less separated than in man; and, I may add, than in the true *Simiæ*: it is, besides, of precisely the same long slender form, is weaker than the rest, absolutely without power of opposition, and habitually acts in the same direction. I have no doubt that it is the backward position of this organ in the *Cèbi*, and the deceptive appearance of opposition which this circumstance produces, that has hitherto prevented zoologists from observing the true characters and affinities of the American *Simiadae*; for, of all these mammals, the *Cèbi* are most commonly brought to Europe, and, unless examined with this express view, previously suggested by the observation of other genera, in which the character is less equivocally deve-

loped, would never have themselves given origin to the idea that they differed from the common *Símiæ* in the opposable power of the anterior thumbs. After having become once possessed of this fact, however, from my observations on the genera *Mycètes* and *Pithècia*, I paid very close attention to the actions of the various species of *Cèbi* which have been from time to time exhibited in the Zoological, and Surrey Zoological, Gardens, yet without having ever remarked them, even in a single instance, to oppose the thumbs to the other fingers in the act of prehension. It was very evident, indeed, notwithstanding the fallacious appearance occasioned by the backward position of the organ, that they had not the power of doing so: and, in fact, their principal power of prehension seems to be altogether independent of the thumb; for, generally speaking, it was not brought into action at all, at least not simultaneously with the other fingers, but hung loosely on one side, as I have seen it do, in like circumstances, in the opossums, phalangers, and other arboreal mammals. When actually brought into play, however, the thumb of the *Cèbi* invariably acts in the same direction as the other fingers; and, consequently, the exception which these animals might be supposed, on a casual examination, to offer to the general law of organisation presented by the other *Simiadae* of the New World, is altogether illusory, and vanishes when put to the test of more accurate investigation.

I have not enjoyed the same opportunities of extensive observation among the *Callitricæ*: indeed, I have seen only two species of this genus alive; but their actions, as well as the form and position of their anterior thumbs, were in all respects similar to those of the *Cèbi*; nor have I any reason to believe that other American *Simiadae* differ in this respect from those which I have seen, and of which I have here described the actions.

It has been already observed that the genera *Mycètes*, *Lagôthrix*, *Aôtus*, *Pithècia*, and *Hápale* have the anterior thumb placed absolutely upon the same line with the other fingers, and acting habitually in the same direction; and I have now shown that the backward position of this organ in the *Cèbi* and *Callitricæ* is the only equivocal circumstance which appears to differentiate them from the other *Simiadae*; but that, when observed more closely and in action, the deception vanishes, and its functions are found to differ in no respect from those of the allied genera. Here, then, we have obtained a new and far more important character, by which to distinguish the *Símiæ* of the Old and New Worlds, than those which have been hitherto so much insisted upon by zoologists, the

comparative thickness of the septum, and the absence of cheek pouches and callosities. The American animals, in fact, are not *Quadrùmana*; and, consequently, they can no longer be included in the same family with the *Símiæ* of Asia and Africa: they are, properly speaking, *Pedímana*; and it now remains for us to consider what are their true relations, and the position which they actually occupy in the scale of animal life.

In the first place, it follows, as a necessary consequence of the observations which I have here announced and detailed, that these animals can no longer be included in the same group with the *Quadrùmana*, properly so called, with the *Símiæ* and *Lemùridæ*, of which the essential and only universal zoological character consists in having the thumbs opposable to the other fingers on the anterior as well as on the posterior extremities. This character, of the highest influence as regards the habits and economy of the animals, and universally admitted to be the most important element in the principles which govern their natural arrangement, is wanting in the American animals; and, consequently, any system which includes them in a group founded entirely upon this peculiar modification of the organs of prehension must be purely arbitrary, and fail to express the actual relations which subsist between them and the true *Símiæ*. But, though the most important and influential, this is by no means the only distinction between these two groups of mammals; the absence of cheek pouches and callosities, the peculiar form of the septum naris, and the superior number of the molar teeth, in the American family, have long been recognised and admitted; and there are still other characters, less prominent, perhaps, but not less influential, by which they are equally distinguished, and which degrade them materially in the scale of animal life. Of these the fierce and intractable disposition of some, the decidedly carnivorous propensities of others, and the limited intelligence of the whole group, may be adduced, as manifestly approximating them to the *Carnívora*, and abstracting them altogether from the character and appetites of the *Quadrùmana*. Indeed, it is only in the *Cèbi* and *Callítrices* that we recognise anything like the liveliness, intelligence, and docility of true *Símiæ*. The *A'teles*, it is true, are quiet and inoffensive; but this arises from apathy or stupidity: all the others are morose, sullen, and apathetic, or exhibit a fierceness and intractability of temper entirely at variance with the character of frugivorous animals. Here, again, it will be observed, that this difference in the intellectual faculties and moral disposition, if I may be allowed the expression, of the American

Simiadae accords precisely with the difference of organic structure already pointed out in these animals; those which approach most nearly to the true *Quadrùmana* in the conformation of the organs of touch and prehension, exhibiting, at the same time, a degree of intelligence vastly superior to their conterminous genera. In short, here, as in all other cases, that admirable instrument, the hand, or even an approximation to its form, however imperfect it may be, entails upon its possessor a superior developement both of mental and physical functions, and, exactly in proportion to its degree of perfection, and to its adaptation to the purposes of touch and prehension, exalts him in the scale of animal life.

But, though the *Sapajous* and *Sagoins* of America differ thus essentially from the true quadrumanous types of the Old World, they exhibit, nevertheless, numerous important relations in other respects, more especially with the family of *Símiæ*, which cannot be overlooked, and which, indeed, have hitherto been solely relied upon for determining their position in the scale of nature. Among the *Pedímana*, in fact, they form a parallel group to the true *Símiæ* among the *Quadrùmana*; and it is for the purpose of expressing at once the difference which exists between these two groups, and the relations which they exhibit to one another, that I propose to appropriate the term *Simiadae* to the American animals, reserving the name of *Símiæ* exclusively for those of the Old World, to which alone it originally and legitimately belongs. I am ready to acknowledge the impropriety, under ordinary circumstances, of substituting new names in the place of those which have been already received into the science; the terms *Catharhínnius* and *Platyrrhínnius*, however, which M. Géofroy St. Hilaire has already applied to the same groups, besides not being generally adopted by other zoologists, express such trivial and unimportant relations, compared with the ideas attached to those which I propose to substitute for them, that the change is in this instance a decided advantage; nor does it deduct from the merit of the learned professor, since whatever novelty or discovery the case presents is contained in the observations here recorded; and the loss of a mere name is not a circumstance that can affect the solid and well-earned reputation of the illustrious French zoologist. The proposed change has, besides, the farther advantage of reintroducing into the science the old classical name of a group which has for some time past fallen into neglect, but which is much more appropriate and expressive than any of those by which it has been replaced.

In the second place, the *Sagoins* and *Sapajous*, or, as I

shall hereafter call them, the Simiadae, are not the only mammals which exhibit the peculiar conformation of the organs of locomotion and prehension here described. There is a small family of marsupials which possess the same character of having opposable thumbs on the posterior extremities only, and which, in spite of considerable variety in the dentition of the different genera, form a very natural group, which I characterised, some years ago, in a paper read before the Linnæan Society, and of which I shall now recapitulate the most important affinities. The group comprehends the genera *Didélphys*, *Cheironectes*, *Balantia*, *Phalangista*, *Petaurus*, and *Phascolarctos*, together with a new genus, *Pseudocheirus* *, which I have found it necessary to separate from *Phalangista* as at present constituted. All these genera, besides the characters proper to them as marsupial and pedimanous animals, agree in their nocturnal habits, omnivorous appetites, and arboreal lives. It has been usual hitherto to separate the Phalangiers and Petaurists from the Opossums, and even from the Koalas, on the supposition that the modifications observable in the dental system of these genera betokened a difference of regimen. Thus, we have had the various families † of *Entomophaga* ‡, *Carophaga* §, *Phyllophaga* ||, *Frugivora* †, &c. all claiming the rank of natural groups, though founded solely upon this presumption. Such *à priori* reasoning, however, should be very sparingly used in a science which depends entirely upon observation; and, in the present instance, the experience which I have had in studying the habits and appetites of the numerous species of all those genera which have been from time to time exhibited in the Zoological Society's gardens convinces me that there is little or no difference, in this respect, between the Opossums and Phalangiers, but that

* It is only necessary to observe, that this genus is distinguished by a peculiar formation of the anterior extremities, the fingers being divided into two groups, as in *Phascolarctos*; not, indeed, opposable to one another, but sufficiently separated to facilitate the act of prehension in moving among the branches of trees. It is separated from *Phalangista*, and includes *P. Cookii* and *P. gliriformis*. Before noticing the important character upon which I have founded this new genus, I could never understand why Mr. Bell, in his excellent paper on the latter species in the *Linnæan Transactions*, spoke of it as having opposable thumbs on the fore feet as well as on the hind. The fact is, however, that it has two thumbs, if I may be allowed a slight latitude of expression, on the anterior extremities; which, though not exactly opposable to the other fingers, are still sufficiently separated from them to have the general appearance of being so.

† Cuv. Règ. Anim., i. 175.

§ Latr. Fam. Nat., 53.

‡ F. Cuv. Dents des Mam., 125.

† Desm. Mam., 262—275.

|| Less. Man. des Mam., 217.

all are equally omnivorous. The Phalangers and Petaurists, indeed, display so decided a preference for live birds, as to make it probable that these constitute a main portion of their food in a state of nature; whilst the Opossums, as it is well known, thrive equally well upon fruit and vegetables as upon flesh, and feed indifferently upon either.

Nor are the modifications of dentition proper to the Opossums and Phalangers, respectively, so very different in reality as they appear to be at first sight. The Opossums have ten incisors in the upper and eight in the lower jaw, canines of the usual form and number, and seven molars throughout, of which four only are true molars, and have flat crowns with blunt tubercles, like the *Símiæ* and *Lemùridæ*: the Phalangers and Petaurists, on the contrary, have only six incisor teeth in the upper jaw, and two in the lower; the latter long and procumbent, and both separated from the true molars by a vacant space containing two insulated false molars, generally rudimentary, but sometimes developed to such an extent as to present the appearance and exercise the functions of real canines. In some species, these anomalous canines are in contiguity with the lateral incisors of the upper jaw, and are in all cases situated upon the suture connecting the maxillary and intermaxillary bones; in other instances, the inferior false molars, though rudimentary, are contiguous to the long procumbent incisors, and inclined in the same direction; so that these teeth may be considered, without impropriety, as lateral incisors in both the upper and lower jaws; a view which greatly diminishes the apparent dissimilarity between the dental systems of the Phalangers and Opossums. The molar teeth of these two genera are still more closely allied in form, being equally provided with flat crowns and blunt tubercles; only that those of the Phalangers approach more nearly to the molars of the *Símiæ*, both in form and number, than those of the Opossums. Still it is unquestionable that a considerable hiatus does exist between these two systems of dentition; and, though it might appear in some degree to be filled up by the *Dasyures*, yet more influential parts of their structure exclude that genus from the present group. At all events, whatever difference may exist in the organs of mastication, between the extreme genera which I have associated in this family, there is, as it has been already observed, but little difference of function, and the natural habits and appetites are nearly the same in all.

But there are other and very influential parts of the organic structure of these animals, in which the chain of affinities is less broken, and more easily recognised, than in their dental

systems. From the naked prehensile-tailed Opossums of South America, for instance, we have a gradual and uninterrupted transition, through the equally naked-tailed Coescoes (*Balantia*) of the Indian Isles, to the true Phalangiers; and from these to the Petaurists directly on the one hand, and, by means of the Pseudocheirs, to the Koalas on the other. Here the chain is perfectly unbroken, and the affinities of the different genera too obvious to be overlooked; and this new relation, added to their common habits, appetites, and economy, the conformity of structure displayed in their organs of sense and prehension, and the marsupial character of the whole tribe, constitutes a mass of evidence in favour of the approximation of these animals which I have here made, as strong as that which supports almost any other natural family. I propose, therefore, to distinguish the present group by the name of *Didélphidæ*, in allusion at once to its most remarkable character, and to the principal genus of which it is composed.

(*To be continued.*)

ART. II. *Observations on some Species of the Genus Motacilla of Linnæus.* By JOHN GOULD, Esq., F.L.S., &c.

HAVING recently brought before the notice of the Zoological Society, at one of the scientific meetings, a few remarkable facts respecting the limited range of some of our native birds, and the strictness with which they are confined to certain localities, I hastily transmit a few additional observations, which, as they principally relate to one of the most elegant and familiar of the British birds, may, perhaps, be worthy of a place in the *Magazine of Natural History*, where they will meet the eyes of many devoted exclusively to the study of British ornithology, and, perhaps, induce a more minute investigation of the subject to which the present observations are directed.

The distinctions pointed out by me, a few years since, between the yellow wagtail of the British islands (*Motacilla flava* Ray) and the species commonly seen on the neighbouring continent, which I have named *M. neglecta*, are now, I believe, well known to most of your readers. My views respecting the separation of these species have since been confirmed by the opinions of ornithologists generally; and, although a few solitary specimens have been discovered in Britain, it must be admitted that the shores of France and Holland constitute the western boundary of the species; while, as far as my observations go, the British islands constitute as exclusively

the habitat of the *M. flava*; its occurrence on any part of the continent being extremely infrequent.

While engaged upon this tribe of birds during the course of my work on the *Birds of Europe*, I was equally surprised to find that the sprightly and pied wagtail, so abundant in our islands at all seasons, could not be referred to any described species, and that it was equally as limited in its habitat; for, besides the British islands, Norway and Sweden are the only parts of Europe whence I have been able to procure examples identical with our bird, whose place in the temperate portions of Europe is supplied by a nearly allied, but distinct, species, the *true* *M. álba* of Linnæus; which, although abundant in France, particularly in the neighbourhood of Calais, has never yet been discovered on the opposite shores of Kent, or in any part of England. As, therefore, our bird, which has always been considered as identical with the *M. álba*, proves to be a distinct species, I have named it after my friend W. Yarrell, Esq., as a just tribute to his varied talents as a naturalist.

The characters by which these two species may be readily distinguished are as follows: — The pied wagtail of England (*M. Yarréllii*) is somewhat more robust in form, and, in its full summer dress, has the whole of the head, chest, and back, of a full deep jet black; while in the *M. álba*, at the same period, the throat and head alone are of this colour, the back and the rest of the upper surface being of a light ash-grey. In winter, the two species more nearly assimilate in their colouring; and this circumstance has, doubtless, been the cause of their hitherto being considered as identical: the black back of *M. Yarréllii* being grey at this season, although never so light as in *M. álba*. An additional evidence of their being distinct (but which has, doubtless, contributed to the confusion) is, that the female of *M. Yarréllii* never has the back black, as in the male; this part, even in summer, being dark grey; in which respect it closely resembles the other species.

A third species of pied wagtail (the *M. lugubris* of Pallas) inhabits the eastern portions of Europe, and is rarely found in any other part of the Continent. In size, this species far exceeds *M. Yarréllii*: it has the whole of the centre of the wing, several of the secondaries, and the basal portion of some of the primaries, white; besides which, it may at all times be distinguished from either of the former species by the lorum, or space between the bill and the eye, being black; a character not to be found in any state of plumage in either *M. Yarréllii* or *M. álba*.

The wagtails constitute a well-defined and somewhat isolated group, are strictly confined to the older known portions of the globe, and may be said almost exclusively to inhabit the continents of Europe, Asia, and Africa; only two or three species having been found in the islands of the Indian Archipelago, and no example of the form having yet been discovered either in America or Australia. They appear to be naturally divided into two distinct sections; one characterised by a pied plumage, which is subject to a seasonal change, and with a short hind claw; the other by a more gay plumage, the colours of which are generally olive and rich yellow. In this latter section, the form is slighter in all its proportions, and the hind claw is much produced. The members of the two sections also differ as much in their economy as they do in external appearance; and I am of opinion that Cuvier's generic title of *Budytes* for the yellow section might be adopted with considerable propriety.

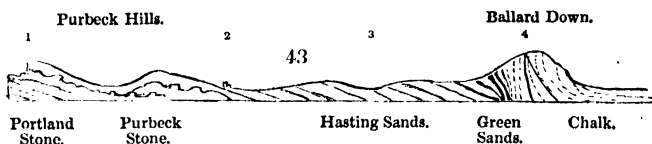
London, August 16. 1837.

ART. III. *Illustrations of the Geology of the South-East of Dorsetshire.* By the Rev. W. B. CLARKE, A.M. F.G.S.

(Concluded from p. 421.)

WE must now revert to *fig. 35.* and *fig. 36.* Those sketches may be better represented geologically in the following section from Tillywhim Quarry (to the westward of Durlstone Head) to Ballard Down, taken from Phillips's and Conybeare's *Outlines of the Geology of England and Wales.*

In this figure (*fig. 43.*), the vertical and curved beds of *fig. 37.* are represented as connected with the general heave

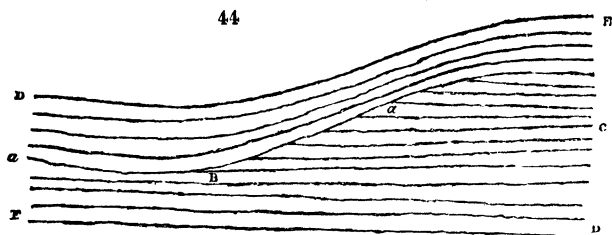


Section from Tillywhim to Ballard Down.

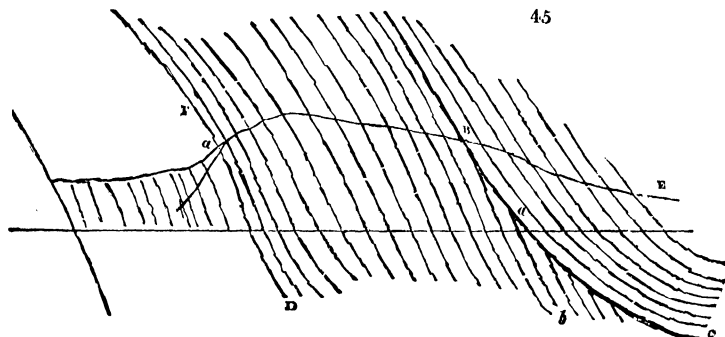
(Contracted from Phillips and Conybeare.)

1, Tillywhim quarry. 2, Swanwich. 3, Swanwich Bay. 4, Handfast Point.

of the inferior formations from under the chalk. Mr. Webster assumes, either that the beds of chalk were formed at two distinct periods, curved strata being laid over horizontal ones, as in *fig. 44.*, and afterwards disarranged; or, as represented in *fig. 45.*, where the whole of the strata are supposed to have been originally curved, the curves corresponding to similar curves, of which the section *fig. 43.* gives the



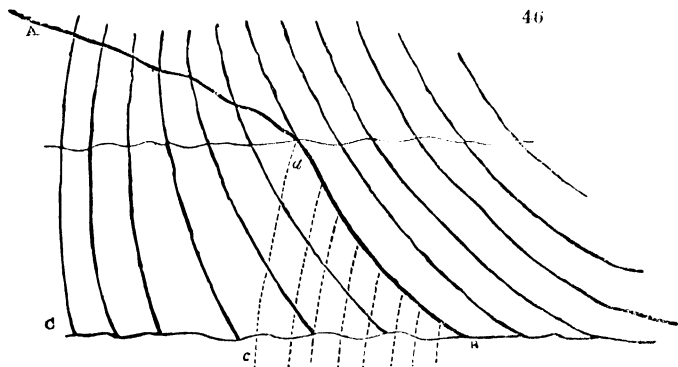
portions that remain. According to this supposition, it is evident that the chalk and inferior beds must have originally formed a dome over the whole of Purbeck; which, taking the height of Ballard Down to be, as he assigns, 584 ft., could not have been less than 4672 ft. thick. Such an enormous denudation as the present surface must have



required, on this supposition, is totally at variance with legitimate assumption; and, therefore, we are called on to reject the original curvature of the chalk altogether. The former idea of *curved* chalk strata over the slope of horizontal strata, as assumed in *fig. 44.*, seems to me equally untenable; because, though undoubtedly the chalk was deposited by degrees, and may have been subjected to the action of currents of water, passing over each successive deposition, there is no example on record, that I am aware of, where the deposition of chalk was interrupted by any long interval, or where it attained a sufficient elevation above the sea to be subjected to denuding causes capable of so rounding and excavating the horizontal beds, and then became depressed, after that long interval, beneath the same depositing sea, whose action was again continued. That different modifications may have occurred in the different portions of the chalk formation, is, no doubt, consistent with facts; for how otherwise are we to

account for the flints of the upper chalk, and the want of flints in the lower, or those siliceous particles occasionally interspersed, without any definite congregation of them, in certain intermediate beds at Harwich* and Lyme? But, as there is no known similar example of the phenomena of Ballard Head, considering, also, the peculiar condition of the inferior adjacent rocks, it is more correct to assume that the solution of the difficulty is to be sought *in some such way* as Mr. Webster suggests in *fig. 45.*, though to me that particular explanation is perfectly unsatisfactory.

The authors of the *Outlines* being of the same opinion, accordingly propose the following as another solution. They observe that "the horizontal strata suddenly turn upwards into a curve forming nearly a quarter of a circle (see *figs. 36, and 37.*), and the vertical layers of flint meet the bent part of the chalk, as so many ordinates would meet a curve, decreasing in height as they get more under it. Mr. Webster has proposed an ingenious, but perhaps not altogether satisfactory, solution of this remarkable position." (See *fig. 43.*, and the observations upon it.) "Instead of repeating this, we shall attempt to show, that it may be simply and completely accounted for by the obvious supposition of such a fault, or dislocation, of the strata, as is familiar to all geological enquirers, and, considering the angular motions which these masses of strata have undergone, might naturally be expected here: for this purpose we must have recourse to a diagram."



"Let *A B* (*fig. 46.*) be the assumed line of fault; then let the mass of strata *A B c* be moved along it in the direc-

* Mentioned in a paper by the author, "On the Geology of Suffolk," read before the Geological Society, March 8. 1837.

tion A to B, till the stratum A c be brought into the position indicated by the dotted line *a c*; and the same arrangement of strata which actually takes place in the cliff will be the result. In order to produce this agreement, we have only to suppose that the line of fault, during a part of its course, coincides with the lines of stratification, which cannot be considered as an impossible, or even improbable, circumstance."

The writer then proposes to copy "the curved and vertical strata, as represented in Mr. Webster's delineation, on two separate species of paper; then filling up the vertical strata, as represented in the above diagram; and, lastly, applying them together and slipping the latter under the former, in the direction of the fault;" he will perceive that "this simple supposition is completely adequate to the solution of the actual phenomena." (*Outlines*, p. 111, 112.)

In the above explanation, there is an assumption that the strata were originally in some such predicament as Mr. Webster supposes, forming part of a huge dome or arch, which once extended 3000 or 4000 ft. higher than any portion of the present elevation of Purbeck, and which has been denuded altogether, leaving only a fragment of its northern side.

It appears to me that a third solution may be offered, with more chance of success; and, accordingly, I venture to suggest some such explanation as the following:—

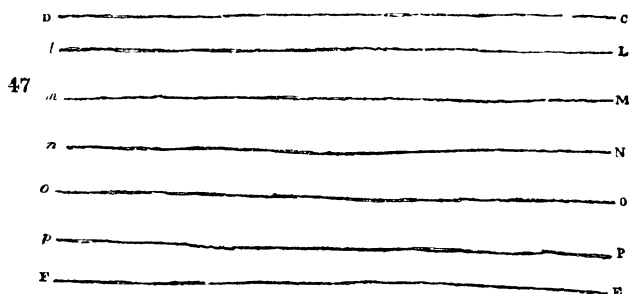
The line of fault is, no doubt, accurately assumed; its presence is actually visible upon close inspection: moreover, it forms the north side of the Purbeck Hills, as may be seen on the outside of Challow Hill, a little to the east of Corfe Castle, where the beds towards Poole are nearly vertical, the flints being fractured, and dispersed; the particles separated by chalk and carbonate of lime in crystals; and the chalk itself as hard as marble, having no streak, and being only reducible to the soft state by scraping.

These phenomena characterise the chalk at the end of the range, under Ballard Down, and are traceable all through the elevated ridge, in the steep slope towards the north.

Now, in the hypothesis that the chalk was formerly altogether horizontal through Purbeck, and that elevation began in the direction of the supposed fault (i. e. by forcing the beds of the whole mass now called Purbeck, to the south, at the same time that they were raised vertically), the chalk would naturally suffer from the strain; but, as it probably did not extend far to the south at the immediate period of the fault's formation, and the northern extremity of the chalk was weighed down by the superincumbent burden of the tertiary beds, which, near Poole, have a thickness of more than

700 ft., the consequence must have been, that a crack would be produced in the line of the strain from below; and the southern portion of the fractured chalk being thus disengaged, it would naturally be moved first diagonally upwards a little, and then, from the very nature of the case, slip backwards under the pressure of lower formations; then forced up, filling, in its fall backwards, some of the vacant space which, in all probability, was produced by the elevation of the adjacent beds from the green sand to the Portland oolite.

The pressure still continuing, and the elevatory motion being continued, the undoubted effect must have been, to slip the southern part of the chalk under the fault, the whole range of strata from Tilly Whim to Ballard Down (see *fig. 43.*) being drawn out like a pack of cards into a lengthened diagonal shape by the double force. The consequence,



of this would be, that the beds of chalk (horizontal in *fig. 47.*) would first become slightly elevated, and then cracked, as in

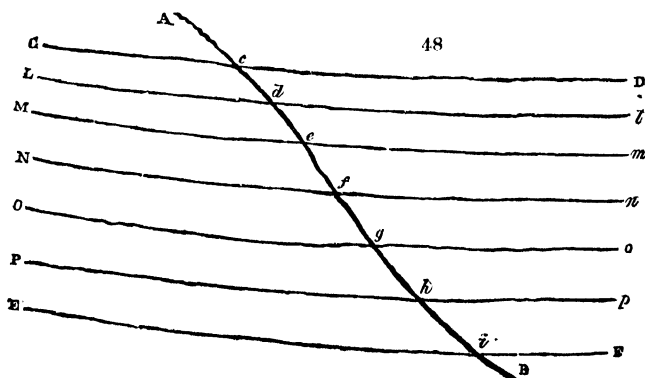
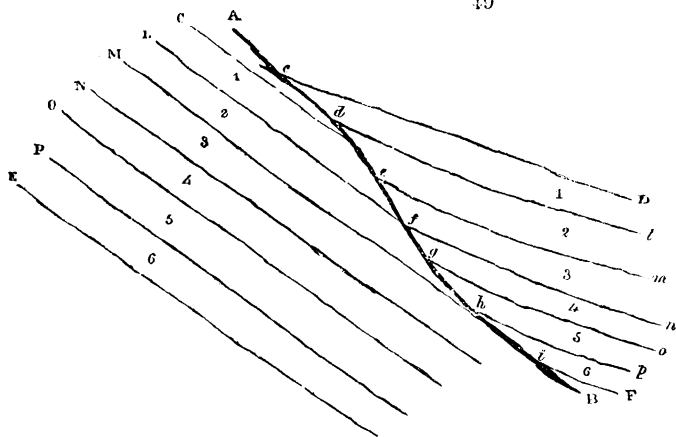


fig. 48., where the line A B represents the fault; next, as shown in *fig. 49.* where the beds are seen, to the south of

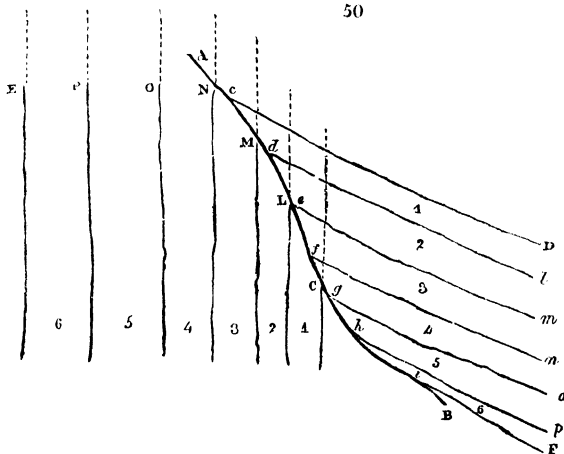
49



the fault, much inclined, the northern ones remaining as before; and, lastly, as in *fig. 50.*, where the southern portions of the beds are seen vertical, the northern being still as in *figs. 48. and 49.*

The portions of the beds 1, 2, 3, 4, 5, 6. are seen so altered in position, that one part of 6. is removed to a

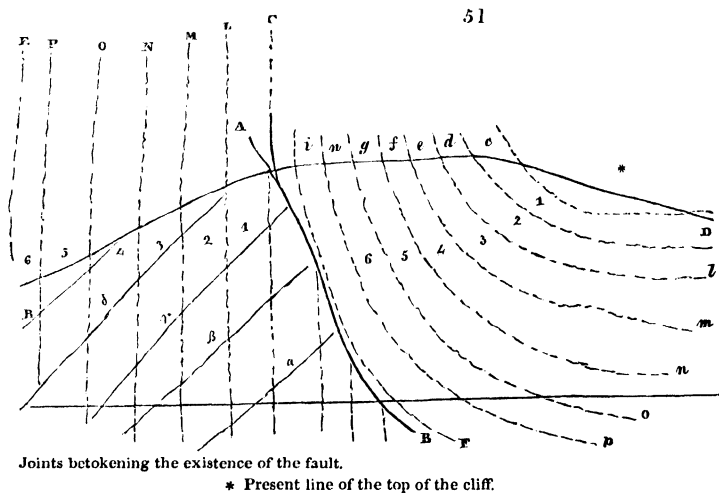
50



considerable distance from the other, the broken portions of 1, 2, 3, 4, 5. intervening. The upper beds are thus shown to be the ordinates of the curve formed by the fault, and which prop up the northern fragments of the once horizontal strata.

We have now only to conceive the same elevatory process and straining to continue in the same direction; and the consequences would be, that, whilst the whole mass of chalk, and the tertiary beds above the northern edge, would gradually acquire a degree of vertical elevation *en masse*, such as it can be shown they now have, above their former submarine level, the fallen portions of the beds below the fault would acquire a motion upwards, in the direction of their vertical position, as represented by the dotted lines in *fig. 51*.

The certain effect of this process would be, not only to squeeze the broken beds together, but, in the process of heaving, the southern portions would, by their truncated edges, catch the sloping beds along the line of fault, and raise them upwards, till a curve should be formed exactly as we now see it; so that the position of the beds would be as represented in *fig. 51.*, which is but a theoretical representation of that taken from nature, in *fig. 37.*



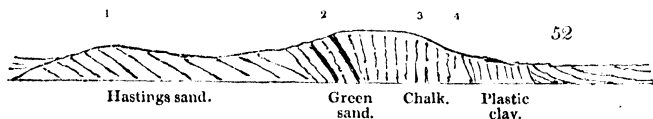
That this is the correct view of the case may be further proved by the fact (accurately represented in Mr. Webster's 27th plate, and copied into our *fig.* 37.), that there are in the vertical beds a series of joints nearly at right angles to the line of fault, and forming sloping declivities along the cliff, on which a few plants have taken root; these joints being nothing else than the parallels to the great fault brought into the position they now occupy, and which I have represented in *fig.* 51. by the lines α , β , γ , δ , ε .

The above explanation accounts for the curved strata oc-

curing as portions of horizontal strata, which seems to be the chief point to be proved, but which is not proved satisfactorily, either by Mr. Webster or by the authors of the *Outlines*. It also accounts for a fact I have observed, that the strata near the fault are *thinner* than at a distance, as well as harder.

That the chalk and plastic clay series have, *en masse*, undergone a vertical elevation, and that the line of elevatory force was in the line of fault assumed, may be shown by examination of the highly inclined and deranged beds of the plastic clay, between Poole and Christchurch, and at Studland, as well as by the other phenomena alluded to at the commencement of this paper; for the lines of fault now forming the joints at Ballard Head have their direction analogous to those cracks of which mention has been made; and it would be unphilosophical to suppose that the chalk could under the effect of a *general* law, which has operated over so extensive an area under precisely similar circumstances, affecting, also, so many different rocks, have exhibited a dislocation *exclusively* eccentric.

That the edges of the southern portions of the fractured chalk beds would necessarily be upheaved, there are numerous examples to prove, in formations of wide geological distance from the chalk: but one instance may be quoted from that very range of chalk in the Isle of Wight, of which the Purbeck Hills are a continuation, and which we give in the following section (*fig. 52.*), taken from Mr. Webster,



Section across Sandown Bay, Isle of Wight.

1, Sandown Bay. 2, Culver Cliff. 3, Bembridge Down. 4, White Cliff Bay.

where the edges of the beds above the plastic clay are seen turned up, exactly as the curved chalk beds are in the case before us.

The dislocation and fissures in Purbeck, on both sides of the chalk, conform to the general law, and mutually illustrate it and the joints and faults at Ballard Down. Thus, the deep fissure in the Purbeck beds, leading to Tilly Whim, if prolonged, passes through the crack in the chalk at Corfe Castle; perpendicular to which line is the junction of Durlstone Head, Peveril Point, Ballard Head, Old Harry, and the Chine at Bourne Mouth, on the Hampshire side of Poole.

Thus, again, the deep fissure which leads from Renscombe

Bottom to Chapman's Pool, on the west side of St. Adhelm's Head, if prolonged, passes through the separation of the chalk at Three-forked Down, between Swanwich and Studland; through a corresponding crack in the plastic clay at Studland, and striking the Hampshire coast or Boscombe Chine, north of Bourne Mouth. These two lines are the parallels of nearly all the drainage channels in the adjacent country: the general direction of Poole and Christchurch harbours, the rivers Stour and Piddle, and the brooks that enter the sea at Bourne Mouth and Boscombe Mouth, being in the first direction; whilst the transverse borders of the bays, &c., in the harbours, and the intersections of lines connecting the headlands between Purbeck and Southampton Water take the latter, which is perpendicular to the former.

It may be observed, that, as the Purbeck ridge is not perfectly straight, but curves in its course; so the transverse lines must accordingly alter: but it is a strong confirmation of the above hypothesis, that the course of the Wiltshire Avon is due north and south *; and that the Vale of Pewsey, in which it rises with its tributary streams, lies east and west, the river forcing its way through the barrier of chalk, having cliffs of upwards of 300 ft. along its course, at the foot of which it flows. Any one, who shall examine the course of this river, will be convinced that its channel is altogether indebted to the action of causes which produced a continuation of rents in the chalk, through which it has now formed a deep and excavated bed; and it is scarcely to be doubted that these rents were formed at the time when the Purbeck portion of the chalk was upheaved from east to west.†

The exact conformation of the surfaces of the vast planes that compose the solid mass of the country can only arise from one general impression; and that impression was given, unquestionably, by the manner in which the elevatory force acted in coming to light towards the south, as it would do, supposing it acted in a line from west to east, producing synchronous phenomena in directions exactly transverse to the different directions of the respective portions of the elevated Purbeck range.

Stanley Green, Poole, April 26. 1837.

* The dip of the chalk in the north of the vale of Pewsey is 45° to the south.

† Between its rise and Old Sarum there are on the Avon twenty-five high cliffs. The distance is not so many miles.

ART. IV. *Additional Remarks upon the proposed Genus Cypræcássis.* By SAMUEL STUTCHBURY, Esq., A.L.S., Curator of the Bristol Institution.

MY attention having been called to some observations by Mr. G. B. Sowerby, and another correspondent, upon my proposed new genus *Cypræcássis*, described in the Fourth Number of the New Series of your Journal, p. 214., I am induced to offer a few additional remarks upon the subject, especially as I have been so fortunate as to receive from Barbadoes, during the last week, two specimens of *Cypræcássis testículus*, with their animals.

Animal unisexual. Head distinct, with two conical tentacula. Mantle membranous, extending the whole length of the ventral disk; free upon the sides, but terminating in a fold, which lines the recurved canal of the shell.

Ventral disk, or foot, thick, fleshy, crenated upon the edges, having a longitudinal sulcus, by which it is enabled to fold itself, upon withdrawing into the shell. *No trace of an operculum.*

When separating *Cypræcássis* from *Cássis*, I did not wish it to be understood that I considered the genus *Cássis* to be then perfect, for I am inclined to think that farther division might with great propriety be made, removing from it such species as *C. ringens* and *pòmum*; also dividing those species with the wide mouth, and having occasional varices at indeterminate distances, such as *C. gláuca*, *granulòsa*, *vibex*, &c., and elevating them into genera or subgenera, for the sake of convenience; being satisfied that such subdivisions tend materially to assist the student in the more ready determination of the subject under his investigation.

Taking *C. madagascariënsis*, *tuberòsa*, *cornùta*, *flámmea*, &c., as typical of the genus *Cássis*, they may be distinguished from all others by the following characters:—

Shell triangular, completing the mouth, or basal face, at every two thirds of a revolution of the whorl, each additional portion being completed without absorption or removal of the internal protruding parts, such as the toothed outer or columella lips; having an epidermis and a horny operculum.

The varices, which Mr. G. B. Sowerby mentions as occurring in certain examples of *C. testículus* which have come under his observation, I have also been enabled to trace; and, if we mean the same, they are evidently merely a thickening of the edge, produced by a temporary cessation of the growth of the shell, most probably occasioned by a change in the condition of the animal, such as a deprivation of proper food,

&c.; and if this condition continues, then it is that the animal completes its mouth, giving to us those dwarf specimens so common in cabinets. Upon cutting into several shells in this state, there is no appearance of teeth, or even a raised ridge upon the interior, while in the true *Cássides* each separate period of its growth is as well determined by the teeth of the outer lip, and the plicæ of the columella, as is the outer basal face.

In examining very numerous specimens, in their natural state, of *C. rufa* and *C. testículus*, I have not found the slightest trace of epidermis; and, indeed, to the want of this protecting covering may be attributed the commonly eroded state of the upper portion, or dorsum, of the shell in old specimens.

Whether it is the mantle or the foot which deposits the thickened outer and columella lips, I shall not attempt to determine, but merely state that the animal has a mantle apparently as capable of secreting and depositing shelly matter as that of any other mollusc.

With respect to the operculum, I do not conceive that any naturalist will dispute the fact, that the presence or absence of this appendage to the animal is sufficient to ground a distinction beyond that of species only; therefore, if we are, for convenience' sake, to have the arbitrary divisions of subgenera, genera, &c., surely it will be conceded in this case.

From general resemblance, I was induced to claim *C. coarctata* *, among others, as species of this genus. Now, the question remains as to whether Mr. Cuming may not by accident have applied the operculum of some other animal to *C. coarctata*, since it is clear that *C. testículus* *has not* an operculum; and, from the close approximation in form of these two species, it is difficult to reconcile so close an affinity, without expressing some doubt as to whether it is not possible that such a mistake might have occurred.

With regard to the young state of *C. rufa*, I have not been so fortunate as to meet with specimens exhibiting the conditions which Mr. Sowerby points out. I certainly never have seen an instance in which the outer lip was completed so far as to have a row of strong teeth, and an increase of the volutions subsequently to have taken place. The figure given by Mr. Sowerby, I imagine to be an animal just arrived at that period of its growth when it would have completed its

* Mr. Sowerby is correct in stating that I was misled by Kiener in quoting Valenciennes for *C. coarctata*. I now recollect perfectly that a description of this species did appear in the *Tankerville Catalogue*.

shell, and that no further increase in the number of volutions would have taken place.

The Cassidæ'a might be divided, I think, with considerable propriety and convenience, in a manner approaching the following; and of such division we have the example given to us in the number for the present month, by Mr. Gray, of the family Máctradæ.

Genus 1. CA'SSIS, exemplified by *C. madagascariensis*, *C. tuberosa*, *C. flámmea*, *C. cornúta*, &c.

2. — , exemplified by *C. gláuca*, *plicària*, *arèola*, &c.

3. — , exemplified by *C. ríngens* and *pòmum*.

4. CASSIDA'RIA.

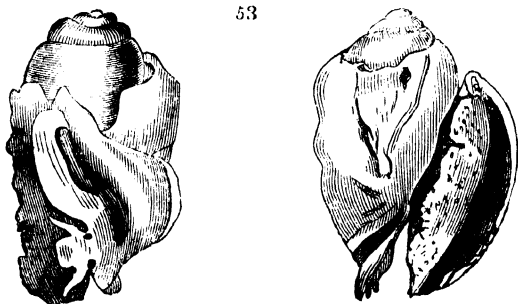
5. ONI'SCIA.

6. CYPRÆCA'SSIS.

From the characters given of the animal and shell, it will be found that Cypræcássis belongs to Blainville's third family (Angyostómata), while CÁssis would remain in the second family (Entomostómata).

Fig. 53. exhibits two views of an animal of *C. testículus* in a contracted state, occasioned by the strong spirit in which it had been preserved.

53



In closing these remarks, I would merely observe that I have endeavoured to meet Mr. Sowerby's objections in the way that I think will best serve the science we are prosecuting, that object being my only motive in making public my opinions upon this subject: and, with these feelings, I cannot help expressing my regret that Mr. Sowerby should have written in a style that I cannot help thinking is not quite consonant with similar views.

Bristol, July 25. 1837.

SINCE writing the above, I have received the Eighth Number of the *Magazine of Natural History*, in which I find some additional remarks by Mr. G. B. Sowerby.

With respect to the name, if I am wrong in having dropped the final vowel of *Cypræa*, I can only say, that, if the genus is adopted by Mr. Sowerby (which I flatter myself will be the case, he (having good classical reasons for the same) will, of course, restore the vowel.

In again referring to the ? *varices* of *C. rufa*, I do not see any reason to modify the observations I have already made.

Of *C. coarctata* I have not had an opportunity of seeing a specimen during the last five years, or, indeed of any other species, except *C. rufa* and *testiculus*; therefore my opportunities of studying their affinities, compared with my London friends', are very limited.

I am pleased to acknowledge I did not conceive that personal feeling could at all have influenced Mr. Sowerby's observations: it was the general spirit of the article which appeared to me as not being written in the dispassionate manner such subjects demand. This view seems to have been taken by at least two other persons. Whether the genus is established or not, to me is of very little consequence; my purpose is completely answered in having called the attention of a naturalist to the subject who has done so much for the science, and to whose opinions we are bound to pay every attention.

August 5. 1837.

[IN the extensive collection of shells exhibited at the British Museum, some specimens of *Cypræassis* may be seen having *varices* so strongly marked that their non-existence cannot certainly be given as a character of Mr. Stutchbury's proposed genus. We feel sure, however, that, even if there should not ultimately appear sufficient ground for the separation from the rest of the *Cassides* of those species enumerated by Mr. Stutchbury, every one interested in the scientific study of conchology will feel indebted to him for having raised a discussion upon the subject. — ED.]

ART. V. *Miscellaneous Zoological Notices.* By J. B. HARVEY, Esq., Corresponding Member of the Zoological Society, &c.

SIR, As it is the duty of all students in Natural History to make known every fact which they may, by accident or otherwise, be fortunate enough to discover, I have ventured to send you a few observations, which, I hope, will not prove either unacceptable to yourself, or devoid of interest to some of your readers. Being at a great distance from any scientific library, I am, of course, but imperfectly acquainted with modern discoveries; I will thank you, therefore, to make any

corrections or omissions in the present communication that you think proper. I am, &c.

J. B. HARVEY.

Teignmouth, Aug. 1. 1837.

DURING the last four years, I have constantly kept a variety of zoophytes alive in china basins filled with sea-water, and placed in a room with a southern aspect. In one large basin I have had several *Actiniæ* for nearly six months. It is very interesting to observe their powers of contraction and expansion. I have one large one (which is usually about 2 in. in diameter, and 1 in. in height), which can elongate itself nearly 6 in., and spread out its circle of feelers on the top. It can contract or expand its circumference and height into a variety of shapes and sizes. Sometimes its membranous stomach is expanded, and thrown over the whole body, (being turned inside out,) giving it the appearance of a hydatid; at others, its feelers are beautifully radiated, like a star, or like the petals of a flower, and cover a circle of 6 or 7 inches in diameter. It is during the night that the actions of these zoophytes are best seen: this I have also very frequently observed in the *Madrépore Caryophyllia*, a large specimen of which I have kept alive nearly five years. The other day, while I was turning over the feelers of one of the *Actiniæ*, I observed a small red substance, about the size of a pin's head, drop from the mouth: this, on examination, I found to be a young polypus, perfectly formed. I have, since that time, had seven others produced, but from different specimens; which I intend, if possible, to keep alive, in order to examine them from time to time, to ascertain their growth, &c. The only difference between them and the parent specimens consisted in the number of feelers, and in their size. Some of the young ones had 12, others 8, and two only 6, feelers: they appeared extremely simple in their formation. (*fig. 54.*) This mode of production agrees with Cuvier's description. He states that the young are hatched in the ovaries, and ejected from the mouth perfectly formed.

54

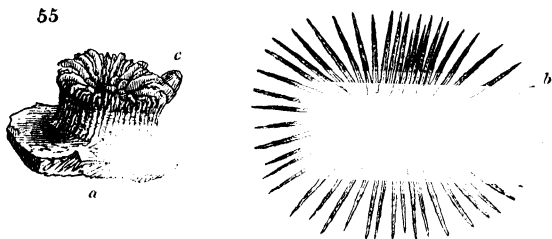


It is rather singular that these polypi, whose voluntary powers appear limited to contraction and expansion, should be able to distinguish between a small animal of their own species, and a fly, a barnacle, a limpet, or a portion of an oyster: the first it ejects from the mouth, the latter are instantly seized and devoured. The animal of the *Madrépore Caryophyllia Smith* * is an *Actinia* in every respect; its outer covering, instead of being a thick coat of skin, is formed

* *Caryophyllia Smithii*, *Zool. Journal*, vol. iii. p. 486. plate 13. — *Ed.*

by the inner walls of the coral. The motions of the Caryophyllia are more active than those of the generality of Polypifera. My specimen has increased in size considerably during the five years that I have kept it. I feed it, every month or so, with a piece of oyster about the size of a pea. It seizes the food with its feelers, and, after a short time, envelopes it in its stomach. It continues in this state for two or three days, when the indigestible matter is evacuated, and the animal reassumes its usual size and appearance. This coral is found in Teignmouth Bay, and in the neighbourhood of Torquay. It is rather rare. I have sketched a hasty diagram of the natural size of my specimens. *Fig. 55. a*, the coral; *b*, the

55

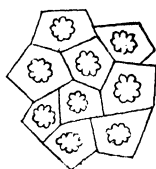


animal expanded, showing its double set of feelers on the circumference. This is the appearance it presents, as seen by night, three or four days after having been fed. On the coral, at *c*, is seen a specimen of *Pyrgoma anglicum* Leach, which is never, as far as I am aware, found, unless attached to this coral. At all events, it has not been found in our neighbourhood, unless accompanying the Caryophyllia. I have had many specimens of them: the coral I have often seen without the *Pyrgoma*, but the latter never without being attached to the coral. I have sent specimens to the Zoological Society.

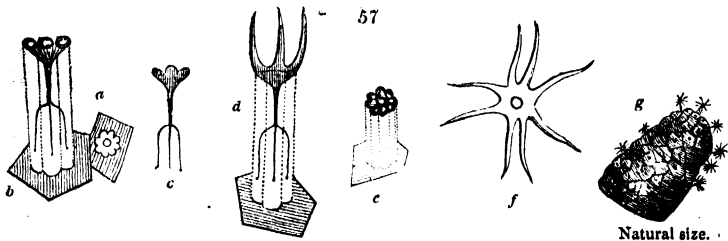
I have lately examined several live specimens of *Alcyonium digitatum* Linn.; and, as its structure can be but imperfectly understood by Ellis's plate and description, I have endeavoured to amend them.

The substance or mass of this polypifer is marked throughout in pentangular divisions, in the centre of each of which is the cell of the animal. This cell is octangular, or rather an octagon, with each side convex. *Fig. 56.* shows a magnified view of the divisions and the cells. When the animal is within the cell, the above is the exact appearance; but, when the animal is expanded in search of food, its form is found to be very different

56



from any of the other polypes with which I am acquainted. From the cell an octangular tube projects, in which the animal is seen suspended, as if floating in a medium of greater density than itself. This tube is perfectly transparent, and the roots, or feet, of the polype are seen suspended from the body, but not touching the substance of the Alcyonium. Around the mouth are the eight feelers, answering to the eight sides of the cell: these feelers the animal has the power of elongating or contracting at pleasure. I have ventured to describe the animal in its expanded state by the accompanying diagrams (*fig. 57.*): the dark lines are the polypes, as seen through the wall of the transparent tube.



a, The cell magnified. *b*, The polype expanded and floating in its membranous tube. *c*, The animal as it appears in the tube, showing only a side view. (There are eight feet, as well as eight feelers: only three seen.) *d*, The animal with its feelers expanded. *e*, Front view of the animal. *f*, Ditto with the feelers at their utmost elongation. *g*, A representation of the Alcyonium, as seen alive, and of its natural size.

I am pretty nearly convinced that this Alcyonium is found among the beautiful fossil zoophytes occasionally met with in the transition lime series of our neighbourhood; and, if I mistake not, there are two, if not three, specimens of it in the Table of Fossil Corals, which I exhibited at the Zoological Society a short time since.*

I remember, about two years ago, seeing a description, in Loudon's Magazine, of *Ophiura bracteata* and *O. neglecta*: the former was considered a fine specimen at $4\frac{1}{2}$ in. in diameter, if I recollect rightly; and they were found in Scotland. I have several of *O. bracteata*, 6 in. and 7 in. in diameter; and of *O. neglecta* (I believe I have sent a specimen). I have one specimen 10 in. across, and many 8 in. I merely mention this fact, to show the mildness of the climate in the south of Devon, if temperature has any influence over their growth. It is certainly a remarkable fact, that the marine productions of Devonshire are noted and prized for their perfection or their size.

In the autumn of 1835, my friend Mr. H. Glossop sent to

* This beautiful table is now in the Adelaide Street Gallery. — *Ed.*

your Magazine * a description of the opercula of the *Sérpula trîquetra* and *Sérpula vermiculâris*, which Dr. Turton had named as "*Patélla tricórnis* and *Patélla extinctòrum*," supposing them to be individuals of the *Patélla* family. At that time, neither Mr. Glossop nor myself had examined a sufficient number of specimens to be certain to which of the *Sérpulæ* each operculum belonged; for the shells are so very brittle, as well as minute, that it is with great difficulty they can be taken out uninjured. I have lately had an opportunity of examining about 200 specimens of both species of *Sérpula* (for they are always found together); and I am satisfied that both opercula belong indiscriminately to either *Sérpula*. I have taken them from each repeatedly. I have also ascertained that the *extinctòrum* and *tricórne*, as Turton called them from their shape, are only different states of the same operculum. I have sent several specimens to the Zoological Society, where they can be examined; I have also a number left, which show distinctly the intermediate state between a complete extingisher, or cone, and a tricorn, or three-horned, operculum. I am of opinion that the cone shape is the first formed, for I have several cones with one horn, and others with two upon them. The three-horned operculum is also a cone; but it would appear that, when the three horns are completed, the cone is lessened in height by absorption, and increased in span at the base. The accompanying diagram (*fig. 58.*) will explain my description.



a, Opérculum *extinctòrum*; *b*, ditto with one horn: found on *Sérpula trîquetra* and *Sérpula vermiculâris*. *c*, Opérculum with two horns. *d*, Ditto with three horns. *e*, *e*, Opérculum *tricórne*. *f*, Opércula of their natural size.

ART. VI. *Some Remarks on the Plumage of Birds.*

By EDWARD BLYTH, Esq.

DR. MOORE states (p. 361.) of the common guillemot, that "Temminck considers that the lesser guillemot is the same in winter dress; but, in that case," he adds, "it is difficult to account for the occasional appearance of the bird in its summer plumage at that season." Montagu speaks of one shot in Devon, in January; and I have a specimen, killed February 20. 1830. It may be the young, which abounds

* See Mag. Nat. Hist., vol. viii. p. 621. — *Ed.*

here in winter: and again, he observes of the razor-billed auk, that in Devonshire it is "often obtained, though more rarely in the adult plumage; yet," he continues, "I possess one killed in February."

As these remarks are calculated to revive a controversy which has long been set at rest by an appeal to facts, I beg to submit the following detail of the seasonal and progressive changes to which these birds are subject, which, I trust, will satisfactorily remove whatever doubts may at present be entertained on the subject. When first excluded, they are clad in a downy covering, which, in its tints and markings, resembles that of the adult bird in summer aspect of plumage*; the young razor-billed auk having even the singular white line from the bill to the eye, which is noticeable in the parent birds, but which gradually disappears previously to the shedding of its down: the latter is replaced by feathers of most delicately soft texture, the tints of which resemble those of the adults in winter; this second plumage being only retained for a few weeks, when the young birds undergo a complete moult (including the primaries), and acquire the fully adult garb, of much finer texture than the last, but resembling it in colour. They thus continue till very early in the following year, when the older birds, some time before their progeny, have the plumage of the cheeks and throat at first but slightly tipped with brownish black, which gradually increases, spreading backwards over each feather, till it pervades the whole; at which time the bird appears in its complete summer livery, having undergone no vernal change of feathers; the white line, also, from the bill to the eye, contemporaneously making its appearance in the razor-billed auks, of which species the altered portion of the cheeks and throat continue of a much browner black than the other dark parts of the plumage. A guillemot which I obtained in the first week of the present month (July) had already commenced its annual moult, exhibiting many growing white feathers on the cheeks and throat.

It may be remarked, that it would be quite as well for naturalists to distinguish betwixt birds that merely undergo an alteration of colour in the same feather, from those which renew their plumage twice in the year, by confining the expressions *summer* and *winter plumage* to the latter, modifying these, in the former instance, by interposing the word *aspect*; a plan which I have followed in the course of a work in which

* In the case of the puffin, however, which undergoes no seasonal changes, this first covering is sooty black.

I am now engaged, wherein the changes to which our British birds are subject are described in detail.

I append a few additional observations, chiefly with a view to elicit exceptive cases, should they happen to have occurred to any reader.

Mr. Selby, in his *British Ornithology*, positively affirms that the snipes and woodcocks undergo a double moult, though without altering their general appearance to any extent. Of great numbers of these birds, however, which I have examined during the spring months, up to the time of breeding, I could never discern the slightest trace of a change of feather. The present season, I examined seven recent specimens of *Scólopax major*, obtained in Holland, about the third week in May, and of which the females would certainly have laid in a few days; but which differed in no particular from others killed in October last, and, on minutest inspection, corroborated my observations on the other species.

In the green ~~hawks~~^{hawks}, and other Tótani, which alter their colours to a certain extent at the approach of the breeding season, I have hitherto failed to detect any appearance of a vernal moult; but, in the little ring plovers, which Temminck confidently asserts to renew their feathers in autumn only, I have found that this applies chiefly, or wholly, to the younger birds; as many (perhaps all) of the older individuals moult to a variable extent in spring.

On a former occasion, I asserted that the amount of constitutional vigour exercises a great influence in determining the extent to which various double-moulting species renew their feathers in spring; and, continuing those researches which led to that conclusion, it soon became evident that the degree of vigour, in its turn, depended principally upon age. Thus, in the ruffs (a species, by the way, in which the retained old feathers undergo no change of colour), the younger specimens put forth but a few new feathers on the upper parts in spring; and it is only in birds of apparently several years old that the vernal change is anything like complete. It is not generally known, that old females of this species develop some appearance of the ruff; producing glossy purplish feathers on the sides of the neck, to a greater or less extent, which are considerably longer than the wing in winter plumage: such females do not vary in any remarkable degree, and have usually the new plumage on the upper parts black, with a fine purple gloss, each feather beautifully margined with light brown.

In addition to the instances mentioned at p. 302. of prolific female birds assuming the masculine livery, I can now record

one of a common linnet, with the crown and breast bright red, the neck ash colour, and wings and tail more broadly edged with white, which proved to be a fertile female on dissection, containing eggs considerably advanced. This is not unusual in the little redpole, or rose linnet; though in neither case, so far as I have hitherto seen, do such females equal an old cock bird in brilliancy; which is the reason the fact has been hitherto overlooked, as dull-looking specimens are rarely thought worthy of preservation; besides which, few observers would have deemed it necessary to look to the sex of a red-breasted linnet, concluding, from this circumstance alone, that the bird was a male. Even the case now recorded was quite accidentally discovered; the specimen, which had been caged several weeks, having been opened merely to ascertain the cause of its death. I believe that the male linnets require two years at least, if not more to attain their summer aspect in full perfection.

Of fifty-eight specimens of the purre, killed during the last week in May, and examined together, the bill was found to vary from less than an inch to more than an inch and a half; a corresponding variance being noticeable in the godwit genus, some of which have the bill longer by upwards of a half than others. This difference, in the same sex, depends principally (as it is well known) upon age; a fact which has been of assistance towards ascertaining that it is the older birds which chiefly renew their feathers in spring; but it always attains a greater length in the female sex, which (as it is equally well known), with the one exception of the polygamous ruff, is, in all this tribe of birds, of superior magnitude to the male. With regard to the plumage of these pures, I found that ten exhibited no appearance of black upon the throat; but that all, one old female excepted, had the upper parts more or less reddened. A second specimen, evidently one of a late hatch of the preceding year, had but a very few red feathers, which were being acquired by moulting. In the rest, new feathers were every where mingled with tinged old ones: four had very little black on the lower parts; and not one of the whole number was absolutely perfect, presenting various intermediate stages. A female, obtained in the market during the first week in July, which, from the denuded state of its under parts, had evidently been incubating, exhibited but very incomplete summer livery.

Of two specimens of *Squatarola cinerea*, killed also during the last week in May, when others of the same species had assumed their full summer appearance (which is obtained, as in the golden plover, both by moulting and change of colour,

but principally the former), one presented not the slightest indication of black on the breast, the other only a few traces in the old feathers, those of the back having been much worn at their edges. The godwits, unless very old birds, rarely, if ever, change more than a moiety of their upper plumage in spring; and, in these birds, the retained old feathers of those parts always appear much worn at their edges, and do not assume the rufous colouring of such as are then put forth. I have seen as many as three specimens, of the bar-tailed species, all of which (judging from their size and length of bill) were apparently old females, which, very late in spring, when others of their kind had completed their vernal development of new feathers, exhibited no symptom of change: these I suspect to have been barren birds, or, perhaps, only temporarily incapable of producing; but the only recent example which I have seen during the present season was not in a fit condition to examine.

It is remarkable, that almost every genus of the smaller grallatons presents peculiarities in its seasonal changes, which will be amply described in the work to which I have before referred. — *July 10. 1837.*

ART. VII. *Description of the Membranes of the Uterine Fœtus of the Kangaroo.* By R. OWEN, Esq., F.R.S., &c. Communicated by the Author.

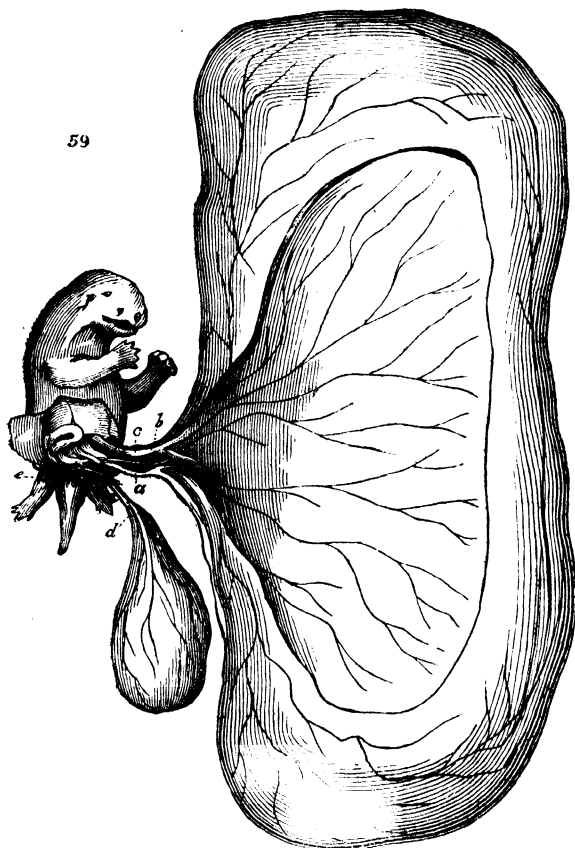
IN a paper read before the Royal Society in January, 1834, I described the fœtus and membranes of a kangaroo (*Macropus major*), at apparently the middle period of uterine gestation, which in that animal lasts thirty-eight days. The membranes consisted of an amnios; a very large vitelline sac, rendered highly vascular by ramifications of omphalo-mesenteric vessels; and a thin unvascular chorion. There was no placenta, nor any adhesion between the exterior membrane of the fœtus and the internal surface of the mother, by the opposition and interlacement of villi, or vessels, as in those Mammalia in which the placenta is replaced by a uniform villous and vascular chorion: the condition of the fœtus was, in short, such as obtains in the viper and other ovo-viviparous reptiles; save that, at the period of development at which the fœtus in question had arrived, there was no trace of the existence of an allantois. In order to ascertain whether an allantois was developed at a subsequent period of uterine gestation, I dissected very young mammary fœtuses of different marsupial animals, as the Kangaroo, Phalangista, and Petaurus; and, finding in them the remains of a urachus, and um-

bilical vessels, I did not hesitate to conclude that an allantois was developed at a more advanced stage of the developement of the embryo.

I took occasion to observe, that, as the growth of the fœtus advanced, the circulating fluids became necessarily more charged with decomposed particles of the organised substance ; and that, although the extended surface of minutely subdivided blood-vessels afforded by the vitelline sac might serve both for respiration and nutrition at the earliest stages of developement, yet that, a late period, an accessory apparatus to that end appeared to be necessary, as the embryo acquired additional bulk and parts. In fact, in all the Reptilia in which the respiratory function of the fœtus is not performed by the extension of vascular filaments from the sides of the neck, an allantois, or cœcal process, organised by umbilical or hypogastric vessels, is produced from the terminal portion of the intestinal tube. The period of the developement of this accessory respiratory organ, in birds, is immediately subsequent to the budding forth of the locomotive extremities. In the placental Mammalia, where the vitelline sac and vitellus are relatively smaller, the allantois makes its appearance much earlier, but is developed in different proportions in the different orders. It is subservient, in all the placental Mammalia, to one important function, viz. the transference to the exterior enveloping membrane, or chorion, of the hypogastric or umbilical arteries ; and in these Mammalia the umbilical vessels coextended with the allantoic cœcum seek a more intimate contact with the vascular surface of the womb, and proceed to organise the chorion, shooting out into villi, either extended over the whole surface, as in the mare ; or disposed in circumscribed tufts, as in Ruminantia ; or limited to one place, and forming a single placenta, as in the human subject, and in all unguiculate Mammalia.*

In the bird and reptile, the umbilical vessels are limited to the allantois, and do not extend beyond that membrane to the chorion ; allantois, therefore, in these plays a primary part in the respiration of the fœtus. In the placental Mammalia, on the other hand, its office as a temporary respiratory organ is secondary, but it is essential as a means of transference of the umbilical vessels to the chorion ; it therefore preexists to the placenta, and without it the placenta could not be formed ; for, if we consider that the embryo is formed within the bag of the chorion, and originally free from any connexion with that membrane, there must of necessity be some support for the

* Pub. Phil. Trans., 1834, p. 342.



a, Pedicle of vitelline sac. *b*, Omphalo-mesenteric artery. *c*, Omphalo-mesenteric vein.
d, Pedicle of allantois, or urachus. *e*, Intromittent organ, grooved below.

umbilical vessels during their passage to the chorion: but we know of no other than the allantois, or urinary bladder, and urachus, as its remains are termed. The existence of a placenta, in my mind, necessarily therefore infers the preexistence of an allantois; but the reverse of the proposition does not therefore hold good. We see in birds, and scaled reptiles, that the allantois itself performs the functions of the placenta, or vascular chorion; and the question to be resolved, relatively to the kangaroo, and other Marsupiatà was, whether the allantois being developed, it would serve as a medium for the organisation of the chorion, or remains, as in the oviparous Vertebratà, an independent vascular bag, or cœcum.

The examination of a uterine fœtus of a kangaroo, kindly

placed at my disposal by Dr. Shearman, has contributed to resolve that question.* This foetus (*fig. 59.*) was farther advanced than the one which I previously described. The ~~objects~~ ^{appendages} on the hinder extremities were distinctly formed. The umbilical chord extended nearly three lines from the abdominal surface of the foetus; the amnios was reflected from this point, to form the usual immediately investing tunic of the foetus; and, beyond the point of reflection, the chord divided into a very large superior vascular sac, organised by the omphalo-mesenteric vessels, corresponding in all respects with the vitelline sac described and figured in my first paper; but below the neck of this sac there extended a second pyriform sac, about one sixth the size of the vitelline sac, having numerous ramifications of the umbilical vessels, and constituting a true allantois. This sac was suspended freely from the end of the umbilical chord: it had no connexion, at any part of its circumference, with the chorion, and was equally free from attachment to the parietes of the uterus in which the foetus was developed.

ART. VIII. *On a new Genus of Land Shells.* By JOHN EDWARD GRAY, Esq., F.R.S., &c,

ZOOLOGISTS have divided the land shells into several genera; but the late Baron Férussac united most of them into a single genus, as he wished to establish as a rule, that all the genera of Molluscans should be alone characterised by some peculiarity in the animal.

The increased knowledge of the animal has shown that some of the species which he referred to the genus *Helix* have very different animals from the typical kinds; and it is probable that eventually several of the genera established before his time (which he attempted to set aside) will be found to be true genera, according to his own theory.

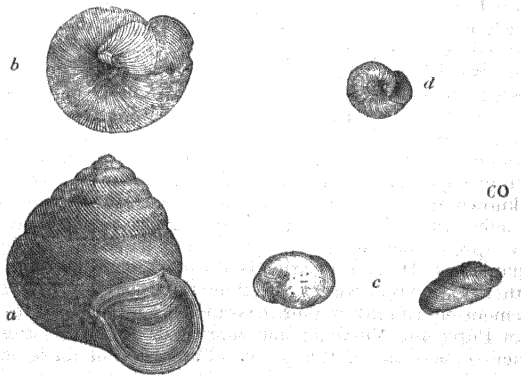
The knowledge of the animal, and the history of several species which were unknown at the time he wrote his system, has shown that several of the characters which he considered as of generic importance are common to other species belonging to quite different groups. Thus, we now know that some *Helices* (*Caricolla inversicolor*, *Balea Chemnitzii*, and some others) are viviparous, as well as the *Partulæ*; that the degree of development in the lower pair of ventricles is variable in the different species of *Pupæ* and *Vertigo*; and that to separate the latter genus from the former, on account of the partial obliteration of these organs, has the effect of dividing very nearly allied species.

I am inclined to think that these, and numerous similar facts, which must be well known to every practical conchologist, show us that we are warranted in establishing genera from any peculiarity in the structure or

* The preparation from which Mr. Owen's drawing for our cut was taken, was exhibited by him at the last Scientific Meeting of the Zoological Society, August 22d, when the facts contained in the present paper were orally communicated. — *Ed.*

form of a series of shells, as well as on a peculiarity in the animal alone; especially when we consider how very few of the animals of the different species which we are called upon to arrange are, or ever can be, known, and also as we constantly find by experience that every peculiarity in the form or structure of the shell is the indication of some peculiarity in the habit or organic structure of the animal which formed it, and warrants its separation from the rest of the species of the family.

The antique lamp, on which Lamarck established his genus *Anóstoma* has been long known and valued, on account of its rarity and strange form; the animal turning up the last whorl before it completes its growth, so that the mouth of the shell is even with the outer surface of the spire. A similar form has been lately observed among the fossil shells, which, on account of its resemblance to the *Cyclostomata*, by the roundness and simplicity of its mouth, M. Deshayes has separated into a genus, under the name of *Strophóstoma*. In my paper on the structure of shells (*Phil. Trans.*, 1833), I pointed out that some land shells, as *Hélix contusa*, when they arrive at a certain period of their growth, throw their whorls out of the regular series, as if the shell had been crushed, producing what may be considered as a natural distortion. Having, since that time had the opportunity of observing several other species of a similar structure, and finding that they all agree in the general form and position of their mouth, I am induced to consider them as forming a peculiar group, for which I propose the name of *Streptáxis*. They also agree in the shell being generally concentrically striated, except in the flattened part of the front of the hinder part of the last whorl, near the mouth, which is smooth. One of the species forms, during the dry season, a hard, thin, calcareous epiphragma, differing considerably in structure from any that have hitherto been observed among the *Helicidæ*; but they may be only a peculiarity of the species, though the epiphragma in this family often forms a good subsidiary character.



Genus *STREPTÁXIS* n. g. Animal like *Helix*? Shell ovate or oblong; when young, sub-hemispherical, deeply umbilicated, with rapidly enlarging whorls. At length the penultimate whorl is bent toward the right and dorsal side of the axis, and the umbilicules become compressed, and often nearly closed. The *mouth* lunate; the edge slightly thickened and reflexed, and often with a single tooth on the outer side of the inner or hinder lip.

These shells inhabit the tropical parts of Africa and South America; and two of the species of these two distant countries appear to be very nearly allied.

The animals of these shells, like the *Anóstoma*, &c., must remain satisfied with its size, after they have once formed its mouth, as they cannot alter it by reabsorption, as many of the *Hélices* do, without removing the whole of the last whorl; for, if a new whorl were added to it, it would entirely alter the form of the shell.

A. Shell depressed, oblong, very oblique. Mouth with a Tooth on the inner Lip. Periostraca thin, polished. Umbilicus linear, closed.

1. *Streptáxis comböides*; *Hélix comböides* D'Orbigny Voy.

Inhabits South America.

M. Moricand (*Trans. Acad. Geneva*) describes two varieties; one from Brazil, and the other from Bolivia.

2. *Streptáxis Maugerae* (fig. 60. c, d.) Shell oblong, white, thin, transparent polished; the three upper whorls regular, the last and last but one very much distorted.

The young shell (d) is depressed, polished (sometimes with a few small crenulations near the suture). The *umbilicus* is very large and deep, showing the volutions.

Inhabits Sierra Leone. Mr. Speck, Mrs. Mauger's, and my cabinet.

B. Shell rather depressed. Subhemispheric, thin, rather oblique. Inner Lip toothless. Periostraca thin. Umbilicus deep.

3. *Streptáxis contusa*; *Hélix contusa* Férussac, t. 31. f. 1.; Copied Wood Supp., t. 7. f. 29.

Inhabits Brazil. My cabinet.

The front of the last whorl smooth, rest of the shell closely concentrically striated.

C. Shell convex, rather top-shaped. Whorls many, rather oblique. Umbilicus small, deep. Inner Lip toothless.

4. *Streptáxis deformis*; *Hélix deformis* Férussac, t. 32. f. 1.; Cop. Wood Cat. Supp., t. 7. f. 40.

Inhabits Brazil. My collection.

D. Shell ovate, thin. Whorls many, oblique. Umbilicus linear, closed. Inner Lip toothless, very thin.

5. *Streptáxis nobilis*. (a, b.) Shell thin, whitish, pellucid. Whorls 6, regularly transversely grooved; the front of the hinder part of the last whorl nearly smooth.

Inhabits Sierra Leone. Mr. Speck, collection of the British Museum, Mrs. Mauger's, and my own.

The epiphragma, which exactly closes the mouth, is nearly flat, rather convex in front, with minute curved cross lines, forming two series, curving round a subcentral cross groove, and all arising from the hinder angle of the mouth; where it is inflexed, and where there is left a small slit, through which the animal doubtless respire. The epiphragma is evidently first deposited as a thin convex membrane, as is shown by the lines on the surface, which are afterwards thickened by an internal shelly coat.

E. Shell ovate, solid. Last Whorls slight, oblique. Umbilicus closed, linear. Inner Lip thickened, with a Tooth on the outer Side.

6. *Streptáxis* ? *Pagoda*; *Hélix Pagoda* Férussac; *Hélix concamerata* Wood Cat. Supp., f. 21.

Inhabits Madagascar. My collection.

This last species appears to be intermediate between this genus and the genus *Gibbus* of De Montfort, of which *Brilèmus Lionetteanus* is the

type. In this shell, which offers another instance of irregularity in the disposition of the last whorl, instead of the whorl being bent out of the axis, the animal, a short time before it is about to complete its shell, produces the front of the mouth, and then, after having suddenly enlarged the size of the whorl, as suddenly turned round, taking care to keep it attached to the proper part of the penultimate whorl, half a turn, and then completes its mouth, thus keeping of the larger whorl on the one before it; and the prominences produced by the enlargement of the mouth at the last stoppage of the growth giving the shell, and especially the last whorls, a depressed, angular, distorted appearance.

The two new species here described were discovered by Mr. Speck, a very industrious collector, who has just returned from Sierra Leone, and communicated to me by my intelligent friend Mrs. Mager of Clapton. With them, besides many other marine shells, he brought a specimen of *Achatina* which, as it appears to be new, and offers some peculiarity in its structure, I shall proceed to describe, under the name of

Achatina clavata, Shell lanceolate, thin, pellucid, white. Whorls 11 or 12, rather convex, closely concentrically grooved; last with a spiral slightly raised keel, and smooth in front; the apex club-shaped, with more distant, sharp, and elevated ridges.

Inhabits Sierra Leone. Mr. Speck, collection of the British Museum, Mrs. Mager's, and my own.

This species is most allied to my *Achatina sulcata* but much larger, and very distinct, from the peculiar club-shaped form of the tip.

ART. IX. *Description of a new Subgenus, and some Remarks on Birds belonging to the Family Laniadæ.* By GEORGE ROBERT GRAY, Esq.

Genus CHAUNONOTUS* G. R. Gray.

Gen. Char. Rostrum capite longius, validum, basi latum, apice attenuatum, vix dentatum; culmen latum, leve, rotundatum, basi lunulata; nares nudi, in medio rostro, laterales, immersi, oblongi; plumis aperturam attingentibus. Alæ subrotundatæ, breves, remigibus 1mâ, 2dâ, 3tiâ graduatis, 4tâ, 5tâ, 6tâ subæqualibus longioribus. Tarsi rostri longitudine; digitis Malaconoti sed brevioribus; unguibus brevibus vix curvatis. Cauda mediocris, leviter rotundata.

CHAUNONOTUS SABINI G. R. Gray. Sabine's Puff-back.

C. supra cærulescenti-niger; dorsi plumis floccosis mollissimis et subtus albis.

Thamnophilus Sabini J. E. Gray's Zool. Misc., i. p. 7.

THE total length of this bird is 8 in.; that of the bill, 11 lines; of the culmen, 10 lines; of the wing, 3 in.; of the tarsi, 11 lines.

The two specimens that I have before me were brought, some time ago, from Sierra Leone, by Captain Sabine, R. A., after whom my brother named them. As they were unaccompanied with any remarks, I am unable to furnish an account of their habits; but the shortness of their toes renders it probable that they are more terrestrial in their mode of life

* *Chaunos*, swollen; *nōtos*, back.

than the Cùbla *, to which species they bear such a resemblance, that, at first sight, they have been mistaken by several persons, to whom I have shown them, for that species. Their larger size, however, as well as the form and size of the bill, at once points out the difference between them and the bird described by Le Vaillant. The principal characters that distinguish these birds from Malaconòtus are, that the bill is broader, and the culmen is also broad, smooth, and rounded, which gives them so great an approximation to the species of the Australian genus Crácticus of authors, that they might be considered an intermediate link between the Malaconòti and that genus. If it were not for these characters, these birds would be placed with the Malaconòti; but I think them of sufficient importance to form a distinct division.

The general colour of this species is very like the Cùbla, except that it possesses a greater gloss of blue on the back; and neither the wing coverts nor the tail feathers are margined with white. When young, both colours are tinged with sepia-brown.

The dorsal patch of milk-white down is of a most beautiful soft texture, and in a greater quantity than in the Cùbla. This tuft Mr. Swainson has described †, in the latter species, in the following terms:—"When the feathers on the back are raised, as they occasionally are, by the bird itself, they seem to form a semicircular tuft of the most delicate and beautifully white down, exactly resembling that of the swan, and as if that part of the body were protected by an artificial tippet. When in a state of repose, this singular appearance completely vanishes, and the feathers repose on each other as in an ordinary bird." The purpose of this tuft of down has not, I believe, been detected by ornithologists.

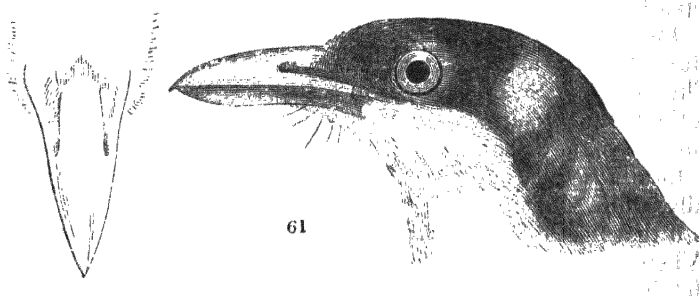
I find that Mr. Swainson, in his work on the *Birds of Western Africa*, has proposed, with his usual readiness, to alter the name of Cùbla, by which the bird has been known for many years, on account of the word being the native name, and, therefore, deemed by him "barbaric," to the more, I presume, elegant word, *mollissimus*, in reference to the softness of the down on the back; which name, however, would be more suitable to the one now described, in which that character is more fully developed.

But Mr. Swainson is not aware that the bird of Western Africa, which he has described as identical with that of the

* Le Vaill. Ois. d'Afr., pl. 72.

† Birds of Western Africa, Nat. Libr., vii. 341.

Cape, has been regarded, for some time, by M. Lichtenstein* as a distinct species, named by him gambénsis, and distinguished by its larger size; by the colour of its wings and back, which are fuscous; that of the scapulars and tergum, which are cæsius; and the tail, which is without any fringe of white. These characters, as well as the locality, agree with Mr. Swainson's description of his mollissimus; so that the name of gambénsis has precedence over Mr. Swainson's newly proposed name. I have also a specimen from Zanzibar, which agrees more with the Cùbla of Le Vaillant than the other, except that the bill is nearly the length of the head, and the wing coverts are not margined with white, nor are the quills or tail feathers so margined. According to the specimens from each locality which I have examined in the British Museum, I find the longest quill in the Cùbla is the fourth, in gambénsis; the third, in affinis; the fifth. But the best mode of displaying the specific characters is by a synopsis, which I will here add.



MALACONOTUS Sw.

Cauda brevis, apice quadrata. — HAPA'LOPHUS † G. R. Gray.

H. CùBLA G. R. Gray. Mas. Supra cærulescenti-niger, subtus albus; alarum tectricibus et caudæ plumis albomarginatis; rostro brevi. — *Femina*. Niger, subtus rufescenti-albus; dorsi plumis rufescenti-plumbeis, alis tectricibus tectricibusque fusciscenti-nigris, omnibus albomarginatis; rostro pedibusque plumbeis, illo albomarginato.

Maris long. 6 poll. 10 lin. Rostr. 9 lin. Al. 3 poll. 5 lin. Cauda, 3 poll. 2 lin. Tarsi 1 poll.

Le Cùbla Le Vaill. Ois. d'Afr., ii. 89. pl. 72. Lanius Cùbla Shaw's Zool., vii. 328.; Lath. Orn. Supp., p. xx.

Habitat ad Cap. Bon. Sp.

H. AFFINIS G. R. Gray. Mas. Præcedenti similis, sed rostro capitis ferè longitudine; alarum tectricibus concoloribus; caudæ plumis remigibusque levitè albomarginatis.

* Lichtenstein's Verzeichniss der Doubletten des Zoologischen Museum, 1823.

† Hapalos, soft; lophos, crest.

Long. 6. poll. 6 lin. Rostr. 11 lin. Al. 3 poll. 3 lin. Cauda, 2 poll. 10 lin. Tarsi 11 poll.

Habitat in Zanzibariâ.

H. GAMBÉNSIS *G. R. Gray. Mas.* Supra niger, subtus albus; alis caudâque fuscis; scapularibus et tergo cæsiis; alarum tectricibus remigibusque albomarginatis. — *Femina.* Cinereus, subtus totus rufo-albus; alis caudâque fusco-nigris; tectricibus remigibusque rufescenti-albomarginatis; rostro pedibusque plumbeis, illo albomarginato.

Maris long. $7\frac{1}{2}$ poll. Rostr. 1 poll. Al. 4 poll. Cauda, 3 poll. 4 lin. Tarsi, 13 lin.

Lanius gambéensis Licht. Verz. Doub. Zool. Mus. Berl. 1823, p. 48.

Malacônôtus mollissimus Sw. B. of W. Afr., vii. p. 240. pl. 23.

Habitat in Gambiâ.

I cannot end this paper, without expressing my surprise, that it has been left for me to show these differences in a genus established by Mr. Swainson; as that indefatigable ornithologist is ever eager to prove the specific distinctions of such birds, as have hitherto been considered identical, but which are found in various localities, as is the case with several birds in the volume now referred to.

Aug. 15. 1837.

ART. X. *Description of a new British Wasp; with an Account of its Developement.* By W. E. SHUCKARD, Esq., V. P. Ent. Soc., Librarian to the Royal Society.

It very rarely happens that the first record of a new creature in the annals of science contains more than merely its technical description. I consequently esteem myself happy in being able, in this instance, to add some traits of the economy, and a particular and consecutive history of the gradual developement from the grub to the perfect insect, of the little animal I here for the first time introduce. My friend Mr. F. Smith, to whom I am indebted for the particulars, as well as for specimens of the insect, during a collecting excursion in the vicinity of Blackwater, upon the borders of Hampshire, in July, 1836, captured the rare *O'smia leucomélana Kirby*, which he observed in abundance, and detected entering the ends of the dead sticks of the common bramble, which it is the custom in that part of the country to use in making mud-wall enclosures. From his observation, it appears that this insect excavates the pith from the stick, and constructs its nests within the tube thus formed. It was not until his return to London that he ascertained the value of his capture, although he was successful enough in the first instance to secure both sexes of the bee, and, by this lucky accident, confirmed a supposition I had long entertained as to the specific identity of the sexes of this insect, the male of which was not before

known, but which will be fully described in my forthcoming *Essay upon the Bees of Great Britain*. Upon a subsequent visit to the same spot in the beginning of September, he was anxious to capture more specimens of the bee, finding it a choice acquisition to his own collection, and a desideratum to his friends; but, as it was to be expected, he was too late to take it; when, fortunately, it occurred to him to secure several of these bramble sticks, having first ascertained, by opening some of them, that there was a certainty of succeeding in his object by finding the tube occupied by the infant grub. It is a remarkable fact, that not in one single instance did the insect which he bred from these sticks prove to be the much wished for bee; but, instead of it, a more desirable acquisition, namely, an entirely new species of wasp, of the subgenus *O'plopus* of Wesmael*, the *Epípone Kirby* of the British catalogues, and congeneric with the *Véspe spinipes Linn*. It does not appear that he had ever captured the new insect at the place, although a most assiduous collector; and the answer to the question of how they supplanted the *O'smia*, if ever the *O'smia* occupied the same sticks, is one to which much interest attaches. Is this wasp a parasite? Reasoning from analogy, I should say not; for its congener, the *Véspe spinipes*, supplies its larva with small caterpillars. But in this instance may I safely reason from analogy, as its habits of construction are dissimilar to the well-known habits of the *O. spinipes*, which forms a trumpet-shaped projection of the agglutinated particles of fine sand upon the vertical face of a sand-bank? Modifications of instinct are of daily observation; and may not the present be an instance of it, and the insect, to save labour, having found these excavated sticks suited to its purposes, adopted them for the burrows of its young? I hesitate, however, in taking this view, and consider that we have before us the constant and uniform habits of the creature; and I am strengthened in my opinion by the circumstance of the cylindrical cavity of these sticks, occupied by the young of this wasp, being invariably used with a coating of agglutinated particles of sand. Consequently, if it resorted to the sticks, to save the labour of excavating and building, it would dispense with this unnecessary task; and this fact also confirms me in my opinion, that the insect is not a parasite upon the bee, and that these sticks were never occupied by the *O'smia*. Although not a parasite itself, this wasp appears to be infested by one, namely, a new *Crýptus Grav.*, bred

* Bulletin de l'Académie Royale des Sciences et Belles Lettres de Bruxelles, 1836, No. 2. p. 45.

together with it, by Mr. Curtis, from some of the sticks that were given to him by my friend Smith.

To continue the history of the wasp, the sandy lining consists of a succession of cells, each shaped somewhat like, and of about twice the length of, the percussion cap of a fowling-piece, with intervals between them of the eighth of an inch. And, that no trait may be lost in this interesting history, I may here remark, that it was from the external cases that the males were produced, and from the internal ones only, the females; and, therefore, it is not until the males are developed that the females can obtain egress. In the present state of these cases, after the developement of the insect, they appear to be slightly lined with a silky texture, spun, doubtlessly, by the larva, when full fed, and prior to its going into a lethargic state; which, in this insect, seems to precede, by a considerable time, the transformation into the pupa. But, that I may not be suspected of misconception, or hazard producing it, I will give the dates of the successive observations. September 2. 1836, was when the sticks were brought to town, and a slice taken from the end of one, to ascertain if it were occupied, and the cream-coloured grub was thus exposed to view; and upon this grub, which subsequently produced a male insect, the successive observations were made. It appeared at the time full fed, and there was no appearance of any kind of food laid up with it. It distinctly had *fourteen* segments; it was footless, and lay in this lethargic state until April 14. 1837; when a change appeared to commence taking place in it, and the two first segments began to coalesce together, giving an indication of the head of the future insect, upon which the position of the eyes was only shown by being slightly darker than the contiguous parts; nor was this even perceptible until the two segments had completely united, but after which the eyes began gradually to project. No further change was detected until May 5., when it was observed to be violently struggling with its still concealed limbs, and, by dint of these exertions, it succeeded in freeing itself from its larva exuviae, and at last the hinder legs were seen pushing it from the body; but, although thus peeled off like a glove, it still remained attached to the extremity of the abdomen. All the limbs now presented themselves: the legs were drawn up closely to the body, the wings and antennae appearing thick and solid; and the whole insect was of a beautiful amber colour. On May 24., the eyes changed to a red brown, and a few scattered hairs presented themselves upon the head. On June 7., the whole insect appeared to be getting darker, which gradually increased until

June 10., when it had assumed the permanent colouring of the imago. It appeared to have been completely exhausted by its violent exertions on May 5., for it did not again exhibit the least signs of life until June 15.; when it began to move its legs slightly, and strove to open its mandibles, also slightly moving its palpi, which were protruded from the cavity beneath the head. No part of the body appears to have been covered with a pellicle, except the antennæ, and this film now began to shrivel up. So soon as it had aroused sufficiently from its lethargy, and its limbs had acquired a freer motion, it gradually and occasionally rubbed its tarsi together, as a man would rub his hands, and now and then drew up its legs, especially the hinder ones, as if stretching. When thus fully developed, it freed itself from its cell, walked out upon the stick about a couple of inches, stood for a second, gave a convulsive shudder, and ejected the meconium. It now began to move its anterior legs very briskly; combed its antennæ, thus freeing them from the shriveled pellicle which covered them; opened and closed its wings, but seemed in no haste to make use of them; nor has it been observed how soon it begins to fly.

I may here remark that Ratzeberg's observations* are thus confirmed; viz. that the head of the pupa takes the first two segments of the larva, and that the larva distinctly consists of fourteen segments. But here, again, as I observed in a note attached to the translation of Burmeister, the insect examined is a male insect; and I have subsequently met with no sufficient reason why there should not be a difference in the number of segments in the sexes. I will therefore now proceed to describe my insect.

M. Wesmael of Brussels published, in 1833, a monograph of the genus *Odynèrus* Latr., which he divided into three families, all of which we possess in England. The characters of these families, which he has since, in the work cited at the commencement of this paper, raised to subgenera, but which I consider of full generic value, I need only give briefly below, as they will be contained, with a description of all the species, in the appendix to my *Essay on the Bees of Great Britain*; but I may here remark that the type of the genus *Odynèrus* being the *Vésa murària*, which he considers the female of the *Vésa spinipes*, the generic name of *Odynèrus* must be retained for that division hitherto known to English entomologists as the MS. genus *Epipone*† of

* Nova Acta, t. xvi. pt. i. p. 144.

† The genus *Epipone* is first named by Latreille in his *Hist. Nat.*, t. 13., where, as well as in the last edition of the *Règne Animal*, he instances

Kirby, and, as such, published in the British catalogues; and that it must necessarily also supersede Wesmæl's sub-generic name *O'plopus*, which I regret, as it is characteristic of one sex of the majority of the species hitherto recorded. But, in pursuance of the principles I have already avowed myself in this Magazine as advocating, I am constrained to this course, which, besides, I consider pregnant with advantage to all branches of descriptive and systematic natural history, and the only mode of reducing to strict order the existing confusion; but to effect this the synonymy must be worked out with indefatigable patience, and an unflinching regard to priority of nomenclature. In furtherance of this object, my view is, that, where no distinct type of a genus is indicated, we must absolutely take the first species named, and consider it as the type to which the generic name must adhere, howsoever much the species classed with it may be subsequently separated: and to obtain this, as I have formerly said, it would not be convenient to go further back for priority of nomenclature than the invention and application of trivial names by Linnæus, which forms so marked an epoch in the systematic treatment of natural history.

The following is a brief characteristic of the three groups:—

I. *Dorsal Surface of the first Segment of the Abdomen consisting of but one Piece.*

- | | | |
|--|---|---|
| Last joints of the antennæ of
the male rolled spirally. | { | 1. ODYNE'RUS Latr.
Type, V. murària ♀ Latr.
♂ V. spínipes L.
(<i>Epípona</i> Kirby, Steph., Curt.
<i>O'plopus</i> Wesm.) |
|--|---|---|

II. *Dorsal Surface of the first Segment of the Abdomen formed of two Pieces, united together by a transverse Surface.*

- | | | |
|---|---|--|
| A. The sides of the posterior
face of the metathorax projecting
angularly. The last joint of the antennæ of the
male forming a hook. | { | 2. ANCISTRO'CERUS Wesm.
(<i>Odynèrus</i> Latr., Curt., Steph.) |
|---|---|--|

the *Véspa Tátua* of Cuvier, *Polistes mório* of Fabricius, as the type. This insect somewhat resembles in habit what is called in the British lists *Eùmenes*, but from which it essentially differs, in being social in its habits; the male, also, is not furnished with a hook at the extremity of its antennæ, if, with Latreille, we may consider the *Polistes cyànea* Fab. as congeneric, but which St. Fargeau does not treat as such in his work on the Hymenóptera (*Suites à Buffon*), and who alters the name to *Epípona*. At all events, Kirby's MS. name must have given way to that of *Odynèrus*, which I have shown in the text to be most correctly applied to the *Véspa spínipes*, and the insect I am about to describe.

- B. Posterior face of the metathorax smooth in the centre, and rugose laterally. The last joints of the antennæ uniform in both sexes. } 3. SYMM'ORPHUS Wesm.
(*Odynèrus* Latr., Curt., Steph)

Genus 1. ODYNE'RUS Latr. Shuck.

(EPI'PONE Kirby, Steph., Curt.; O'PLOPUS Wesm.)

Sp. 1. O. SPI'NIPES Latr.

Vespa spinipes Lin., ♂ Fab., Rosi, Illiger, Oliv., &c. *V. murària* ♀ Latr. &c.

Sp. 2. O. LÆ'VIPES Shuck. n. sp.

Niger, flavo varius, glaber, genis inflatis. Mas., femoribus intermediis incrimis.

Female. Black, shining, glabrous, or, viewed under the lens, sparingly covered with short grey hair. Head and thorax deeply and coarsely punctured. Head, seen from above, squarer than in the former species, and the cheeks appearing somewhat swollen. A small yellow dot on each side, above, behind the eyes, and two yellow spots, which sometimes coalesce between the insertion of the antennæ. The clypeus deeply emarginate, very convex, less punctured than the rest of the head, and with an oblique yellow line on each side, at its base.

The thorax with a small yellow mark on each side of the collar, and another, smaller, beneath the insertion of the wings. The tegulæ red-testaceous, with a minute yellow spot behind. The wings subhyaline slightly clouded, with a narrow dark border at their extremity; the stigma and nervures piceous, except the costal, which is testaceous. The legs, with the extreme apex of the femora, the tibiæ, and tarsi, yellow-testaceous.

The abdomen minutely punctured, with a very narrow yellow border to the first five segments; widest on the second, especially laterally, where it slightly dilates; and continued, but still more slightly, upon the ventral plate; and that of the fifth abbreviated on each side.

The male differs, in having the clypeus (except its extreme lateral edges, and the teeth of the emargination, which are black), the labrum, the middle of the mandibles, and the scape of the antennæ beneath, all yellow. Their tenth and eleventh joints, and sometimes the entire spiral portion, red, testaceous. The yellow on each side of the collar forming a line; a minute yellow spot, also, in front of the tegulæ; the intermediate and posterior coxæ in front yellow; and a yellow mark towards the apex, beneath, of the intermediate femora; and the colour of the tibiæ and tarsi more inclining to yellow. The sixth segment has, also, an abbreviated yellow line; and the yellow

border of the third segment is sometimes continued upon the ventral plate.

Obs. This species differs considerably in habit from the *Od. spinipes*: it is smaller, rather more robust, more shining, less pilose; the antennæ, in both sexes, considerably slighter; the extreme spiral joints, in the male, much less compressed; the bands of the abdomen much narrower; and especially in wanting, in that sex, the teeth to the intermediate femora.

I may conclude with adding that, of the genus *Ancistrócerus Wesm.*, we have evidently very many species, although *Wesmael* limits the Belgian ones to four, including, I think incorrectly, many of the others, which we also possess, as varieties of one or the other of these four. Of the genus *Symmórrhus Wesm.* we have three species; viz. *O. crassicórnis Panz.*, *S. élegans Wesm.*, and *Vésa bifasciàta Lin.* This last genus is distinguished by a more elongate and elegant form, and especially by the terminal joint of the antennæ of the male being simple.

Aug. 20. 1837.

ART. XI. *Observations on the Palm Squirrel (Sciúrus palmàrum of Authors.)* By G. R. WATERHOUSE, Esq., Curator to the Zoological Society of London, &c.

IN the description given by Buffon of the palm squirrel (*Histoire Naturelle*, tom. x.), two animals are referred to that species which are there stated to differ in their colouring. I have reason to consider these two animals specifically distinct, although I believe they have always been confounded; and my object in the following observations is, to show that, besides the distinctions mentioned by Buffon, well-marked points of difference may be observed, upon a careful examination, which appear to have escaped the notice of that distinguished naturalist.

The animal which that author describes in detail (that is, the first specimen mentioned) I imagine is the young of a species of which I have examined some hundreds of skins. It may be described as follows:—

Above, brown, with three (or five *) longitudinal white lines; external surface of the limbs greyish; sides of face (below the eye), the chin, throat, under parts of the body, and inner side of limbs, white; tail having the hairs variegated with black, white, and cream-colour.

The hairs on the head are black at the base, then ochreous, and at the point black; the ochreous tint, however, is more prevalent, especially on the muzzle, if we except a little longitudinal ridge of black hairs which runs from the tip of the

* See note *, p. 499.

nose backwards. The hairs on the upper parts of the body (except those which constitute the white lines) have their basal half black, and their apical half rusty-yellow; the extreme points, however, are generally blackish, and *some* of the hairs are totally black. The general tint produced by this mixture of colour is deep brown. A slender line, which is generally of a deep cream colour, runs along the middle of the back, and extends from the occiput to the root of the tail: parallel to this (leaving an interstice of about four lines in width) is another line, which is almost always white; this line commences at the root of the tail, and is continued, along the body, as it were through the ear, and over the top of the eye. On the outer side this line is bounded by a band which is almost black, and which commences on the shoulders, (where it is very narrow), and extends almost to the root of the tail: in the middle it is about four lines in width, but towards the haunches, as well as at the shoulders, it blends into the general gray hue, which covers those parts, and likewise the external side of the limbs. The sides of the body (between the fore and hind legs) are of a pale greyish-yellow hue; this tint, however, is separated from the dark bend just described by a yellowish white line. The sides of the muzzle, and that part of the face which is below the eyes, as well as all the under parts, are white or approaching more or less to cream colour. The hair which covers the upper surface of the feet is white, cream-colour, or sometimes grey-white. The hairs of the tail are of a dirty pale yellow at the base: this is followed in succession by black, pale yellow, then again black, and ultimately white; the two latter colours being more conspicuous. The ears are covered internally with short yellowish-white hairs, and externally with minute hairs of the same colours as those on the top of the head.

The above description is drawn up with considerable care, in order that I may point out more clearly the distinctions between the animal just described, and that which I am about to notice.

The general tint of the upper parts of this latter animal is usually rusty red on the head, greyish over the shoulders, black on the middle of the back, and of a rust colour over the haunches. The sides of the face are yellowish rust colour; the sides of the body, the feet, and the outer side of the fore legs are grey; the outer portion of the hind legs is grey, with a yellowish, and sometimes rusty, tint; the chin, throat, under part of body, and the inner side of the limbs are white. The rump is of a deep rust-colour, and so, likewise, is the under side of the tail at the base. A longitudinal white or yellowish

line extends from the occiput along the middle of the back nearly to the root of the tail; over the shoulders and haunches this line, however, is scarcely to be traced, and sometimes is quite obliterated; parallel to and on each side of this pale line is another, which commences a little behind the ear, and extends to the root of the tail; over the shoulders it assumes a grey cast, and is very indistinct, and on the hinder part of the body it is frequently of a deep yellow hue; the intermediate portion is generally white; the distance between this and the central line is about five lines, and the intermediate space is occupied, in some specimens, almost entirely with black hairs, and in others the hairs in the same part consist of a mixture of yellow, or rust colour, and black. These last pale lines are bordered externally by a dark stripe, which is, in most cases, totally black, and extends only along the middle portion of the body, or the flanks.

The hairs on the upper side of the tail are most of them white at the apex, of a deep rust-colour at their base, then annulated with black, rust-colour, and black. The greater portion of the hairs on the under side of the tail have their basal half rusty red, the apical portion white, with an intermediate black space. The ears are covered externally and internally with minute yellow and black hairs.

I have before stated that Buffon, in his article on the palm squirrel, describes two animals. The former of my descriptions, I imagine, refers to the same species as that which he first notices, and the latter to that which he afterwards mentions.

My reasons for so believing are, that in his second description Buffon particularly notices the rust-like tint in describing the hairs of the tail, whereas in describing the first individual he says that each hair of the tail is black near the root, then grey, and at the point, black.

The animal first described by me agrees well with his description, except that I find that the hairs of the tail are all tipped with white; and I imagine that this difference may be accounted for by the age of the specimens, Buffon having expressly stated that his was a young animal; and this is confirmed by the dimensions he gives, which would appear to be those of an individual not more than half grown.

Now, independently of the proportions, which will be seen to differ considerably, the animal described last in this paper differs from the first in having the scrotum and anal region, and the whole of the central portion of the tail, beneath, red; in having the sides of the face and muzzle *below* the eye, as well as above, of a rusty yellow tint; and in having only three longitudinal white stripes on the body, whereas the animal

first described may be said to have five. * The sides of the body are of a deeper hue, and the feet are of a deep grey, consisting of a mixture of black and white hairs.

There are other points of difference in the colouring, but they are of minor importance. I may mention that, generally speaking, this animal is of a deeper hue; often, if not generally, being quite black on the back between the striæ. It is certainly more subject than the first to variations in colour.

Should these two animals be considered as distinct species by the generality of naturalists, I would propose that the specific name of *palmàrum* be kept for the former, and that of *tristriatus* be adopted for the latter.

The dimensions of these two animals are as follows:—

		<i>S. palmàrum.</i>	<i>S. tristriatus.</i>
		in. lin.	in. lin.
Length from the nose to the root of the tail †	-	6 9	7 5
to the ear	- - -	1 4	1 7
of tail to end of hair	- - -	6 3	7 6
of naked part of fore foot beneath to end of claws	- - -	0 8 $\frac{3}{4}$	1 0
of tarsus to end of claws	- - -	1 5	1 7 $\frac{1}{2}$

Both these animals inhabit the continent of India. The species called by me *tristriatus* is from the more southern parts of Hindostan.

REVIEWS.

ART. I. *Le Règne Animal, distribué d'après son Organisation.*
Par Georges Cuvier. Nouvelle E'dition, par une réunion
d'E'lèves de Cuvier. Roy. 8vo, in numbers. Paris, Crochard
and Co.

2. *Iconographie du Règne Animal.* Par E. F. Guérin. 8vo, in parts. Paris.

3. *Dictionnaire pittoresque d'Histoire Naturelle.* 4to, in numbers. Paris.

4. *Suites à Buffon; formant, avec les Œuvres de cet Auteur, un Cours complet d'Histoire Naturelle.* 8vo. Published in separate volumes, with fascicles of plates. Paris, Roret.

5. *Suites à toutes les E'ditions de Buffon. Histoire Naturelle des Animaux Articulés.* Par Laporte de Castelnau et M. Lucas. 8vo, in numbers. Paris, Duménil.

* The outer white line on each side of the body is joined on the lower side by so pale a colour, that it is not very evident *as a line*; but when we compare the two animals here described, we see that much difference in general appearance arises from there being *no white* on the flanks in the latter.

† Measuring along the curve of the back.

6. *Magasin de Zoologie*. Par E. F. Guérin. 8vo, in parts. Paris.

WE have here strung together a few of the periodical works at present in course of publication in France; with some of which, at least, the majority of our readers will possibly be unacquainted, and which serve to indicate the strong feeling in favour of zoological pursuits at present existing amongst our neighbours on the other side of the Channel. We are not of those who would decry the productions or the state of science in our own country; but a few remarks, by way of instituting an enquiry into the comparative progress recently made in both countries, ought not to be without good effects, if it be shown that our neighbours are stealing ahead of us. It is true, they have no Linnæan Society (at least, the society so called appears to have fallen to the ground), no Zoological Society, no Ornithological Society. They have, however, the Jardin des Plantes, where are combined in one locality the zoological and horticultural gardens, and the national museum, of our own country, and where gratuitous admission cannot but extend a much wider desire for a knowledge of the objects observed in such establishments, than is diffused by exhibitions to which the public at large have not access. The *Transactions* of our societies are, however, proof of the advantage of these associations; and it is not too much to say, that in no country, and at no period, have there been more valuable materials published than are to be found in the recent volumes of the societies above mentioned, in conjunction with the *Transactions* of the Royal Society. It is true that the French have their *Mémoires de Muséum**, by way of set-off, and which is a very valuable series of memoirs; but the number of contributors is so few, that the majority of French writers seek elsewhere for the means of publishing their researches. In our own country, on the contrary, there are so many "*Transactions*" and periodical journals of a general nature constantly open to the writer, that, were he ever so voluminous, there is no necessity for him to embark in separate publications. In France, therefore, the cause for numerous and distinct publications is evident; and, whether we consider them in the light of "entertaining" or scientific works, it is certain that their number far exceeds that of similar works in our own country.

In traversing the streets of Paris a short time ago, we were greatly surprised at the number of editions of the

* Why have we no memoirs of our British Museum, in which ought to be described its valuable materials, instead of their being partially served up in works which confer no honour upon such an establishment?

works of Buffon in course of publication, in all shapes and sizes ; and, on asking one of the professors at the Jardin des Plantes whether there were not as many as a dozen, the reader may judge of our surprise at his replying that the number was nearer thirty. It is the practice, indeed, for the French "éditeurs" to use the name of Buffon as a catch-word for all sorts of natural history books ; and, therefore, many of these editions may not contain one word written by Buffon, being abridgments, entirely new works, or additions. Still, the fact that such a number of works are from time to time making their appearance before the public, fully proves that the attention cannot but be, to a very great extent, directed to this branch of science.

The works at the head of this article are not amongst the least valuable of these modern productions. The first of these is a joint production of Messrs. Andouin, Deshayes, d'Orbigny, Dugès, Duverney, Laurillard, Milne Edwards, Roulin, and Valenciennes. The object of this edition of the *Règne Animal* is to illustrate the old edition (the text of which is reprinted entire), by figures and details of all the species given in that work as *types*. The idea is an excellent one, and, so far as the art of draughtsman or engraver is concerned, nothing further is to be desired. It will be sufficient to say that these plates remind us more of the great work on Egypt than any others we have yet seen. The work is in royal octavo, and appears in livraisons, each containing 4 plates filled with figures ; the price, uncoloured, 2 $\frac{1}{4}$ francs (double price coloured). In one of the entomological plates we perceive that an insect (*Phyllium siccifolium*), in the pupa state, has been given as that of the imago. The various portions of the work may be obtained separately.

With the same view of pictorially illustrating the *Règne Animal*, the *Iconographie* of M. Guérin was commenced, which now consists of between 600 and 700 plates and many thousand figures. The principle which was adopted, however, in this work, was, rather to give new species than the express types described by Cuvier ; so that there are many species, and even genera, which are not found in the *Règne Animal*. This has its inconveniences and advantages ; and, for our own part, we cannot help thinking that the repetition of figures of well-known species, in every body's possession, is a practice which does not allow so great an extension of science as the illustration of rare and new species. As it is, the *Iconographie* is a very valuable work, precious for the number of new materials, and for the immense variety of structural details which its plates comprise, the value of which have, indeed, caused them to be already twice pirated in our own country ; a practice of

which the author has expressed to us his great dissatisfaction. Another number will complete the work; to which will be added the description of the new species and genera, and which has been the cause of the delay in the appearance of the latter parts, of which such complaint has been made.

Our third work is a Dictionary, somewhat in the same style as Partington's *Cyclopædia of Natural History*, but far more extensive, four volumes being completed, and the letter N only reached. The work is of the size and appearance of the *Penny Cyclopædia*, but with plates detached, and without woodcuts. The price of the work is one of the most curious things connected with it: eight pages and a well-engraved plate are sold for a penny. Messrs. Guérin and Percheron (well-known names) are employed in the entomological parts.

The *Suites de Buffon* are a series of volumes, written by authors especially devoted to the subjects selected by them, comprising some of the most celebrated naturalists in France: Desmarest, Fr. Cuvier, Andouin, De Blainville, Sander Rang, Baron Walckenaer, &c., are engaged in this undertaking, which promises to be of the greatest value. The plates are, in general, well executed; indeed, some of them are very superior productions. They will not, it is true, bear comparison with such works as those of Curtis, &c.; but the price is comparatively very small, a volume costing only 4½ francs, and a livraison of 10 plates uncoloured only 3 francs.

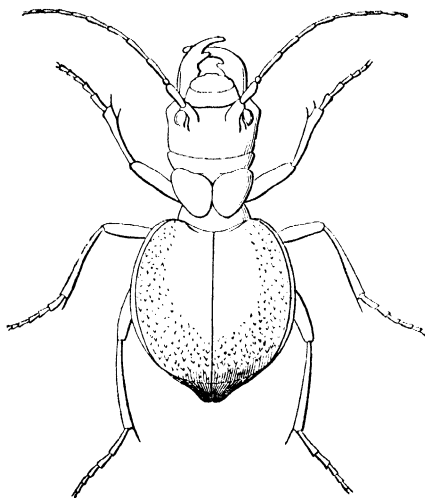
Our fifth work is another exceedingly cheap production. The "éditeur," M. Duménil, having brought to a successful close a very cheap edition of Buffon, perceived the advantages of completing the work by the addition of the articulated animals, to be published on the same plan. The Count de Castelnau, a distinguished entomologist, has undertaken this task; and, from the smallness of the type and the conciseness of the style, the two volumes, to which the work will extend, are calculated to contain the matter of eight ordinary volumes, accompanied with 100 plates, representing 800 or 1000 different objects from original figures, many of the drawings of which we have seen in the hands of the author. The price of the work is 4 sous (2d.) per livraison, including 16 very closely printed pages in double columns, and 2 uncoloured plates, representing a great variety of species, many for the first time here figured from the author's cabinet.

The *Magasin de Zoologie* is a work in which coloured figures are from time to time published of new and chiefly isolated species. Occasionally, however, valuable monographs and memoirs are given; as, for instance, the monographs of the Pselaphidæ, by M. Aube; that of the Trachyderides, by M. Dupont; and that of Phyllosoma, by the author.

The work comprises a great variety of rare and curious species. The various portions may be purchased separately; and amongst its contributors are to be numbered some of the first naturalists of the age.

SHORT COMMUNICATIONS.

DESCRIPTION of a new Coleopterous Insect of the Genus Mantícora.—The genus *Mantícora*, in most modern classifications, stands at the head of the *Cicindélidæ*, and appears to be connected with the more typical species of that family, by means of the genera *Platychile* *Macleay* and *Megacéphala* *Latreille*. Of this genus hitherto but one species has been known; we are now, however (through the indefatigable exertions of Dr. Andrew Smith), made acquainted with a second. (*fig. 62.*)



62

This species, Dr. Smith informs me, he discovered near Kurrichane, in a clump of dead trees. It is of a larger size than the *Mantícora maxillòsa*, which has long been known as an inhabitant of the Cape of Good Hope; the most striking difference, however, between our present species and that just referred to consists in the greater proportionate width of the elytra; I would therefore suggest for it the specific name of *latipennis*. It may be characterised, — *M. atra*. Elytris subcordatis, latis, scabris; longitudo corporis, $21\frac{1}{2}$ lin.; latitudo, 10 lin.

Upon comparing *M. latipennis* with *M. maxillòsa* the following differences may be observed:—In the former, the head

is larger, exceeding that of the latter nearly one line in length, and about half a line in breadth.* It is also more sparingly punctured on the upper parts, and so is likewise the thorax.

The elytra, as before stated, are much broader (having the proportion of ten to eight), less convex, the lateral margins are more distinctly recurved, and the minute pointed tubercles (which are observed on the elytra of both species) are not quite so distinct, nor do they extend so far inwards as in *M. maxillòsa*. The disc of the elytra is smooth, rather glossy, and has a pitchy hue. — *G. R. Waterhouse. Aug. 19. 1837.*

Bridlington Tertiary Deposit (Mag. Nat. Hist., vol. viii. p. 355.) — “The Bridlington crag bed remains in the same state, and many years may pass away ere any portion of it be again laid bare.” — *William Bean. Scarborough, Aug. 7. 1837. (Extract from a Letter to the Editor.)*

Notice respecting Rhèa Darwinii Gould. — We observe, by a letter which lately appeared in one of the French scientific journals, that M. D’Orbigny claims the right of having first described the *Rhèa* brought home by Mr. Darwin from South America, and which Mr. Gould named, a few months since, *R. Darwinii*. It appears that D’Orbigny gave it the specific appellation of *R. pennata*, but in his letter he does not refer either to his *published* characters, or to the specimen which he examined.

Literary Notice. — Dr. Andrew Smith has just obtained from the government a grant of money to enable him to publish the whole of the zoological drawings made during the late expedition into Africa, and which are now included in the exhibition of the South African Museum, Egyptian Hall, Piccadilly. In consequence of this, an arrangement is being made with the intended publishers (Smith and Elder, Cornhill), by which the public will obtain the work at one fourth or fifth of the actual cost price, the government grant defraying the whole expense of engraving the plates. A grant, for a similar purpose, has also been made to Charles Darwin, Esq., who brought to this country, after the voyage of the *Beagle*, such an immense addition of species in different branches of zoology. In our next Number we shall probably be able to furnish our readers with more definite information as to the plan which will be adopted in carrying the above objects into effect. The works will, of course, be quite distinct.

* I am now comparing the new species with two specimens (of different sexes) of the *M. maxillòsa*; these, however, have been selected by me from a number of individuals of that species, and with which they agreed very closely.

THE MAGAZINE OF NATURAL HISTORY.

OCTOBER, 1837.

ART. I. *Letter from Dr. CLARKE of Ipswich to William Yarrell, Esq., Secretary of the Zoological Society, noticing the recent Occurrence of the Fry of a Species of Hemirámphus on the Coast of Suffolk; with some additional Observations by Mr. YARRELL.*

Ipswich, August 18. 1837.

MY DEAR SIR, As I find in your valuable work on the British fishes, at the termination of the Esócidae, you have given as a vignette the head of a fish (a species of Hemirámphus) which has been considered a doubtful visitant of our shores, and which hitherto appears only to have been observed by Mr. Couch, I have great pleasure in forwarding to you a couple of specimens of this interesting genus, which were captured upon the Suffolk coast.

The circumstances attending the discovery of these fish are as follows, viz.:—My brother (Mr. Edward Clarke of Ipswich), who is particularly interested in the study of British fishes, was examining the sea shore in the vicinity of Felixtow*, a few days ago (on August 7. 1837), when he observed a shoal consisting of myriads of small fish, which, upon a nearer examination, he supposed to be the young of the garfish. As he had previously not found any so small, he secured a few specimens; and, upon bringing them home and examining them, they were found not to be the young of the garfish, but those of a species of Hemirámphus. From their being so very young, it probably may be difficult to determine whether they belong to a described species; but, from the circumstance of their having been seen in great abundance in a small pool left by the retiring tide, it is, I think, pretty evident that the ova must have been deposited and vivified in the neighbourhood of our shores. I send you the fish, thinking that an examination of the specimens themselves will be far more satisfactory than any figures or de-

* A village in Suffolk, between Harwich and Orford. — *Ed.*

scription of my own. One specimen was taken about double the size of those now sent to you.

If you will be kind enough to add to these observations a few remarks relative to this interesting little fish, and send them to my friend Charlesworth for publication in *Loudon's Magazine of Natural History*, you will greatly oblige

Yours, &c.,

William Yarrell, Esq.

W. B. CLARKE

To the Editor of "Loudon's Magazine of Natural History."

DEAR SIR, I have great pleasure in transferring to your hands, for insertion in the *Magazine of Natural History*, the letter received from our friend Dr. Clarke of Ipswich. I have had a drawing made from one of the specimens of this interesting little fish, half as large again as the natural size, which, with the remarks that follow, is equally at your disposal.

Mr. Couch's observations on the single example of a species of *Hemirámphus* which occurred to him are as follows:—
 "I have met with a species which I have never seen described, unless it be the *Esox brasiliensis* Linn. *Syst. Nat.* It was taken by me in the harbour at Polperro, in July, 1818, as it was swimming with agility near the surface of the water. It was about an inch in length, the head somewhat flattened at the top, the upper jaw short and pointed, the inferior jaw much protruded, being at least as long as from the extremity of the upper jaw to the back part of the gill-covers. The mouth opened obliquely downwards; but that part of the under jaw which protruded beyond the extremity of the upper, passed straight forward in a right line with the top of the head. The body was compressed, lengthened, and resembled that of the garpike (*E. Belone*). It had one dorsal and one anal fin, placed far behind and opposite to each other. The tail was straight; the colour of the back was a bluish green, with a few spots; the belly silvery."

This notice, which appeared in the 14th volume of the *Linnaean Transactions*, induced me to insert as a vignette in the *History of British Fishes* the head of a species of *Hemirámphus*, in order to draw the attention of observers on our coast to the subject; and it is a sincere gratification to me to know that it has had the effect intended. It can scarcely be doubted, from the quantity of fry seen, as well as from their very small size, that the spawn from which they were produced must have been deposited on our shores by the parent fish; and yet, as far as we are aware, these parent fish

have hitherto escaped capture. This might not appear very extraordinary, but from the circumstance that the size attained by the fry in the months of July and August, as well as the general similarity in the form and appearance of the Hemirámphus to our well-known garfish and saury-pike, would lead to the belief that the Hemirámphus visited our shores about the same time of the year as these fishes. The garfish appears on the coast in April, and spawns in May. The saury-pike makes its first appearance in June. For these fish, but particularly for the first of them, nets are worked on various parts of the coast, and considerable quantities are taken; but no adult specimens of the Hemirámphus, unless we are to suppose they have remained hitherto unrecognised by the fishermen. It is also not a little singular, that, up to the present time, with the exception of the small specimens already referred to, as taken at two places very distant from each other, no example of any species of Hemirámphus has been found, either in the Mediterranean, the Channel, or the North Seas. I have lately had an opportunity of conversing with two eminent foreign naturalists, to whom I showed the specimens, who agreed with me that no adult species of Hemirámphus had been recorded as found in the European seas. The examples taken by Dr. Clarke are too young, and too minute, to make any attempt to define specific characters desirable, beyond such as the remarks of Mr. Couch, and the representation here given (*fig. 63.*), will supply; and I would

63



Hemirámphus europæus Yarrell.

only propose, for distinction's sake, that it should be called Hemirámphus europæus. — I am, dear Sir, yours very truly,
September 8. 1837. W. YARRELL.

ART. II. *Remarks on the Habits and Economy of the common Fox.*
By W. WEISSENBORN, D. Ph.*

IN reading Mr. Blyth's highly interesting article "On the psychological Distinctions between Man and all other Animals"

* Dr. Weissenborn accompanied this paper with a request that we would "mend his un-English expressions;" we thought it, however, quite unnecessary to attempt any improvement upon the clear and simple manner in which he has expressed his ideas.

(Vol. I. p. 1. n. s.), I found two instances mentioned in which the fox is said to have simulated *death*, with a view of duping man, and of escaping from imminent danger. This expedient, however, I must judge, from what I know of the habits of the fox, it never resorts to. It is true that it simulates *sleep* when it intends duping some prey; but this it does with an *aggressive* intention; and, whatever "untoward event" may happen when the life of the fox is at stake, the means to which it resorts I have invariably found of the most *active* nature; nor do I believe that any animal, whether belonging to the higher or lower orders, does *instinctively* employ a means of defence which does not confer on the animal some real protection, though the protection may not always be sufficient for the emergency. In the case of simulating death, the more vulnerable or delicate organs always take a position in which they are screened by the hard, or even threatening, integuments, as instanced by those Coleóptera which fold up their legs; the centipede, which rolls itself up in a spiral; the univalve and bivalve molluscos animals, that draw in their soft parts, as the polypi do their tentacula. Of the higher animals, I may quote the familiar instances of the tortoise and hedgehog; and, as to the elater, I may observe that the rigid and immovable position is, at the same time, that which enables it to take its leap. When, however, the higher animals, as the partridge and hare*, keep immovable, that their locomotion may not draw upon them the attention of some enemy, the case is quite different, as they do so with their eyes open, and ready to start, though their volition is sometimes paralysed by fear.

Before I return to the two cases where the fox is said to have simulated death, I may observe that the history of this animal still teems with false notions, or points not quite settled. It has been compounded, in the first instance, from the statements of inaccurate reporters of what they had inaccurately observed; from the observations of unscientific huntsmen and gamekeepers, who, besides being extremely superstitious, had most of them a good spice of Baron de Münchhausen; and, as it is often impossible to refute an assertion by facts directly opposite, and, as in former ages, almost any fiction could be palmed upon mankind for truth, we shall find that the very animals with whom man has become first acquainted are often the least perfectly known.

In applying this general remark to the fox, I shall first try

* The fox does the same to let the men pass when the woods are beaten up; but, in crouching down on a stump, &c., on such occasions, he is eagerly watching all the movements of the men near him.

to explain what did really happen in the two instances quoted by Mr. Blyth, Vol. I. n. s. p. 5.

1. "The fox has been known to personate a defunct carcass when surprised in a hen-house; and it has even suffered itself to be carried out by the brush, and thrown on a dung-heap, whereupon it instantly rose and took to its heels, to the astounding dismay of its human dupe."

The true version of this case, I think, is, that a man surprised a fox in his hen-house, and beat the animal on its head till he thought he had killed it; whereupon he flung it in the yard, when the fox instantly recovered through the concussion of its nervous system, and ran away. Suppose the fox had really kept crouching in a corner till the man touched its brush, which I am far from thinking probable; it would have bitten him most unmercifully when grasping any part of its body. But I have myself tracked a fox into a barn, and, after a long search, without dogs, discovered it by its eyes shining like two balls of fire from out of a corner *inside the eaves* of the roof. The instant the animal saw it was perceived, it did not wait for my arrival, but scampered away along the eaves towards the staircase, and was with some difficulty caught alive. As to the probable cause I have given of the revival of the fox, I may refer to an analogous instance, which can easily be verified. When a small bird, just caught, becomes insensible by knocking its head against the pane of a window, it may be as well revived instantly by dropping it from the height of 5 or 6 feet on a hard floor, as by submerging it in cold water; and I have witnessed an instance in which the bird (a sparrow) took to the wing the moment it touched the floor.

2. As to the second case mentioned by Mr. Blyth: "In like manner, this animal has submitted to be carried away for more than a mile, swung over the shoulder, with its head hanging; till at length, probably getting weary of so uncomfortable a position, or perhaps *reasoning* that its instinctive stratagem had failed in its object, it has very speedily effected its release, by suddenly biting:" I may say that cases bearing a close resemblance to the above one, except in the stratagem ascribed to the fox of *feigning* to be dead, are of frequent occurrence in Germany, where the fox is commonly *shot*. The wounded animal is deprived of life by beating it on its nose; then the sinew above the hock joint of one leg is separated from the fleshy parts and bone of the thigh, by a knife being thrust through the integuments; whereupon the other hind leg is passed through the hole so formed, and the carcass hung on a stick, which a man carries over his shoulder.

In this position, foxes that were not really killed have often been revived, after having been carried for miles, and have released themselves by biting; nay, they have effected their escape with their hind legs joined in the manner indicated, when no gun or dog was at hand.* On one of these occasions, an old knowing gamekeeper scolded the man who had beaten the fox on its snout, for not having seen the animal convulsively twisting its brush, which, he said, was a symptom that always preceded the fox's death. M. de Wildungen even relates a case in which a fox fell a biting when a portion of it had already been skinned; but it is needless to say that in this case the fox did as little simulate death as in those of more frequent occurrence, where foxes are wounded in such a manner that they lie for some time apparently lifeless, and at once run away as quickly as if nothing had happened to them.

I shall now advert to different other points in the history of the fox, which either are erroneous, or were hitherto still considered as uncertain.

A question has been discussed in our journals with some warmth, about the beginning of this year; viz. whether the fox preys on its own species, and, more especially, whether there are well-established examples of foxes having killed foxes, with a view of procuring food. It is certain that one third, on an average, of the foxes caught in iron traps are found missing in the morning, only one of the legs being left in the trap. The opinion hitherto generally received was, that the fox, when caught by a leg, bites it off, if he has sufficient time for so doing, and thus makes his escape. This view has lately been contested by a few observers, who wished to prove that the animal was, in the like cases, generally devoured by its congeners.

As to the general question, whether the fox will eat fox flesh, there is no doubt that it must be answered in the affirmative. Like all the other carnivorous or omnivorous quadrupeds, hunger may bring it to devour the carcasses of its own species, or to kill individuals of it, if no other food can be had; but, in common cases, it will only do so when pressed by hunger; for, in the districts where the fox is skinned on the spot where it is killed, I have often seen the carcasses of the animal untouched till they were decomposed. On the other hand, there are instances on record, that a number of foxes have killed and devoured one of their species, even when well

* The possibility of a fox escaping under these circumstances will be readily credited by any one who has seen a rabbit, with its hind legs tied together, turned out before a young spaniel. — *Ed.*

provided with other, and even choice, food. A case of this nature occurred two years ago in Silesia, where a farmer kept in a kennel nine young foxes, the cubs from two burrows. One morning the weakest, that had been often bitten by the others during the preceding days, was missing, only the bones and scraps of the skin being left. Another case was observed on the 28th of February last, when M. Krüger of Hohenlinden, in Prussia, wounded a fox, which he traced the following morning to a spot where the state of its remains proved that it had been no doubt killed and devoured by its congeners.

With reference to legs of foxes found in traps, there have been many authentic facts brought forward, which prove that the fox often contrives to make its escape from the trap by sacrificing one of its extremities. Several have been found in the morning that were only yet attached to the leg engaged in the trap by a sinew; and many three-legged ones have been traced from the trap and caught with dogs. As the bone of the leg is often broken by the violent meeting of the bow-pieces (and in such cases only the animal can probably be freed through its own exertions), it may get loose either by twisting itself about, or by the more expeditious means of gnawing through the flesh and sinews. That it is resolute enough to do so, will become sufficiently clear from the following analogous facts: — In 1829 (as stated by a well-known sportsman, signed K., in No. 80., 1837, of the *Berlinische Nachrichten*), a fox was wounded with a rifle bullet in such a manner that its intestine prolapsed through the integuments, and impeded its flight by becoming repeatedly entangled in the bushes. As often as this happened, the fox turned round with fury and liberated itself with its teeth; till the dogs coming up, it was caught, when almost nothing of the intestine was found remaining in the abdominal cavity. A similar instance is related by Dietrich aus dem Winkell, who broke one of the fore legs of a fox with a rifle bullet close under the shoulder. The fox being hampered and annoyed by the leg dangling about its head, turned angrily round and bit it off.

However, there is one observation on record which settles the point that caught foxes are *sometimes* devoured by their own species, as no one would question the authority of so accurate an observer and reporter as Dietrich aus dem Winkell, who relates the following fact in his excellent *Handbuch für Jäger und Jagdberechtigte*: — In the winter of 1816, one of my gamekeepers shot a fox in the act of devouring another which had been entrapped during the night. This happened about eight o'clock in the morning; and the fox satisfied its

appetite with such greediness (or had, perhaps, also been so much excited by the combat), that the gamekeeper could approach it in the open field, and in the fur of the robber obtain an equivalent for the torn skin of the fox which had been caught." This occurred about half an English mile from a village called Rossbach, in the Untermainkreis of Bavaria.

There is a most astonishing power of induction brought into operation, when a fox devours an animal caught in a trap set for the fox. The truth of the circumstance does not solely rest on the authority of the case just mentioned ; for, whenever a cat is tempted by the bait, and caught in a fox trap, Renard is at hand to devour the bait and the cat too, and fearlessly approaches an instrument which the fox must know cannot *then* do it any harm. Let us compare with this boldness the incredible caution with which the animal proceeds when tempted by the bait in a *set* trap. Dietrich aus dem Winkell had once the good fortune of observing, on a winter evening, a fox, which for many preceding days had been allured with loose baits to the spot where the trap was set for it. The observer sat waiting for a wild boar, when the fox, pressed by hunger, unexpectedly came trotting up before it was dark. Eagerly, and without the least suspicion, it took up the more distant loose baits, and, as often as it ate one, it sat comfortably down, wagging its brush. The nearer it approached the trap, the longer did it hesitate to take the baits, the oftener did it make the tour round the catching-place. When arrived near the trap, it squatted down and eyed the bait for ten minutes at least ; whereupon it ran three or four times round the trap ; then it stretched out one of its fore paws after the bait, but did not touch it ; again a pause, during which the fox stared immovably at the bait. At last, as if in despair, the animal made a rush, and was caught by the neck. (*Handbuch*, p. 91.)

Some of the points in the habits of the fox which must be regarded as uncertain refer to the peculiar uses which he is said to make of his urine. It is pretended that the fox, when baited with dogs, has been seen to wet his brush with his urine, and by swinging it over the face of the dog, to blind his enemy for a short time, and to make him start back with a howl. I have been assured by sportsmen that they have witnessed the circumstance, to which already the ancient poem, *Reynaert de Vos*, alludes, which, by the by, contains many striking proofs that the author was well acquainted with the habits of the fox ; but the movements of the animal are so extremely rapid on such occasions, that I doubt whether anything certain can be known about this matter. The feline animals, when they fly, certainly spurt their urine against their pursuer ; but in them

the direction of the intromittent organ indicates this means of defence as purely instinctive, whilst in the fox, we may judge from analogy that it can sufficiently refine upon its natural resources to employ them in a manner which bears full evidence of a process of reasoning. I am, therefore, not disinclined to believe that the fox, as is asserted, contaminates the entrance of the burrow of the badger, an uncommonly clean animal, with its urine, and thus induces it to leave its habitation, from which the fox could never drive the badger by main force. The fox is also said to employ its urine with a view of obliging the hedgehog to open its coil; and it is not improbable that this means is resorted to when there is no brook or pond at hand into which the hedgehog can be rolled.

The artificial way in which it is asserted the fox gets rid of its fleas, viz. by grasping in its mouth a wisp of hay, &c., walking backwards into the water, and dropping the hay in which the fleas have collected, may easily be shown to be a fiction, as the fleas will not gradually recede from the water, and assemble on the head of an animal which is slowly submerged from the tail upwards. Otherwise there would be nothing in the expedient that must at once condemn it as a story; for the fox does many things by way of experiment, as it were; and, if any well-authenticated fact of the fox having simulated death to escape from danger could be brought forward, it must, I think, be explained on the *experimental*, not the *instinctive*, principle. In an animal which often employs such unexpected and original means, we may even suppose that one individual will, *cæteris paribus*, not behave like the other, but that there exist in the species, to a certain degree, gradations of reasoning power.

I shall now communicate another case which does, perhaps, belong to the same class, and, at all events, will, I hope, be read with interest, as an instance of great boldness in the fox. In 1814, an old fox was baited in a hall at Waltershausen (Duchy of Gotha), to make young terriers sharp, to which there was as usual added an old terrier. Every door and window had been carefully secured or screened, but it was forgot to shut the chimney of an iron stove belonging to an adjoining room, wherein there was a blazing wood fire. After some hard fighting, the fox, thinking, probably, that where there was so much light there must be an exit, did the cool thing of leaping into the fire, and was dragged out of the stove, smothered with the flame and smoke.

In 1820, I was present, in the principality of Saalfeld, at one of those butchering parties which have now, upon the whole, ceased to be regarded as princely sport, and appear to

be revived here and there, only to show the grossness of the taste of our ancestors. Sixty head of red deer and fifteen of roe had, by the joint exertions of many hundred peasants, during a fortnight, been collected from an extensive woodland district, and crammed into a sort of fold formed by a double row of canvass and nets, about 14 ft. high. There they underwent their sentence by being shot in passing near three lodges erected in a straight line, passing through the middle of the *chamber* (so the fenced space is called), in which they were driven to and fro, till they were so tired and listless, that the last twenty or thirty survivors laid their heads together not far from the lodges, and suffered themselves to be killed without stirring. However, it was good sport to observe how four foxes, which happened to be in the chamber, tried to sneak out of the sight of man in the open ground over which they had repeatedly to pass with the deer. Commonly they contrived to get a stag between them and the nearest lodge, and they generally kept as close as possible to the canvass. Three of them had already met their fate, when the fourth, observing that several bullets had passed through the canvass where it was nearest to one of the side lodges, so that a sort of irregular staircase had been formed, deliberately stopt in the most exposed place, and, among a hail of bullets made its escape over the canvass, by inserting its paws into the holes.

The most astonishing instance of the reasoning powers of the fox which has ever been brought before the public, is the one communicated in M. de Wildungen's *Neujahrgeschenk für 1796*, the truth of which, the author says, was solemnly attested by a respectable sportsman on his deathbed.

"The observer had posted himself, on an evening, for shooting deer, when he saw an *old* fox jumping several times up a high stump of a tree. After having practised in this way, the animal ran away, and returned with a heavy dry oak branch in its mouth, wherewith it went through the same exercise as before, until it had acquired sufficient dexterity in reaching the top of the stump with its burden: then it dropped the branch, and crouched down on the stump. When twilight came, a wild sow with five very young shoats arrived, taking its accustomed path near the stump. Two of the shoats were a little in the rear, and scarcely had they reached the dangerous place where Reynard was lurking, when he pounced upon one, and, in the twinkling of an eye, regained his asylum with his prey. The squeaking of the shoat caused the sow to make desperate efforts to uproot the stump upon which the fox was comfortably feasting, and the

night was far advanced when the furious animal left the spot quite exhausted." *

I would not vouch for the truth of this case, even though an old hunter has confirmed it on his deathbed; as there are many who have talked themselves into a firm belief of their stories. But, if the former examples must give us a high opinion of the fox's reasoning faculties and boldness, the following will bear evidence to its daring and forethought:—A few years ago, a fox entered, in broad daylight, the poultry-yard of the parsonage of Sentzke, in Westhavelland (Regierungsbezirk Potsdam), and succeeded in killing and burying in the neighbouring garden nineteen fowls. When the animal was entering the garden with the twentieth, it was observed, and took to its heels. On account of its burrow being distant, it had availed itself of so favourable an opportunity of laying in a store near the yard, which, for several nights and days running, it tried to bring away to a safer place, until it was caught in one of the traps set for the purpose. Those who care about craniology as indicative of mental faculties, have, no doubt, already observed that the region of cautiousness is marked in the skull of the fox by a *very large* protuberance; and I can testify that a fox will, even in winter, save half a hare towards the night to come. In my youth, one morning, after a night during which there had been a moderate fall of snow, I hit upon the track of an old hare accompanied by that of a fox. I followed them in the open field for about an English mile, when I came to the spot where the hare had been killed, and partly devoured; but, observing in the continuation of the fox's track that something had been dragged, I had the curiosity to follow it farther, and, at the distance of a few hundred paces, found the posterior half of the hare, in excellent condition, buried in the snow under a little bush. I confess the hare was so well carved, that I had no objection to partaking of Mr. Reynard's fare, preferring, at dinner,

— "No doubt,
A rogue with venison to a saint without."

On the other hand, the fox, like most cunning persons who show great activity in executing their plots, sometimes betrays a great want of good sense, and is essentially averse to honest labour. The same animal which, by some of its wicked wiles, drives the badger out of its snug lodgings, and, always disinclined to dig its own burrow, will sometimes

* There is evidently something more in this relation than is conveyed by Dr. Weissenborn's English translation. — *Ed.*

inhabit a *spacious* burrow in common with the badger, does likewise not scruple to enter an artificial burrow constructed by the hand of man with rubble stones and earth, for the purpose of more conveniently digging after the cubs. Such burrows are more particularly formed in little bushy woods surrounded by fields well stocked with hares, partridges, &c., and presenting a convenient hunting-ground to the fox for supplying its young. The fox cannot resist such a temptation, and falls, with his family, a victim to the *dolce far niente*.

Moderate winters, particularly if there is pretty hard frost without snow, are those in which the fox is most distressed for food. It is then not very successful in catching the hare, which is sufficiently supplied with food to remain in full vigour; and it cannot dig after field mice, the ground being frozen comparatively deep, as it is not protected by the snow. In soft snow, it hunts the hare down with comparative ease; and, when deep snow has been lying for a long time with hard frost, the hares are so weak from want of food, that they become that of the fox without any great trouble on the part of the latter. But in the forests its table is most copiously provided when the snow is from $1\frac{1}{2}$ ft. to 2 ft. deep; and, a hard frost having succeeded to a short thaw, by which the surface has become wetted, the snow gets a crust sufficiently firm to carry the fox, but not the roe. Not only is the swiftness of the former then comparatively much greater, but the roe, or young red deer, to which it gives chase, soon bleeds at the shins, and falls an easy prey to its pursuer. This copiousness of food appears to be the reason why, in severe winters, the rutting time of the fox begins about a fortnight earlier than in mild ones.

It is a curious circumstance, that even the severest hunger cannot compel the fox to eat the flesh of birds of prey, though most other birds are its greatest dainties. It has not the same objection to that of the weasel-tribe, cats, or other beasts of prey.

I shall reserve a few other remarks on the fox for an article on the statistics of some of the more important wild animals of Germany, which I shall take an early opportunity of forwarding, if the above observations are found sufficiently interesting to appear before the English public.

Weimar, July, 1837.

ART. III. *Observations on the opposable Power of the Thumb in certain Mammals, considered as a zoological Character; and on the natural Affinities which subsist between the Bimana, Quadrùmana, and Pedimana.* By W. OGILBY, Esq., M.A., F.L.S., F.G.S., F.Z.S., &c. &c.

(Concluded from p. 459.)

HAVING thus got a group of Pedimana, consisting, as in the Quadrùmana, of two distinct families, I proceed, in the third place, to develop the relations which subsist between these minor groups; and to show, in the fourth place, that the Didélphidæ form, in some measure, a parallel chain to the Lemùridæ, as I have already shown that the Simiadae do to the Simiæ.* Now, it must be observed, once for all, that there is no gradual transition of character, no intermediate forms, to connect by imperceptible gradations the extreme links of the Quadrùmana and Pedimana, nor even to unite the two minor groups of which I have shown that these families are respectively composed. The Lemùridæ are as distinct from the Simiæ as the Didélphidæ are from the Simiadae, in some of their most remarkable and influential characters; but there are, nevertheless, other relations, besides those

* It was only within the last few days that I accidentally happened to meet with a passage in the *Histoire Naturelle* which shows that these relations had occurred to, and made a strong impression upon the mind of, the great Buffon; a philosopher who, had he not been unfortunately biassed against all system, would have probably given us a more correct arrangement of mammals than any which has yet appeared. The little that he attempted of this nature is almost perfect in its kind, and has never since been departed from. He was the first to introduce anything like order or generic distinctions among the Simiæ and Simiadae, and more particularly to distinguish these two groups from one another; he appears, indeed, to have made an especial study of the relations of all of these animals; and it is not a little singular, that, with the extremely imperfect materials which he possessed, he should have arrived at the same results to which I have been myself conducted by a much more extended range of observations. In fact, he only knew the most distant extremes of the groups; the Lemurs proper and Indris among the Lemùridæ, and the single genus of Opossums among the Didélphidæ: of the connecting links which fill up the chasm he was only acquainted with one species of Balántia. His words are:—"Cependant comme les Singes, les Babouins, et les Guenons ne se trouvent que dans l'ancien continent, on doit regarder les Sapajous et les Sagouins comme leurs représentans dans le nouveau; car ces animaux ont à peu près la même forme, tant à l'extérieur qu'à l'intérieur, et ils ont aussi beaucoup de choses communes dans leurs habitudes naturelles: il en est de même des Makis, dont aucune espèce ne s'est trouvée en Amérique, et qui néanmoins paraissent y être remplacés ou représentés par les Philandres, c'est à dire par les Sarigues, Marmoses, et autres Quadrumanes à museau pointu, qui se trouvent en grand nombre dans le nouveau continent, et nulle part dans l'ancien." (*Hist. Nat.*, 4to edit., xiv. 368.)—*W. O. August 10. 1837.*

which belong to them as *Quadrùmana* and *Pedímana* respectively, which may be easily traced between the constituent members of each group, and which approximate them more nearly to one another than to the analogous groups of the other family. Thus, we have seen that the *Didélphidæ*, though, generally speaking, omnivorous, exhibit a marked predilection for animal food. The very same appetites prevail among the *Simiadæ*, and that to an extent hitherto unsuspected by the majority of zoologists, as is clearly demonstrated by the following extract from Baron Humboldt: — “*La Viudita*,” says M. de Humboldt, speaking of the *Cállithrix lùgens*, “seule et abandonnée à elle-même, devient furieuse à l’aspect d’un oiseau ; elle s’élance sur lui comme un chat, et l’égorge à l’instant. Elle est très-friande de viande fraîche, quoiqu’on la nourrisse généralement de fruits ; elle mange, comme les autres *Sagoins*, en portant les deux mains à la fois à la bouche : à la voir guetter les oiseaux et rôder autour d’une cage, on la prendrait pour un Mammifère carnassier du genre *Viverra*. Je dois faire observer, cependant, ici, que ce goût pour une nourriture animale ne se trouve pas uniquement chez le *Douroucoulis* et la *Viudita*, mais aussi chez des espèces de *Sagoins* qui sont connus depuis long-temps. Le *Tamarin Nègre de Cayenne* (*Símia Midas Linn.*) mange volontiers de la viande cuite ; et M. Audibert cite l’exemple d’un petit *Sapajou*, lequel il a vu attraper des oiseaux sur les toits pour les dévorer.” *

This is precisely what I have myself seen the *Phalangers* and *Petaurists* do over and over again ; but there is a remark incidentally made by Baron Humboldt in the foregoing passage, which indicates another relation between the *Simiadæ* and *Didélphidæ*, and which deserves to be more particularly noticed, as it depends, in some measure, upon the pedimanous conformation of these animals. It is, that the *Viudita*, like the other *Sagoins*, as M. de Humboldt observes, made use of both its anterior members at the same time, for the purpose of carrying its food to its mouth. This action, which I have repeatedly witnessed both in the *Simiadæ* and *Didélphidæ*, manifestly arises from the want of the opposable thumbs on the anterior extremities, and the consequent impossibility of grasping the object securely with one hand. I have never observed any species of *Símia* or *Lemùridæ* to have recourse to both hands under similar circumstances ; obviously, because the more perfect structure of their organs of prehension precludes the necessity of doing so, to which the less favourably organised *Pedímana* are reduced : and this is a very important fact, which not only indicates a new and intimate affinity

* Humb. Rech. d’Obs. Zool., i. 320.

between the two natural groups of the *Pedímana*, but clearly points out the general inferiority of the whole family to the *Quadrùmana*, in the function, as well as in the structure, of the organ of prehension.

Another and still stronger affinity between the *Simiàdæ* and *Didélphidæ* arises from the prehensile power of the tail, which the great majority of these animals possess; and it is not a little remarkable, that this singular faculty should be almost confined to the *Pedímana*; a strong proof of the natural character of this family, and of the propriety of uniting its component parts more intimately than has hitherto been attempted. Indeed, there are but three other known genera (containing altogether only 6 species) which agree, in this respect, with the *Pedímana*; *Synethères*, *Myrmecóphaga*, and *Cercoléptes*; all of which present other striking analogies, as well of structure as of habits, with the *Sapajous* and *Opossums*, besides inhabiting the same climate: but their influential zoological characters associate them with other groups, and preclude a nearer approximation to the present family. As far as regards the prehensile power of the tail itself, which, as I have just observed, is almost confined to the *Pedímana*, and forms one of their most influential and important characters, it seems to be a kind of compensation which nature has given these animals, to balance the deficiency of power and dexterity entailed upon them by the peculiar structure of their ordinary organs of prehension. The *Quadrùmana*, which have the anterior thumbs completely opposable to the other fingers, and therefore possess the most perfect power of prehension in the hands alone, present no instance of prehensile power in the tail; whilst, on the other hand, among the *Pedímana*, in which the prehension of the anterior hands is seriously diminished by the absence of opposable power in the thumbs, this character is possessed by no fewer than 9 out of the 15 genera which compose the group; the remainder, too, embracing, comparatively speaking, only a small number of species. The general prevalence of this character among the *Pedímana*, and its almost exclusive confinement to this group, certainly constitutes one of the most curious and interesting facts in this department of zoology; and the discovery of its almost exclusive confinement to this family is a striking example of the important deductions which we are always enabled to draw from natural groups, but which no skill or penetration would enable the zoologist to discover from the best constructed artificial system.

But, to pursue the affinities which subsist between the *Simiàdæ* and *Didélphidæ* as component members of the same

natural group of *Pedimana*, I would remark, in the next place, that these animals, particularly those which possess the prehensile power of the tail, are remarkably slow, awkward, and undecided in their movements, advancing only with great caution and deliberation, as if not perfectly confident of their powers of prehension. This character is equally remarkable in the other prehensile-tailed mammals, in the *Synethères*, *Myrmecophaga*, and *Cercoléptes*, which exhibit the same unsteady wavering gait, and the same slow awkward movements. All are, moreover, distinguished by their timidity, gentleness, and docility; results which naturally follow from their want of confidence in their own powers. More active and favourably organised mammals, which have a freer use of their limbs, and do not require at every step to secure their tottering equilibrium by the slow and awkward operation of twisting the tail round whatever object happens to be within reach, display a corresponding quick and petulant temperament, because they are equally aware of their power to avoid or retaliate the assaults of their enemies; but the prehensile-tailed animal must be content to trust to cunning and sagacity to elude attack, or surprise its less wary prey. In this respect, also, there is a notable difference between the characters of the *Pedimana* and *Quadrumana*. Among the latter, the *Loris* (*Nycticèbi*) alone resemble the *Pedimana* in their tardy pace and insecure movements; whilst among these the nearest approximation to the lively, petulant, and capricious temper of the *Simiæ* and *Lemuridæ* is made by the *Cèbi* and *Callitricés*, the very genera which, as I have already observed, approach them most nearly in organic conformation.

A farther, and not less interesting, relation of affinity, which subsists between the two minor groups of the *Quadrumana* and *Pedimana* respectively, regards the geographical distribution of these animals; the former being exclusively confined to the Old World, and the latter almost as exclusively to the New; the only exception being in the case of a single genus of *Didelphidous Pedimana* (*Phalangista*), some species of which are spread over that long chain of islands which unite the south-eastern shores of Asia with the north-eastern coast of Australia, and which are partly considered to belong to each of these continents. The intermediate position of this locality, however, between the two proper and chief habitats of the *Quadrumana* and *Pedimana* respectively, can scarcely be considered as an exception to the general law of geographical distribution just announced, since it is a necessary and well-known fact in the dispersion of animals and vegetables, that the appropriate productions of conterminous climes are more or less

intermixed where these climes begin to lose their essential and distinguishing character, and gradually merge into one another. Now, this is precisely the case with respect to the Indian isles : they are neither entirely Asiatic nor entirely Australian, but a kind of debatable land, or, rather, neutral ground, in which the productions of both continents meet and mingle ; the Asiatic Apes and Macacs, in the present instance, sharing the same habitat as the naked-tailed Phalangiers, the representatives of the didelphidous *Pedimana* of New Holland and South America. The exception to the general law of habitat is, consequently, more apparent than real ; and I am therefore justified in insisting upon this beautiful and remarkable principle in the physical geography of animals, that there are no quadrumanous forms in the New World, and no pedimanous in the Old. I have always shown, in tracing the other affinities which exist between the constituent members of the *Quadrùmana* and *Pedimana* respectively, that the prehensile power of the tail is appropriate only to the latter family, and absolutely unknown in the former. It follows, as a corollary from this principle and the law of habitat just established, that there should be no prehensile-tailed animals in the Old World ; and this curious fact is equally true, since the only quadrupeds with prehensile tails which do not belong to the *Pedimana* (the *Synethères*, *Myrmecóphaga*, and *Cercoléptes*) are equally confined to South America.

It has been already observed, in the fourth place, that, as the *Simiadæ* among the *Pedimana* form a parallel group to the *Símiæ* among the *Quadrùmana*, so also the *Didélphidæ* in the former family may be considered as representing the *Lemùridæ* in the latter. This relation, however, is neither so obvious nor so important as many of those which I have already developed. It is displayed, principally, in the greater prolongation of the face and the lengthened muzzle, which equally characterise the *Lemùridæ* and *Didélphidæ*, as compared with the *Símiæ* and *Simiadæ*, respectively ; in the procumbent position and abnormal characters of the incisor teeth, both as regards the number and the form of these organs ; and generally in the more limited faculties, as well intellectual as physical, of both these groups. It is unnecessary, however, to insist farther upon relations which are obvious to the most casual observer, and which are otherwise of very small importance in a zoological point of view.

I have hitherto spoken of the *Pedimana* as composed of two natural families only, the *Simiadæ* and the *Didélphidæ* ; but there is, in reality, a third and very singular form included

in this group, the characters of which are so remarkable as to merit a more ample notice. The only known representative of the subfamily in question is the aye-aye, or *Cheïromys* of Madagascar, one of those abnormal forms which we continually find interposed between natural groups, partaking in some measure of the characters of each, without decidedly belonging to either, and separated from both by a breach in the chain of affinities, which, as far as our present knowledge extends, is not filled up by those gradual and successive modifications of organisation which unite the generality of natural families. The *Cheïromys* has been associated by some zoologists with the *Rodéntia*, and by others with the Lemurs, among the *Quadrùmana*; but it really belongs to neither of these groups; and the following considerations will show that its proper place will be found among the *Pedímana*, in a distinct subfamily, probably interposed between the *Simiadá* and *Didélphidæ*. I speak hesitatingly upon this subject, because, having never had an opportunity of examining the animal itself, I am acquainted with its characters only at second hand; but, from the descriptions of Buffon, Cuvier, and Desmarest, it is manifest that its proper location is somewhere in the present family, and probably between its two principal groups. According to Baron Cuvier, the form and characters of the skull assimilate this animal to the *Simiæ* and *Simiadá*, and it is only in the number and arrangement of the teeth that it bears any relation to the *Rodéntia*: its organs of locomotion and prehension are in all respects those of the *Pedímana*; and its habits and economy, which chiefly depend upon the modification of these organs, are, no doubt, equally similar. In other respects, even its dental system is not so entirely dissimilar to that of the *Didélphidæ*, as to be altogether without approximate or intermediate connecting modifications. These are very apparent in the *Phalangers* and *Petaurists*, both of which resemble the *Rodéntia* in the absence of canine teeth, and in having the incisors separated from the molars by a vacant space; for the two false molars which partly occupy this interval are mere rudiments which do not enter into the function of mastication, and which may therefore be overlooked in the present enquiry. Both these genera have, moreover, two incisor teeth only in the lower jaw; and, though they have invariably six in the upper, yet the very superior development of the central pair, compared with the lateral, which in some species are not more than half their length, brings them alone into contact with the lower incisors, and thus really makes the *Phalangers* and *Petaurists* in some degree

rodential animals. The *Cheíromys*, consequently, is not in reality so abnormal in the present family as in those with which it has been hitherto associated; the form of the head and extremities is in all respects the same, and even the organs of mastication are not very dissimilar. Here, then, is the natural situation of this singular being in the scale of animal life, and here, associated with its natural congeners, its apparent anomalies vanish, and it takes its place as a regular constituent part of a natural and well-defined group. It is only, indeed, the absence of the marsupial character which would make us hesitate to unite the *Cheíromys* with the *Didélphidæ*; but this circumstance is so material as to require that it should be placed in a different subfamily. At the same time, its analogy to the *Rodéntia* ought not to be overlooked; and it is for the purpose of expressing this relation that I propose to denominate the small group which I am obliged to form for this animal, *Glíridæ*. I suspect, indeed, that the *Cheíromys* bears a more intimate relation to the real dormice (*Glís*) than we are yet aware of.*

Hitherto, I have intentionally abstained from alluding to the bimanous type of organisation as exemplified in man. It is now necessary to consider that form, and investigate the relations which subsist between the *Bimana*, *Quadrùmana*, and *Pedímana*, between all those mammals, in short, which are provided with opposable thumbs, either upon one or both pairs of the extremities. Baron Cuvier, as it is well known, places man in an order by himself, apart from the *Símiæ* and *Lemùridæ*; but Baron Cuvier knew nothing of the relations here developed, and shown to subsist between the *Quadrùmana* and *Pedímana*, properly so called; and, in other respects, the separation in question depends rather upon moral and intellectual, than upon physical and zoological, data. The naturalist, however, must view man in a different light from the metaphysician and the divine; anatomical structure and organic conformation are the only principles which the zoologist can admit as the foundations of natural science; and, in this respect, man is too closely connected with the apes, and other *Símiæ*, to admit of being placed so widely apart from them as he has been in all recent classifications of mammals. I do not mean to affirm that the bimanous form approximates

* I have not yet seen the *Cheíromys*, but am inclined to think that it may, after all, belong to the *Lemùridæ*, with which it is associated by Desmarest, and with which it agrees in structure and habitat; the loss of prehensile power in the fore thumb being but a similar phenomenon to the entire absence of that organ in the *Semnopithécus* and *A'teles*.

so nearly to the quadrumanous as this does to the pedimanous, but that the whole three form so many constituent and subordinate groups of the same natural order, and are united by a chain of affinities too strong to be arbitrarily dissevered. At the same time, the Bimana have peculiar and appropriate characters, which, even in a physical point of view, exalt them sensibly above the allied families. The very separation of the functions of locomotion and prehension, and their appropriation to different organs, gives man a notable superiority over all other mammals; for by this means the organs of touch and prehension preserve their delicate and sensitive structure unimpaired by contact with the hard and rough ground. They are, besides, resident in that pair of the extremities which is situated in the immediate vicinity of the organs of sense and mind, and thus in the most convenient situation possible for executing all the various commands of the will; whilst the erect station of the body, and the appropriation of the function of locomotion to the posterior extremities alone, prevents them from being interfered with in the execution of these essential duties. The Quadrumana, on the contrary, continually obliged to employ the anterior as well as the posterior extremities in the act of progression, have the sense of touch and power of prehension seriously diminished in consequence; whilst the Pedimana, with the proper organs of prehension upon the posterior extremities only, are placed in still more unfavourable circumstances with regard to the facility of executing these functions, or obeying the commands of volition. In fact, the hind thumb in pedimanous and quadrumanous mammals is manifestly designed for no other purpose than to assist the function of locomotion, by giving those animals a more perfect power of prehension in grasping the branches of the trees among which they habitually reside; but the Quadrumana have the farther advantage of anterior hands, which the Pedimana do not possess, which adapt them to still more important acts of prehension, and approximate them more closely to the human type. They consequently occupy an intermediate position between the Bimana and Pedimana, with which they are connected by means of the real Apes (*Pithëcus*) on the one hand, and of the *Simiadæ* of South America on the other. The entire group thus presents a beautiful gradation of zoological characters from man to the *Simiæ*, and from those to the *Sapajous*, *Sagoin*s, and *Opossums*, and an uninterrupted chain of the most important affinities, which clearly vindicate its right to be considered as a strictly natural family of mammals; whilst the important

and influential character of opposable thumbs, either upon one pair of the extremities or upon both, definitely distinguishes it from all other groups, and renders it at once easy to recognise, and susceptible of a strict logical definition. This principal group or order of mammals, which I propose to call Cheiropeds (Cheirópoda), in allusion to the circumstance which forms their most important character, with its subordinate groups, or families, of Bimána, Quadrumána, and Pedímána, and the still more subordinate subfamilies which compose the latter two groups, is accurately defined and represented in the following table : —

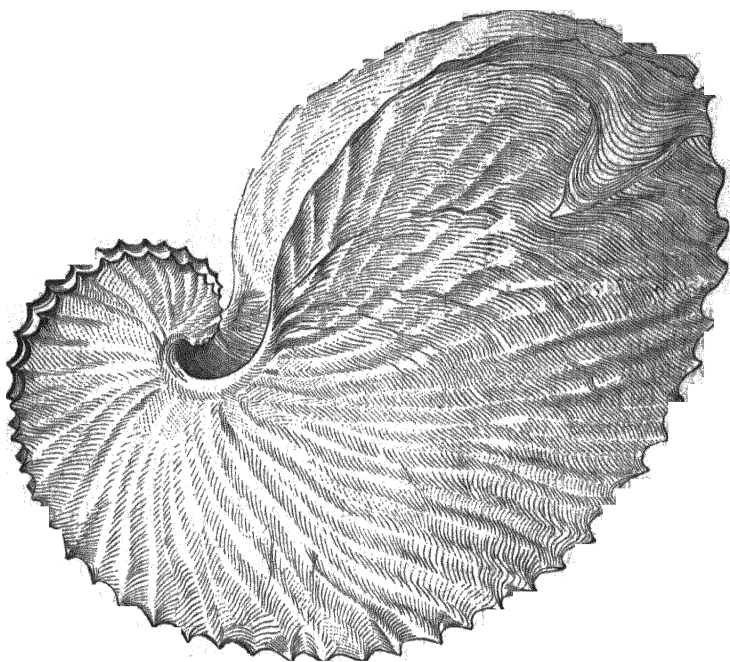
CHEIRO'PODA Mammals with op- posable thumbs	{	BI'MANA - - - - -	Hòmo.		
		on the anterior extremities only.			
		{	QUADRU'MANA - on both anterior and posterior extremities,	{ <i>Símia</i> - - - and with anthro- poid teeth.	{ Pithècus. Semnopithècus. Cólobus. Cercopithècus. Macàcus. Cynocéphalus.
				{ <i>Lemùridæ</i> - - and with abnor- mal teeth.	{ Lichanòtus. Propithècus. Lèmur. Nycticèbus. Otolícnus. Microcèbus. Cheirogàteus. Társius.
		{		{ <i>Simiadaæ</i> - - - and with anthro- poid teeth.	{ Cèbus. A'teles. Mycètes. Lágothrix. Cállithrix. Aòtus. Pithècia. Hápale.
					{
		{ <i>Didélphidæ</i> - - and with abnor- mal teeth.	{ Petaúrus. Phascolárcetus. Pseudocheirus. Phalangísta. Balántia. Cheironéctes. Didélphys.		

ART. IV. *Illustrated Zoological Notices.* By EDWARD CHARLES-WORTH, F.G.S., &c.

1. *On the Power which the Animal of the Argonaut has of repairing Breaches in its Shell.*
2. *On the recent Discovery of a Fossil Crocodile at Whitby.*
3. *On a Form of chambered cephalopodous Shells, connecting the Genera Nautilus and Ammonites.*

THE difference of opinion entertained respecting the legitimate tenant of the shell called the Argonaut, or Paper Nautilus, has given rise to more interesting discussion, and furnished materials for a greater display of ingenious reasoning, than perhaps any other question that has agitated the philosophical world in connexion with zoology. A doubt may, perhaps, even be hazarded whether the true interests of science would be advanced by a termination of the controversy, either from demonstrating the *Ocýthœ* to be the constructor of its shell, or by discovering the mysterious creature, if such really exist, that frames a habitation for another being, and of whose nature we are as profoundly ignorant as of the animals which inhabited the extinct testaceous genera occurring in the rocks of the Silurean system, or mountain limestone series. The researches undertaken for the purpose of arriving at a solution of this obscure problem, whether by direct experiment upon the immediate subject of dispute, or by attempting to discover in allied organisms conditions which shall reconcile the apparently anomalous points in the history of the genus *Argonaúta*, cannot fail to evolve facts more or less interesting when considered in relation to comparative anatomy and physiology, although the ultimate object of the investigation may never be attained. I had long, in common, probably, with many others, wondered that no series of experiments, similar to those lately instituted by Mrs. Power, and still more recently repeated by Captain Rang *, had not been attempted by some of the naturalists whose opinions and personal observations are on record in reference to the relation existing between the *Ocýthœ* and its shell; since the power of repairing its dwelling in common with other conchyliferous Molluscs, naturally suggests itself as a simple and satisfactory refutation of the parasitic propensities attributed by many to this Cephalopod. Upon reading Captain Rang's description of the important distinction which he remarked between the original shell and the diaphragm with which the *Ocýthœ* repaired the breaches artificially made in its habitation, it immediately occurred to me that, if both his

* See *Mag. Nat. Hist.* for Sept. 1837, p. 393.



experience and that of Mrs. Power coincided in particular, I had only to discover, if possible, specimens of the Argonaut exhibiting removed portions replaced with true shell, and the experiments of both these parties would go very far towards proving the very reverse of the position which it was the object of Mrs. Power to establish.

With this end in view, I determined to inspect all the collections of shells, whether public or private, within reach, considering it at the same time not a little remarkable that I could not call to mind ever having seen a repaired Argonaut, although this shell, from its extreme delicacy and large size, might be reasonably supposed more liable to fracture than, perhaps, any other. It was in the collection of Mr. George B. Sowerby that I was first fortunate enough to meet with the object of my search. The figure (*fig. 64.*) represents a specimen which he had had reserved, from the circumstance of its having been broken and subsequently repaired; and he informed me that this was the only instance of the kind which had come under his observation during his whole experience as a scientific conchologist and dealer in shells. One specimen, however, was to me as good as a thousand to establish the fact which I was desirous of proving, that of the constructor of

q q †

the Argonaut having power to repair any loss of substance with fresh deposit, agreeing in every respect with the original shell. By a reference to the woodcut, it will be seen that a triangular breach of about 1 in. in depth has been made in the margin of the shell; and this has been subsequently repaired in a most beautiful manner, the union of the newly formed parts with the old being so neatly effected, that it cannot be detected by touch. The reproduced portion has also the "texture," "solidity," and "whiteness" of the rest of the shell. I have placed this specimen in the museum of the Zoological Society, where it is open to the inspection of any one curious upon the subject.

Being now in possession of the evidence necessary to show that the constructor of the Argonaut had the same reparative powers as other testaceous Molluscs, I naturally felt interested to obtain a specimen in which the reparation had been effected by means of the false membrane so minutely described by Captain Rang, and which it was clear was *really* the work of the *Ocýthœ*. Here, however, two difficulties presented themselves: in the first place, the imperfection would be so strongly marked where an Argonaut had been repaired with only *membrane*, that very few in this condition would be likely to reach this country, so long as entire shells could readily be procured; and, secondly, if, among a large series of specimens, a solitary example of the kind escaped observation, the process which the shells undergo for the purpose of bleaching and cleaning them might be expected to remove all traces of this reparative action. Under these circumstances, I hardly expected to meet with any facts bearing upon the result of Captain Rang's observations; but, in looking over the large collection of shells belonging to Mr. Graham of Ludgate Hill, I was agreeably surprised by detecting an Argonaut with several small apertures in the body of the shell, across which a diaphragm had been thrown of precisely the same nature as that described by Captain Rang; the membrane, in this instance, being preserved, probably from the small size of the apertures, and from their not being marginal.

At a recent meeting of the Zoological Society of London (August 22. 1837), I exhibited the two specimens of which I have spoken, along with several others, in which injury to a greater extent than in the one figured had been repaired, and in a similar manner. On that occasion, I argued rather strongly in favour of the parasitic character of the *Ocýthœ*, from the evidence which had been adduced by Captain Rang respecting its non-reparative powers; it being clear from

the specimens in my possession that the *real* constructor of the Argonaut was fully capable of subsequently secreting true shell, if circumstances rendered it necessary. In the course of the discussion which followed, Mr. Owen introduced a very fair argument to show that I attributed more weight to the above facts than they were really entitled to, inasmuch as neither Mrs. Power nor Captain Rang had given the slightest intimation of the particular region of the shell from which they removed the portions spoken of; a circumstance of most material importance with reference to any inference which might be drawn from their experiments, since the Ocýthõe might not have the power of applying the secreting portion of its mantle to apertures in the body of its shell, although it might readily repair breaches taking place in the margin. In relation to this view of the case, Mr. Owen referred to some experiments instituted by Mr. Bell upon the common garden snail, published in the first volume of the *Zoological Journal*, and which no apology is necessary for introducing here. They are appended in a note to an abridged translation of M. Gaspard's *Memoir on the Physiology of Helix pomatia*, originally published in Majendie's *Journal de Physiologie*, tom. ii. p. 295.

“Although it would appear, from some circumstances, such as the filling up of the apex of the shell, that other parts are occasionally capable of producing a calcareous secretion, yet there is no doubt that the edge or collar of the mantle is the organ which ordinarily performs this function. I have at different times cracked the shell, removed small portions, and drilled holes through it, at different parts; and I have found that, if the injury were within the reach of the edge of the mantle, it was always drawn up to repair it. I will particularise one only of these experiments to show the manner in which this is done. I drilled a hole in the shell of *Hélix pomatia* in the last whorl but one, thinking that it could not draw the edge of the mantle high enough to repair it in the usual way; however, it effected this immediately by protruding the foot to make room for the mantle being drawn high up into the shell; and as soon as the edge came in contact with the injured part, it was passed repeatedly over the hole, leaving a layer of calcareous matter each time, until it became opaque; and, in a day or two, on examining it, I found the newly formed part apparently as strong as the rest of the shell. Another curious circumstance connected with this subject is, that in the species of snails with coloured bands (*H. nemoralis*, for instance) there are the same number of bands on the mantle as in the shell, which are brown and transparent; and these, probably, contain comparatively little

carbonate of lime. It is therefore not unlikely that the glands necessary for secreting this substance do not exist, at least to an equal degree, in those parts of the mantle marked by the bands. This, however, is but a conjecture, and only important as connected with a subject which deserves a much more accurate investigation than has ever yet been bestowed upon it." (*T. B., Zool. Journ.*, vol. i. p. 94.)

Now, upon the assumption that the *Ocýthœ* is the real constructor of the Argonaut, if we give it credit for the same anxiety to repair apertures in the body of its shell as that evinced by the animal of *Hélix pomatia*, the former Mollusc would certainly of the two appear the better adapted for effecting such an object, since it not only has no organic attachment to its habitation, but has even the power of detaching itself altogether; a circumstance which, upon a *primâ facie* view, would certainly indicate a greater freedom of accommodating its secreting organ to injured parts than if the body of the Cephalopod were confined, as in the case of the pearly Nautilus. Dr. Leach, in a paper published in the *Philosophical Transactions* for 1817, thus alludes to Mr. Cranche's statement respecting the power which the *Ocýthœ* possesses of quitting its shell:—

"The observations made by the late Mr. John Cranche, zoologist to the unfortunate Congo expedition, have cleared from my mind any doubts on the subject. In the Gulf of Guinea, and afterwards on the voyage, he took, by means of a small net (which was always suspended over the side of the vessel), several specimens of a new species of *Ocýthœ*, which were swimming in a small Argonauta on the surface of the sea. On the 13th of June, he placed two living specimens in a vessel of sea water; the animals very soon produced their arms, and swam on and below the surface, having all the actions of the common Polypus of our seas, by means of their suckers, they adhered firmly to any substance with which they came in contact, and when sticking to the sides of the basin, the shell might be completely withdrawn from the animals. They had the power of completely withdrawing within the shell, and of leaving it entirely. One individual quitted its shell and lived several hours, swimming about, and showing no inclination to return into it; and others left the shells as he was taking them up in the net. They changed colour like other animals of the class Cephalopoda: when at rest, the colour was pale flesh-coloured, more or less speckled with purplish; the under parts of the arms were bluish grey, the suckers whitish."

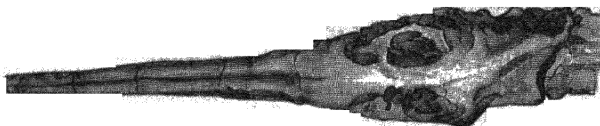
There is one fact which I cannot help regarding as highly favourable to the opinion of the *Ocýthœ* being a parasite, and

that is the very small proportion of these shells which exhibit any traces of reproduced parts : for I cannot believe this circumstance to be accounted for upon the supposition that repaired specimens are not sent to this country, because the animal, be it what it may, mends in so workmanlike a manner, adapting the renewed portions so accurately and evenly to the edges of the breach, that the flaw, even if detected, would not lessen the market price of the shell. How constantly do we observe traces of the reparative process upon the lips of *Fûsi*, *Pleurótomæ*, *Volûtæ*, &c. ; and, as we know the Argonaut, while inhabited by the *Ocýthœ*, is exposed to accidents, if that animal possesses the power of renewing the shell, why are instances of the kind so rare ? But, if the lawful tenant of the Argonaut dwells in the depths of the ocean, and does not visit the surface, we have a ready solution of this difficulty, since the very same conditions which have kept us in ignorance upon this point, furnish the most satisfactory reason for so frail a production being rarely liable to those accidents from external violence to which so many of the testaceous Molluscs are exposed.

In offering these few observations, I have not attempted to discuss the merits of the question at large, or to enter upon the mass of evidence which has been brought forward either on one side or the other, except in those particulars which bear directly upon the points immediately under consideration. It is most probable that, before long, I shall have again to revert to the subject; and, in the mean time, I cannot help expressing a hope that all conchologists, or, indeed, I may say all cultivators of natural history, who may chance to fall in with these remarks, will examine such specimens of the Paper Nautilus as they have access to, noting with care any indications of renewed parts, the region in which the injury has been sustained, and the nature of the reproduced portions; communicating the result of such observation to the public through some scientific channel.

Mr. Broderip thus terminates a paper on the animal of the Argonaut, in the fourth volume of the *Zoological Journal*, page 66.:—"There is not, perhaps, sufficient evidence to convict the subject of our memoir of piracy, but there is quite enough to make us strongly doubt the assertion, that 'he is his own industrious shipwright.'"

Turning to the consideration of the beings of another era, we have at *fig. 65.*, the representation of the head of a Crocodile (? *Steneosaurus*) lately discovered in the lias at Whitby, and a very nicely executed drawing of which I have received from Viscountess Sidmouth, taken from the original



specimen, by the Rev. Mr. Howman, who, in writing to Her Ladyship, thus notices this interesting fossil remain :— “ I have been delighted with the scenery of Scarborough, Whitby, Robin Hood’s Bay, &c., and not a little to find myself dwelling amidst Crocodiles, Ichthyosauri, and a hundred other rare remains of the antediluvian world, which that coast teems with. The museum of Whitby has the finest specimen of fossil Crocodile known, 15½ ft. long; from two to three additional feet being wanting to complete its jaws. I found a smaller, but perhaps more perfect, specimen, 8½ ft. long, in the possession of a poor man who discovered it, and served me as a guide; I made a very accurate drawing of it to a scale; for some of your scientific friends may like to see it.”

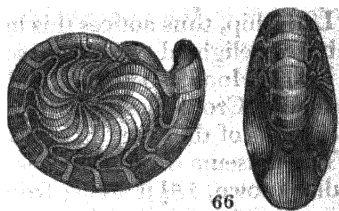
I believe Whitby is the only *lias* locality in which the skeletons of Crocodiles have been discovered in this country; and, as the number of specimens hitherto found is very small, every additional one is worth recording. A short time since, I examined a specimen about 5 ft. long in the collection of Captain Kaines at Chatham, having what I should imagine to be the most perfect head and jaws extant. This was likewise obtained at Whitby. The specimen of which I have figured the head is in the possession of a man named Crosby, and might be purchased at a very reasonable price, a short time since. I should think it well worth the attention of some museum, as *fossil Crocodiles* are not quite so abundant as *Ichthyosauri*.

The extensive cuttings in the beds above the chalk either completed or now in progress, at various localities round London, connected with the projected lines of railway, have been the means of considerably augmenting the list of species known to geologists as occurring in the London basin, besides, in some instances, furnishing entire examples of fossils, of which only fragments or imperfect specimens had previously been obtained. Mr. Whetherell of Highgate, whose unrivalled series of London clay fossils is well known to all metropolitan collectors, made some most valuable additions to his cabinet whilst the excavations were going forward for the Birmingham line, several of which he has placed in my hands, with a view of having them noticed in the *Magazine of Natural History*. The suite of tertiary Nautili in the pos-

session of this gentleman is truly splendid : the specimens of several species exhibiting every gradation of size from an extremely young state up to the adult period.

The specimen here figured (*fig. 66.*), certainly the rarest and most interesting of the species of this genus which occur in the London clay, he procured from the tunnel at Primrose Hill.

In the *Mineral Conchology*, we find at tab. 1. *fig. 4.* a representation of an imperfect specimen of this truly elegant fossil, under the name of *Nautilus ziczac*; but Mr. Sowerby does not notice the remarkable character of its chambers, except as



a ready means of distinguishing the species. The sinuous septa, so beautifully shown in this specimen, from the loss of the external coat, would place this species in that division of fossil multilocular shells to which the term *Goniatite* has been applied by Von Buch, were not the siphunculus placed along the internal margin. The characters of this shell, indeed, will not admit of its being placed in either the genus *Nautilus* or *Ammonites*, as will be seen by a reference to the following characters of the families *Nautilidæ* and *Ammonitidæ*, in the article *Cephalopoda*, by Mr. Owen, recently published in *Todd's Cyclopædia of Anatomy and Physiology*:—

Fam. 1. *Nautilidæ*. Shell external, spiral or straight; septa smooth, simple; the last chamber the largest, and containing the animal; siphon central or marginal and internal.

Fam. 2. *Ammonitidæ*. Shell external, spiral or straight; septa sinuous and with lobated margins; the last chamber the largest, and lodging the animal; siphon central or marginal and external.

Now, it is clear, that the specimen before us is neither *Nautilus* nor *Ammonite*; for we are here presented with *sinuous* septa, whilst the siphuncle is marginal and *internal*.

The following may be given as its characters:—

Shell involute; inner whorls concealed as in *Nautilus*; septa with deep lateral narrow sinuosities; siphuncle continuous, marginal, and internal.

These characters might, perhaps, be thought by some sufficiently tangible to establish a genus for the reception of *Nautilus ziczac*; but I should not consider myself warranted in so doing, because I am aware of the existence of a fossil also from the London clay, and which is figured by Mr. Parkinson (*Organic Remains*, vol. iii.), in which the septa are like those of *N. ziczac*, but the siphuncle is not marginal. This specimen, which is of large size, is now in the possession of Mr.

James De C. Sowerby, through whose kindness I have had an opportunity of examining it.

Two points are involved in the history of this fossil, and the other to which reference has been made, which are well worthy of attention (connected with their zoological characters, and the conditions under which they are found). The position of the siphunculus in the chambered cephalopodous shells appears to be of less value as a generic character than has been hitherto imagined; and, secondly, it seems that *Goniatites*, or at any rate something very like them occur in the London clay, a bed in which we certainly should not have anticipated their existence.

Although the true *Nautili* are rather plentifully met with when any considerable excavations are made in the neighbourhood of the metropolis, the species of this genus are by no means abundant throughout the whole extent of the clay deposit overlying the chalk. They are rather numerous in the Isle of Sheppey, and I have occasionally seen very fine specimens in the cliffs of Essex and Suffolk; but I have never detected a fragment of a *Nautilus* in that rich deposit of tertiary fossils on the Hampshire coast, nor am I aware that it ever occurs there. As the genus is unknown in either the coralline or red crag as a tertiary fossil in this country, it is characteristic of the London clay. Mr. Bowerbank has one specimen of *N. ziczac* from Sheppey, and Mr. Sowerby's specimen was from Highgate. The one figured here (by far the most perfect specimen of the three) was obtained from a labourer at the Primrose Hill tunnel.

In the tertiary beds at Dax, and one or two other localities on the Continent, a large species very closely allied to, if not identical with, *N. ziczac* is not unfrequently met with. I regret that I have not had an opportunity of learning whether M. Deshayes enters into any details respecting this species, in his *Description des Coquilles Fossiles des Environs de Paris*. The only copy of this valuable work to which I have access is in the library of the Royal Society, and the late parts, containing the Cephalopods, have not been received.

Having a number of interesting subjects worthy of notice, as illustrating points of interest in connexion with recent and fossil zoology, I propose, from time to time, introducing them in a series of papers to the readers of the *Magazine of Natural History*.

London, Sept. 21. 1837.

ART. V. *Characters of a new Form in the Fringillidæ ; with a Description of the only Species yet referrible to it.* By ANDREW SMITH, M.D., Surgeon to the Forces, Superintendent of the late Expedition for exploring the Interior of South Africa.

IN the many instances in which we have already detected, amongst birds, well-defined natural groups, we have found a certain harmony of characters pervading the entire of their species: indeed, it has been that evident harmony which led to their being regarded as natural groups. It is true, in each group some species are found which do not exhibit all the characters of the more typical ones; yet they nevertheless present us with sufficient indications of their relationship to enable us at once to perceive their proper connexions.

If, then, the existence of these marked corresponding characters are to be regarded as the essence of such groups, it will be necessary, whenever a species presents itself which does not possess the qualifications requisite for admitting it amongst forms already established, to view it as a legitimate object for the type of a new subdivision. Under such circumstances, the Sociable Finch of Southern Africa presents itself to our notice. Whilst no one will deny this bird a place in the Fringillidæ, most observers will admit it deficient in the series of subordinate characters which would admit of its being properly included in any of the yet characterised subdivisions of the family; and, in proof of what we have affirmed, no two original observers have hitherto placed it in the same genus. By the most accurate enquirers, it has either been placed in the *Plòceus* of Cuvier or the *Euplécetes* of Swainson.

Unless we are to allow the characters of a group to stand so loosely defined as to admit of the introduction of forms so remote from the typical ones, that no two observers would, in all probability, refer them to the same genus, we cannot possibly regard the bird now under consideration as appertaining either to *Plòceus* or *Euplécetes*. It has not that series of external characters which would establish its place either in the one or the other; and its resorts and habits are directly opposed to both; unless it be believed that we have already sufficient evidence to warrant the conclusion, that every natural genus must of necessity have certain modified forms as representatives of other genera.

If it is to be discarded from any connexion with either of the above genera, its legitimate position is far from evident; and, therefore, to speculate upon probabilities might only increase that obscurity. What is quite incomprehensible with our present materials, will doubtless become evident,

when most of the stores which nature has still in reserve shall have been accumulated; and, till then, any labour directed otherwise than to that end will, in all likelihood, only prove labour lost. For the reception of this South African bird, I would, then, propose the

Subgenus PHILETAI'RUS.

Bill rather long, and pointed, higher than broad, and entering between the feathers of the forehead; culmen rounded and curved; commissure sinuated; edges of mandibles slightly inflexed; nostrils near base of upper mandible, round, and behind edged with feathers; a few short rigid bristles at angles of mouth. *Wings* moderate; when closed, covering half the tail; three outermost quill-feathers nearly of equal length, and the longest. *Tail* rounded. *Legs* strong, scutellated in front; middle toe considerably longer than the lateral ones, which are nearly of equal length, and shorter than the hinder one. *Claws* strong, compressed, curved, and pointed.

PHILETAI'RUS LE'PIDUS. (Plòceus sòcius Cuvier, Eupléctes lépidus Swainson.)

Male. The upper parts of the head and the back drab brown; the sides of the neck, the interscapulars, and a longitudinal stripe in front of each leg at base, black or black brown; the feathers margined with Isabella; chin, and a stripe between it and anterior angle of each eye, pure black; sides of head and under parts of body, Isabella; quill and tail feathers dark brown; the latter, towards tips, of an Isabella tint: bill a pale horn-colour, inclining to bluish white towards point. Length, from shoulder to tip of wings, 2' 10''; tail, 1' 10''; tarsus, 10''; bill, 8''. Total length of bird, 5 in.

Female. No black on the chin or at the base of mandibles; in other respects, resembles the male.

Inhabits the interior of southern Africa, and is generally found in dry arid situations. A great many individuals are usually found associated together; and under one common roof they build their nests, which in some cases form such large and weighty masses as to break the strong branches of large and lofty trees, upon which they usually place them. In its manners, it resembles the *Pyrgitæ*, and still more, perhaps, the *Plocépasser*, a small African group, first indicated by me in June, 1836.

ART. VI. *Notes on the Pern, or Honey Buzzard.*
By EDWARD BLYTH, Esq.

AFTER the admirable and detailed description which Mr. Yarrell has collated of that curious and interesting bird, the *Pérnis apívorus*, and the attention which Mr. Macgillivray has bestowed upon it, in common with the rest of its tribe, in his laboured work on the raptorial birds of Britain, it would seem almost a hopeless task to endeavour to throw further light upon the species. Whilst every writer, however, who has

described it has alike spoken of it as a most variable species, it does not appear that the nature of that variation of plumage to which it is liable has ever been satisfactorily explained. I have examined a considerable number of skins and stuffed specimens, as many as seven or eight of which were British-killed; and have found the difference observable among them to be sufficiently intelligible, being reducible, over and above the regular progressive changes to which the species is subject, to a mere want of fixity, or definitiveness as regards extent, rather than of constancy in the normal markings; to a running or suffusion, or, on the other hand, sometimes to a deficiency, of the colouring matter. The following are its typical states of plumage, with all the markings duly developed and defined:—

Adult Male. In the finest specimen which I have seen, the head, including the lores and ear-coverts, was of a dark dull ash-colour; upper plumage nearly uniform brown, distinctly tinged with cinereous, and having a fine reddish-purple gloss when held to the light; the feathers white at base, and little more than tipped with brown about the nape; throat white, with a dark line down the centre of each feather; breast plumage broadly terminated with brown, which lower forms upon each feather two or more distinct broad bars; tail whitish at base, with three broad bars of dark brown, one near the tip, and terminated with white; between the bars were numerous dark, wavy, transverse lines.

Adult Female. Some are said to have the forehead bluish-grey; but this I have not seen. A beautiful specimen, killed not far from London, had all the upper parts deep chocolate-brown, with the base of the feathers on the head and neck very pure white, which appeared conspicuously about the nape, as in most other *Falconidae*; lower plumage with distinct, large, transverse bars; quills and tail marked as in the male.

Immature Dress. An example, in what may be deemed its characteristic plumage at this age, with the markings more than usually distinct, had the forehead dull white; the crown of the head and neck brown, tipped with whitish, with a dark line along the shaft of each feather; lores, and streak passing through the eye, dark chocolate-brown; scapularies uniform clove-brown; smallest wing-coverts edged with a paler tint; outer primaries dark brown; the remainder barred with different shades of the same; secondaries and tertiaries tipped with white; the tail barred with different shades of brown, and tipped with whitish; throat reddish-white, with a defined dark streak along the middle of each feather: this gradually becomes more diffused till, on the breast, the feathers appear almost uniform brown. Under parts whitish, longitudinally

streaked with brown; and more or less barred on the sides; lower tail-coverts whitish, with a few broad bars of brown.

It is not unusual for them to have the head, neck, and all the lower parts, of a dull white, with a very narrow dark streak down the centre of each feather, scarcely occupying more than the shaft, the lores and streak through the eyes continuing brown; others have the lower parts uniform brown, sometimes with a darker streak down the middle of the feathers; and there are some in which the colour, not having quite diffused itself, leaves the sides of the feathers whitish. The adults are much less variable than the young. Their progressive changes follow the same general law as in the hawk genus.

Willughby describes the nestlings to be "covered with white down, spotted with black." [Probably the dark feathers appearing beyond the down?] "Their feet," he says, "were of a pale yellow; their bills, between the nostrils and the head [the *cere*], white." "Les jeunes de l'année" (meaning the birds a little older), remarks Temminck, "ont la cire *jaune* et l'iris d'un brun clair." Mr. Selby, however, as quoted by Mr. Macgillivray*, states of an individual entrapped in Northumberland, that "It proved a male, and an adult bird, as I judged from the plumage, and pure yellow of the *cere* and legs. Its colour is uniform deep clove-brown, very unlike that of the females I have met with in collections, or of the young males, which have the whole of the head and neck nearly white." I have no hesitation in pronouncing this bird to have been immature, and of the same age as the partially white specimens adverted to. The adult female of which I have described the plumage, had the irides of a dull brownish yellow, and the *cere* dark grey. Its stomach contained a greenish fluid matter, probably digested wasp-maggots; and it was excessively fat, and difficult to prepare, on account of the liquidity of the grease. Buffon says that, "in *winter*, when fat, this bird is good eating." The season specified is probably an inadvertent expression of that author; as, in Britain at least, it is only known as a summer visitant.

The following particulars have been communicated to me respecting a living *pern*, which was kept for a long while in confinement. This bird was excessively tame; insomuch that it was occasionally suffered to fly at large, when it was generally satisfied to alight on a neighbouring cage, without appearing to care for exercising its wings. It evinced more familiarity and confidence than an equally tame kite; but appeared to be less intelligent and cunning. Sometimes it

* Macgillivray's *Rapacious Birds*, p. 472.

emitted a lengthened very plaintive cry, particularly when in want of food: it was by no means, however, so quick in recognising its feeder as the kite was. It devoured insects of every description, which it would take readily from the hand; and, contrary to the usual habit of birds of this family, would commonly seize its food with the bill rather than its talons: this it always took to the ground to consume, where it passed much of its time; and it invariably tore its prey into very small pieces, never bolting it in large masses, as the kite did. It would kill a rat, by adroitly seizing it by the back of the neck, fixing its talons in it simultaneously; and it murdered one of a pair of *Nóctua nùdipes*, which had long resided in an adjoining compartment of the same prison, and that occasionally used to fly up and cling to the bars which separated it from the pern. The latter, seizing his opportunity, contrived to pull it through, and devoured it. A bird of this species, described by the Hon. H. T. Liddell, in the *Transactions* of the Natural History Society of Northumberland, was shot while in pursuit of a wood-pigeon.

It is usually considered a very rare species, though, in the neighbourhood of extensive beech woods, it would seem to be far from being so. In Burnham Beeches, near Windsor, Mr. Gould informs me they annually breed, and that he has seen the egg from that locality. Stuffed specimens are not at all unfrequent in the taverns and places about the vicinity. Gilbert White mentions its nestling in the beech hanger at Selborne; and Willughby even considered it pretty frequent in England. It is undoubtedly, however, a very local species till after the breeding season, when they would appear to be rather disposed to ramble, as specimens have then been met with in various parts of the country, though chiefly, as remarked by Mr. Yarrell, along the eastern coast, from Suffolk to Northumberland; which renders it probable that these had wandered from the Continent. A very young male, with its primaries not full grown, and which, therefore, could not long have left the nest, was sent to Dr. Leach from Cornwall, and is now in the national collection. This bird, it may be remarked, has all its markings considerably less distinct than the specimen, in a corresponding state of plumage, which I have described.

M. Vieillot, as quoted by Mr. Yarrell, relates of this species, that it seldom flies, except from one tree to another, or from bush to bush, and then always low; and that it runs when on the ground with great rapidity, like our common fowls; a circumstance which is also noticed by Willughby. And the captive individual of which I have spoken, when allowed its

liberty, betrayed the same inactive disposition as regards the exercising of its volar powers which that account implies. Still, however, when we consider the long and ample wings with which this bird is furnished, it is impossible not to suspect that our information respecting its habits is yet incomplete. Sir W. Jardine, indeed, states that "there are some partly insectivorous hawks (*Pernis*, for instance), which seize and devour the insect during flight *; but I am unaware that he has any further authority for assuming this (I mean, that the *pernis* is in the habit of pursuing insects on the wing), than the following paragraph in Montagu's *Supplement to his Ornithological Dictionary*:—"A few years since, the Rev. Mr. Holdsworth (a very intelligent observer of nature), who resides contiguous to a large piece of fresh water, called Slapton Ley, in South Devon, close to the sea, noticed a large species of hawk skimming over the water, in pursuit of the larger dragon flies, which it seized with its talons, and took them from thence with its beak. This bird was observed to frequent the lake daily for a long time, for the purpose of preying on these insects; and Mr. Holdsworth's account of the bird induces us to believe that it was the honey buzzard." Mr. Macgillivray conceives the *pernis* to be related to the kites (*Milvus*); and I fully agree with him in considering it as more distinct from the buzzards than is generally held; and, for this reason, would drop the name honey buzzard, as he has done, substituting an appellation which is at least as unobjectionable as *tern*. I have been accustomed to regard the form as mediate, rather between *Buteo* and *Elanus*; a view which has lately been considerably strengthened by a remark of Nuttall on the *Elanus*, or rather *Nauclerus*, *furcatus Vigors*, to the effect that that species also seizes on the nests of locusts and wasps, and devours both the insects and their larvæ. Should the latter view of the affinities of this genus, then, prove to be the correct one, the probability is much increased that it often feeds by chasing the larger insects, as is a common habit with the *Elni*: which group, by the way, does not appear to me to be much allied by direct affinity to the kites. We require more information of the *pernis*'s habits, at other seasons than when wasps' nests occur in abundance; for to the larvæ of these insects they certainly appear to give the preference, over any other food; and there can be little doubt that the unusual clothing of the face, so characteristic of them, is ordained to furnish a protection from the envenomed stings of the insects alluded to, which, consequently, would be thus indicated as their most appropriate prey. These birds have the gape wide, and re-

* Note to 4th edition of Wilson's American Ornithology, vol. ii. p. 275.

markably flexible in recent specimens, reminding one of the typical *Fissiróstres*; and in this they agree with the *E'iani*. The most nearly allied species, however, to the true perns, which are confined in their distribution to the ancient continent, is a South American bird, which has even been styled, I believe, by d'Orbigny, *Pérnis americanus*. This species, indeed, only differs in wanting their most distinctive peculiarity, the close feathering in front of the eyes; having this part thinly covered with the usual radiating bristly plumes; it is therefore scarcely separable from them, and only by very rigid dividers. A specimen of it exists in the museum of the Zoological Society. — *Sept.* 11. 1837.

REVIEWS.

ART. I. 1. *Magazine of Zoology and Botany*. Conducted by Sir William Jardine, Bart.; P. J. Selby, Esq.; and Dr. Johnston. Nos. 7, 8, and 9.

2. *Naturalist; illustrative of the Animal, Vegetable, and Mineral Kingdoms*. Edited by Neville Wood, Esq.

3. *Mining Journal and Commercial Gazette*. Conducted by Henry English, Esq., F.G.S., &c.

It was our intention to notice at some length one or two of the more important articles which have appeared in the late Numbers of the *Magazine of Zoology and Botany*; but a very liberal supply of contributions from various correspondents compels us to be brief in the number of our reviews, and also to limit our remarks to a few general observations.

We have heard but one opinion expressed as to the scientific value of a large proportion of the *Memoirs* which have been published in this Journal; and that opinion, we need hardly say, is in the highest degree favourable. But, in calling attention to its undoubted merits, as a part of our periodical scientific literature, we cannot help feeling that we are placed in rather an awkward predicament. Several of the leading contributors to the present work were formerly supporters of the *Magazine of Natural History*, and at the period when a secession took place, to establish a journal which should take a higher stand in the scientific world, the parties thus acting had, we think, ample and just reason for calculating upon the combined support of all the naturalists of note in this country.

The change, however, which has taken place in the editorial arrangements of Mr. Loudon's Journal has completely

altered the position of affairs, and placed matters on a totally different footing.

It is obvious enough that there is a very strong feeling in favour of the *Magazine of Natural History*, and that it will be supported, not only by a class who observe the varied phenomena of nature as an amusement or recreation, but by those who are engaged in the higher departments of scientific research. It, then, becomes a matter worthy of consideration, how far the interests of science are promoted by the publication of two journals, having similar objects in view, when the effect produced must, to a certain extent, be that of crippling the powers of each; at least, in so far as they may be dependent upon *direct proceeds*. From a knowledge of the actual sale of the various scientific journals published in this country, we are well aware that there is not the slightest probability for a demand to meet the expenses of two periodical works devoted to zoology in connexion with other branches of natural history; and whatever tends to promote the circulation of one must, under ordinary circumstances, be at the expense of the other.

Now, supposing the Magazine of Sir W. Jardine and that of Mr. Loudon to stand equally well with the scientific public as channels for communicating the observations of those engaged in the study of zoology, botany, &c.; the latter has this great advantage over the former, that, although its sale may not produce anything like a fair equivalent for the labour and anxiety unavoidably attendant upon a monthly publication, yet it has a larger circulation than any other scientific journal in this country embracing the same general plan of publication. Our scientific periodical literature seems, certainly, at the present time, carried forward in any but an advantageous form, whether we take into consideration the labour which editors give for nothing, or the comparatively small circulation which each individual publication can command, and the consequent tardy introduction of facts and observations, which ought often to be disseminated as widely and as rapidly as possible. It is much to be regretted, that many of the papers which appear in the *Entomological Magazine* are limited to so small a circle of readers; since articles which, if they had only a more extended circulation, might be the means of *making* entomologists, as the case stands, are, generally speaking, only in the hands of those who have acquired the taste, and, perhaps, made some proficiency in the study. This disadvantage will always be present where a periodical embraces only one branch of natural history; indeed, there are many reasons which induce us to consider that, within certain obvious

limits, the more diversified the contents of a scientific journal are made, and the wider the range of objects which it embraces, the more extended may be its sphere of usefulness. A general combination of forces would be most desirable, if editors, contributors, and subscribers would all pull one way; but the difficulties of bringing about such an arrangement are probably insuperable.

Whatever course may be adopted by the conductors of the *Magazine of Zoology and Botany*, we shall always feel pleasure in bearing testimony to the value and interest of the matter contained in the pages of that work; and we think the cultivators of science in this country owe a debt of gratitude to the parties by whom it was established. We are at a loss to understand the object in issuing two numbers on the last publication; since some of the contributions appear to us of an inferior nature, and *double* numbers are not very popular with either booksellers or subscribers. We intended to have noticed the uncalled-for cut at Miss Mary Roberts in No. IX., and the severe strictures upon Mr. Swainson, which, if contrasted with *previous* opinions, look passing strange; but we may say a word on this hereafter.

Naturalist. — There is an old and well-known adage, that “honesty is the best policy;” the truth of which, if it required confirmation, might be seen in the miserable failure of the *Naturalist* in its attempt to supplant the *Magazine of Natural History*, without being over and above scrupulous as to the means by which this object was to be attained. Notwithstanding the numerous lies which have emanated from the parties connected with this periodical, they have neither succeeded in gulling the public with their false representations, or in injuring the sale of Mr. Loudon’s *Magazine*, as the increase both in the number and value of the communications sent to us amply testifies.

Mr. Groombridge, hitherto the publisher, being unable to obtain a sale for the work, it has been handed over to Whitaker and Co.; and we think it highly creditable to this house, that they have refused to insert the abominable falsehood relative to the sale, which has latterly appeared monthly upon the cover; “a mischievous violation of truth,” for the sake of obtaining a few paltry shillings in the way of advertisements, and that, too, under the sanction of a Rev. individual, who, for reasons unconnected with his sacred office, ought to have shrunk from participating in anything bearing even the semblance of falsehood and deception.*

* See Mr. Morris’s accusation of Mr. Waterton, *Mag. Nat. Hist.*, Vol. IX. p. 434.

We do not know which stands forward in the more prominent light, the folly, or impudence, of both editors and proprietors, in supposing that cultivators of natural history are such flats as to throw away their money in the purchase of a trashy periodical because solicited to do so by the author of *British Song Birds*, in the following manner : —

“Sir, — We beg to introduce to your notice ‘The Analyst,’ and ‘The Naturalist;’ the only Periodicals, so far as we are aware, printed and edited in the country. We should feel honoured by your becoming a Subscriber to them; and shall at all times be happy to receive Communications for their pages from yourself or your friends. Of the Analyst, No. XXI. will appear Oct. 1. 1837; of the Naturalist, No. XII. will be published Sept. 1. 1837; and any of the back Nos. may be had, by order, of all booksellers. — We are, Sir, your obedient servants, *William Holl and Neville Wood.*”

The above circular is a specimen of the way in which, we understand, several individuals, eminent as naturalists, are being dunned; parties, too, who are not at all ambitious of having the credit of extending their patronage to either of the two periodicals thus politely “introduced to their notice.” There is one circumstance which, we own, gives us some surprise; and that is, that Mr. Maund, the editor of two extremely useful botanical publications, the *Botanic Garden* and *Botanist*, and whom we believe to be a gentleman of most honourable feeling and integrity of purpose, should permit his name to be in any way associated with the firm of “Orpen Morris, Neville Wood, & Co.”

In thus freely expressing our opinion of the line of proceeding adopted by a contemporary periodical, we entirely disclaim all feeling of opposition, on the ground of its being a rival publication.

It must be evident to every one, from the condition of the *Naturalist*, both as regards its reception up to the present time, and future prospects, that it is utterly out of its power to injure the *Magazine of Natural History*; and, even had it accomplished its object of benefiting at our expense, provided that end had been attained through fair and honourable means, by bringing before the public matter of more general interest, or of greater scientific value, we should not for a moment have regarded the possible diminution of our circulation, but have felt just the same readiness to render justice to its merits as we did to the *Magazine of Zoology and Botany* when commencing the first number of the present series.*

* We have desisted from entering into any details respecting either the public or private misrepresentation of the parties who have been attempting

Mining Journal. — We certainly feel that an apology is due to Mr. English for having so long neglected to notice the *Mining Journal*, a work which we regularly receive, and always peruse with pleasure, from the able manner in which its leading articles are written, and from the nature of the scientific information which is brought forward in its pages. When first announced, we thought it a bold attempt to start a weekly mining publication; but we believe its success has fully realised the expectations of the conductor, and completely justified his venturing upon so important an undertaking. Its circulation, indeed, must be very considerable, for many take it in, solely from the judicious selections of articles from foreign publications upon scientific subjects, which are translated and inserted in its columns, whilst it is indispensable to every one interested in mining affairs, whether in a scientific or commercial point of view. One or two rival publications have made unsuccessful attempts to establish themselves; but Mr. English is now in undisputed possession of the field; and though, from his determination to expose abuses wherever he can detect them, without any respect to “companies” or individuals, he has raised a considerable party against him, we feel sure that he will be no loser in the end by persevering in the same spirited and straightforward line of proceeding. A supplementary sheet is published every two or three weeks, devoted exclusively to reviews and general scientific intelligence.

SHORT COMMUNICATIONS, SCIENTIFIC INTELLIGENCE, ETC.

MR. MURPHY'S Prognostications of the Weather. — It will probably be fresh in the recollection of our readers, that, at the

to establish the *Naturalist*; because we have neither room, nor would it be at all edifying to our readers; we may refer, however, to one instance of gross perversion of truth, as a justification of our strictures upon them. The prospectuses circulated at the commencement of the second volume intimated that the contents of the *Naturalist* were double that of any other similar periodical, published at the same price; meaning, of course, the *Magazine of Natural History*. Now, the *Naturalist* contains 56 pages large octavo, the letterpress being placed so far apart, that each page has from 6 to 12 lines less than is found in the same space in the *Magazine of Natural History*. Instead of the former work containing double the amount of the latter, it therefore actually has one fifth less, to say nothing of the almost entire absence of illustrations; a deficiency, however, probably arising from their having *nothing* to illustrate. This circumstance connected with *quantity* is a simple matter of fact: the respective value of the articles in each is, of course, one of opinion.

close of last year, a gentleman named Mr. Patrick Murphy astonished the members of the Meteorological Society, by publicly announcing, at a meeting of that body, that he was so deeply read in the laws which govern aerial phenomena, as to be able to lay down in black and white the various changes of the weather, temperature, &c., in the order, and at the exact periods, during which these several variations would take place for the space of one prospective year. He judged it, however, expedient to commence operations by trying his hand upon only one month at a time; and he accordingly communicated the order of meteorological events for the then forth-coming January to the daily papers and scientific journals, that the public generally might be apprised on what particular days it would be unsafe to venture abroad without a due supply of great coats and umbrellas. Unfortunately, however, the ruling powers did not sanction Mr. Murphy's arrangement of hot and cold, wet and drought; and, as though determined to expose the utter fallacy of his prognostications, the very night on which, by Mr. Murphy's calculation, the frost should have been most intense, turned out the mildest in the whole month; every one of his predictions, without exception, being nullified in a similar manner. The secretary of the Meteorological Society, who appears to have acted upon the impression that Mr. Murphy's position among meteorologists was akin to that of Lyell or Sedgewick among the cultivators of geology, became alarmed for the effect which this unfortunate occurrence might have upon the progress of the science at large; and, with a view of allaying the excitement, and counteracting the injurious results consequent upon Mr. Murphy's mishap, addressed an explanatory letter to the editor of the *Magazine of Natural History*, which will be found in the Number for February, 1837. The writer there exhorts meteorologists not to be discouraged in consequence of what he terms Mr. Murphy's "unlucky hit," ingeniously observing that, although the frost, rain, and wind, did not come on those particular days on which they ought to have arrived, yet, as all three were present during the month of January, it was clear that Mr. Murphy was perfectly right as to "facts," his miscalculations being merely with regard to "dates."

Whatever might have been the effect upon the minds of the public, Mr. Murphy, with the true spirit of a philosopher, was determined not to be disconcerted, or induced to mistrust the soundness of his theory, from the circumstance of one month's failure in its practical operation; and, having taken the best part of a year to revise his *calculating machine*, he is now again before

the scientific world, confidently asserting his claim to hold the same elevated position as that assigned to a Newton, a Herschel, or a Faraday. It seems that, on the 2d of September, Mr. Murphy addressed a communication to the editor of the *Times*, warning all merchants, captains, and owners of vessels to look out for squalls on or about the 14th. The captains, however, of several vessels on the north-west coast, probably aware of Mr. Murphy's error as to "dates" in the month of January, conceived it possible he might be equally out in his calculations for September; and, making light of his in-junction, have paid for their temerity with the loss of their cargoes and the lives of their passengers.

Mr. Murphy, totally regardless of the unfortunate beings who have gone to the shades beneath, is perfectly intoxicated with joy at his predictions being fulfilled; and, in the *Times* of the 21st, speaks of this "lucky hit" as establishing beyond a doubt the correctness of his prognosticating powers, and the discovery of principles which will have a far more important influence over the destinies of mankind than any discovery which has been made for ages past. Now, although we are not quite so sanguine upon this head as Mr. Patrick Murphy himself, yet, having upon a former occasion spoken rather disrespectfully of his insight into futurity, we are bound, in fairness, to call attention to these facts as recorded in the columns of the *Times* newspaper. — *Ed.*

Black Jack, Nigger Caterpillar of the Turnip, or Larva of Athalia centifolia. — An arrangement has been made between the Entomological Society and the Agricultural Association of Saffron Walden, whereby the sum of ten guineas has been proposed as the prize to be given to the writer of the best essay (to be drawn up from personal observation) upon the natural history and proceedings of this insect, to be illustrated by figures of the insect in its different states; together with the result of actual experiments made for the prevention of its attacks, or the destruction of the insects themselves. The essays must be accompanied by testimonials of the success of the remedies proposed by the writers, and must be forwarded to the secretary of the former Society (at No. 17. Old Bond Street, London), with fictitious signatures, on or before the fourth Monday in January, 1838; when they will be referred to a committee to decide upon their respective merits; after which, with the permission of the writers, both the prize essay, and any others of value, will be published. The essays must be respectively accompanied by a sealed letter, indorsed with the fictitious signature adopted by each author, and enclosing the real name of the writer.

Power of imitating Sounds in a Canary. — A curious fact came under our observation, a short time since, in connexion with the power which some species of the feathered tribe have of imitating the articulation of the human voice. A lady, residing at the west end of the metropolis, wrote to Mr. Yarrell, stating that she had a talking canary, and requesting him to visit it, that he might be convinced of the fact. Having received an invitation to accompany Mr. Yarrell, we called on the lady, and had an opportunity of witnessing a performance which greatly surprised us. The canary repeated words, and whole sentences, certainly as distinctly as any parrot we ever heard, and that as often and as naturally as its own song. The lady stated that she had reared the canary, which was a male bird, from the nest; and on one occasion, whilst addressing to it some endearing expressions, to her surprise it repeated the words after her, and has been in the daily habit of talking ever since, a period of about six months. We thought it worth while to notice this fact, not being aware that any similar instance is on record. — *Ed.*

Birth of a Dromedary (Camelus Dromedarius) at the Gardens of the Zoological Society. — Within the last three weeks, one of the dromedaries at the gardens of the Zoological Society has produced young; and this interesting addition to the menagerie appears likely to thrive well. We believe this is the first instance of the entire period of gestation in the dromedary being passed in this country.

Remarks on the possible Origin of Ignis Fatuus. — In one of your late Numbers there appeared some discussion, and various opinions given, concerning the real nature of the Ignis Fatuus or Jack-with-the-lantern; a phenomenon very often seen, but of the real cause of its luminosity accounts are various and conflicting. One considers it to be an unctuous phosphorescent vapour arising from marshy ground; others, that it is an accidental combination of some inflammable gas, which becomes visible when floating in dense air; but the general opinion now appears to be, that it is a winged insect, which has some luminous member, or apparatus, attached to some part of its body, which renders the insect visible on nights.

That the insect is the mole cricket, as asserted by two witnesses, is feasible, in so far as mole crickets usually abound where the Ignis is most frequently seen; but this cricket, like its congeners, is ill calculated for flight of any long duration. I have lived near a rivulet, the banks of which were honey-combed by the inroads of these crickets, but never observed one of them on the wing. When digged out of the bank (which they often were, in forming drains), they would give a

convulsive kind of *leap* to regain the broken ground ; but this was very imperfect flight. It may happen, however, that at certain seasons, during darkness, they may exercise a volant power, which they do not seem to possess by day : and, from their habit of living constantly in the dark, it is likely they may make their distant transmigrations, if any, in the night.

Travelling once by the Ipswich coach, I had for a companion a farmer, who, from his conversation, appeared to be a man of veracity. He had been, in his youth, a cattle drover and salesman in Smithfield market, but at the time of our journey was a Norfolk farmer.

On passing Dedham Vale, some one in the company mentioned that it was famous for Will-with-the-wisp seen dancing about on nights. My friend the farmer immediately exclaimed that all the world were mistaken with respect to this delusive light ; for, said he, " it is nothing but a fly." My curiosity was raised to the highest pitch, as I had seen the " fire-flies " in India ; and I naturally thought that something of the same kind might appear occasionally in this country. On further questioning him, he gave the following account : — " I was once," said he, " driving a drove of cattle from Aylesbury to London ; and, on my way from Little Missenden to Amersham, opposite Shardeloes Park, a Will-with-the-wisp appeared hovering over the backs of my cattle when it was just getting dark. Sometimes it was on one side of the drove, and sometimes on the other ; now it would be over the park pales, among the trees and bushes, and again hovering over the cattle. At last, it came so near, that I struck it down with my stick. I picked it up, but its light was extinguished, and it appeared to me exactly like a Moggy-long-legs [? *Tipula*]. I carried it in my hat to the Crown Inn in Amersham, and gave it to Mr. Fowler, the landlord, who will tell you the same story if you apply to him."

Now, it so happened, that I knew Mr. Fowler perfectly well as a most respectable man ; and, as I would have occasion to be at Amersham in about a month after my *rencontre* with the Norfolk farmer, I congratulated myself on the prospect of having gained the knowledge of a new fact in natural history.

Soon after my return into Buckinghamshire, I visited Mr. Fowler, but was *sadly disappointed* to find that he could remember no such circumstance of receiving an insect, or of any person bringing him one. Mr. Fowler added, that, as the circumstance happened several years back, and when he considered the motley group of drovers, waggoners, &c., who

crowded his large kitchen every evening, he might well forge a matter which was no part of his business to remember.

The above occurrences took place twenty-seven years ago and from that time, till I saw the remarks in the *Magazine of Natural History*, I have not heard of any one else entertaining the idea that the Ignis Fatuus was emitted by an insect. As to the supposition of the male glowworm carrying the female is extremely improbable; the former being totally incapable of carrying the latter, as the male is a much smaller insect. These last may be easily collected by placing a lighted candle upon a table near an open window, in warm showery weather in the latter end of summer. To the light they mistakingly speed, only to meet disappointment: for it is the lamps of the other sex they are in quest of; and, therefore, that line in the amiable poet Thomson's *Summer*, viz. —

“ Among the crooked lanes, on every hedge
The glowworm lights *his* gem, :

should be rendered *her* gem; for, though the male has also two luminous vesicles attached to the posterior ring or joint of the abdomen, they are so very dim, that they can scarcely be seen, and certainly not at all while flying on nights, however near to a spectator.

I take the liberty to add a report which I have lately heard respecting a very strange phenomenon witnessed by a most respectable authority; namely, Mr. White, chief officer of the preventive service on the Scarborough station, and which cannot well be reconciled with accounts of the Ignis Fatuus as described by others.

One clear starlight night, as that gentleman was proceeding from his house to the cliff where one of his men, named Trotter, had the “look out,” he passed a plantation in his way, in which he heard a loud crash among the trees, as if it had been the fall of an aerolite. There was no appearance of northern lights; but he saw before him what he thought were balls of fire, about the size of an orange, appearing and disappearing with an undulating motion, about 5 ft. or 6 ft. from the ground; not accompanied by any noise, nor did they move over the hedges; but he observed other luminous appearances shooting across the road and sky, emitting a hissing noise like a rocket, but not so loud. The same appearances (particularly the latter), which, like “the fiery cressets” that filled the air at the birth of the redoubtable Owen Glendower, had so frightened the man Trotter, that he had actually hid himself for fear of them. (*Extracted from a letter lately received from Mr. White's youngest son.*)

How can the above appearances be explained with reference to the other accounts published concerning the *Ignis Fatuus*? — *J. Main. Chelsea, September 18.*

Ignis Fatuus. — Your correspondent R. Chambers, F.L.S., having suggested, in his paper on this subject (n. s. page 353.), the probability that this phenomenon proceeds from the light emitted by certain insects while on the wing, I avail myself of the present opportunity of stating one or two instances that have come within my own observation, which may serve to corroborate the fact mentioned by Mr. Chambers.

In the days of my boyhood, the Jack-o'-lantern, or *Will-with-the-wisp*, as this phenomenon was more commonly termed in Derbyshire, was, in one particular spot, in the spring of the year, of frequent occurrence. My late father, who frequently made observations upon these *merry-dancers*, and observes, in one of his papers, he was fully convinced that the *Ignis Fatuus* was nothing more than male glowworms at play, like gnats in the sunbeams.

In the spring of 1813, I was riding between Sleaford and Lincoln, when a *Jack-o'-lantern* caught my attention, proceeding in the same direction as I was travelling. Its motion was irregular, sometimes near the surface of the ground, and then suddenly rising to the height of five or six feet. I followed very cautiously for some distance, being determined, if possible, to obtain a near view of my luminous guide. As the night was rather dark, I had every thing favourable for observation. At length it rested just at an angle in the road. I dismounted, and proceeded very cautiously, in the hope of capturing it; but in this I was disappointed; for, on my near approach, whether from the noise I made, or some other cause, it suddenly rose from its resting-place, about two feet from the ground, cleared a high bank, and pursued its course in a direct line over the adjoining fields. The broad and deep dikes rendered pursuit fruitless; but my eyes followed its almost butterfly motion till the glimmering taper was lost in the distance. I have on one occasion witnessed a very similar flight, if I may so term it, of the *Ignis Fatuus* in Derbyshire, and near the same spot I have frequently captured female glowworms.

On my father once being appealed to for the cause of the *Jack-o'-lantern*, he said it was, he had no doubt, "the male glowworm bearing on amorous wing his joyous partner."

Whether the *Ignis Fatuus* is a *meteor*, or whether it proceeds from luminous insects, is a phenomenon of great interest and worthy of investigation. The following extract from the *Kentish Gazette* may not be out of place here:—"On Tuesday

evening, July 4. 1837, the old castle, at the southern entrance to the city of Canterbury, appeared as if a stream of red light was issuing from the old ruins. On repairing to the spot, it was discovered that the light emanated from an innumerable swarm of small insects which had collected on the walls, and about the old ruins. They disappeared at sunrise next morning. A similar phenomenon was witnessed in the same place about thirty years ago."—*W. H. White. July 27. 1837.*

[The above paragraph appeared in one of the London papers as a quotation from the *Kentish Gazette*, but we have some reason for believing the statement to have been a mere fabrication. — *Ed.*]

Origin of the Ignis Fatuus. — The July Number of your Journal is just lying before me; and, among the many interesting articles it contains, I have found one which, I think, ought to be refuted, as it tries to explain the phenomenon of the Ignis Fatuus by the phosphorescence of insects. From your remark at the end of the article, it sufficiently appears how little you are swayed by the opinion of the author. However, I have observed the meteor too well myself to give the least credit to any attempt of ascribing such effects to such causes; not to mention that the season at which Ignis Fatui are commonly observed (November) is one when scarcely an insect, except the *Phalæna Nôctua brumària*, is able to stir. The light of the fire-fly, though moving, is but a spark, and that of the glowworm does not change its place. As for the mole cricket, it certainly haunts boggy meadows; but the insulated observation of a farmer of Simpringham cannot, I think, militate against the negative testimony of the many who, like myself, have kept that animal in confinement during long periods, without observing in it the least phosphorescence. I may say that I have taken great trouble, and spent many a night, to observe the Will-with-a-wisp in its haunting-places; yet, though in dark and misty weather I had often seen lights moving, and had many a time fallen into swamps and quagmires, I had never come near enough what I thought a Jack-o'-lantern to observe it closely, or even to become fully convinced of the existence of the phenomenon from my own experience. However, in the year 1818, I was fortunate enough to get a fine view of the Ignis Fatui operating on an extensive scale. I was then at Schnepfenthal, in the Duchy of Gotha; and in a clear November night, between 11 and 12 o'clock, when I had just undressed, the bright moonshine allured me to the window to survey the expanse of boggy meadows which spread two or three English miles in length, by a quarter of a mile,

from the foot of the hillock on which the house where I was is standing. Through the first third of the meadows there runs a winding rivulet, of the breadth of 7 or 8 feet, which then turns off into an artificial bed, whilst the old bed continues in the direction of the meadows, which are bounded on one side by a range of brush-wood, on the other by cultivated grounds, with marshy dells here and there. My intimate acquaintance with the locality, together with the bright moonshine, enabled me to discern every object round the meadow-ground sufficiently well to judge of the position and direction of the luminous phenomena, the display of which I saw, as soon as I had posted myself at the window. I perceived a number of reddish-yellow flames in different parts of the expanse of almost level ground. I descried, perhaps, no more than six at a time; but dying away, and appearing in other places so rapidly, that it was impossible to count them; but I should say, on a rough estimation, that there were about 20 or 25 within a second. Some were small, or burned dimly; others flashed with a bright flame, in a direction almost parallel with the ground, and coinciding with that of the wind, which was rather brisk. After having for some time looked with amazement at this brilliant scene as a whole, I tried to study its details; and soon found that the flames which were nearest originated in a quagmire, whose position I knew exactly, by a solitary cluster of willows; and I could trace a succession of flashes from that spot to a certain point of the margin of the wood, across the rivulet and meadow. The distance of the two points from each other was more than half a mile, and the flames travelled over it perhaps in less than a second. The first flash was not always observed in the immediate neighbourhood of the quagmire; but the succession of flames lay always in the same straight line, and in the direction of the wind; whilst other sets were, though not with the same distinctness, observed in the more distant parts of the meadow-ground. After about an hour, a bank of mist began to overspread the meadow; but I saw the light still glimmering through it, whilst I dressed myself to examine the phenomenon in its laboratory. However, when I reached the meadow, the atmospheric conditions which gave rise to the *Ignes Fatui* had ceased to exist. From what I saw, I must judge that the *Ignes Fatui* are owing to the causes given by Volta; viz., that the phosphoric hydrogen exhaled by certain swamps is kindled by coming into contact with the atmospheric air; but, as the hydrogen is not saturated with phosphorus, the greater proportion of the latter being precipitated, in passing through the water, as red oxide of phosphorus, there

is a certain electrical tension of the atmosphere necessary to cause the combustion. Thus, under common circumstances, the gas is dissipated without being observed; but, when the state of the atmosphere is competent to effect its combustion, the proper degree of electrical tension is lost at the place where an explosion is effected; and, until it is replaced, or the gas comes into contact with that layer of the atmosphere which possesses the requisite degree of electrical tension, a considerable body of bog-gas may collect, and be carried in the direction of the wind, so as to give afterwards rise to a sort of quick fire, with occasional flashes, in those places of the stream of gas where there happens to be a considerable volume of it. In calm nights, the flames may play in a vertical direction, so as to imitate the motions of gnats; and they may even *appear* to alight on some object; though, when this has been observed, it is more probable that the case has been one of the St. Elm's fire. — *W. Weissenborn. Weimar, Aug. 4. 1837.*

Plants collected in the Isle of Sheppey. — I take the liberty of sending to your Magazine the localities of some marine plants collected last week at the Isle of Sheppey, between Garrison Point and East Cliff, by the sea, should you consider them worthy a place in your intelligence.

Glaucium luteum; shore near the Garrison.	Typha angustifolia; ditches.
Ranunculus Philonotis; beyond the coast-guard vessel on the cliff.	Atriplex portulacoides; every where.
Lepidium ruderale; in one spot only.	Zostera marina; ditches, not frequent.
Arenaria media; every where.	Plantago maritima; marshy ground.
peplodes; on the beach, rare.	Triglochin maritimum; edges of ditches, &c.
Frankenia laevis; edge of the wall.	Carex? incurva; on a marshy plot.
Limbardia tricuspis; on the beach.	Scirpus maritimus; ditches.
Aster Tripodium; on the beach.	Juncus maritimus; ditto.
Glaux maritima; frequent.	Rottboellia incurvata; along the wall
Statice Limonium; marshy ground and edges of ditches.	Poa rigida; along the wall.
	Hordeum maritimum; ditto.

—*Daniel Cooper. 82. Blackfriars Road, July 26. 1837.*

Notice respecting a young Cuckoo. — I have in my garden, in the country a young cuckoo, that I find every morning in a somewhat sluggish state on the roof of the paling; and no great distance from it I often see a small bird of, I think, the blackcap kind, with a worm in its bill, ready to feed her young. I suppose she must be the mother of the cuckoo. I can almost lay my hand upon the latter. When I get very near it, it gently flies into a neighbouring willow tree: it seems fully fledged. Is this an unusual circumstance? — *Charles Cradock. Paternoster Row, Sept. 15. 1837.*

Nomenclature of the Subgenera separated from Ody-

nérus. — The *Véspa murària* of Linnæus, regarded as the female of the *Véspa spínipes* by Latreille and Mr. Shuckard, is perfectly distinct from that insect, both specifically and subgenerically, as may be seen by the original specimen of the former, preserved in the Linnæan cabinet, and to which the Linnæan label is still attached. I much doubt, also, whether the *V. murària* of Latreille be the female of *V. spínipes*, as several of the *Odynèri* of the British catalogues will agree with it in habits and description. — *J. O. Westwood. Sept. 20. 1837.*

Redwing's Nest near Godalming, in Surrey. — A nest of the redwing thrush was found in a gooseberry bush near Godalming, a few seasons ago, containing three eggs, which are still preserved. As the parent bird was taken upon it, all doubt is thus removed concerning the species. I am indebted for this information to Mr. Stafford, animal preserver of Godalming, who is practically well acquainted with the ornithology of his neighbourhood. — *E. Blyth. August 17. 1837.*

Two Specimens of the Green Sandpiper shot in August. — I have just received two beautiful specimens of the green sandpiper (*Tótanus óchropus*), male and female (proved to be such on dissection). They were both shot on a small brook falling into the river Darwen, about $3\frac{1}{2}$ miles south of Blackburn. The male was killed on Saturday, July 29. 1837; and the female on Tuesday, August 1. 1837. They were very wild and wary. It required great caution in approaching them; as, when disturbed, they soared off to a immense distance, still, however, following the windings of the stream. Had this not been the case, it would have been impossible to have taken them. The male was pursued for six hours before he was killed. This is an additional fact proving that this bird breeds in England occasionally. Taking the latest authority, Mr. Gould (*Birds of Europe*, part 15. plate 20.), states this fact as doubtful. However, though neither the nest, eggs, nor young, were found, it is not very probable that, at this early period (and I should observe, further, that one or both of these birds has been seen for two or three weeks back), they would have migrated from a more northerly breeding-ground. I am perfectly satisfied myself that these birds have bred in the neighbourhood of the spot where they were killed.

A Fork-tailed Stormy Petrel (Thalassídroma Leáchii) was picked up dead, but quite fresh, on Hoddlesden Moss, a high moor 5 miles south of Blackburn, on Tuesday, November 11. 1834. There had been a severe storm the preceding

night, which will account for this bird having wandered so far from its usual haunts. The nearest point of the sea coast is 23 miles distant, as the crow flies. — *John Skaife. Blackburn, Lancashire, August 4. 1837.*

Meteorological Errors in Vol. VIII. p 446. (See the present volume, p. 448.) — I am obliged for Mr. Brown's kindness in pointing out the errors in the memoranda on the state of the atmosphere at Berne, in 1755, as given by me in my seventh essay on the connexion of phenomena.

To prevent any idea of the general incorrectness of the statements contained in the paper in question, it is better to mention, that it was not intended to say that the barometer *fell* from 21·10 in. to 25·6 in.; but that, being at 21·10 in. in the morning, when the earthquake took place, the mercury had fallen in the evening to 25·6 in., the mean height, *as mentioned further on*; being, at Berne, 26·2 in. Whether any change took place intermediately between the morning and evening, from a gradual *rising*, I cannot now state, as Bertrand's work, from which I took the particulars, was only lent to me by, and, when used, returned to, Professor Daubeny of Oxford, and, therefore, I cannot now refer to it; but I think there is an ambiguity in the expression used by Bertrand, and that I, *for the sake of conciseness*, wrote "*fell* to," instead of using other words. I do not recollect the original term.

The second error pointed out by Mr. Brown, where 51° Fahr. should be 19 $\frac{3}{4}$ ° Fahr., was occasioned by employing the table [ix. (chap. v.)] in the Appendix to Dr. Lardner's *Treatise on Heat* (p. 410, 411.); and, in the hurry of writing, merely marking down the equivalent of 8 $\frac{3}{4}$ ° R., without recollecting *zero*. As to the note (in VIII. 446.), I have no explanation to offer: how it got thither, I do not know. If it was intended by me to quote the extreme intensity of cold sometimes felt at Berne, and particularly on the 2d and 3d of February, 1830, the quotation failed. I believe the note was not appended by me, but by a friend who saw the MS. before it went to press. I had myself noticed the errors alluded to by Mr. Brown; but, as they are all so palpable, carrying with them their own correction, I did not take the trouble to mention them afterwards, as I ought to have done. As, however, being now noticed in print, they may, to some readers, convey an idea of the incorrectness of the *facts* quoted in my papers on the phenomena of the earth and the air, I think it advisable to acknowledge Mr. Brown's kindness.

As to the rest, I must reply in the words of Horace (who, no doubt, wrote them in pity to magazine contributors, who

are compelled, by unavoidable engagements, to scribble at midnight), "DORMIT HOMERUS."

The communication appended to my essay in Vol. VIII. (p. 450—453.) from the pen of Mr. Brown, after which reference is made by Mr. Denson to a narrative from my pen, published in the *New European Magazine*, has brought us previously into close quarters. I shall be extremely happy, when time allows, to enquire into the connexion between the Nevis hurricane of August 17. 1827, and the Alpine storm he experienced on August 26, 27. of the same year. There is no doubt of the possibility of the connection, and I have little of the *probability*. Some facts, which I hope, if I live, to mention at Liverpool in September, will confirm the attempt I have made to establish a positive connection between distant portions of the atmosphere, deranged by terrestrial action, Mr. Brown will render me an essential service, if he will be so good as to register any great instances of atmospherical or terrestrial convulsion which he may observe in Switzerland, and communicate either privately or publicly. It is only by the accurate testimony of various observers simultaneously at work, that the truth or fallacy of any such hypothesis can be tested. The Meteorological Society will, I trust, do much towards this end.

There is a more curious error in the paper alluded to by Mr. Brown, than those above noticed. *The first sentence*, in the "addition," commenced at the bottom of p. 449. (Vol. VIII.), ought to have been the *last*. It was so written, but, by a mistake in the printing-office, was not so published. — *W. B. Clarke. Stanley Green, August 1. 1837.*

Geology. — Count Vargas de Bedemar, who has made the geology of Madeira and the Azores his peculiar study, has availed himself of a short residence in Lisbon to publish a pamphlet, bearing the title *Resumo de Observações Geológicas feitas n' Huma Viagem al Ilhas da Madeira, Porto Santo, e Açores, nos Annos de 1835 e 1836*, in which he gives a list of the rocks found in those islands; and, from the existence of primitive clay slate in the islands of Graciosa and Flores, draws the conclusion, that not all these islands owe their existence to volcanic action, but that some must be considered as the remains of an ancient continent which has been overwhelmed by the ocean. The count has again set out for the Canaries, to ascertain whether the occurrence of primitive rocks there will confirm his hypothesis, and give it a greater extent.

Habits of the Boat Fly (Notonecta glauca). — I once resided near a pond which was formed for the use of ducks and

geese, in which there were myriads of these insects; but, during the whole term of my residence of fifteen years on the spot, and passing the pond once, and often many times, in a day, I never once observed the ascent of a single beetle out of the water; but have, times out of number, witnessed their *descent* in vast numbers; and therefore conclude that they must have risen in the night, or early in the morning, or come from some distance to merge themselves in the pond during the day.

They descend like aerolites; but from what height, no opinion can be formed. Their descent is, however, soon observed and announced by the bustle of the ducks, who are quickly on the alert, either with an eye turned anxiously upward, or dashing to seize a beetle which has just plunged into the water. The insects drop with their wings folded, their own weight only, apparently, bringing them down; and though their descent through the air is most rapid, their motion downwards in the water is rather slow; because from the flattened form of their bodies, and that of their oar-like feet, they can only descend in spiral curves.

It is during the devious descent that the ducks are able to capture the precious morsel of their food; and the energy and alacrity displayed by the flock, during a fall of the insects, is really an amusing scene. Many an hour have I spent in witnessing this sportive scramble of the ducks and ducklings in this guiltless pursuit. Some fluttering along the surface, others diving, and all as eager after every beetle that drops as the keenest fox-hunter with the chase in view.

That the sight of the insects is not very powerful when they begin to descend becomes evident from the circumstance of their often mistaking any other reflecting surface for that of water. For instance, they drop frequently on the roofs of hot-houses, skylights, and glazed garden frames. Indeed, I never could account for their *rattling* down upon the frames in such numbers until I lived near the duck pond: for then it was I learnt the cause of their mistaking glass for water.

The insects fall out of the air with such force that the noise of their plunge is exactly like that of a small pebble or leaden bullet thrown, from a considerable height, perpendicularly, into deep water; and this bubbling sound often called my attention to the phenomenon, which, in the absence of ducks, would have otherwise escaped notice.

I have reason to believe that the common water shrew feeds on these insects, when, in his short foraging excursions, he can capture them in the mead. — *James Main. Chelsea, May 30. 1837.*

Biographical Notice of the late Mr. Joseph Sparshall, from a Correspondent.

— Among the various duties which we are called upon to perform, that of writing a *memento mori* is of a nature differing from all the rest; uniting, as it does, at the same time, melancholy and pleasing sensations. For, while it is with sorrow we record the event which has deprived us of a friend, it is with satisfaction and pride we register the worth and talents of the departed, for the information and example of those treading the same path, and hand down the name to posterity, as one link in that chain by which any peculiar science has been benefited or enlarged. Of late years, death has made sad inroads among the ranks of our native naturalists; and we find them following each other with rapid strides towards “that bourne from whence no traveller returns,” but where we may fondly anticipate, and without presumption, they are still employed in praising and beholding the majesty of that Being whose wisdom and beneficence toward the most minute objects of his care they had so long been accustomed to contemplate with delight in this their sublunary abode: for, as the venerable Kirby expresses himself, “The book of Nature, to whatever page we turn, is written by the finger of Him who created us; and in it, provided our minds be rightly disposed, we may read His eternal verities; and the more accurate and enlarged our knowledge of His works, the better shall we be able to understand His word; and the more practised we are in His word, the more readily shall we discern his truth in His works: for, proceeding from the same great Author, they must, when rightly interpreted, mutually explain and illustrate each other.” The sphere of our knowledge, therefore, of the natural productions surrounding us may be extended and improved by two means,—literary labour and practical exertions; for, while one may be employed in describing and illustrating new-discovered animals, plants, &c., another will be gathering together, with not less toil, the materials for such dissertations: thus each is mutually assisting to extend the boundaries or natural science. To the latter class belonged the subject of this memoir. Joseph Sparshall, Esq., F.L.S., who died, after a few days’ illness, on the 15th of April, 1837, at his residence in Norwich, in the 45th year of his age. The name of Mr. Sparshall has long been connected with the natural history of the county of Norfolk, and more especially of his native city. Though entomology was his principal fort, ornithology, and the general zoology of the district, claimed no small share of his attention. At an early age he exhibited a fondness for collecting and observing the habits of the lower classes of animals, which increased with his maturer years. Being destined for the medical profession (which, however, he never practised), his studies gave him many opportunities for adding to his previous stores of information; and, while a pupil at the Norfolk and Norwich Hospital, he captured, in that institution, on the 22d of July, 1809, a specimen (perhaps the only authentic British example) of the *Odonestis pini*, which is now in the British Museum. About this time, he became acquainted with other kindred spirits, well known in the neighbourhood, as well as to the scientific world at large; among whom were Joseph Hooker (brother to Sir W. J. Hooker), Howard Sims, Richard Griffin, Rev. J. Burrell, A. H. Haworth, Sir J. E. Smith, S. Wilkin, Rev. W. Kirby, Rev. J. Skrimshire, J. Curtis, J. Scales, Dawson Turner, Dr. Leach, J. C. Dale, J. F. Stephens, Lily Wigg, A. McLeay, &c., with all of whom he kept up a friendly intercourse. Though many of the above have since passed, like himself, from this world; many of the remainder will remember with feelings of pleasure the entomological excursions on which they have accompanied him to Horning Ferry, Woodbastwick, a favourite resort of his, to which he invariably drove his friends, and one the finest places for entomology in the county of Norfolk; though his fondness for the study led him to visit every part of the kingdom celebrated for the capture of rare insects; such as the New Forest, Isle of Wight, Ep-

ping Forest, Newmarket Heath; Birch, Darn, and Combe Woods; Dover, Whittlesea Mere, &c.; and the writer of this well remembers a trip he made with Mr. Sparshall and Mr. Kirby to Martlesham Heath, in Suffolk, to capture *Cicindela sylvatica* and *Lycus nebulosus*. In 1824, Mr. Sparshall, in conjunction with Mr. Wilkin, Mr. R. C. Taylor, Mr. Sothern, and Mr. S. Woodward, originated the Norfolk and Norwich Museum, of which he continued an active member until his death; for, while the herbarium was arranged by the joint labours of Sir J. E. Smith and Mr. Wigham, the insects were arranged by the Rev. W. Kirby and Mr. Sparshall. In his manner he was plain and unostentatious, of easy access, and appeared never so happy as when aiding his fellow-creatures. To any individual, however humble his sphere, who exhibited a fondness for the study of insects, he was ever ready to afford assistance by his own experience, his valuable cabinet, and his library; and to those whose future prospects he felt an especial interest in advancing, his exertions were unbounded, and his disinterestedness and kind-heartedness most exemplary. To the distressed he was ever ready to afford relief, many of whom will have to lament the loss of a generous and cheerful benefactor. Mr. Sparshall was the sixth member of his family who has died within a few months. — *H. D.*

Siliceous Animalcula. — In the public meeting of the Royal Academy of Sciences in Berlin, held on the 3d of August (the king's birthday), M. Ehrenberg read an article on the relative quantities of the living animalcula, and, at the same time, laid before the Academy more than a pound of tripoli, prepared from animalcula now found living at the Thiergarten (Deer Garden), near Berlin. He concluded with observing, that at the Thiergarten there is a sort of mould, in which these siliceous animalcula predominate: 1½ lb. of this living earth was submitted to the inspection of the Academy.

Leeches in Moldavia. — We are informed by a letter from Jassy, written about the beginning of June, 1837, that, though the officinal leech has there been an object of extensive commercial speculation only for the last two years, the breeding-places are already fast exhausting, and the leech merchants have to draw upon Asia for new supplies. The leeches are sold by the hundred weight, which contains from 30,000 to 35,000 middle-sized individuals, these being best suited for exportation. It is sold at the rate of from 800 to 1400 florins. The merchants, who often have 30 cwt. or 40 cwt. at a time, keep them either in pools, or, which is preferable, in tuns. The animals are so strongly affected by electricity, that a violent storm will cause them to vomit, or even die; wherefore, it has been successfully tried to insulate the tuns, in which they are kept, by glass feet. (*Berliner Nachrichten*, No. 153.)

THE MAGAZINE

OF

NATURAL HISTORY.

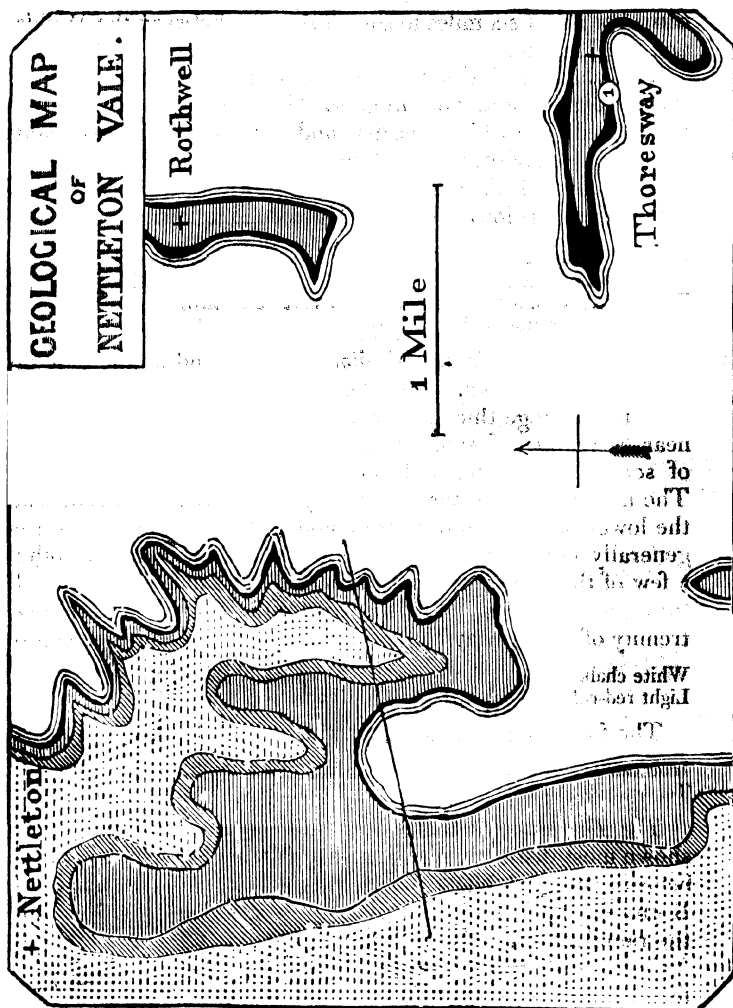
NOVEMBER, 1837.

ART. I. *Outlines of the Geology of Nettleton Hill, Lincolnshire.*
By WILLIAM HEY DIKES, Esq., F.G.S., and JOHN EDWARD LEE, Esq., one of the Secretaries of the Hull Literary and Philosophical Society.

IN the following attempt to give some idea of the modifications of green sand which appear in the north-east of Lincolnshire, it will be our endeavour to describe, as accurately as possible, a small tract of country, which contains numerous sections of all the beds, from the chalk to the Kimmeridge clay inclusive. The neighbourhood of Nettleton, a small village near the market town of Caistor, is what has been selected for this purpose.

The accompanying map will give a general notion of the geological nature of the country. The space left white represents the chalk and chalk marl; the two light lines following the course of the lower beds are the red chalk; the black line is what, for the sake of distinction, we will call Thoresway sand. The horizontal lines signify what is provincially called "grey stone." The diagonal lines are green sand and sandstone; and the space covered with dotted horizontal lines represents the Kimmeridge clay.

Chalk and Chalk Marl. The edge of the chalk in this district, instead of forming large, rounded, prominent hills, as in Yorkshire, and several parts of Lincolnshire, appears as a thin nearly horizontal bed, spread over the inferior strata, and capping the hills, of which it forms but an inconsiderable portion. For the distance of about a mile or a mile and a half from the outcrop, it forms a platform, nearly horizontal, running north and south, from which on each side a series of valleys run east and west: those on the eastern side extend in a ramified form to the rise of the chalk, at the distance of about 7 miles; in several of them, for a considerable distance, the chalk has been denuded, and the bottom is formed by the inferior strata. In these cases, the valley loses its usual



rounded appearance, becoming generally more level where the chalk joins the inferior beds. In Thoresway Valley, the red chalk, sand, and grey stone may be traced for nearly 4 miles to the eastward, after which they are again covered up by the chalk. The valley, however, continues gradually to descend, which is rendered evident by the fact that the water from Thoresway spring, which rises at the junction of the sand and the grey stone, instead of running to the outcrop of

the chalk, which is about two miles distant, runs eastward a course of about six miles to the alluvial flat between the Wolds and the Humber.

The chalk and chalk marl appear in mineralogical character to pass into one another. In general, however, the higher beds are whiter, harder, and contain a few flints; and the lower are softer, without flints, and of a dead white colour.

The upper beds are remarkably destitute of organic remains; from the lower beds we obtained the following fossils:—

Remains of fishes.
Turrilites undulata?
Terebratula subundata.
Inoceramus cordiformis?

Inoceramus Cuvieri.
Pecten quinquecostata?
Ostrea semiplana.

The Red Chalk is very similar to that found at the base of the Yorkshire wolds. In the district represented by the map, the average thickness will not exceed 6 ft.; but, at a hill near Stenigott, a few miles further south, it appears as a bed of some importance, and cannot be less than 30 ft. thick. The upper bed is generally of a lighter or yellowish red, and the lower of an even dull red colour. These subdivisions are generally very distinct, but the fossils are the same in both: a few of the quartz pebbles of the inferior sands are scattered through both beds. On the road side, at the western extremity of Thoresway Valley, the following section is seen:—

White chalk marl.
Light red-coloured chalk, 1½ ft.

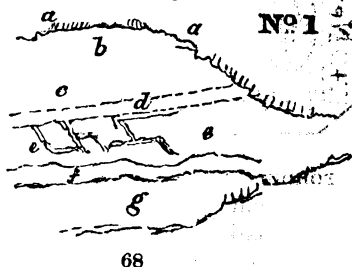
Deep red chalk, 4½ ft.
Thoresway sand.

The fossils we obtained from the red chalk were,—

Inoceramus ———.
Terebratula subundata.

Terebratula biplicata.
Belemnites Listeri, in abundance.

The Thoresway Sand has been so denominated because it is shown most distinctly in Thoresway Valley: it may be traced beneath the red chalk near Rothwell, and through all the ramifications of Nettleton Vale, as will be seen on reference to the map. The best idea of its composition will, however, be given by the annexed natural section at Thoresway springs. Fig. 68.



a a, White chalk and chalk marl.

2, Red chalk.

3, Bed of highly ferruginous sand and sandstone, composed of grains of quartz, of various sizes; in some places cemented together, and in others loose,

- d, Bed of similar materials to the last; but the grains are so large as to amount to pebbles - - - 1 ft.
 e e, Bed of small-grained sand and sandstone, divided irregularly by linear intersecting concretions, an inch or two wide 3
 f, Bed similar to d, - - - 1
 g, The upper part of the grey stone.

Wherever any good section of this bed has been obtained, it uniformly is observed to retain the same characters. In Nettleton Valley it becomes very thin, and in some places is almost lost. No traces of fossils have yet been found in it, though we examined it very carefully.

Grey Stone is the term which has been provincially given to the bed which underlies the Thoresway sand; and the name has been retained for want of a better: it will be seen from the map that it forms the brow of Nettleton Hill, and may be seen under the sand, through the whole eastern side of the valley beneath: it also forms the bottom of Thoresway and Rothwell Vales. It is well exposed, in various places, on the brow of Nettleton Hill: the following section is obtained there:—

Diluvium, 1 ft. to 2 ft.	Ochrey hard stone, with reddish cores, 3 ft.
Rubbly sandy stone, 2 ft.	Sandy rubble, $\frac{1}{2}$ ft.
Soft earthy ferruginous stone, $1\frac{1}{2}$ ft.	Alternating beds of earthy rubble, and very hard stone, with blue cores.
Sandy, reddish, loamy rubble, 1 ft.	

The stone from the lowest of these beds is occasionally burnt for lime, and is very generally used for building.

The following is the list of organic remains:—

<i>A'stacus rostratus</i> .	<i>Exogyra lævigata</i> .
<i>Sérpula pléxus</i> .	<i>Exogyra lævigata</i> var.?
<i>Sérpula antiquata</i> ?	<i>Gryphæa sinuata</i> .
<i>Sérpula</i> ———.	<i>Trigonia</i> ———; a large species, agreeing, in many characters, with <i>T. angulata</i> , but without a crenulated line.
<i>Vermiculària</i> .	<i>Trigonia</i> ———; nearly approaching to <i>T. gibbosa</i> .
<i>Lutrària gibbosa</i> .	<i>Vénus</i> ———.
<i>Lutrària ambigua</i> .	<i>Terebrátula mèdia</i> .
<i>Lutrària</i> ———.	<i>Terebrátula globata</i> .
<i>Pécten orbiculàris</i> .	<i>Terebrátula obtusa</i> ?
<i>Pécten cinctus</i> . This appears to be a very characteristic shell: we have not observed it in any other bed. There are specimens in the museum of the Hull Literary and Philosophical Society, more than double the size of Mr. Sowerby's plate.	<i>Belemnites fusiformis</i> .
	<i>Belemnites</i> ———; a large species, remarkably flattened on one side.
	<i>Ammonites lewesiensis</i> ?
<i>Pécten</i> ———.	<i>Ammonites</i> ———; very similar to <i>A. Beudanti Cuvier and Brong.</i> , vii. 2., but more depressed, and covered with waved ribs; one long, and from two to five short.
<i>O'strea carinata</i> .	A fragment of a large shell, which
<i>O'strea edulina</i> , jun.?	
<i>Plagióstoma rigidum</i> , jun.	
<i>Plagióstoma</i> ———.	
<i>Dianchòra striata</i> ?	

appears to belong to the genus *Malleus* of Lamarck. Large masses of wood are occasionally found by the workmen in the lower part of this bed.

The Green Sand and Sandstone are composed of grains of quartz of various sizes, mixed with abundance of green specks. Sometimes this sand is cemented together, and forms a very hard sandstone. The general colour of the bed is greenish; but sometimes the cementing matter is ferruginous, which, of course, alters the appearance. This is peculiarly the case with a bed which was discovered by Mr. Dikes, in a late excursion to this neighbourhood. At first sight, the stone in this locality appears like an oolite; but, on closer examination, it is merely a mass of small, globular, shining grains, of a dark brown colour, cemented together by ferruginous matter: it occurs in the higher part of the bed, nearly at its junction with the grey stone; and, possibly, ought to have been classed with it.

The whole thickness may be taken at from 30 ft. to 40 ft.

Organic remains are rare in the greenish beds; or, at least, they are confined to few species: we only met with *Pecten orbicularis* and *Belemnites*, similar to *B. mucronatus*.

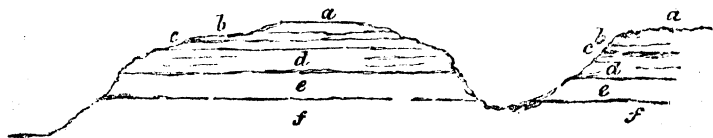
In the ferruginous stratum mentioned above, Mr. Dikes obtained the following fossils:—

<i>Tròchus monilifer?</i>	<i>Mýtilus edéntulus.</i>
<i>Tròchus</i> ———.	<i>Exogyra cónica.</i>
<i>Gryphæ'a nàna?</i>	<i>Exogyra plicàta?</i>
<i>Astárte lineàta.</i>	<i>Trigonia clavellàta.</i>
<i>Astárte formòsa</i> Dr. Fitton, <i>Geol.</i>	<i>Plagiostoma ovàlis?</i>
<i>Trans.</i> , xvi. 16.	<i>Terebrátula striátula.</i>
<i>Lucina cràssa.</i>	<i>Ammonites circùlaris</i> Dr. Fitton,
<i>Cucullæ'a</i> ———.	<i>Geol. Trans.</i> , xi. 20.
<i>Vénus submèrsa</i> Dr. Fitton, <i>Geol.</i>	
<i>Trans.</i> , xvii. 4.	

The Kimmeridge Clay extends over a large tract of land in the north of Lincolnshire: it is the substratum of the wide plain at the foot of Nettleton Hill, and even forms a large portion of the hill itself. This will be rendered more ap-

96

Nº. 2



parent by the annexed section (*fig. 69.*), taken across the hill and the valley. The black straight line in the map represents

the line of section; *a* stands for the white chalk and chalk marl; *b*, the red chalk; *c*, the Thoresway sand; *d*, the grey stone; *e*, the green sand; and *f*, the Kimmeridge clay.

This bed principally consists of a dark blue clay, adapted to the brick-yards; but occasionally beds of shale are met with, called by the brick-makers "dice," from its falling into squares when wet. This shale is entirely useless. *Septaria* also occur, in some places, in tolerable abundance.

The thickness must be considerable, for the junction of the green sand and clay on the slope of the hill is about 165 ft. above the plain below.

No very good sections occur on the hill side; but the numerous brick-yards at its foot afford an opportunity of examining the organic remains: we met with the following species:—

Ostrea deltoidea.

Crassina minima? *Phillips*, ix. 23.

Trigonia clavellata.

Nucula ———.

Turritella muricata.

Ammonites mutabilis.

Ammonites ———.

Patella latissima.

Wood sometimes occurs, but not in large masses; and bones of the *Ichthyosaurus* are also occasionally found.

Hull, September 16. 1837.

ART. II. *On the Counterfeiting of Death, as a Means to escape from Danger, in the Fox and other Animals.* By EDWARD BLYTH, Esq.

THE following highly interesting narrative occurs under the head "Fox," in Partington's *Cyclopædia of Natural History*; a recent publication, which is in the hands of few professed naturalists, wherefore it may not be amiss to quote from it at considerable length. Mr. Mudie, the writer of the article in question, relates, from his own "personal knowledge," one instance of the common fox endeavouring to elude the vigilance of its human foe, by the stratagem of feigning dissolution; which fact, as regards this animal, is doubted on very reasonable grounds by Dr. Weissenborn, in his admirable remarks on the intellectual resources of the species, at p. 505. et seq. of the current Volume of this Magazine:—

"Many anecdotes have been mentioned and recorded of the craft of the fox, and some of them place the sagacity of irrational animals in a very striking light, and perhaps none more so than those in which the crafty animal attempts, to disguise his death. To run away from death by dying; or rather, by counterfeiting death. One morning early, a

man in the North was going to his work through furze bushes on a common, and came upon a fox stretched out at length under the side of one of the bushes. The fox was drawn out by the tail, swung right and left, and then laid on the ground; but not a symptom of motion or life did he show. The man, never doubting that Reynard had gone the way of all foxes, and nothing loth to add a fox-skin cap to the list of his personal garniture, and the brush to the tail of peacock's feathers, and other ornamental trophies, over the little looking-glass that stood inclined from the wall of his cottage, took the animal by the tail, and swung it over the one shoulder, at the same time placing his mattock on the other, to keep up the balance; and having done so, onward he trudged to mend the high road, for the accommodation of those who got foxes and their brushes in another way, which was his ordinary vocation. The two shoulderings were not exactly paired, and so the mattock began to assail the ribs of the fox in no very gracious manner. The animal had counterfeited death to admiration, and he did not mind being carried in the manner of a dead fox (it is remarkable, that dead animals are usually carried with the head down); but, dead as he seemed, he had no inclination to undergo that species of dissection which the point of the mattock was ever and anon giving his ribs: so at last he gave that decisive snap which we have described as the characteristic bite of foxes, on that portion of the labourer's rear which is supposed to be more sensitive to all manner of inflictions than any other region of the human body. The man felt that something was the matter, but knew not very well what: so, throwing fox and mattock from him, he turned round to face the foe, whoever he might be; and, in turning, he espied his dead fox at the distance of full fifty yards, making for the brake with all imaginable speed. The man was much annoyed at his adventure, and wished to conceal it; only he told it to his fellow-labourer as a great secret; and thus, as is generally the case with secrets confided in this way, rendered it better worth telling than it otherwise would have been.

"We shall mention one other anecdote, which came within the personal knowledge of the writer of this article; because it throws some light on the mode of action of the fox, as well as confirms the truth of his counterfeiting death in all cases where there is a likelihood that it may ensue. The parsonage of Kilnorrac, in Inverness-shire, is situated in a highly romantic spot. It is near the brow of one of the precipices which form a gorge, through which the river Beaully has, in the lapse of ages, cut a deep channel through a great length of rock, thus emptying a lake which must at one time have occu-

prided that singularly beautiful dell known by the name of the Dream of Kilmorac. The northern bank of this singular valley, or rather ravine, for it is something intermediate between the two, is richly wooded, and much of the sloping bank is a natural strawberry-bed. It swarms with all those inhabitants, whether of the air or of the earth, which are found in warm and wooded spots of the Highlands. To render the collection complete, there are eagles on some of the towering rocks, near the lower part, and no want of goshawks any where. The hill beyond, too, is well stored with grouse; and as it is near the cultivated grounds, there are common hares, as well as alpine ones. Of course, this is a very favourite retreat for foxes; and though the wild cats are said to keep them at bay when they attempt to assail the preserve, they kennel in the margins, and infest the country around. The then clergyman of Kilmorac was a man of great taste, very fond of society, and very hospitable; and he accordingly endeavoured to provide for his numerous guests all the good things which his glebe land, on field or on hill, could afford.

“A well-stocked poultry-yard is an essential requisite in such cases: but here foxes were so numerous, and their covers so near, that a poultry-yard was out of the question; and it was sometimes necessary to employ boys to ‘hoo! hoo!’ the fox, even after the parson’s pullets were turned out to range the fields. A poultry-house was thus requisite, and the rev. doctor prided himself not a little in having constructed one which was completely fox proof; and for a good many years it had been impregnable to Reynard, so that the doctor’s pullets and their eggs were known far and wide for their excellence, their abundance, and the frankness with which they were given to every one who courted the very pleasant society of their owner. A friend of ours had spent a night in this romantic and hospitable abode; and while fresh salmon from the Beaul, dressed in very delicious steaks, formed one article for the breakfast-table; new-laid eggs, from the strong hold of the hens, were of course to form another. Christian, the purveyor in these cases, took the key, and marched off, basket in hand, to bring the supply; but, when she opened the door, a scene of the most direful havoc presented itself: every perch and nest-hole was bedabbled with blood; dead hens lay in dozens on the floor, and in the middle was a full-sized fox, stretched out at full length, and apparently, a sharer in the common mortality. The maid never doubted the death of the fox; but attributed it to a different cause, namely, that he had so gorged himself on the poultry, that he had burst. Here were three causes to rouse the mingled wrath and contempt of Christian. The

fox had, by some means or other, shown that the place was not impregnable; there had been terrible havoc among the hens; and the fox had been gluttonous even to the death. She pronounced his funeral oration in certain most expressive Gaelic phrases, which we shall not quote, and will not translate; and then, without farther ceremony, gave him a resting-place, which, she said, was worse than a dog's burial. She took him up by the tail, and swung him with all her might into the receptacle in which were accumulated the requisites for garden compost. The fox fell safely, and rose again speedily, and, like Curl the bookseller, in the *Dunciad*, he "scoured and stunk along," until he gained the cover of the woods, leaving Christian in utter consternation, and the minister minus both his pullets and the glory of his impregnable hen-house.

"The entrance to this place was by a stone some feet from the ground, with a little hole over it, and by this the fox must have gained admission; and so, gaining admission, he had killed every fowl that he could reach; and he must have killed them so silently and so suddenly, as that no noise or complaint on the part of any one had in the least alarmed the others. This is, we believe, the most striking peculiarity of the fox on his predatory excursions; and the above anecdote shows it in a very striking light: for there were perches so elevated, that no fox could reach them; and as the pullets were in the habit of taking to them in other cases of alarm, of course they would have done so on the invasion of the fox, if his deeds of slaughter had been attended with any noise. We have mentioned these anecdotes, because they are characteristic, and we know them to be true."

The above are the instances to which I before alluded in the essay which I am pleased to observe has elicited Dr. Weissenborn's interesting communication; only, as they were orally more briefly related to me by Mr. Mudie, a trivial discordancy occurs in the narration of one of them, the circumstance of the mattock having being omitted, which negatives a consequent remark that I was led to append. A species more celebrated for feigning death on similar occasions is the common opossum (*Didélphis virginiana*) of North America; insomuch that to "possum" has become a current word with our trans-Atlantic brethren to express the deceit. "Suppose the farmer," remarks Audubon, "has surprised an opossum in the act of killing one of his best fowls. His angry feelings urge him to kick the poor beast, which, conscious of its inability to resist, rolls off like a ball. The more the farmer rages, the more reluctant is the animal to manifest resentment; at last, there

it lies, not dead, but exhausted, its jaws open, its tongue extended, its eyes dimmed; and there it would lie until the bottle-fly should come to deposit its eggs [larvæ], did not its tormentor at length walk off. 'Surely,' says he to himself, 'the beast must be dead.' But no! reader, it is only '*possum-ing*'; and no sooner has its enemy withdrawn, than it gradually gets on its legs, and once more makes for the woods." *

The foregoing instance tends in the main to substantiate Dr. Weissenborn's statement, as concerns the circumstance of its primarily contracting itself into a ball. The same, however, cannot be said in the instance of the kanchil (*Trágulus javanicus*, one of the *Móschidæ*), which is said to practise a similar *ruse* when caught in nooses. It lies stretched, and looking as if strangled; but, if the hunter undoes the noose, the kanchil is apt to vanish in an instant.† The following anecdote occurs in the *Field Naturalist's Magazine*, vol. i. p. 189.:—

"When the interesting bird named from its cry the corn-crake (*Crex pratensis*) is alarmed, it has the instinct, in common with some other animals, and especially insects, to feign death. A gentleman had one brought him by his dog, that was dead to all appearance. As it lay on the ground, he turned it over with his foot; he was convinced it was dead. Standing by, however, some time in silence, he suddenly saw it open one eye. He then took it up, its head fell, its legs hung down, it appeared again totally dead. He put it into his pocket; and before very long he felt it all alive, and struggling to escape; he took it out, it was lifeless as before. He then laid it on the ground, and retired to some distance; in about five minutes it warily raised its head, looked round, and decamped at full speed." It is needless to remark, that Dr. Weissenborn's position that "when the higher animals, as the partridge and hare, keep immovable, that their locomotion may not draw upon them the attention of some enemy, they do so with their eyes open, and ready to start, though their volition is sometimes paralysed by fear," will not apply in this instance. It recalls to my mind a tame brambling (*Eringilla Montifringilla Linnæus*), which I long kept in confinement, and which would simulate death, whenever handled, with surprising pertinacity. This bird would remain motionless, with its eyes closed, and suffer itself to be rolled backwards and forwards in the open hand, but not to be thrown up; I have frequently thus carried it round a room, to show it to different persons: after a while, it would warily open one

* Audubon's Ornithological Biography, iii. 456.

† Dictionnaire des Sciences Naturelles.

eye, but again close it instantly, if rocked to and fro. I imagine there are few but must have occasionally observed the same in the common sparrow.

Dr. Weissenborn remarks of the elater, that "the rigid and immovable position is, at the same time, that which enables it to take its leap;" but readily granting this, in the instance of that particular group, the same cannot be asserted of numerous other Coleóptera, which exhibit the same phenomenon, much less of the various moths (*Noctuidæ*, &c.) in which it is equally observable. The former, indeed, will even endure to be torn limb from limb, without manifesting signs of life; and the same is noticeable in most spiders.

Whether either of the cases here particularised of the fox simulating death can be accounted for as an experimental essay on the part of Reynard*, founded on observation and reflection, which would imply a degree of mental acumen certainly far beyond what I am disposed to give it credit for, notwithstanding the many undoubted proofs of its exercising (in common with others of the higher animals, which are necessitated to circumvent their prey) a decided reasoning faculty, wherewith to modify and refine upon its instinctive wiles, and to profit by remarking coincidences and sequences, but certainly not to trace causes, or, indeed, in any way to extend its speculations beyond the sphere of its immediate requirements; or whether the stratagem be not as purely instinctive as in the American opossum; must, I suppose, remain a matter of opinion, though analogy would certainly much rather indicate the latter to be the truth. Let it be remembered, that such proof of rationality, supposing it to be so, argues a knowledge of self,—that is to say, an identification of the *me* as the same in kind with the lifeless, or even living, bodies that had been observed,—which we must pause before we venture to award to ought inferior to the human race. One of the most admired definition suggested by the fertile genius of Linnæus is that of man, as a "self-knowing animal," which, hitherto, I have seen no reason to call in question; for even admitting that an inferior being had observed and remembered the decease of its companion, and had meditated on this so as to anticipate the future loss of another, which is allowing a very great deal, it surely does not by any means hence follow that it should apply the observation to its own case, and reason that itself should in like manner one day cease to be: more over, it is least of all likely that it should avail itself, calmly and collectedly, of this acquired knowledge in a sudden moment of emergency, when taken by surprise, on which occa-

* See p. 513.

sion that first law of nature, as it has been termed, the *instinct* of self-preservation, is so extremely apt, even in the human race, to get the better of reason; or indeed, at any time, in the particular instance of the fox, which, itself a preyer on deceased animals, could only *reason* that its own defunct carcass would serve for a meal: from all which considerations I cannot otherwise than conclude, that the feigning of death is *in every instance* a manifestation of pure instinct.

As I delight to bring together scattered notices of facts which have a mutual bearing, or tend to illustrate some general position, or which are simply analogous, I will here annex to Dr. Weissenborn's statement, that the fox, even when severely pressed by hunger, constantly refuses to eat the flesh of birds of prey, although most other birds are its greatest dainties, and it feeds indiscriminately on weasels and other beasts of prey, the assertion of Gilbert White, that "spaniels, as all sportsmen know, though they hunt partridges and pheasants, as it were by instinct, and with much delight and alacrity, yet will hardly touch their bones when offered as food; nor," it is added, "will a mongrel dog of my own, though he is remarkable for finding that sort of game. But, when we came to offer the bones of partridges to the two Chinese dogs, they devoured them with much greediness, and licked the platter clean."

It had previously been remarked, of the latter, that "when taken out into a field, the bitch showed some disposition for hunting, and dwelt on the scent of a covey of partridges till she sprang them, giving her tongue all the time. The dogs in South America are dumb: but these bark much in a short thick manner, like foxes; and have a surly savage demeanour like their ancestors, which are not domesticated, but bred up in sties, where they are fed for the table with rice meal and other farinaceous food. These dogs, having been taken on board as soon as weaned, could not learn much from their dam; yet they did not relish flesh when they came to England. In the islands of the Pacific Ocean, the dogs are bred upon vegetables, and would not eat flesh when offered them by the circumnavigators.

"No sporting dogs," continues White, "will flush woodcocks till inured to the scent, and trained to the sport, which they then pursue with vehemence and transport; but then they will not touch their bones, but turn from them with abhorrence, even when they are hungry.

"Now, that dogs should not be fond of the bones of such birds as they are not disposed to hunt, is no wonder; but why they reject, and do not care to eat, their natural game is

not so easily accounted for, since the end of hunting seems to be, that the chase pursued should be eaten. Dogs, again, will not devour the more rancid waterfowls; nor indeed the bones of any wild fowls; nor will they touch the fetid bodies of birds that feed on offal and garbage; and, indeed, there may be somewhat of providential instinct in this circumstance of dislike; for vultures *, and kites †, and ravens, and crows, &c., were intended to be messmates with dogs over their carrion, and seem to be appointed by nature as fellow-scavengers to remove all cadaverous nuisances from the face of the earth." ‡.

True, however, as the above remark may be in the main, the circumstance that the fox has no objection to prey on fox-flesh, tends to qualify it in some degree. It is a curious fact, that no cat will eat the body of a skinned bird; though every one knows how apt grimalkin is to make off with one, not of its own killing, that has its feathers on. This, and the following fact, will throw some light on the refusal of sporting dogs to feed on the remnants of *cooked* partridges:—

Near where I formerly lived, there existed, for two or three years, a fine male pointer, which was a great destroyer of game, and, at times, of poultry also; but so extremely wary that the keepers could never entrap it, or even get a shot at the animal. It was not much in the habit of worrying sheep, but appeared to subsist chiefly on hares and rabbits, which it hunted during the twilight. This animal was at length shot, after several nights tedious watching. The circumstance of its having been known to steal poultry places it beyond a doubt, that it was not over-scrupulous about preying on feathered game. §

* Hasselquist, in his travels to the Levant, observes, that the dogs and vultures at Grand Cairo maintain such a friendly intercourse as to bring up their young together in the same place.

† "Wild and shy as hawks are," observes the present Bishop of Norwich, "it will scarcely be credited, that at one time the common kites were numerous in London streets. This happened in the time of Henry VIII., when it seems that they were attracted by the offal of butchers' and poulterers' stalls; and as, on account of their use in removing so extensive a nuisance, they were not allowed to be killed, they became so fearless, as actually to mingle with the passengers, and take their prey in the very midst of the greatest crowds." (Stanley's *Familiar History of Birds*.)

‡ Letter xlviii., to the Hon. Daines Barrington.

§ However wild and savage, and insensible to kindness, may be the ordinary character of the wolf, there are instances on record of their being as tractable, and attached to their owner, as the most faithful dog; and the inverse of this I have had occasion to observe in two instances, wherein the dog evinced the usual disposition of the wolf and fox. The second case occurred in a female greyhound, which derived its sustenance much

Gilbert White remarks, "As my neighbour was housing a rick, he observed that his dogs devoured all the little red mice (*Mus messòrius*) that they could catch, but rejected the common mice; and that his cats ate the common mice, refusing the red." * A very interesting paper might be written on the predilections and antipathies of animals, as regards particular food. There is not one of our small insect-eating birds that will feed on the common magpie moth (*Abráxas grossulariàta*), either in its larva or perfect state, which, there can be little doubt, is the chief reason of its extreme abundance. Few birds are more thoroughly omnivorous than the white stork; yet Willughby informs us, that one taken in Norfolk, and kept alive for some time, rejected toads.

Oct. 9. 1837.

ART. III. *On the alleged Transformation of Avena sativa into Secale cereale.* By W. WEISSENBORN, Ph. D.

ABOUT fifteen years ago, there was announced an observation, as having been made in Sweden, which, at first sight, would strike every one as a palpable mistake, as to the cause to which an accidental effect had been ascribed; viz. that, when oats are sown about St. John's Day, and clipped a few times in the course of the warm season, so as to prevent them from forming stalks, and to enable them to live through the winter, they will, if allowed to grow during the second spring and summer, yield a *thin* crop of rye.

Although the communication was considered by many as a mere hoax, and by others as a fact the conclusiveness of which it was not worth while to verify, on account of its evident futility, yet some persons have had the curiosity to bring it to the test of experiment; and, for several years subsequent to the original announcement, we have read articles emanating from the pens of farmers, confirming the observation, but attracting only the notice of the credulous, or giving rise, here and

in the same manner as the pointer above-mentioned. It was an animal of a very fine breed, insomuch that, on its being entrapped, an eminent sportsman deemed it desirable to obtain from her a litter of puppies. She was accordingly chained to a kennel, but always continued savage, even to her feeder, and while her puppies were still very young, she managed to escape to the woods, and never returned. The progeny, five in number, were accordingly brought up by hand, and three of them grew to be excellent hounds; but the other two inherited the wild character of their dam, and, notwithstanding every attention, contrived finally to escape, and were afterwards shot, as was also their dam, for their destructive poaching propensities.

* Letter xl., to T. Pennant, Esq.

there, to a few remarks that went to prove the utter want of foundation of so heterodox an opinion.

The most obvious manner in which the phenomenon can be accounted for is, to suppose that the ground where the oats had been sown contained a certain number of rye seeds, that had been accidentally mixed with the oats, or left in the ground after a previous crop of rye, or transported there with the stable dung. Still, it appeared strange that, in all the experiments, rye was the exclusive offspring from a crop of oats treated in the above manner; but I think the hypothesis that, in consequence of a natural rotation of vegetation, a crop of oats, treated in the peculiar manner I have indicated, might leave the ground in such a state as to excite *only the seeds of the rye* to vegetate, would be far from giving a satisfactory solution of the problem.

Within the last few years, there have been two experiments of this sort made in a more than commonly careful manner. One took place in Livonia. In the middle of a cabbage garden, a bed of 12 ft. square was carefully dug and pulverised, and sown, about the end of June, 1836, with picked oats. The blade sprang not particularly well, and was thin, as the seed had suffered from frost in the preceding autumn. It was cut, for the first time, when part of it had already begun to form a shoot. The second clipping took place in autumn. In the present year, the second of the experiment, the bed is seen covered with healthy rye stalks, though fewer in number than the oat plants which stood on the bed last year. (*Nürnberg Correspondent*, No. 185., 1837.)

M. Waitz of Schweighof, near Coburg, has published the following article in the same paper (No. 210., July 29. 1837.):—
“M. de Schauroth, Lieut.-Colonel of Coburg, had communicated to me already, five years ago, that the above experiment had succeeded with him seven times, and that in every case there had rye sprung from oats, which he had, during the first season, hindered from forming stalks. M. de Schauroth had been averse from publishing his observation, lest it might give rise to a literary controversy, which he was not inclined to follow out; but, as for his own person, he was fully satisfied about the truth of the phenomenon, and asked me to repeat the same experiment, to verify his own. However, I delayed the execution, in order to have an opportunity of sowing oats on ground which had neither yielded a crop of rye, nor had been manured with straw-dung for a long time successively, that the experiment might be the more conclusive. Three years ago, I ploughed a paddock in which there had nothing been grown but grass for the last fifteen or twenty years. It was planted with potatoes

for two years, and the third spring sown with oats and lucerne (*Medicago sativa*), which were used as sheep pasture, so that none of the oat plants could form a stalk. During the severe spring of the present year, the greater part of the oats were destroyed; but, when the lucerne had attained a sufficient size to be used as sheep pasture, it was found intermixed with a great many healthy rye plants, just in flower. It appears not necessary for the success of the experiment that the oats should be sown about Midsummer Day; and it is very natural that the rye plants should be fewer than those of the oats, as all summer corn is, in a great proportion, destroyed during winter. M. de Schauroth has just communicated his observations to Dr. Hornschuh, Professor of Greifswalde, who has promised to make similar experiments in the botanic garden attached to the College of Agriculture."

This being the present state of the question, it is, perhaps, not premature to mention it in a scientific journal. The above names appear to warrant the truth of the phenomenon; and, however doubtful its cause may still be, it appears sufficiently interesting to enquire more closely into it. That oats could be changed into rye would not only be at variance with the acknowledged general principle of specific constancy, but also with the analogy of other annuals placed under similar circumstances; e. g., *Reseda odorata*, which, by clipping, can be changed into a biennial, or even perennial, but always retains its specific characters. Moreover, if such a treatment could produce a change of form, we should expect to obtain some new variety of the same plant, or even one changed so as to differ sufficiently in its type from all other known species and genera, but not individuals presenting all the genuine characteristics of an existing species of a different genus. All our cultivated species and varieties of corn have, no doubt, originated from some of the wild *Gramineæ*, which it may be very difficult to find out; as, in the case of wheat, M. Raspail is not disinclined to believe that it has sprung from *Ægilops ovata*, a grass growing wild in Sicily (where the empire of Ceres is said to have originated), and which Professor Latapie of Bordeaux, who travelled with M. de Secondat over Sicily, has cultivated in pots, whereby, after a succession of generations, it became not only much taller, but also changed in its habit and generic character. However, though it appears not impossible that the free operations of man may happen to modify in a constant manner organisations already existing, or even to resuscitate ancient conditions long gone by in the natural course of things, by which fresh spontaneous generations become possible; yet even the widest view of organic

unity we can take, will not, at present, warrant the conclusion, that the operations of man can throw back an organism sufficiently specialised to be capable of propagating its species into that ambiguous state in which it may be obliged, by the ambient media, to exchange its form with that of another existing species. It is, therefore, not with a view of engaging any body to believe the alleged transformation that I call the attention of the English reader to the above observations, but merely from a wish to mention a curious phenomenon, whose frequent recurrence can scarcely be doubted, on account of the mass and respectability of evidence now before the public; and the cause of which, for the same reason, it appears not altogether irrelevant to enquire into, by repeating the same experiments in various localities.

Weimar, July, 1837.

ART. IV. *Description of some new or little known Mammalia, principally in the British Museum Collection.* By JOHN EDWARD GRAY, F.R.S., President of the Botanical Society of London.

Felis chinensis. Yellowish grey, with numerous small unequal black spots. Forehead and nape with four or five, and cheek with two, black streaks. Eyebrows, cheeks, and chin, white. Throat, belly, insides of the legs, white, with larger black brown spots. Feet and soles grey, not spotted. Tail as long as the body, slender, black-spotted, with four or five cross bands on the upper side of the end, and the tip black. Length: body and head, 21 in.; tail, 10 in.

Inhabits China. British Museum.

Felis inconspicua. Grizzle-grey, black and white, slightly varied with brownish streaks and waves; beneath, white. Back of ears, large spots and cross bands on the throat, belly, and outside of the legs, black. Two obscure streaks on the cheeks, yellowish. Tail elongate, cylindrical, grizzled. Soles grizzled.

Inhabits ? Nepal.

Felis ornata Gray Illust. Ind. Zool., part 2. pl. 2. Fulvous, with large round, black spots; a black band across the upper part of the legs. Tail elongate, and with five or six black rings.

Inhabits India.

Felis pulchella. Pale yellowish white; hinder part of the vertebral line varied with black-tipped hairs; sides and outer part of legs with a few indistinct darker cross bands; beneath white; crown and nape with five or six narrow darker stripes; two bands across the upper part of the fore legs black; tip of ears dark. Young. Paler, band rather darker.

Inhabits Egypt.—*T. Christie, Esq.* British Museum.

Canis chrysurus (*Fulvous-tailed Dog*). Fur pale, foxy, varied, with black-tipped rigid white hairs, which are most abundant on the sides, and only scattered on the hinder part of the back. Under fur soft, silky; of the back, fulvous; of the sides, whitish; lead-coloured at the base of the hairs. Cheeks, chin, throat, and belly, white. Sides of the chest, inner sides of the legs, yellowish white. Upper part of the legs and anal region bright reddish fulvous. Tail cylindrical, reaching nearly to the

ground; pale yellow, with a dark brown tip, and a large tuft of rather rigid hairs (placed over a large gland) at its upper part near the base. Ears rather large, acute, grey, and edged with black externally; internally, whitish. Length, $23\frac{1}{2}$ in.; tail, 10 in.

Inhabits India. — *Colonel Cobb*. Brit. Museum.

The long hairs of the back are thin at the base, and enlarged, white, and rigid at the tip; each is marked with a broad blackish ring, and a brown tip, which varies greatly in length, according to the place in which the hair is situated; those on the sides of the body having the longest tips.

Canis procyonoides (*Raccoon-faced Dog*) Gray Illust. Ind. Zool.

Grey brown, varied with black tips to the hairs. Cheeks and legs dark chocolate brown. Tail short, thick, pale brown, with white tips to the hairs. Ears rounded, hairy. Length of head, $5\frac{1}{2}$ in.; body, 17 in.; tail, 5 in.

Inhabits China. — *J. R. Reeves, Esq.* Brit. Museum.

Vulpes nepalensis (*Nepal Fox*). Fur soft, silky, long; above, bright fulvous yellow.

Inhabits Northern India, Nepal. — *Gen. Hardwicke*.

Like the common European, and the American fulvous, Fox; but the fur is much softer and brighter-coloured.

Vulpes Hodgsonii (*Hodgson's Fox*). Fur rather woolly; above, bluish grey. Forehead, nape, and middle of the back, yellowish brown. Tail end black. Chin, and beneath, white.

Inhabits North India, Nepal. — *Hardwicke*.

Vulpes magellanica (*Magellanic Fox*). Greyish, varied with black on the back. The cross band on the nape, and the upper part of the tail, black. Head pale yellowish. Back of ears, nape, and side of the limbs, and under parts of the tail, bright fulvous. Chin, throat, chest, belly, and front of the legs, white. Length of the head 8 in.; body, 20 in.; tail, 12 in.

Inhabits Magellan's Straits. — *Captain P. P. King*. British Museum.

Hair of the back long, slender, with a broad subterminal white band. Under fur very thick, silvery.

Vulpes griscus (*Grey Fox*). Pale grey, with blackish tips to the hairs. Legs pale fulvous. Lips, throat, belly, and front of the thighs, white. Tail blackish at the upper part of the base, and at the tip.

Inhabits Magellan. — *Captain P. P. King*.

Herpéstes Smithii. Dark grizzled, black, white, and grey. Face, neck, and feet reddish, varied. Feet and tip of tail black.

Inhabits —.

Herpéstes Bennettii. Red brown, slightly grizzled with whitish. Tail rather depressed; under side pale red; tip black-penciled.

Inhabits Madagascar.

Herpéstes nepalensis. Fur blackish, finely grey-dotted. Hair black, with a broad subterminal yellow band. Tail tapering; under part greyish. Soles $\frac{3}{4}$ part bald.

Inhabits North India.

Like *H. griscus*, but smaller and darker.

Herpéstes brachyurus. Black. Hairs yellow, ringed. Under fur brown. Face, cheeks, and sides of neck, yellower. Belly and tail darker. Throat pale yellow brown. Fore legs and feet blackish. Tail thick, about half as long as the body.

Inhabits Indian Islands. British Museum.

PARADOXURUS. The species of this genus may be arranged in the following manner: —

A. *Cheek with a white Spot under the Eyes.*

a. *Back plain-coloured.* *P. larvatus*, *P. Clossii*, *P. Grayii*, *P. Jourdanii*.

- b. *Back variegated brown and white.* *P. leucopus*, *P. leucomystax*.
- c. *Back obscurely spotted or lined.* *P. dubius*, *P. typicus*, *P. niger*.
- d. *Back lined, sides spotted, forehead white.* *P. Pallasi*, *P. Musanga*, *P. dubius*, *P. musangoides*, *P. prehensilis*.

B. Face without any Spot under the Eyes.

- a. *Forehead and Nape with three black Streaks. Back black-spotted, with two yellow Spots on Shoulders.* *P. Hamiltonii* (*Viverra binotata Temm. and Gray*).
- b. *Back with three or five black Stripes.* *P. trivirgatus*, *P. quinquelineatus*.
- c. *Tail ringed.* ? *Parad. Zebra*.

Paradoxurus quinquelineatus. Brown. Hairs black-tipped. Back with 5 continued black stripes, rather bent over the shoulders. The 2 outer stripes on each side ending in a series of small round spots; outermost one very short. Forehead, and especially the eyebrows, reddish white. Var. more spotted.

Paradoxurus leucomystax. Black brown, with elongated black shining hairs. Orbits dark brown. Face pale, without any orbital spots. Large spot at the lower angle of the ears; and the tip of the tail white. Whiskers long, rigid, white. Ears large and rounded, not bearded.

Inhabits ———.

Paradoxurus musangoides. Grey brown. Muzzle, crown, nape, feet, tail, three continuous streaks on the back, and the small round spots on the sides, blackish brown. Belly, band across the forehead, spot under the eyes, and one on the side of the nose, white; the lateral dorsal streaks continued, and forming a series of round spots on the side of the base of the tail; and the upper series of spots forming a nearly continued line on the sides.

Inhabits Asia.

Very like *P. Musanga*; but the back has three distinct stripes, while in that species they are only series of spots.

Paradoxurus Derbyanus. Grey brown; streak up centre of the nose; broader one on each side of the face to the orbits; a streak along each side of the nape; seven crescent-shaped bands across the back and tail, black; front and under side of the legs rather darker. Feet brown. Hairs pale yellowish with a short black tip.

Inhabits ———. Cab. Zool. Soc.; and Lord Derby.

Paradoxurus ? Zebra. Yellowish. Face and forehead brown. Streak over each eye, white; two oblique streaks on back of neck; second shorter one across the shoulder; five bands on the back; and the rings round the tail black.

Inhabits ———. Mus. Lyons.

Paradoxurus Jourdanii. Pale fulvous. Hairs black-tipped. Lozenge-shaped spot on back of neck. Feet and end of tail black. Back of ears, sides of nose, and front of orbit, brown. Face whitish. Spot on temple and tip of tail, white. Legs fulvous brown, white grizzled.

Inhabits ———, Mus. Lyons.

CYNOGALE Gray. The grinders $\frac{2}{3}$; false, three above and four below; compressed, elongate; the upper carnivorous grinder oblong, triangular, nearly as broad as long; the lower oblong, nearly twice as long as broad. The head elongate, produced; whiskers very long and rigid. Plantigrade. Soles bald nearly to the heel. Toes $\frac{3}{4}$, half webbed. Tail elongate, cylindrical, hairy. Fur soft, crisp, with longer rigid hairs. Intermediate between *Paradoxurus* and *Arctitis*.

Inhabits Asia.

Cynogale Bennetti. Brown, with elongate rigid black hairs, with a broad

subterminal silver-white band. Whiskers white, rigid. Ears short, rounded. Upper lip and chin white.

Inhabits Sumatra. British Museum.

LU'TRA indica. The muffle bald. Soles of hind feet bald in front; hinder half hairy. Fur pale brown, grizzled with white. Hairs short; longer scattered ones broad. Lips, and lower part of body, pale brownish white. Under fur short. Var. tip of tail white.

Inhabits Bombay. — *W. Elliott, Esq.* British Museum.

Lùtra californica. Muffle bald. Soles of hind feet bald in front, hairy behind. Fur dark brown, with scattered whitish-tipped hairs; sides, lips, and beneath, pale brown; the webs with scattered hairs.

Inhabits California. — *Capt. P. P. King.* British Museum.

Lùtra chinensis. Muffle bald. Soles of hind feet bald in front, hairy behind. Fur pale brown. End of ears, lips, cheeks, chin, throat, under part of the body, hinder sides of the legs, and under side of the base of the tail, pale yellow.

Inhabits China. — *J. Reeves, Esq.* British Museum.

Quite distinct from the *Lùtra Baráng* of F. Cuvier, from Sumatra, which is also a true otter, and has a muffle.

The species of this genus are difficult to determine; but the characters to be derived from their toes, and from the nakedness of their soles, have been overlooked.

A. Toes equal, separate, webbed. Claws acute.

a. Muffle bald.

* *Soles of hind feet bald to the heel.* *L. vulgàris*, *L. roënsis*.

** *Soles bald in front, hairy behind.* *L. indica*, *L. californica*, *L. chinensis*, *L. E'nhydri*, *L. chinensis*, *L. Baráng*.

*** *Soles covered with hair.* *Lùtra Làtrix*.

b. Muffle none. — *L. brasiliensis*.

B. Toes half webbed. Middle and Ring Finger longest, united together to the first joint. Claws obsolete. — **A'ONYX Lesson.**

A. Horsfieldii Gray, Lùtra Léptonix Horsf., — A. Lalándii Lesson.

PTERONURA Gray. Head large, depressed. Muzzle hairy. Feet large; toes 5 : 5, distinct, very largely webbed. Tail elongate, subcylindrical, with a fin-like dilatation on each side of the hinder half.

Cutting teeth $\frac{5}{5}$; the four upper middle ones larger, equal, lancet-shaped; the outer ones small, conical; canines elongate; grinders like *Lùtra*? Nostrils with only a slight naked space on their upper edge. Eyes small. Ears small, round, very hairy on the inner side. Feet very large, intermediate in size between those of the otter and the fin-shaped feet of the *E'nhydra*. Toes elongate, with long acute claws; the hinder toes very long; two outer ones longest, and the others gradually shorter to the inner ones.

This genus is intermediate between *Lùtra* and *E'nhydra*.

Pteronura Sambachii, new species. Fur soft, liver-coloured brown; orbits paler. Lips, chin, and throat yellow; the latter brown-spotted. Length of head, $6\frac{1}{2}$ in.; body, 10 in.; tail, 12 in. Width of head, from ear to ear, $4\frac{1}{2}$ in.; the fore feet, $3\frac{1}{2}$ in. in diameter; the hind feet, $4\frac{1}{2}$ in. long, and 3 in. wide.

Inhabits Demerara. — *Mr. Lawrence Edmonston.* Museum of the Royal Institution, Liverpool.

PROCYON nivea. Fur soft, silky, white. Tail one-coloured.

Inhabits North America, Texas.

This may prove an Albino variety; but the softness of the fur at once distinguishes it from the Raccoon.

MEPHITIS. I am inclined to confine this genus to the species which have the following characters:—The hind feet rather narrow, depressed. The soles two thirds bald; the middle ridge divided into four oval pads (the inner pads the smallest); the hinder portion largest, and divided into two oblong longitudinal pads. Front claws moderate. False grinders $\frac{2}{3}$; upper tubercular grinder square. Of this I have seen three species, which may be thus divided.

a. *Tail elongate, hairs spare, long, and pendent.*

Mephitis varians. Black, with a narrow white streak on the forehead, a large square spot on the nape, and two narrow streaks between the blade-bones. Tail black; base of the hairs white.

Inhabits Texas. Brit. Museum.

Mephitis mexicana. Fur very soft, silky. Black. Narrow streak on the nose; broad band across the crown; a broad vertebral streak, and two narrow lateral dorsal streaks, and a small spot on each side of the shoulder, white.

Inhabits Mexico. Mus. Zool. Soc.

b. *Tail short, bushy, subcylindrical, ending in a pencil of hairs.*

Mephitis bicolor. Fur soft, short, black. Oval spot on nose; larger spot on each temple, in front of the ears; broad stripe down each side of the nape and front part of the back, and two narrow stripes between them on the back; two or three cross bands of small spots on the loins; a spot on each side of the tail, and a large pencil at its tip, white.

Inhabits North America.

Length, 15 in.; tail 7 in.

The other species which have been referred to this genus I should include in the two following genera:—

CONEPATUS Gray. The hind feet large, broad. The bald soles half the length of the feet, oblong, broad; rugose and warty, rounded behind, divided into two convex parts by a cross groove, and scarcely subdivided into smaller pads. Front claws very long. The tail short, bushy, subcylindrical. Teeth like Mephitis.

Conepatus Humboldtii, *Mephitis Conepatii* Denn., *Viverra Conepatii* Gmel. Black, with some rather longer shining hairs, with a broad white band along each side of the back, which is united over the crown. Tail subcylindrical, very bushy, white, with interspersed shorter longly black-tipped hairs. Var. fur softer brown, with the white band continued on the base of the tail: perhaps the summer coat.

Inhabits Magellan Straits. Brit. Museum.

MARPUTIUS Gray. The hind feet moderate. The bald soles extending to the heel. Front claws elongate. Tail rather short. Nose acute, produced. Fur bristly, close-pressed. Teeth like Mephitis.

Marpūtius chilensis, *Mephitis chilensis* Geoff.

Inhabits Chili. Brit. Museum.

The *Mephitis násua* Bennett, and *Viverra Marpūtio* Gmelin, probably belong to this genus.

CENTE'NUS *variegatus*. Whitish. Hairs and spines brown, ringed. Orbits and face brown. Face very long, produced, slender. Cutting teeth $\frac{1}{2}$; upper deeply bifid.

Inhabits Isle of France.

Cuvier, in his *Règne Animal*, has, by mistake, misplaced his character of the Terrac and Tendrac.

The species of this genus may be thus divided : —

A. *Back grizzled.*

- a. *Face and spine short.* C. spinosus.
b. *Face and spine long.* C. caudatus, and C. variegatus.

B. *Back streaked. Face very long.* C. madagascariensis.

LE'PTONYX Gray. Cutting teeth $\frac{4}{3}$, conical, the upper outer ones very large ; canine very large ; grinders $\frac{5}{3}$, compressed, bluntly 3-lobed. Muzzle broad, rounded, simple ; muffle hairy. Whiskers slightly waved. The front claws small. The hind feet clawless.

This genus is nearly allied to *Stenorhynchus*, but differs in the form of the grinders, and in the muzzle not being produced.

Léptonyx Weddellii Gray. Fulvous. Front of back, and line down the back, blackish grey. Whiskers brown, tapering. Young blackish grey above ; sides yellow-spotted ; beneath, pale fulvous when it is The Sea Leopard, *Weddell Voy.*, 23. ; Leopardine Seal, *Jameson* ; and *Otaria Weddellii Lesson*.

Inhabits South Seas.— *Captain Fitzroy*. British Museum.

Phoca ? platythrix. Chestnut brown ; rather paler beneath. Whiskers and eyebrows black, compressed, strongly waved. Fur formed of uniform short flat hairs, without any under fur.

Length, 47 in. ; fore feet, $8\frac{1}{2}$ in. ; and hind feet, $10\frac{1}{2}$ in.

Inhabits Cape of Good Hope. British Museum.

The family of seals (PHOCIDÆ) may be very naturally divided into the following groups : —

A. *Grinders with many roots. Ears none. Toes simple. Soles and Palms hairy*

- a. *Cutting teeth $\frac{4}{3}$* (*Stenorhynchina*) Léptonyx, Pelàgias, *Stenorhynchus*.
b. *Cutting teeth $\frac{5}{3}$.* (*Phocina*) Phoca, Callocéphalus.

B. *Grinder rootless.*

- a. *Ears none. Muzzle truncate, simple. Cutting teeth $\frac{6}{3}$; canines large.* (*Trichisina*) Halichærus and Trichecus.
b. *Ears none. Toes simple. Muzzle of males with an inflatable appendage.* (*Cystophorina*) Cystophora, Morunga.
c. *Ears cylindrical. Toes with long membranes ; palm and soles bald, longitudinally grooved. Nose simple.* (*Arctocephalina*) Arctocéphalus and Otaria.

THE KANGAROOS (MA'CROPUS). As the species of this genus have been very imperfectly described, I have been induced to make the following synopsis of the species which have come under my observation ; and have divided them into the following genera : —

1. **MA'CROPUS** Shaw (part). The muffle hairy, with a narrow naked line over the nostrils, and a small naked spot in front. Canines none ; the upper cutting teeth of nearly equal length, grooved ; the hinder much the broadest ; and formed of two lobes, folded against each other, the hinder fold nearly three times as long as the front one, and grooved on its hinder parts.

Mácropus major Shaw. *Zèbua gigantea* Erxl. Tail strong, covered with close-set soft hair.

HALMATU'RUS F. Cuv. (part). Muffle bald, distinct. Canines none ; the upper cutting teeth nearly of the same length ; the front pair rather incurved, marked with a groove ; the hinder ones broadest, with a more

or less distinct fold. Tail thick at the base, scaly, more or less covered with hair, which is thickest on the under side.

A. *The hinder Fold of the hinder upper cutting Teeth nearly twice as long as the front ones, making the Tooth appear notched near the Centre.*

Halmatùrus ualabàtus, *Kangùrus ualabàtus* ? Lesson. Tail moderate, covered with longish, soft, close-set hair, rather tufted at the tip. Face, streak on the forehead, feet, and tip of tail, blackish. Cheeks grey. The fold of the hinder cutting teeth subposterior.

This is the species usually called the *Whallabee* in England. But there is another species in museums of the zoological societies, which better agrees with M. Lesson's descriptions, in being darker, more rufous, and in having the head, round the base of the ears, dark fulvous. It may be called *H. Lessonii*.

Halmatùrus álbus, *Kangùrus álbus* Gray. Nearly like the former; but whitish, or white. Tail covered with close-set hair, rather tufted at the end, and the fold of the hinder cutting teeth nearly posterior.

Halmatùrus dorsàlis. Tail moderate, covered with very short close-set hair. The hinder upper cutting teeth with a centre plait, and the front one with a subanterior groove. Fur black, rufous, and grey grizzled. Neck and limbs pale rufous. Feet, and streak on the upper part of back, black.

Halmatùrus Derbyanus. Tail rather short, thick, covered with short close-pressed hairs. Hinder upper cutting teeth rather small, with a very slight plait, rather behind the centre. Fur black, reddish, and grey grizzled. Neck and legs rufous, with a dark streak on the nape.

Inhabits ———. Menagerie of Lord Derby, now in Mus. Zool. Soc.

Peculiar for the small size and simplicity of the hinder cutting teeth.

Halmatùrus Pàrryi, *Mácropus Pàrryi* Bennett Trans. Zool. Soc. Tail elongate, compressed, with short adpressed hairs above, and a band of larger close-pressed hairs beneath; tip slightly tufted. Hinder upper cutting teeth with a distinct subcentral fold. Fur grey. Face blackish, with a broad pure white streak across the cheek. Mus. Zool. Soc.

Var. *pállida*. Pale reddish-grey. Face, backs of ears, and middle of the back, rather redder; face streak, lips, tail, and beneath, white. Feet and tip of tail darker, varied. Mus. Brit.

Inhabits Swan River: called Willaroo.

B. *The hinder Fold of the hinder upper cutting Tooth scarcely larger than the front one, so that the Tooth appears only notched behind. Front Incisor short, simple.* — THYLO'GALE Gray.

Halmatùrus Eugèni Schinz. *Kangùrus Eugèni* Desm. Tail moderate tapering, covered with rather short scattered hairs, showing the rings of square scales, and with a band of close-set long adpressed hairs beneath. Fur brown, slightly grizzled. Nape rufous. Tail, above, dark; beneath, white.

Inhabits Swan River. British Museum, and Zoological Society.

PETRO'GALE Gray. Muzzle bald, distinct. Canine teeth none; the upper cutting teeth unequal; front rather longest, and incurved; the hinder one hatchet-shaped, dilated at the top, and notched in the centre (scarcely folded). The tail cylindrical, covered with long rather rigid hairs, forming a tuft at the tip.

Petrógale penicillàtus Gray. *Mácropus penicillàtus* Gray. Ears, shoulders, thighs, tail, and streak on the nape, blackish. Lips, and narrow streak on the chest, white. Cheeks greyish.

Inhabits Swan River: ? called Gunar. Sits with its tail between its legs. The *Macropus Brunii* has the same teeth as this genus.

Besides these, there is a species called *M. ruficollis*, in the Museum of the Zoological Society, which is peculiar for the length of the hair in its tail; but it has no skull, so that the teeth cannot be examined.

BETTO'NGIA Gray. Muffle bald, distinct. Canine teeth distinct; upper cutting teeth unequal; the front much longest, the hinder small, simple. Tail scaly, covered with shortish hairs, which are longer, and form a tuft at the tip. Hind legs and toes elongate; the outer toes longer than the inner ones.

Bettongia setosus *Hypsiprymnus setosus* Ogilby. Grey grizzled. End of tail blackish, slightly tufted. Ears moderate.

Inhabits Swan River. British Museum.

Bettongia penicillata. Grey and white varied; beneath, whitish. Under fur lead-coloured. Tail grey, end tufted, black. Ears small, rounded.

Bettongia rufescens. Reddish grey, slightly grizzled; beneath, whitish. Back rufous. Ears rather large. Tail whitish (? end simple).

HYPSIPRYMNUS *F. Cuv.* (part). Muffle bald, distinct. Canine distinct; upper cutting teeth unequal; front much longest; the hinder small, simple. Tail with rings of square scales, and close-set bristly hairs. Hind legs and toes shorter; the outer and inner hind toes nearly equally long. Fur rigid.

Hypsiprymnus minor Cuv., *Macropus minor* Shaw.

Inhabits ———.

PTE'ROMYS *melanotus*. Fur soft, bright red bay. Feet, end of nose, hinder half of the outside of the ears, and end of the tail, blackish-brown. Cheek, and beneath, pale.

Inhabits Nepal.

Quite distinct from *Pteromys nitidus* (which Cuvier erroneously considered as the female of *Pt. Petaurista*), which is dark red bay, with the feet, base of the whiskers, orbits, and end of the tail, blackish; ears dark red-brown; and the cheek and the under parts, pale reddish.

Pteromys albiwenter Gray Illust. Ind. Zool. Fur soft. Reddish-brown, grizzled. Hairs long, white-tipped. Sides and limbs darker. Band across nose, whiskers, orbits, and feet, black. Checks grey. Throat white. Belly reddish-white.

Inhabits Nepal.

Pteromys Leachi. Grey, blackish, varied; beneath, white. Fur very soft. Hair of the back lead-coloured, with a grey subterminal band, and black tips; of the belly, with pure white tips. Ears, end and sides of nose, edges of the orbits, and upper part of the feet, blackish. Whiskers black. Tail elongate, round, grey; upper half blackish. Soles of the hind feet $\frac{2}{3}$ bald. Length, 12 in.; tail, 11 in.

Inhabits India.

Like *Sciurus Volucella* in colour and softness of the fur, but has an elongate round tail.

SCIURÓPTERA *Turnbullii* Gray. Fur short, soft, blackish; hairs with a whitish subterminal band. Cheeks, chin, and beneath, white. Orbit and whiskers black. The tail narrow, tapering, black-brown; rather paler beneath. Feet small; front thumbs rudimentary. Hind feet scarcely fringed at the outer side. Soles narrow, without any tubercles on the centre of the outer side, but with a tubercle in front, and two unequal ones on the hinder part of the inner side. Length, 11½ in.; tail, 8 in.

Inhabits India. — Colonel Cobb. Brit. Museum.

SCIURÓPTERA *fimbriata* Gray. Fur long, soft, grey, varied with black; hairs lead-coloured above, flattened, pale brown, with a black tip. Face whitish; orbits black; whiskers very long, black; chin, and beneath, white.

Tail broad, rather tapering, fulvous, with black tips to the hairs at the base; black at the end. The feet broad; front thumb rudimentary. The outer edge of the hind feet with a broad tuft of hair; the soles of the hind feet with a small oblong tubercle on the middle of the outer side, a tubercle in front, and with two unequal ones on the hinder part of the inner side. Length, 12 in.; tail, 11 in.; hind soles; 2 in.

Inhabits India. — *Colonel Cobb*. Brit. Museum.

Mus's. This numerous genus may be divided into three, by the form of the crowns of the grinders. In the true rats (*Mus Gray*), the grinders, when perfect, have a high and convex crown; and the ridges of the crown of the upper one are slightly three-lobed. *Mus gigantea* Hardwicke may be regarded as the type, to which may be added the two following new Indian species, which have the tail shorter than the body, and the fur with scattered bristles: —

Mus rufescens (*House Rat*). Fur pale brown; beneath, yellowish grey. Under fur lead-coloured, with numerous slender brown bristles, marked with a deep central channel, ending in a black hair point; of the chin and under sides, softer, with whitish slender bristles. Tail nearly as long as the body, with rather small square scales, and very short hairs. Feet brown; claws white, covered with white hairs. Length of the body and head, $6\frac{1}{2}$ in.; tail, $5\frac{3}{4}$ in.; hind foot, $1\frac{1}{4}$ in.; to base of thumb, 9 lines.

The teeth of this species are rather deeply lobed, and somewhat intermediate between *Mus* and *Golunda*.

Mus Kók (*Arvicola Indica Gray Illust. Ind. Zool.*). Fur pale brown, with interspersed black tips; sides paler. Chin, and beneath, greyish. Feet pale brown. Ears rounded, slightly hairy. Whiskers as long as the head. The under fur lead-coloured. The brown-tipped longer hairs rather rigid, slender, fusiform, flattened, with a longitudinal groove; black, often with a subterminal black band. Forehead with some silvery hairs. Thumb of fore feet rudimentary, with a short thick claw; rest of claws conical, curved. The three middle toes equal, and longest; the little toe and thumb subequal. Tail thick, shorter than the body, scaly, with short scattered hairs. Length of body (dry), $9\frac{1}{2}$ in.; tail, $4\frac{1}{2}$ in.; hind feet, $1\frac{1}{4}$ in.; from heel to base of thumb, $7\frac{1}{2}$ lines.

Inhabits India. Brit. Museum.

Mus Hardwickii. Above, yellow brown. Hairs of back lead-coloured, with thicker yellow-brown, or dark brown tips; some of those of the back, and especially the rump, much longer, and bristle-like. Checks and sides rather paler. The chin and under parts with short whitish-tipped lead-coloured hairs. Tail as long as the body, naked, scaly. The cutting teeth large, smooth, yellow, and flat in front. The thumb of the fore feet small, clawed.

Inhabits India. Gardens. Brit. Museum.

Very much like *Mus Kók*, but the skull is much wider and stronger, and rather larger; and the cutting teeth are nearly twice as wide, and are flat in front. The grinders are very little larger than those of that species.

Mus asiaticus. Pale brown, blackish, varied. Ears large, nakedish. Cheeks, chin, and beneath, greyish. Whiskers elongate, black. Tail as long as the body and head, with short adpressed black hairs, longer and more abundant near the tip. Cutting teeth smooth, and yellow in front. Thumb of fore feet quite rudimentary, slightly clawed. Sole of hind feet bald to the heel, with six tubercles; outer hinder largest. Heel narrow, one third the length of the foot. The ball of the outer toes rather less than half the distance from the front of the foot.

Inhabits India. Brit. Museum.

LEGGÀ'DA Gray. The grinders rather high, with rather convex crowns; the cross ridges of the crown of the upper grinders deeply three lobed; the front one with an additional lunate lobe at the base of its front edge. Rest like *Mús*.

Leggàda Boodàga. Fur mouse-coloured, varied with brown; beneath, greyish white. Under fur lead-coloured, with pale, slender, grooved, black-tipped bristles. Whiskers slender. Tail as long as the body, slender, grey, with black short close-pressed hairs. Ears hairy, rather large. Length of the head and body, 2 in.; tail, 2 in.; hind foot, $6\frac{1}{2}$ lines; from the heel to the thumb, 4 lines.

Inhabits India, Bombay. Brit. Museum.

They live in pairs, in the black soil, making little burrows, in which they produce two or three young.

The *Mús Plátythryx Bennett*, which has, flat spine-like channeled hair, is a second species of this genus, and may be called *Laggàda Plátythryx*.

GOLU'NDA Gray. The grinders, when perfect, low, with a broad flat crown; the cross ridges of the crown of the upper grinders divided into three distinct slightly raised tubercles. Rest like *Mús*.

Golúnda Elliöti. Fur pale brown, with minute, very slender, hair-pointed black tips. Chin, throat, and beneath whitish. Under fur paler. Teeth yellow; upper cutting teeth grooved in front. Ears covered with short hairs.

Inhabits India, Bombay. Brit. Museum.

Golúnda Melkàda. Fur very soft, mouse-coloured, varied with black.

Chin, and beneath, whitish. Under fur lead-colour, with very numerous soft brown hairs, having long black tips; of the belly, white, with brownish tips. Ears large, hairy. Whiskers very slender, long. Tail shorter than the body, scaly, covered with short adpressed black hairs, hiding the scales. Feet pale; claws white. Length of body and head, $4\frac{1}{2}$ in.

Inhabits Bombay. Live in cracks in the black soil, in pairs; and are often crushed, when the rain, or cultivation, obliterates the cracks. Brit Museum.

Mús bárbara Bennett, belongs to this genus.

LE'PUS Douglassi. Fur yellowish, blackish varied. Under fur lead-coloured, with blackish tips. Hair of back enlarged at the tip, rigid, black, with a very broad subterminal yellow band. Nape, and upper surface of feet, rufous. Tail, above, grey brown. Chin, belly, and under part of tail, white. Throat yellowish. Upper cutting teeth narrow, with a deep groove on the inner side. Hind feet elongate. Var. 1. rather larger. Var. 2.:—Fur rather softer, blacker; and the soles more hairy. From California.

Inhabits North America, Texas: ? called the Marsh hare.

Lepus longicaudatus. Grey brown, black varied; beneath, paler. Cheeks, belly, and legs, greyish. Orbits whitish. Under fur pale grey, soft. Hair of the back pale; upper half black, with a rather broad subterminal brown band. Tail elongate, black; beneath, white. Ears longer than the head; edge of tip black. Nape pale rufous. Palms and soles dark rufous. Whiskers black. The upper cutting teeth are rather narrow and converging, with a shallow, indistinct, subcentral groove, and a few other indistinct grooves. Length, 25 in.; ears, $5\frac{1}{2}$ in.; hind feet, 5 in.; tail, 5 in.

Inhabits Magellan Land.—*Captain P. P. King*.

Lepus californica. Fur black and grey grizzled; sides rufous, black varied. Feet yellowish black varied. Chin and belly white. Orbits pale, with a small black spot over the middle of the eyebrow. Tail elongate,

black; beneath, rufous. Ears very long; hinder part of end black, and black-edged; front edge longly ciliated with pale brown hairs. Under fur of the back pale grey; above, brown, with black tips. Hairs of the back enlarged at the tip, black, with a broad subcentral pale band. Soles and palms very hairy, brown. Nape, and hinder edge of ears, whitish. Upper cutting teeth rather narrow, converging, with a deep groove, rather on the inner edge of the middle of the tooth. Length, 23 in.; ears, 6 in.; tail, $4\frac{1}{2}$ in.; hind feet, 5 in., Var. whiter, the ring of the hairs whiter.

Inhabits California, St. Antoine, in May.

Bos brachyceros Gray. Forehead broad, flat. The horns rather short, very strong; flattened in front, at the base; rounded behind; diverging on each side, scarcely bent back; the apices bent forwards, and slightly incurved. Fur brown.

Inhabits Central Africa. — *Captain Clapperton*. British Museum.

The horns are somewhat like those of the short-horned varieties of the buffalo; but they are shorter and thicker, and not bent back: as they are in all the varieties of that species.

ART. V. *On the Strata near Swanwich, in the Isle of Purbeck.*
By JAMES MITCHELL, LL.D., F.G.S., &c.

I AM induced to send you a few remarks on a paper, in your Number for August, "On the Geology of the South-East Dorsetshire;" because it appears to me that the writer has, in some instances, fallen into errors himself, besides trusting too implicitly to the authority of those persons who have previously written on this part of the coast. I shall make no remark on the discursive preliminary matter, but confine myself exclusively to what he has given as the description of the strata from Durlstone Head to Standfast Point, or, as he calls it, the point of Old Harry and his Wife.

The following are the words of the passages, and for the woodcuts, I refer to p. 417, 418, and 419.

"In illustrating the particular phenomena presented by the section of the vertical chalk at Ballard Head, near Swanwich, it will be necessary to represent, by woodcuts, the general features of the locality. On approaching from the sea the eastern termination of Purbeck, the coast appears as represented in *figs.* 35. and 36.; the latter being merely a continuation of the former.

"In *fig.* 35. the overhanging, dark, curved strata and breccia of Purbeck stone at Durlstone Head, the highly inclined red cliffs of Hastings sand in Swanwich Bay, and the commencement of the chalk cliffs ranging from Ballard Head, are sufficiently represented to show the order of succession and inclination of the separate formations. *Fig.* 36.

represents the chalk from Ballard Head to Old Harry Point, forming the southern horn of Studland Bay.

"It will be seen that the older formations rise from under each other at an angle continually increasing, till it becomes 90° under Ballard Down; and that at Ballard Head the vertical strata are in contact with curved strata; which latter gradually approach towards a horizontally direction, as represented in *fig. 37.* (taken from Mr. Webster's drawing in Sir H. Englefield's splendid work on the Isle of Wight); and in *fig. 38.*, which represents the inclination at Old Harry on a larger scale, showing that the beds there dip under the sea at about 19° to the north; so that the range of the curve from Ballard Head to Old Harry is about 71° . The cliff at Ballard Head is about 352 ft.; at Old Harry, about 100 ft. high.

"It will be seen, also, that the cliffs toward the north are buttressed, as it were, by a number of perpendicular masses, which the action of the sea and the atmosphere have worn out of the chalk; and that at the extremity, as represented in *fig. 39.*, there are four insulated masses, two of which are designated the Pinnacles, or, in a nautical phrase, Old Harry and his Wife. The elemental agencies have nearly produced two other and larger pinnacles, which cannot remain many years uncompleted. The beds in Studland Bay appear nearly horizontal, which they must do, being merely the ends of those which are along the eastern section, represented as curved; but it will instantly occur, that these horizontal beds, in the upper part of the cliffs are the remains of beds whose continuation on the top of the down has been partly destroyed. It is also clear that the termination of the beds in junction with the vertical ones does not appear in Studland Bay."

I first observe, that he states that Durlstone Head is composed of curved strata and breccia of Purbeck stone.

The stone is a coarse sort, known at Swanwich by the name of Purbeck Portland. It is a kind of grit, or sandstone, rather than an oolite, but more nearly resembles the oolite of Portland than the Purbeck stone.

The strata of stone are not curved, but are in long parallel lines, separated from each other by intermediate masses of clay.

Throughout the coast, for many miles, beginning at Swanwich, the strata, though dipping a little, approach to horizontality of position.

I give two sections observed at Durlstone Head in 1833; only remarking that the measurements were taken by the eye.

	Ft. in.		Ft.
Vegetable mould and brown clay	- - - 4	Blue clay debris with stone here and there sticking out	- 10
White clay	- - - 3	Stone	- - - 3
Blue clay	- - - 1	Blue clay	- - - 30
Stone	- - - 1	Stone	- - - 5
Blue clay	- - - 1 6	Blue clay	- - - 6
Stone	- - - 1 6	Stone	- - - 5
Blue clay	- - - 1 6	Stone clay	- - - 40
Stone	- - - 1 6		114

A section with fewer changes occurs a little further south: —

	Ft.		Ft.
Mould and clay	- - - 6	Debris of the clay	- - - 6
3 Tiers of stone	- - - 3	5 Tiers of stone	- - - 5
Blue clay	- - - 2	Loose blue clay	- - - 30
Stone	- - - 1	Stone	- - - 2
Blue clay	- - - 3		—
Stone	- - - 1		59

I will now remark on what are called “the highly inclined red cliffs of Hastings sand in Swanwich Bay.”

To judge from the woodcut, it would be supposed that the cliffs referred to were close to the town, and rose at a high angle. Now, this is certainly not the case. I found this part of the shore, for about half a mile, covered with grass, and no sand visible; and on the few spots left bare of grass I found red, brown, and white clay, the latter resembling tobacco-pipe clay.

Half a mile from Swanwich, and for the extent of more than half a mile, as far north as the chalk, are alternate layers or stripes of what, to the eye of a person in a boat in the bay, will appear to be red sand and yellow sand.

The dip is to the north. The angle at which they incline is about 15° . It is a most extraordinary thing to find so very frequently repeated those alternations of stripes of red sand and stripes of yellow sand, and endless conjecture may be made in accounting for the origin.

If the apparently red stripes be examined, and the external crust be struck off by the hammer, it will be immediately seen that these are beds of brown sand, and it is only the part in contact with the atmosphere which, by oxidation, has become red.

It is for theorists to identify these beds with what are called Hastings sands. I have never heard of any fossils being found in them; and, mineralogically, the sands are not to be distinguished from some of the perpendicular strata directly opposite, in Alum Bay; and I will add what may excite reflections on the sands of this place, and of Alum Bay also, that sands exactly similar have been found both over the chalk,

and, what is more, over the London clay ; but such alternations of yellow and brown sand I know of in no other place.

From that point where these sands terminate and chalk begins, to Ballard Head, which is visible in figs. 35. and 36. is about half a mile.

At the point of junction near the sand is an immense mass of debris, thickly overgrown with grass. The theorists say that the green sand formation is there : I saw none of it. The chalk is the lower chalk, or that without flint. We soon began to see lines of flint towards the top of the cliff, which, in some places, dip about 40° to the east. Towards Ballard Point, they become quite horizontal, there being still chalk without flint at the bottom.

The author of the paper, therefore, was inaccurate when he spoke of the chalk as beginning at Ballard Point, and of the strata, as gradually becoming more and more elevated on approaching to it.

At Ballard Point, misnamed in Sir Henry Englefield's work Standfast Point, commences that portion of the chalk cliff which is most remarkable. Fig. 37., which is a miniature of Mr. Webster's drawing in Sir Henry Englefield's work, is characteristic ; but our author has also given fig. 36., from what authority he does not state ; but it bears some resemblance to that in Conybeare and Phillips, and is exceedingly bad ; and fig. 38. is equally so.

The perpendicular lines of flint, from the top to the bottom, extend from the point northwards just about 300 yards. I went to see them in a boat three several days : I measured the distances as nearly as I could by the eye, for it is impossible to walk along under the cliff. I assisted my judgment by observing the height of the cliff, and by the help of the boatmen ; and I think 300 yards is exceedingly near the distance.

The termination is exactly opposite a sunk rock, called the *Argyle Rock*, from the wreck of an Indiaman of that name. The perpendicular lines beneath the curved lines, which may be called ordinates to them, are just fourteen in number, and no more ; and from the first to the last of these fourteen is only about ten yards along the foot of the cliff.

The bending lines of flint are exactly twenty-two in number. They descend in a curve, but soon become quite horizontal. From the point where the first curved line begins, to that where they are all horizontal, is about fifty yards.

From this point, all the way to Standfast Point, just a little north of the rocks called Old Harry and his Wife, a distance of upwards of three quarters of a mile, the lines of flint are

perfectly horizontal, and not as in fig. 38., and as alleged in the text.

In one place, nearly half way between Ballard Point and Old Harry, is a rock about 100 ft. high, with mould and grass on the top. It is at the bottom a square of, say, 11 yards; and there are 49 tiers of horizontal flint. I was informed that some very old men recollect that, about seventy years ago, they could creep along a narrow path out to this rock; but, about fifty years ago, it was disjoined, but scarcely any other change has taken place. The chalk is, in fact, so exceedingly hard, that the waves must make very little progress in wearing it away.

The boatmen who took me out said that they had ascertained Old Harry to be about 70 ft. high, by looking at the mast of an Indiaman, which came very near to him.

I shall conclude this paper by endeavouring to remove an error which has appeared in Sir Henry Englefield's work, and is also in that of Messrs. Conybeare and Phillips. It is asserted that the flints in the perpendicular lines are shivered into pieces, and only held together by the surrounding chalk. Such is the case with the perpendicular flint in the Isle of Wight, but it is not so here. I landed from the boat at several points, and found it was not so. Often, indeed, some of the external flints, which had been grazed by the lumps of the chalk, which is here excessively hard, bore this appearance; but many flints were not so broken; and, on getting at flints still protected in the chalk, I found they were as entire as in any other cliffs. The first appearance, together with the recollection of the flints at the Needles and Freshwater Gate, must have led to the error. It is stated to be difficult to get to examine this part of the coast; but there really is no difficulty but what a boat from Swanwich will enable a geologist easily to overcome; and, if any of your geological readers, who may take up their abode in that delightful habitation, the hotel at Swanwich, will survey carefully this part of the coast from Durlstone Head to Standfast Point, they will derive much gratification, and will escape the errors of those who have only had occasional peeps from the tops of the steep cliffs on shore.

The whole of this coast, and onwards to Weymouth, is a rich study for the geologist; but, if he keep the eyes of his understanding open, he will not be able to find such a concentration of strata as imaginative theorists have persuaded themselves are there.

London, August 18. 1837.

ART. VI. *Observations on the Humming-Bird.* By RICHARD CHAMBERS, Esq., F.L.S., F.Z.S., &c.

THOSE beautiful and delicate little creatures, the jewels of ornithology, which form the race of humming birds, have always attracted the admiration of mankind. The ancient Mexicans used their feathers for superb mantles in the time of Montezuma; and the pictures so much extolled by Cortez were embroidered with their skins. The nation of the Aztecs call their capital Tzinzunzan, from the number of humming birds in its vicinity, with which the statues of their gods are adorned; and the Indians of Patzquara are still famous for this art. They compose figures of saints with the feathers of the colobri, which are remarkable for the delicacy of the execution and the brilliancy of the colours. The Indian could appreciate their loveliness, delighting to adorn his bride with gems and jewellery plucked from the starry frontlets of these beauteous forms.

Every epithet which the ingenuity of language could invent has been employed to depict the richness of their colouring: the lustres of the topaz, of emeralds, and rubies, have been compared with them, and applied to their names. "The hue of roses steeped in liquid fire;" even the "cheveux de l'astre du jour" of the imaginative Buffon, or beams or locks of the sun, their name in the Indian language, fall short of their dazzling and versatile tints.

It was formerly imagined that these birds were nearly confined to the tropical portions of the New World; and, according to our best information, that great archipelago of islands between Florida and the mouths of the Orinoco, with the mainland of the southern continent, until it passes the Tropic of Capricorn, literally swarms with them. In the wild and uncultivated parts, they inhabit those forests of magnificent timber overhung with lianas and the superb tribe of *Bignoniaceæ*. The huge trunks clothed with a rich drapery of parasites, whose blossoms only yield in beauty to the sparkling tints of their airy tenants; but, since the cultivation of various parts of the country, they abound in the gardens, and seem to delight in society, becoming familiar and destitute of fear, hovering over one side of a shrub, while the fruits or flowers are plucked from that opposite. As we recede from the tropics, on either side, the numbers decrease; though some species are found in Mexico, and others in Peru, which do not appear to exist elsewhere. Thus, Mr. Bullock discovered several species at a high elevation, and consequently low temperature; on the lofty table-lands of Mexico and in

the woods in the vicinity of the many mountains of Orizaba; while Captain King, in the late survey of the southern coasts, met with numerous members of this diminutive family flying about in a snow-storm, near the Straits of Magellan; and discovered two species, which he considered undescribed, in the remote island of Juan Fernandez.

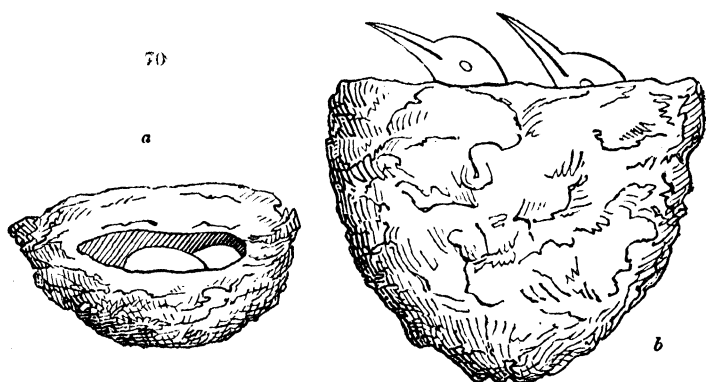
Two species only extend into the northern continent of America: the one, the ruff-necked humming-bird (*Selasphorus rufus* of Swainson), was discovered by Captain Cookin Nootka Sound, and has been traced by Kotzebue to the 61st degree along the western shores; the other, the northern humming-bird (*Tróchilus Cólubris* of Linnæus), which is thus beautifully described by Wilson:—"Though this interesting and beautiful genus of birds comprehends upwards of seventy species, all of which, with a very few exceptions, are natives of America and its adjacent islands, it is yet singular that the species now before us should be the only one of its tribe that ever visits the territory of the United States. According to the observations of Mr. Abbott of Savannah, in Georgia, who has been engaged thirty years in collecting and drawing objects of natural history in that part of the country, the humming-bird makes its first appearance there from the south, about the 23d of March, two weeks earlier than it does in the county of Burke, sixty miles higher up the country towards the interior; and at least five weeks sooner than it reaches this part of Pennsylvania. As it passes on to the northward, as far as the interior of Canada, where it is seen in great numbers, Mr. M'Kenzie speaks of seeing a beautiful humming-bird near the head of the Unjigah, or Peau River, in latitude 54°. Audubon is of opinion that they migrate during the night, passing through the air in long undulations, raising themselves for some distance at an angle of about 40°, and then falling in a curve; but he adds that the smallness of their size precludes the possibility of following them farther than fifty or sixty yards, even with a good glass.

"About the 25th of April, the humming-bird usually arrives in Pennsylvania; and, about the 10th of May, begins to build its nest. This is generally fixed on the upper side of a horizontal branch, not among the twigs, but on the body of the branch itself. Yet I have known instances where it was attached by the side to an old moss-grown trunk; and others where it was fastened on a strong rank stalk, or weed, in the garden; but these cases are rare. In the woods, it very often chooses a white oak sapling to build on; and, in the orchard or garden, selects a pear tree for that purpose. The branch

is seldom more than 10 ft. from the ground. The outward coat of the nest is formed of small pieces of a species of bluish-grey lichen that vegetates on old trees and fences, thickly glued on with the saliva of the bird, giving firmness and consistency to the whole, as well as keeping out moisture. Within this are thick matted layers of the fine wings of certain flying seeds, closely laid together; and, lastly, the downy substance from the great mullein, and from the stalks of the common fern, lines the whole. The base of the nest is continued round the stem of the branch, to which it closely adheres; and, when viewed from below, appears a mere mossy knot, or accidental protuberance. The eggs are two, pure white, and of equal thickness at both ends."

The following extract from a letter by Captain Lyon to a friend in England, dated Gongo Soco, Brazil, March 17. 1829, is taken from the *Zoological Journal*:—

"It may interest you to have an account of some humming-birds, whose hatching and education I studiously attended, as the nest was made in a little orange bush by the side of a frequented walk in my garden. It was composed of the silky down of a plant, and covered with small flat pieces of yellow lichen. The first egg was laid on January 6.; the second, on the 28th; and two little creatures like bees made their appearance, on the morning of February 14. As the young increased in size, the mother built her nest higher and higher; so that, from having at first the form of *fig. 70. a*, it became ultimately like *fig. 70. b*. The old bird sat very close



during a continuance of the heavy rain, for several days and nights. The young remained blind until February the 28th, and flew on the morning of March 7., without previous prac-

tice, as strong and swiftly as the mother; taking their first dart from the nest to a tree about 20 yards distant."

The singularity of this little bird has induced many persons to attempt to raise them from the nest, and accustom them to the cage. Mr. Coffey of Fairfax county, Virginia, raised and kept two, for some months, in a cage, supplying them with honey dissolved in water, on which they readily fed. As the sweetness of the liquid frequently brought small flies and gnats about the cage and cup, the birds amused themselves by snapping at them on the wing, and swallowing them with eagerness; so that these insects formed no inconsiderable part of their food. Mr. Charles Wilson Peale, proprietor of the museum at Philadelphia, had two humming-birds, which he had raised from the nest. They used to fly about the room, and would frequently perch on Mrs. Peale's shoulder to be fed. In the summer of 1803, a nest of young humming-birds was brought to Wilson, that were nearly fit to fly. One of them actually flew out of the window the same evening, and, falling against a wall, was killed. The other refused food; and, the next morning, he could but just perceive that it had life. A lady in the house undertook to be its nurse, placed it in her bosom, and, as it began to revive, dissolved a little sugar in her mouth, into which she thrust its bill; and it sucked with great avidity. In this manner it was brought up until fit for the cage.

The only instance of their being carried to a different climate is thus related by Dr. Latham; and there can be little doubt, from the partial success of these attempts, that great care and great experience, with a more perfect knowledge of their proper food, would enable them to reach this country, and, perhaps, adorn a separate apartment in some conservatory. The European summer birds of passage have been now successfully kept in confinement for several years, and an attempt upon similar principles might prosper.

It was a mango humming-bird (*Tróchilus mángo*), which was successfully brought to England. "A young gentleman, a few days before he sailed from Jamaica for England, met with a female humming-bird sitting on the nest and eggs; and, cutting off the twig, he brought all together on board. The bird became sufficiently tame to suffer herself to be fed on honey and water during the passage, and hatched two young ones. The mother, however, did not long survive; but the young were brought to England, and continued for some time in the possession of Lady Hammond. The little creatures readily took honey from the lips of Lady Hammond; and,

though one did not live long, the other survived for at least two months from the time of their arrival."

I was lately informed by Miss Tuckerman, daughter of Dr. Tuckerman of Boston, that humming-birds are readily bred in cages in that city; and she was astonished when I told her that only one instance had occurred of their being domesticated in England. She observed that the climate of Boston, and that of England so nearly approximated, that she was convinced they could be bred in this country were the same attention paid to them as in America.

These remarks are only those of an ardent admirer of nature, not of an ornithologist: I skim the surface, not attempting at the soaring scientific flights of a Wilson, an Audubon, or a Yarrell. The remarks I have made, I know, are trifling; but, according to Dr. Johnson, man is a trifling animal, and every trifle that can arouse the attention of a fellow trifler at least is productive of pleasurable sensations, and may improve him, by adding to the stock of his trifling ideas. Before we condemn trifles, let us bear in mind what they have produced. The trifling incident of an apple falling from a tree gave rise to that train of ideas in Sir Isaac Newton which led to the discovery of the attraction of gravitation; a ladybird pouncing on a letter that Mr. Kirby was writing led him to the study of entomology; and the sight of a trifling moss (hardly half an inch high) in fructification, made the heroic Mungo Park hope against hope when in the midst of his distresses and privations, and inspired him with that confidence in the overruling love of the Great Spirit of the universe, that despondency forsook him, hope cheered him, and success crowned his endeavours.

ART. VII. *Remarks on some of the Marine Animals met with during a Sea Voyage.* By J. B. PEACOCK, Esq.

THERE are few subjects which attract more attention, during a voyage, than the multitudes of marine animals which, in all latitudes, from the mouth of the Thames to the shores of the Indian Ocean, are continually floating past a ship; and, as the works on these subjects are generally too voluminous to be in the possession of ordinary voyagers, it may not be without its use to furnish a few remarks on these animals. They consist chiefly of that class to which Cuvier, from the destructive property possessed by most of them, of irritating the skin, has applied the term *Acalèphæ*; and they are commonly known as the sea-nettles, or blubber-fish, of sailors.

They are defined by Cuvier to be a class of "animals swimming in the water of the ocean, in whose organisation we can still perceive vessels, which, however, are generally mere productions of the intestines, excavated in the parenchyma of the body." They are divided by him into the *Symphixia*, *Medusæ*, properly so called, or the bell-shaped sea nettles of our coast; and into the *Hydrostáticae*, those provided with a natatory sac, or air vesicle. A more useful arrangement, however, for practical purposes, is that of M. Lesson, quoted in a note to an article on this subject in the *Cyclopædia of Anatomy and Physiology*. It consists in their division into those possessing a solid axis, as the *Vellélla*, *Porpita*; and into those composed entirely of a soft gelatinous mass, as the *Physalus*, *Medusa*, &c. This class being subdivided into the simple, of which the second species affords an example; and into the aggregated, the body being composed of more than one individual, or possessing supplementary organs, as the air vesicle of the *Physalus*.

The number of these animals now known is considerable; Eschscholtz having, as stated by Dr. Coldstream in the article to which we have referred, described 200 species. In the degree of their organisation, they are found to differ widely. The digestive organs consist, in those having a solid axis, of an oval aperture leading into an elongated stomach, with which the tentacula around the mouth communicate. In those possessing an air vesicle, the digestive organ is a sac situated below it, with which the tentacula are in connexion; and, in the *Medusæ*, the stomach forms a branched cavity within the bell-shaped mouth; and the oval apertures are sometimes one only, situated between its leaf-shaped processes; sometimes dorsal at the extremity of each process; and in some cases there is a complete passage through the mouth of the animal. In some of these animals, a nervous system cannot be detected; nor do the habits of the animal render its existence probable, as is the case with the *Physalus*. In the *Vellélla*, I saw, in some specimens which I examined, several delicate white cords external to the stomach, which may probably constitute a rudimentary nervous system; and in the *Medusæ*, some of which (as the *M. aurita*) have eyes developed from the margins of their mantle, and highly irritable tentacula, nervous cords are observed surrounding the mantle and mouth, and having ganglions upon them, from which those organs receive their supply.

As it is only my intention to dwell upon one or two kinds of these animals, which I have had an opportunity of examining, I will speak of the *Physalus*. This species (generally

known by sailors as the Portuguese man-of-war) is commonly met with in tropical seas; but the largest which I have seen (the air sac measuring about 6 in. in length, and 3 or 4 inches in depth) was met with on the edge of soundings in the Channel.

The following is the account of it which, after a careful examination, I inserted in my note-book. The form of the air vesicle is not unlike that of the human stomach; having a convex and concave margin; the former being the lower, and having the tentacula attached to it. The upper is surmounted by a crest, bearing some resemblance to the appendiculæ epiploicæ of the colon. The vesicle terminates obtusely at each extremity; the beautiful blue or purple tint so delicately suffused over all the membrane here becoming darker, and occasionally, when first taken out of the water, of a bright pink colour. On compression, air escapes from the sac by small orifices at each extremity; a circumstance which induced Blainville to regard this as the digestive organ; an idea contradicted by the uniform absence of any remains of alimentary matter on its internal surface, and by its having no communication with the cavities of the tentacula. It is said to possess orifices opening into the crest; but, in the specimens which I have examined, I did not detect them. The tentacula are of two kinds; the short ones, which are very numerous; and others which, though few in number, attain the length of several feet. The latter consist of a transparent and tubular portion, and a blue-coloured string of vesicles. The tubular portion gradually dilates as it approaches the inferior surface of the body of the animal; till, when inflated, it presents an elongated sac; the other portion remaining unaffected, and, therefore, probably not having any communication with it; these unite with several of the smaller tentacula; and then pierce the inferior membrane of the sac so as to open by an oblique aperture, covered by a valvular fold of membrane, not into the cavity of the vesicle itself, but into one situated below it, and separated from it by a thin and transparent fold of membrane; the sac thus formed being the digestive cavity: there are five or six of these large apertures. The power of stinging, which is so characteristic in the *Physalus*, is possessed by the tentacula alone, and exists only during the life of the animal; no irritating property being communicated to fluid in which it is macerated. Towels, however, which have been used to wipe the hands, after touching it, will produce irritation, when applied to the skin, after several days. This property is, doubtless, the means by which the fish entangled in its lengthy tentacula are destroyed, they being

often seen drawn close to the body of the animal, and partially dissolved.

The light blue, purple, and pink tints possessed by the *Physàlia* soon fade after being removed from the water.

The *Medùsæ* are more frequently seen than the *Physàlia*, and are more extensive in their distribution. Masses of these fishes are continually seen lying on our shores, or swimming in our estuaries by the contractions and expansions of their bell-shaped mantle. Their size is very various: generally, those I have seen in the tropics are small, but often they attain a large size. They consist of a mantle, which is hemispherical, convex before, concave behind, and having tentacula projecting from the margin of the mantle, and broad processes from the centre of its concave surface. The commonest form possess four larger leaf-shaped processes, and eight marginal tentacula; and are of a yellowish or brownish colour throughout. On the convex margin of the mantle, there is a central dark spot, from which lines radiate to its circumference: of these I have generally counted about thirty-two; and they constitute the narrow cords described by Dr. Grant. The digestive cavity is situated within the mantle, and branches towards its circumference: the aperture is situated below, between the roots of the leaf-shaped processes. John Hunter, and, since his time, Cuvier, regarded the digestive canal as acting also the part of a circulating organ; and it is probable that, besides these functions, the water flowing through it is accessory to the respiration of the animal. When first captured, the motions of these little animals are extremely active, swimming by the contraction and expansion of their mantles; whirling round, and turning backwards, when they meet with any obstacle. Their size I have stated to vary greatly; and their form and colour are not less subject to variety: this may be in the shape of the mantle, the number of the tentacula, or the number and shape of their leaf-like processes.

Perhaps, however, the most common forms of *Acalèphæ* are the *Vellèllæ*; these having a cartilaginous dorsal plate, from which projects a vertical one. They are common in our seas, exceedingly so off the Cape of Good Hope, where they form an article of food to the numerous sea-fowl, and, it is said, of whales; and almost cover the sea in a calm in the tropics. In length, they are 2 or 3 inches, and $\frac{3}{4}$ in. in breadth; but often they do not attain this size. Their horizontal plate is of an oblong form, crossed diagonally by the vertical one, which is somewhat semivalvular. The border of the first supports externally the deep blue mantle, and, below, the tentacula, the

outer of which are pointed; the inner have acetabula, or suckers, at their extremity; and seem, from partaking of the discoloration of the stomach, to communicate with that organ. In the centre of these is situated a tubular mouth, leading into a simple stomach; and external to this lie the delicate cords I have described as nervous. The plates are firm and resistant, the horizontal one appearing to be composed of series of imbricæ concentric to the apex, from which, also, radii extend towards the circumference of each. The plates would appear to consist of two laminæ; the upper portion of the horizontal one being elevated, to form the vertical plate; while the lower is continued across; since they separate freely, leaving glistening surfaces in the direction which would result from such an arrangement. When off Tristan d'Acunha, we saw numerous Velléllæ, almost all of which had become the nucleus to which common barnacles (the *Pentalismus Annátifa*) had attached themselves; the valves, however, covering their cirri consisting only of cartilage, without any intermixture of carbonate of lime.

It is not, however, the Acalèphæ alone which fall in our way at sea; there are numerous animals of the order Tunicàta, the first division of Cuvier's class of Mollúsca, which are met with. These animals show considerably greater advancement in the chain of animal organisation than those we have described: they are enclosed in an elastic membrane, with two openings, by which the water is made to circulate through it, to afford them nourishment, and effect the aeration of their fluids: they have ciliated branchiæ, an oral and anal aperture, a stomach, sympathetic ganglia, and a circulatory apparatus. To this class of animals belongs the beautiful *Pyrosòma*; consisting of an aggregate of minute, globular, transparent bodies, enclosed in a common sheath, open at each extremity, through which the water circulates. Its motions are effected by the expansion and contraction of each animalcule; and, during these, it throws out the most brilliant flashes of phosphorescence. Early one morning, when off Cape Lagullas, the sea was literally covered by long strings of what I then took to be some species of spawn, but which I now recognise as masses of one of the animals of this class, the *Sálpæ*; probably the *Sálpa confederàta*, since it closely resembled the specimen of this animal preserved in the museum of the College of Surgeons. These cords, often nearly a yard long, presented a curious serpentine movement from the slight swell of the sea, for it was nearly calm. Upon examination, they proved to consist of transparent ovoid masses, about the size of a nut, strung together in such a way as to give a beautiful beaded

appearance, and bear a fancied resemblance to a bracelet; yet so delicate was their connexion, that their own weight, and the force of the falling water when raised in a landing net, seldom left many pieces together. Each portion presented a dark purple spot at one extremity, with a still darker spark in its centre, from which proceeded two pinkish-coloured branches, to unite at the other extremity. The animals continued floating on the sea, till, a breeze suddenly springing up, they sank. For several days preceding we had observed much phosphorescence, with light s. and s. w. winds: it is, in fact, to the *Pyrosoma*, *Sálpæ*, and other allied genera, that phosphorescence is chiefly ascribable; yet the greatest degree to which I have seen it prevail was in the absence of any animals of this kind; at least, of such a size as to be detected without powerful magnifiers, and on a cursory examination. On this occasion, we had, however, proofs of its depending on some form of animalcula; since, during the day, the sea had the green and dirty appearance which we observe in shallow water; very different from its deep blue transparency when out of soundings. It was in the Atlantic, in the latitude of the Cape de Verd Islands, and continued several nights; the ship appearing to traverse a sea of fire; the flashes of light thrown up by the spray being sufficient to illuminate the deck and rigging, though the absence of the moon, and the thickness of the weather, would otherwise have caused the nights to be dark.

August 17. 1837.

ART. VIII. *List of Lepidopterous Insects, found in the Neighbourhood of Witham, Essex.* By EDWARD H. BURNELL, Esq.

I HAVE sent a list of some of the principal lepidopterous insects, taken in this neighbourhood, for your Magazine, should you consider it worth insertion. The only thing that induces me so to do is, the fact that this spot is quite neglected by all but a very few resident entomologists; and the list may be interesting to some of your Essex readers, if to no others. It is as perfect as I can make it, as far as *Papilionæ*, *Sphingina*, and *Bombacina* are concerned; while only a few of the species of the remaining divisions are noticed.

PAPILIONÆS.

Gonépteryx rhámni.
Póntia brássicæ.
rápa.

Póntia nàpi.
Mancípium cardámines.
Leucophàsia lóti. Rather scarce.
Melitæ'a Athàlia. Two specimens

- were taken in June last, which were the first that were seen in the neighbourhood.
- Melitæ* a *Silène*. Not very common.
- Euphrósyne*. Abundant.
- Argýnnis Páphia*. Some seasons very common, and particularly so this year in one wood, about a mile from the town, where they actually swarmed.
- Adíppe*. Not very common.
- Cómma C. álbum*. Very rare: perhaps it can hardly be called a Witham insect, as the only specimen we have was taken 5 miles off, in Eastlands Wood, near Maldon.
- Vanéssa Polychlóros*. Abundant.
- I'o*.
urticæ.
- Ammirális Atalánta*. Not very common.
- Cýnthia cárdui*. Rather scarce.
- Apatúra Iris*. Some seasons not very scarce.
- Hippárchia Ægèria*.
Megæ'ra.
Sémele. Common on Tophill Heath.
- Tithònus*.
Janíra.
Hyperánthus.
Pámphilus.
- Thècla bétulæ*. Two specimens were taken, for the first time, Sept. 5. 1837, and two more a few days afterwards: all four were females.
- W. álbum* occurred rather plentifully this year, and in 1832; but in none of the intervening seasons.
- quercus*. Common.
- rubi*. Very rare: we have but one specimen.
- Lycæ'na Phlæ'as*. Rather common.
- Polyómmatas Argiolus*. Common in the spring, and sparingly in the autumn.
- Aléxis*.
Agéstis. Scarce.
- Thýmele alvéolus*. Not very common.
- Pámphila línea*.
Sylvànus.
- SPRINGI'NA.
- I'no státics*. Rather uncommon.
- Anthrócera filipéndulæ*. Not very common.
- Smerínthus ocellátus*.
pópuli.
tília.
- Acheróntia A'tropos*. Rare: we have but two specimens, though the larva is occasionally met with.
- Sphínx ligústri*. Common.
- Deilléphila Elpènor*. Not common.
- Porcéllus*. Scarce. It has been taken twice: once on July 26. 1836; and again, when flying over the flowers of the honeysuckle, July 31. 1837.
- Macroglóssa stellatàrum*.
- Sèsia bombylifórmis*. Scarce: four specimens were taken this season.
- Ægèria tipulifórmis*.
mutillæfórmis.
- BOMBYCI'NA.
- Hepíalus Héctus*. Scarce.
lupúlinus.
húmuli.
- Zeuzèra æ'sculi*. Not very scarce.
- Cóssus Lignipérda*. Rather uncommon.
- Pygæ'ra bucéphala*. Abundant.
- Clóstera cúrtula*. Very rare: we have one specimen only, which was bred from the larva, and appeared July 18. 1836.
- Episèma cæruleocéphala*. Common.
- Cerúra fúrcula*. Rare.
Vínula. Not common.
- Lophópteryx Camellína*. Common.
- Satúrnia Pavónia minor*. Rather common.
- Lasiocámpa rúbi*. We not unfrequently find the larva, but have never succeeded in rearing; nor have we ever taken the imago.
- róboris*. Common.
- Trichiúra cratæ'gi*. Rather scarce.
- Pæcilocámpa pópuli*. Rare.
- Eriogáster lanéstris*. Not scarce.
- Clisiocámpa Neústria*. Very common.
- Odonéstis potatòria*.
- Gastrópacha quercifólia*. Rare.
- Psilúra monàcha*. Found rather plentifully this year by one collector; though, till this season, it was considered very rare.
- Dasychira pudibúnda*.
Orgýia antiqua.
Porthèsia chrysorrhæ'a. Abundant.
aúrflua. This insect has been

taken here, but has quite disappeared lately; none having been taken for several seasons.

A'rtia Cāja.

villica. Rather scarce.

Phragmatobia fuliginosa. Scarce.

Spilosoma menthastri.

lubricépda.

Diaphora mendica. The females taken rather plentifully this spring, but only one male.

Fumea muscélla. Scarce.

Nudaria hemerobia. Scarce.

NOCTU'NA.

Callimorpha jacobæ'æ. Uncommon.

Lithosia auréola. Uncommon.

complana.

quadra. Uncommon.

Triphæ'na Orbôna. Common.

prônuba. Common.

fimbria. Rare: once taken in a garden, July, 1836; and fragments have likewise been met with.

interjecta. Not very common.

Ianthina. Not rare.

A'grotis ségetum.

exclamatiônis.

Graphiphora plécta.

Semiophora góthica.

Orthosia instábilis.

Amphipyra pyramídea. Scarce: two specimens have been taken this year.

Dipterygia pinástri. Rare.

Næ'nia típica. Variable: in some seasons plentiful; in others, none are to be found.

Xylia pùtris.

Xylophasia lithoxýlea.

polyodon.

Maméstra pisi.

brássicæ.

persicariæ. Rather rare.

Eupléxia lucípara. Not common.

Apamèa ocúlea.

ràva.

Misélia oxyacanthæ. Rare.

aprilina. Rare.

Pòlia bimaculôsa. Uncommon.

flavocincta. Common.

dysòdea.

Seladônia. Rather scarce.

Acronýcta psi.

tridens.

rùmicis.

Thyatira deràsa. Uncommon.

Bàtis. Very rare.

Calýptra libàtrix.

Cósmia diffinis.

affinis.

Xánthia flavàgo.

?gilvago. One specimen only.

Lucània impùra.

Phlogóphora meticulôsa.

Cucúllia verbàsci. Not common.

umbrática. Rather rare.

Arbróstola triplàsia.

Plùsia iôta.

gámma.

Chrysitis.

festicæ. Rare.

Anárta heliaca.

Mórmo maúra.

Catocàla núpta. Common.

Brèpha Parthénias. Scarce.

Euclídia mì. Scarce.

GEOMETRI'NA ET TORTRICI'NA.

Anisópteryx leucopheària.

æsculària.

Biston prodromàrius. Scarce.

betulàrius. Common.

hirtàrius. Rather scarce.

Himèra pennària.

Crocállis elinguària.

Geómetra erosària.

angulària.

Juliària.

Angeròna prunària.

Rùmia cratægàta.

Ourápteryx sambucària.

Campæ'a margaritàta.

Hippàrchus papilionàrius.

Chloríssa thymiària.

putalària.

Cleòra bajulària.

A'lcis rhomboidària.

Hemeróphila abruptària.

Hàlia vauària.

Cabèra pusària.

exanthémata.

Bradyépetes amatària.

Eurymène dolobrària.

Phasiàne plumbària.

Laréntia cervinària.

Harpályce fulvàta.

ocellàta.

biangulàta.

Cidària fluctuàta.

Polyphàsia centumnotàtum.

Steganolòphia prunàta.

Anticleà derivàta.

rubidàta.

Abráxas grossulariàta.
 Xerène procellàta.
 Lozogramma petrària.
 Chèsius spartiàta.
 Cheimatòbia vulgàris.
 rupicaprària.
 Bápta punctàta.
 Strènia clathràta.
 Venílla maculària.
 Pæcilophàsia marginàta.
 Timándra Imitària.
 Cilix compréssa.
 Hypèna proboscidiàlis.
 Pýralis farinàlis.
 Agrotèra costàlis.
 Hydrocàmpa sambucàta.

Hyd. potamogàta.
 nymphæàta.
 lemnàta.
 Bòtys forficàlis.
 urticàta.
 Margarítia verticàlis.
 limbàlis.
 Tórtrix viridàna.
 Crámbus margaritéllus.
 Adèla viridélla.
 DeGeerélla.
 Yponomeùta Padèlla.
 Pteróphorus pentadàctylus.
 fureodàctylus.
 Alucìta hexadàctyla.

Witham, Oct. 3. 1837.

SHORT COMMUNICATIONS, SCIENTIFIC INTELLIGENCE, ETC.

CORROSIVE Quality of earthy Substances.—M. C. Moritz, a German, who is now travelling in the north of South America, and whose letters are now successively publishing in the *Berlinische Nachrichten*, passed near Guigue, over tracts from which the lake has retired, the former extent of it being indicated by strata of little petrified fresh-water shells of the same species, which are still living in the lake. The dust which arises from the pulverisation of these shell-beds has a corrosive quality, and, when brought into contact with the human skin, causes a very disagreeable burning sensation, from which M. Moritz had much to suffer, and which he ascribes to the remains of the helicitæ. The inhabitants of the district use to say, *El arena de la laguna pica*. It appears, however, that this quality of the dust is to be accounted for by the admixture of saline particles, as M. Michel Chevalier was annoyed in the same manner, in 1835, when travelling in Mexico over those beds of ancient lakes, which, by the laceration of their high banks through earthquakes, have been changed into dry savannahs. These lakes appear to have been salt, as there are many extensive deposits of rock-salt, and as the ground is, in many places, so impregnated with muriate of soda, that it is altogether unfit for cultivation.—*W. Weissenborn. Weimar, July, 1837.*

Objections to the Nomenclature employed by Mr. Ogilby.—I beg to make a few remarks on the nomenclature adopted by Mr. Ogilby in his excellent paper on the Cheirópoda in

your last Number. There is a very convenient rule now generally adopted by naturalists, that the name of a *family* (i. e. of the next larger group to the *genus*) should be compounded of the name of the most typical or best known *genus* contained in it, with the termination *idæ* or *adæ*. See *Mag. Nat. Hist.*, Vol. I. n. s. p. 175., Rule 18. Mr. Ogilby's families of Lemuridæ and Didelphidæ (at p. 525.) are named conformably to this rule. But I am sorry that Mr. Ogilby has departed from it in three other instances. His family *Símia* should have been called *Simiadaæ*, after the *genus* *Símia* (*Pithécus*) contained in it. For the same reason, his family name of *Simiadaæ* is objectionable as applied to the anthropoid *Pedimana*, from its leading to the inference that the *genus* *Símia* belongs to that group. Would not the name *Cébidæ* be preferable? Again, the term *Glíridæ* implies that a *genus* *Glís* is contained in that family. The appropriate term is obviously *Cheiromyidæ*.

I must also remark that, when the name of a *genus* has once become well established, it should never be dropped, whatever be the subdivisions into which it may become necessary to break up that *genus*. The usual custom is to retain the original term for the most typical or most familiarly known of the subordinate groups. With this view, I think that the term *Símia*, given by Linnæus to the whole monkey tribe, should be retained for the orang-outangs, instead of Geoffroy's name *Pithécus*. — *H. E. Strickland. Oct. 20. 1837.*

The Green Sandpiper. — Observing at p. 555., as well as in other instances, that the *Tótanus óchropus* is still currently regarded as a *rara avis*, or, at least, as a species of which the occurrence of British specimens is deemed worthy of being reported, it may be worth while to remark, that such is far from being the case; as, in several of the southern counties, this bird is not very unfrequent, and examples of it are met with every spring and autumn within a few miles of the metropolis, chiefly in marshy places, contiguous to the Thames; and occasionally, in spring more especially, along small brooks or water-courses, which appear to be its most appropriate habitat. I have every reason to believe that they breed in Surrey, having seen a very young one, shot near Godalming, with its primaries incompletely developed. During a recent tour, I observed several of these birds, principally in a small salt-water marsh, lying westward of Yarmouth, in the Isle of Wight, where I tried to study their manners a little, though unsuccessfully; as, although they frequently rose within gunshot (the adults solitary, or in pairs, the young in groups of

three or four—the amount of broods), the nature of the place, a sedge-tufted morass, intersected in every direction by tortuous muddy channels, covered at high tide, was more favourable for the collection of specimens than for the purpose I had in view; though, even with the former intent, the gunner would often meet with disappointment, in consequence of his birds falling upon the soft mud, where they could not be picked up, or, in the event of their being obtained, if not killed outright, they would commonly be so much soiled, that it became a hopeless task to restore them to their pristine beauty; for it was remarked, that the species in question, whenever put up, followed all the abrupt windings of the muddy channels whereon it sought its food, deviating from them even less than the *T. hypoleucus*, which abounded in the same locality: it was decidedly much more timorous than the last-named species, appearing to take wing (generally with a whistling note, its conspicuous white rump at once distinguishing it) at first sight of me; whereas the other, if not suddenly come upon, would trip about and feed quite unconcernedly in my presence, within a dozen yards' distance. During high tide, I flushed a single adult of *T. óchropus* beside a small pond, adjoining a farm-yard, about a mile and a half inland; and another upon the muddy shore. Both species were then (the first week in August) most excessively fat, and, consequently, extremely difficult to prepare: they subsisted, for the most part, on minute crustaceans. I know of a beautiful pair of green sandpipers, that were obtained in the London market during the third week of last August; and also of one specimen killed in February. — *E. Blyth. Oct. 7. 1837.*

Notice respecting Victòria regàlis.—You are, perhaps, aware, by this time, that the plant which Mr. Schomburgh has named *Victòria regina*, thinking that he had discovered it, is, beyond all doubt, the same as that which Dr. Pöppig found in the river Marañon, and described first in a letter, dated “River Marañon, below Montalegre, end of March, 1832.” He named it *Euryale amazónica*; and, if the permission of keeping up the other name cannot be obtained from Dr. Pöppig, I am afraid it must be withdrawn. The description first published by Dr. Pöppig, in No. 757. of V. Froriep's *Notizen aus dem Geb. d. Nat. u. Heilkunde*, November, 1832, runs thus:—“*Euryale amazonica Pöppig. E. aculeatissima, foliis orbiculatis, peltatis, dichotomo-nervosis, supra bullatis, subtus cellulosis. Descriptio: Caulis nullus. Petioli ac pedunculi 1—2 orgyales, teretes, diametro 1—2 pollicari, uti et reliqua planta, petalis solum exceptis, aculeis innumeris*

acutissimis vestiti. Folia natantia, recentius aperta diametro 3—4 pedali, seniora sæpe 6 pedes lata, supra concava, margine teneriore plano horizontali, centro infra aquarum superficiem depresso; pagina superior bullis innumeris, juglandis magnitudine obsessa, inferior ob nervos et processus membranaceos reticulatos transversos, in cellulas quadrangulares, pollicis cubici magnitudinem æquantes, divisa. Nervi radiati dichotomi, ancipites, valde prominentes, processibus reticulatis membranaceis invicem juncti. Substantia folii tenerior, colore supra pallide viridi Pistiæ, subtus lurido. Flos speciosissimus, apertus diametro pollicum Anglicorum novem ad decem, odore debili haud ingrato. Calyx campanulatus, limbo lato 4-fido, aculeatissimus, coriaceus, cinereus. Petala seriebus quinque eadem altitudine cum calycis lobis inserta, oblonga, exteriora nivea, interiora versicolora, primum sanguinea, dein violaceo-purpurea. Stamina 40—50, ante petala inserta, in strobilum valde depressum conniventia. Filamenta lanceolata, coriacea, acuta, 18 lin. longa, exterius sæpius sterilibus. Antheræ cum filamentis arcte connatæ, iisque infra apicem adnatæ, biloculares, loculis valde sejunctis, lateralibus, ab apice inde dehiscentibus. Ovarium cum calyce connatum, toro concavo, multoloculare. Stylus brevis, conicus, crassus, stigma unicum indivisum radiatum. Bacca immatura fere magnitudine pomi majoris, multilocularis, loculis 5—6 spermis, interstitiis fungosis. Semina immatura pisi magnitudine, dura, nigra, parietibus loculorum adfixa. Embryo obovatus, basilari-lateralis.—Planta congenerum facile speciosissima a Brasiliensibus vocatur Mururú, floribus splendidissimis ornatur tempore pluviarum a mense Januario inde; fructus qui aurantii dicuntur tardius perficit, maturi quidem ad fundum aquarum usque descendunt, ubi semina emittunt. Crescit in aquis profundis sed mansionibus (mansuetioribus?) fluminis Amazonarum, versus confluentem Teffé."

Plants of the genus *Euryale* had, till now, only been found in the East Indies, according to De Candolle. — *W. Weissenborn. Weimar, Oct. 20. 1837.*

Change of Plumage in the Guillemot.—Having been absent from Plymouth last month, I did not obtain your September Number until a few days since, in which I notice Mr. Blyth's comment on my observations respecting the greater and lesser, or old and young, guillemot. Your able correspondent will observe that, while stating the apparent anomaly regarding these birds, I have not presumed to impugn the authority of Temminck and others by making them distinct in my list.

Mr. Blyth is correct in his account of the plumage of the young when just fledged, as I have one in that state, which I obtained at the Bass Rock a few years ago.* I have five specimens now before me, killed in winter, according with Temminck's description of the bird at that season: two of these I shot on Feb. 20. 1830, the very day on which I obtained another, in its wedding dress; which I was certainly surprised to see, not being then aware that the old birds changed their plumage earlier than the young.

With regard to the razor-billed and black-billed auk, I do not doubt the identity of the two; although, in stating that they are scarce in the adult plumage, I alluded more particularly to Plymouth, as I am aware that they are abundant at Lundy in the breeding season. The shape and size of the bill affords a distinction between the young and old; and most of the specimens I have seen here in winter were young birds, being destitute of the elevation at the base, and of the white furrow in the centre of the bill. I am not certain of the precise period at which this white line on the bill is acquired, but suspect that it is during the second year; as I shot a specimen in August, 1831, having the bill equally pointed, but slightly broader than that of the black-billed auk, which has the white furrow on it: but then it has the white cheeks of winter, and is therefore, I presume, a young bird of the second year, already decked in its winter garb.

I do not doubt that the difficulties respecting the change of plumage in birds may be overcome by proper attention on the part of those who have good opportunities of investigation; and I shall look forward, with pleasure, to the appearance of Mr. Blyth's forthcoming work on the subject. — *Edward Moore. Plymouth, Oct. 10. 1837.*

Domestication of Grouse. — The gamekeeper of Joseph Fielden, Esq., of Wilton House, near Blackburn, kept a male red grouse (*Lagopus britannicus*) in a state of domestication for six years. I believe the bird was supplied with fresh ling every day, or every second day. It died February 1. 1835. *John Skaife. Blackburn, Lancashire, August 4. 1837.*

* This bird was knocked off its ledge of rock by a falling kittiwake which I had shot; and, although it doubtless had never been in the water before (its wing feathers being scarcely half an inch long, and its whole surface downy), it seemed fully sensible of the purposes for which its legs were intended, as it continually evaded my grasp by diving. Having at last caught it, I took it to Edinburgh, where it survived a week.

THE MAGAZINE OF NATURAL HISTORY.

DECEMBER, 1837.

ART. I. *Historical Notice of Antoine Laurent De Jussieu.**
By M. AD. BRONGNIART.

(Translated from the *Annales des Sciences Naturelles*, January, 1837.)

THERE are, in the scientific world, men who have been occupied during their whole lives with a single idea, but that idea, great, important, and fertile in consequences; and whose labours, though apparently of less extent than those of many others, engaged in similar pursuits, have, nevertheless, exercised an immense influence upon the march of the sciences; because these labours are often the base of the edifice constructed by their contemporaries or their successors.

The individual to whose memory we wish to consecrate some pages, a man distinguished throughout the world of science, and venerated by all who knew him, was an instance of this. It might be said, that to a single volume the whole of his reputation may be attributed: his preceding works were but the prelude to it; those which have followed it were only its further developement; and, notwithstanding their importance, every one will acknowledge that they were not necessary to add to the reputation of A. L. De Jussieu; for this unique volume was the *Genera Plantarum, secundum Ordines Naturales disposita*; and it contained the most profound exposition of the whole of the vegetable kingdom; an exposition as elevated in its principles as it is perfect in its details. It was sufficient, without doubt, to confer on its author the high reputation which he enjoyed, and which has gone on to increase in proportion as this work has been better known, and its principles have been sifted, discussed,

* The above translation was sent to the *Magazine of Natural History* immediately after the publication of the original memoir; and, being furnished by a correspondent to whom we are indebted for the previous translations in the present volume, we have availed ourselves of it, although we are aware that a translation of the same article has appeared in the *Magazine of Zoology and Botany*.

and applied, both by A. L. De Jussieu himself, and by the botanists who have trod in his steps.

Indeed, what more convincing proof could be given of the superiority of the grounds upon which this method has been established, than its general adoption by all the most distinguished botanists of Europe; who have, without doubt, modified, and sometimes improved upon it; but who have all taken the work of Jussieu for their starting points, from which the greater part have very little differed, or scarcely in any degree departed.

We may ask, however, whether the natural method, such as it is displayed in the admirable work of A. L. De Jussieu, is destined to a permanent reign; whether it is, in a word, the method that comes nearest to nature; or whether, like many other systems, it is destined soon to be replaced by some other. If we consulted only the history of the sciences, and in particular that of botany, we should be disposed to believe that Jussieu's method would only enjoy a predominance of greater or less duration, like the systems of Ray, Tournefort, Linnæus, &c.; and would afterwards be replaced by some method more in unison with the progress of the sciences.

If we consider only the systematic parts of Jussieu's work, we can foresee that important changes may be made in some points of this part of his work; and already modifications of greater or less value have been proposed by the numerous scientific men who have embraced this department of science. But will this modified method still owe its origin to the rules established by Bernard and Antoine Laurent De Jussieu? I think we may say beforehand, that, whatever may be the method which shall arise from future investigation, it will be founded upon the principles admitted by these illustrious naturalists, and, consequently, will be but their system brought to perfection, and not an entirely new one.

This opinion naturally results from an examination of the principles which have directed these celebrated botanists in their labours, and from observing the track followed in this branch of science since the publication of the *Genera*. But let us for a moment examine the origin of this method, the first attempts which were made to develop some parts of the system, and the state in which this branch of botany was when A. L. De Jussieu really introduced it into the sciences.

The greater part of the classifications which preceded that of Jussieu had for their object the distribution of vegetables upon a system which should facilitate their determin-

ation, rather than the connecting them with each other in natural groups. Some eminent botanists, however, had partially detected the importance of those characters which were calculated for dividing the vegetable kingdom into great natural classes. Thus Ray since 1682, and Boerhaave in 1710, had recognised the value of the characters furnished by the embryo, and the distinction of monocotyledonous and dicotyledonous plants, though they often applied this principle inaccurately; but the rest of their classification, though preserving, like all the other systems, a tolerable number of natural groups, is too systematic not to introduce many which are completely artificial. Besides, all the old methods admit the separation of trees and herbs, which frequently destroys all natural relations.

Linnæus also, who occasioned so great an advance in botany by the precision which he introduced into this science, from the simplicity of his sexual system, and by his sagacious investigation of the most striking phenomena of vegetable life, ought, according to the prepossession of his numerous disciples, to be looked upon more especially as the leader of a systematic school, though he positively declared that he had directed his utmost efforts at laying the foundations of a natural method, of which he has presented the outline in his *Classes Plantarum*, in 1738, and a new edition in his *Philosophia Botanica*, in 1750.

He always esteemed this method above every other, and considered it as the essential object of the science: but it must be owned that, if he first attempted to point out some fragments of it (*fragmenta methodi naturalis*), as he himself expresses it, these fragments were nevertheless very imperfect in many points; for, among sixty-seven groups which he has established, only half are tolerably similar to those which have been retained, the others uniting genera belonging to very different families.

Besides which, he has never pointed out the characters of these groups, nor the principles which had directed him in forming them: we might even believe that it was rather by that natural perception of relations, which a botanist of such penetration must necessarily possess, that he has allowed himself to be directed, than by a profound and comparative study of the organisation of the different genera which he has associated in each of his groups. We even perceive that no fixed principle guided him in the formation of these different natural orders; for in some (the *Sarmentacææ* for example) the dicotyledonous and the monocotyledonous plants are mingled almost in an equal number; in others, the

monopetalous and polypetalous are so, as his *Dumòsæ* and *Vepréculæ*.

After Linnæus followed Adanson, and Bernard De Jussieu, who both, at nearly the same time, devoted themselves to the study of the natural method.

Adanson, struck with the variety of the then established system, and perceiving that, notwithstanding the diversity of the principles upon which they were founded, the greater part agreed in preserving untouched certain groups which the perception of natural relations pointed out to all the world as naturally formed, thought that, by expressly multiplying systems, in founding them upon all the organs, and all the observations which these organs could furnish, we should thus render apparent all the relations which exist between different vegetables; and that, by classing together in one family such of these genera as should be united in the greatest number of these artificial systems, we should arrive at a true natural classification. With this object before him, he established sixty-five different systems, founded, sometimes upon characters of real value, sometimes upon such as were of trivial importance, and almost impossible to define. From which it has resulted, that, assigning an almost equal value to these different systems, the general classification which he has deduced from them, far from being more perfect than that of Linnæus, embodies a smaller proportion of the natural relations. In fact, if, in order to judge by comparison of the two systems, we apply to them the principles admitted by Adanson himself, in order to judge of the system which had preceded him; that is to say, if we examine how many there are of these groups, which, notwithstanding the progress of the study of the natural families, have continued to be admitted, or correspond to two or three families, which our methods still leave beside one another, we shall find that, among the sixty-seven families of Linnæus, thirty-four have undergone scarcely any alteration; whilst, out of fifty-eight families established by Adanson, only twenty-six can stand the same test. Thus, the result of Adanson's long and difficult labour, at an epoch when science had made fresh progress, has conducted him to a result which comes no nearer to the truth than that of Linnæus.

We ought, however, to observe, that Linnæus, conscious of the imperfect condition of the knowledge possessed in his time with respect to the natural classification of vegetables, had left at the end of his method, under the title of "*Vagæ et etiamnum incertæ Sedis*," a tolerably numerous assemblage of genera, but little known, and whose position appeared to

him doubtful; whilst Adanson, believing his method almost infallible, endeavoured to class them all; and this attempt to exceed the knowledge of his period has, perhaps, been the cause of many of the unnatural relations which he has established. It would, nevertheless, be unjust not to acknowledge that there are, in many parts of this work, affinities previously unperceived, which this naturalist has very happily indicated. Whilst Adanson devoted himself to these complicated labours, in order to arrive at the natural method, Bernard De Jussieu, scrutinising nature with a sagacity of which the few memoirs he has published furnish proof, established the principal basis of this method, not in a book, but in nature itself, in the series of plants in the garden of Trianon; or, better still, in the catalogues, which have served for a foundation in the planting of this garden; for the manuscript lists which he has left, and of which the most complete has been published, under the head of *Genres d'Antoine Laurent De Jussieu*, refer to many genera, which, at that epoch, had never been cultivated in gardens.

We have only to compare this simple list with attempts of Linnæus and Adanson, to perceive its superiority over theirs, and how much knowledge and profound sagacity it implies in the learned botanist, whom Linnæus delighted in pointing to, as one of the masters of the science. Thus, more than two thirds of the groups established by Bernard De Jussieu remain unaltered, notwithstanding the progress of botany; or have only undergone subdivisions, without the relations of affinity being altered. We see, by an examination of the genera united in each of these families, and by the series which he has established, that Bernard De Jussieu recognised, as a character of the first order, presenting no real exception, the structure of the embryo acotyledon, monocotyledon, or dicotyledon; for it is evident that the small number of cases where he has united in the same family plants which differ in this particular, results from the still imperfect state of our knowledge of the nature of some fruits.

We see, also, that he had appreciated the importance of the characters furnished by the relative insertion of the different parts of the flower, and that he had made them the subject of a profound examination; for he has very rarely united in one family plants presenting very evident differences in this respect; and the order of these families, as well among the monocotyledonous as among the dicotyledonous plants, is founded upon the insertion of the stamens or of the corolla upon the pistil, the calyx, or the receptacle.

Thus, although Bernard De Jussieu has not made known the rules which directed him in his researches respecting the natural method, we cannot doubt that he had recognised two of those principles of this method, which are admitted in the present day as the most essential and the least subject to exception; namely, that the differences in the structure of the embryo furnish the characters of the first order; and the different modes of insertion of the parts of the flower, the characters of the second order. But, when we examine the different catalogues which preceded the planting of the Trianon garden, we see that it was not at the first essay he arrived at this result, and how he has successively completed both the association of genera into families, and the distribution of these families.

Such was the condition of botany, as it respects the natural method, when Antoine Laurent De Jussieu, born at Lyons in 1748, came to Paris, in 1765, to finish his medical and scientific studies, under the direction of his uncle, Bernard De Jussieu. The first years of his stay in this city were solely appropriated to his studies, which he terminated in 1770 by his thesis for a degree of doctor in medicine, containing internal evidence of the direction which he had given to his labours; and the genius which had guided him since his entry upon a scientific career, was evident from the style and subject of this thesis, which was entitled, *An Œconomiam Animalem inter et Vegetalem Analogia?* and it is, in fact, a concise exposition, written with elegance and precision, of all that was most positively known at that period upon the structure and the functions of vegetables, and a comparison of these with the phenomena of animal life.

The manner in which this question is treated was evidently a brilliant *début* for a youth only twenty-two years of age; and, as Limonnier, then professor of botany, was unable, on account of the engagements devolving upon him from his situation of first physician to the king, to fulfil his duties at the Jardin Royal, Bernard De Jussieu proposed the young Antoine Laurent De Jussieu to supply his place, which was agreed to; and he then applied himself with renewed ardour to study the branch of science which he found himself called upon to teach. The paper upon the Ranunculî, which he read, in 1773, to the Academy of the Sciences, proves how quickly he had profited by his studies, and that he was thoroughly imbued with the excellent principles which, as we before pointed out, had evidently directed Bernard De Jussieu in his attempts at natural classification.

In this first memoir, which gained for him admission into

the Académie des Sciences ; and, in a second, presented in the following year, upon the new order introduced into the plants of the Jardin Royal, at Paris, we find, for the first time, the fundamental principles of the natural method laid down with clearness and precision. We there observe, above all, the great principle of the subordination of characters, and of their unequal value well appreciated, a principle unknown to Linnaeus and Adanson, evidently recognised by Bernard De Jussieu, but of which Antoine Laurent De Jussieu was the first to show the great importance, and which he afterwards so skilfully applied.

Thus, in the first of the papers cited above, we find this passage : — “ We have seen, by some general principles developed in the course of this paper, the affinity which exists between the parts of fructification ; we have recognised different degrees of this affinity : all these characters have not the same value, the same power to unite or separate plants. Some are primitive, essential in themselves, and invariable ; as the number of lobes of the embryo, its situation in the seed, the position of the calyx and of the pistil, the connexion of the corolla and the stamens. These serve for principal divisions ; the others are secondary, they vary sometimes, and become essential only when their existence is connected with one of the preceding ones ; it is their assemblage which distinguishes the families.”

We may here very well see from the year 1773, the fundamental principles which have directed Antoine Laurent De Jussieu in the arrangement of the *Genera Plantarum*, expressed with precision ; and, if he has sometimes deviated from them, we perceive that it is rather a concession that he makes to a facility of study, or to the old methods, than the result of a true conviction. Thus, in the paper read in 1774, upon the new order established in the Jardin des Plantes, he has evidently departed from the rigorous principle of the insertions, such as Bernard De Jussieu had admitted it in the Trianon catalogues, by dividing the dicotyledonous plants into apetalous, monopetalous, and polypetalous ; but we need only read through the paper, to perceive that his sole purpose has been to multiply the large classes, and to establish some relations between the new order and the method of Tournefort, which it took the place of, and which was generally known, not only to the students, but to the greater number of contemporary botanists ; and we must not lose sight of the origin of this part of Jussieu's classification, when we would appreciate the method followed in the *Genera Plantarum*, which does not differ sensibly from it.

From this period, until 1785, Antoine Laurent De Jussieu

continued to classify the plants of the Botanic Garden according to this method. His catalogues employed at his lectures, worn out with use, renewed at several different times, covered with notes and additions, and, at length, presenting not only a list of the genera and species cultivated, but the characters of families, and more frequently those of genera, traced with concision and clearness, show that these eleven years were devoted to bringing to perfection the natural method. From 1770, Bernard De Jussieu, then seventy-one years of age, almost entirely ceased to occupy himself in the gardens, the care of which he had confided to his nephew. His health, and more particularly his sight, grew weaker; and, in 1777, after having suffered many attacks of apoplexy, he terminated the long career which had had so much influence upon the march of botany, though it had, in-appearance produced so little effect.

We have only to compare these dates to ascertain what share is due to Bernard De Jussieu, and what belongs to Antoine Laurent, in the establishment of the natural method, as made known by the *Genera Plantarum* of 1789. The orders of Trianon, established in 1759, show us that the classification of families according to the cotyledonous structure, and the insertion of the stamens, is due to Bernard De Jussieu. Antoine Laurent De Jussieu imbibed, probably, these first principles of the science in the study of that series, and in his first botanical education which he owed to his uncle; but every thing proves this to have been the utmost extent of the influence exercised by Bernard De Jussieu over the labours of his nephew.

In fact, the three note-books by Bernard De Jussieu, relative to the order of the Trianon Garden, do not present a single character of class, family, or genus: there are not even any other classes specified than the monocotyledonous and dicotyledonous. In some notes upon the cards, we find some generic characters, accompanied by a section of the seed; but those of cards, which have been carefully preserved by his family, are very few in number.

The same method of descriptions upon cards was followed by his nephew: his are often dated; and we see that they mount up in a considerable number as far back as 1774.

Finally, the oldest lists used in the lectures of Antoine Laurent de Jussieu contain characters of families which we do not find upon any of those belonging to his uncle.

Thus, the first principles of classification are due to Bernard De Jussieu; the profound and sagacious application of these principles, and the true institution of natural families, to Antoine Laurent.

In 1785, Desfontaines succeeded Lemonnier and A. L. De Jussieu discontinued the demonstrations which he had made, as substitute for this latter. It was then that he began the digest of the *Genera Plantarum, secundum Ordines Naturales disposita*, which was nothing more than the developement of the notes used in his lectures, which he had been successively perfecting since 1774. We see, indeed, the materials prepared for this work in a catalogue of genera, at the end of which is added a list of all the new genera pointed out in recent works, and which might now take their places in a complete *Genera*.

The four years of 1785 to 1789 were therefore employed in the study of the materials which were to enter into the composition of the *Genera*, in the digesting and the printing even of the work, the printing being done by degrees, as the author wrote it down, without, however, this successive, and at the same time definitive, digest having caused any error of importance; so well had the general plan and the series of genera been previously arranged.

The fifty years which have almost elapsed since the publication of this work, and the numerous investigations of which the natural method has been the object since this period, will almost justify us in considering the present opinion of the scientific world with regard to it as the opinion of posterity; and this opinion is so general and so unanimous, that it would (so to speak) be useless to demonstrate its merit and importance here. However, without pretending to decide upon what has been already determined by the most distinguished botanists of all countries, we may be allowed to enquire to what kind of merit the *Genera* of Antoine Laurent De Jussieu owes more particularly the influence which it has had, not only upon the progress of botany, but also upon that of almost every branch of natural history.

Until the time of the publication of the *Genera Plantarum*, the natural method, we may say, had not entered into the domain of the public. The series of Linnæus and Bernard De Jussieu, which were very incomplete, and only nominal, could only rouse consideration in men better able to arrive at its principles; the work of Adanson, being without general principles, and interrupting, in many instances, the natural relations of plants, was, besides, presented under a form which necessarily rendered it difficult to use, and which never allowed the author to develop the principles by which he had been directed in establishing this or that relation. So that, from 1763, the period of the publication of

Adanson's tribes of plants, until 1789, a period of 25 years, the natural method made no progress in the scientific world. Neither in France, nor in other countries, had it any new followers. The natural method was but foreseen; it was not yet really demonstrated.

The *Genera* of 1789 had, on the contrary, an influence not, indeed, immediate (for public attention was then distracted by events foreign to the sciences, and of too great importance), but very decisive, upon the direction of botanical studies. Thus, at the end of a few years, it had pervaded, in an almost universal manner, public instruction in France; not only in the higher studies of the faculty and of the Jardin des Plantes, in Paris, where it had its birth, but even in the lessons of the greater number of central schools, those too soon extinguished fires of general and varied information.

In the *Flore Française* of Lamarck, and that of De Candolle, botanical works in common use, many local floras were arranged according to this method, and served to diffuse a knowledge of it. At length, when scarcely twenty years had passed, a foreign botanist, of eminent talent, declared himself one of its most devoted champions, and contributed powerfully towards bringing it to perfection. Since then it has spread itself through Europe, and, we may say, through the whole world. Its superiority is generally acknowledged over the artificial methods, which were no longer made use of, except as what they really are, more or less convenient clues to arrive at the nomenclature of plants.

We may add, with Cuvier, that the influence of the *Genera Plantarum* is not confined to botany: all natural history and zoology, in particular, have benefited by the principles which had directed Jussieu, and which he had so well developed in his admirable introduction; and we are led to think that Cuvier, in expressing this opinion, founded it on his own experience, and that the principles of the *Genera Plantarum* were able, to a certain degree, to direct him in the reforms which he introduced into zoological systems. For a work to obtain gradually, and in a permanent manner, an influence so positive and so generally acknowledged over the progress of science, it must necessarily combine two different kinds of merits: ideas that are general, true, important, and novel; and an application of these ideas as perfect as possible in all its details. This is, in fact, what we find united in the *Genera* of Antoine Laurent De Jussieu. The introduction presents, in the clearest and most elegant Latin ever employed in science, not only an explanation of the fundamental principles of the natural method, but as perfect a description of the

structure of plants as the state of botany at that time permitted.

The characters of the classes and families illustrate the application and developement of these principles; and the exactness, clearness, and precision of these characters, especially those of families, allow them still to be considered, if we look back to the period when they were traced, as a model which few authors have equalled, and none surpassed.

Finally, the notes at the end of almost every family are, perhaps, the part of the work which principally exhibit the judgment and extensive knowledge of the author.

It is there, indeed, that he frequently corrects the artificial tendency of a linear series; that he points out the multiplied relations of families among themselves, and acknowledges the doubts which were left in his mind by imperfect observations which he had been unable to verify, or which a deep foresight of affinities had given rise to; an impression which often outstrips, so to speak, the actual state of science. How many corrections, introduced later into the natural method, are, in fact, foreseen and pointed out, either in these notes, in the divisions of the sections of families, or even by a word placed at the end of a generic character!

This last part of the work, the characters of genera, considered by some superficial authors as a simple labour of compilation, is, in our eyes, not the least remarkable part. Certainly, if the *Genera Plantarum* of Antoine Laurent De Jussieu had only given, at the end of the characters and the notes upon the families, a list of genera comprised in each of these families, as has since been done by all those who wished to follow his traces, he would have already rendered an immense service to science, and rendered the natural method sufficiently evident. Nevertheless, without generic characters, a table of families would then have been merely a work to study and meditate upon: it would not have been a work in common use; the manual, as it might be called, of the botanist; and the natural method would have spread itself much more slowly through the scientific world.

But, in introducing generic characters, could they be taken by simple compilation from the most esteemed works of the age? Not in general; for characters that are simply distinctive, suitable for an artificial system, are frequently no longer suited for a natural method; or a character, apparently useless in the eyes of the systematic author, acquire great importance in those of the student of natural relations. So that the characters of the genera have been generally

traced, by the hand of Antoine Laurent De Jussieu, either from nature, or from the published or manuscript descriptions of the botanists who inspired him with most confidence; and his references to the sources from which he has drawn, makes us able to appreciate their value. If the characters of the *Genera* partly consist of compilation, it is yet one of those compilations indispensable in a work of this nature, and which often denotes more talent and penetration than direct observations.

Thus, the *Genera Plantarum*, published in 1789, was a work as perfect in its execution, as the state of botany permitted; and this execution is entirely due to Antoine Laurent De Jussieu.

As to the principles of classification, the first foundation of the method, they were the same as those indicated by the same author in his memoir upon the series of plants in the Paris Garden; that is to say, those admitted by Bernard De Jussieu, and drawn from the number of cotyledons, and the relative insertion of the parts of the flower, to which he had added those furnished by the presence and structure of the corolla.

The use of these characters, as the basis of the first classification of dicotyledonous plants, has, perhaps, contributed to break the relations perceived by Antoine Laurent De Jussieu himself between the apetalous and polypetalous plants, and, in some rarer cases, between the monopetalous and these two latter classes. But we need only look back to the paper quoted above, to see that the desire of multiplying the number of classes, in order to render the natural method of easier application, has, in this case, led the author to wander from what he considered as rigorous principles of that method. Now, if there be in anything occasion to reproach the author of the *Genera* with regard to the classification he has adopted, it is, I think, for having made this concession, with the intention of rendering his work of easier application; for it is probable that, in a greater or less degree, the employing of characters furnished by the corolla will one day be renounced: and this will be the most considerable modification (in appearance) that the method of the *Genera Plantarum* will have undergone; a modification, nevertheless, by which we do but return to the principles of its author.

The public events which followed almost immediately upon the publication of the *Genera Plantarum*, must of necessity have interfered with the botanical labours of its author. There was little time suited for the peaceable study of natural

history from the year 1789 to 1800: Antoine Laurent De Jussieu devoted them to labouring in the cause of humanity and science, in contributing to the amelioration of the hospitals, and to the organisation of a museum of natural history.

In fact, from 1790, he was nominated by his section member of the municipality of Paris; and was intrusted, under this title, with the administration of the hospitals and convents of that city. He fulfilled these functions until 1792.

In 1793, the Jardin des Plantes, or Royal Garden, was remodelled, under the name of the Museum of Natural History. All the persons intrusted, under different titles, with the direction or the preservation of collections, were elevated to the rank of professors, and intrusted with a share in the administration of this establishment. M. De Jussieu, who, like Vaillant and Bernard De Jussieu, had till then only the title of *démonstrateur*, was, under the name professor of rural botany, appointed to teach botany in the country. He thus shared the teaching in this science with his colleague Desfontaines; and his herborisations, followed by a crowd of young students and of distinguished amateurs, contributed to spread a taste for the study of botany, to diffuse the sound principles which the professor had introduced into the science, and to render it beloved through the simplicity and kind-heartedness of him who made it known.

Chosen successively by his colleagues to fulfil the duties of director and treasurer in the government of the museum, he rendered great services to this establishment, especially in the difficult period of its reorganisation, when, notwithstanding the obstacles that political events often opposed to the opening, and even the maintenance, of the museum, he found means, by his zeal and activity, to render this establishment many services which have contributed to its prosperity.

He resumed the publication of his botanical researches at the time the *Annales du Muséum* were begun, in 1802.

Independently of a succession of notices upon the history of the Muséum d'Histoire Naturelle, we find in the first volumes of this collection, many papers upon new or ill-described genera, or upon families which recent discoveries, or more accurate observations, had enriched with new genera. Thus, the *Amaranthæ*, the *Nyctaginæ*, and the *Onagraceæ* were successively submitted to a fresh examination.

It may be seen that these labours had already for their object the perfecting of the *Genera Plantarum*, and of the natural method; but this design becomes more evident in the fifth volume of this collection, in 1804; for Antoine Laurent De

Jussieu began then to publish a series of memoirs, in which he examines particularly the general characters of families, drawn from the seed, and confirmed or rectified by the observations of Gærtner ; but in which he shows, at the same time, the additions which these families had received since the publication of the *Genera*, and discusses the disputed points of organisation or synonymy ; displaying always great talent in the examination of obscure genera, often ill described by their authors, and of which he refers the organisation to their true types with remarkable penetration, which recent observations have almost always confirmed.

This revision forms the object of fifteen papers, published from 1804 to 1819, and includes all the families of dicotyledonous, apetalous, and monopetalous plants, as well as the polypetalous, epigynous, and hypogynous.

Always anxious to complete the view of the vegetable kingdom which the *Genera Plantarum* presented, and to place this work on a level with new discoveries and the progress of the science, A. L. De Jussieu published successively other papers, which had for their object the establishment of new families, founded upon genera whose organisation was not well known at the time of its publication, or whose formation had been rendered necessary by the numerous discoveries resulting from recent scientific voyages, which had introduced into our collections so many specimens that were either completely new or associated with genera till then isolated, and which botanists had, therefore, not ventured to make types of particular families. It was thus that the author of the *Genera*, in retouching the first edifice which he had reared, showed that he himself considered this monument as susceptible of modification and completion ; for, like all men of elevated genius, he knew that the sciences never remain stationary, and was aware that the natural method must perfect itself in proportion as botany became more widely extended.

He added, thus, to the families admitted into the *Genera Plantarum* of 1789 those of the Loàseæ, the Passiflòreæ, the Monímiæ, the Lobeliáceæ, the Polygaleæ, and the Paronychiæ ; and, finally, many papers had in view the examination of obscure genera, whose connexion with known genera and natural families was difficult to establish ; among these are the papers upon the Phelypæa of Thunberg, and the Hydropítyon of Gærtner ; upon many genera of Laúrinæ, which might be united into one ; and upon different genera of Loureiro. There are, perhaps, few larger papers which prove better than these brief notices the judgment and extensive knowledge of Antoine Laurent De Jussieu ; and we perceive every mo-

ment with what certainty his appreciation of characters, of their value, their subordination, or their incompatibility, directed him in this difficult discussion. We there distinguish plainly the method which directed him in connecting numerous exotic genera, often such as were imperfectly known, and which he has classed, almost always so happily, in his immortal work.

The last of these papers that was published by A. L. De Jussieu appeared in 1820, in the sixth volume of the *Memoirs of the Museum*. It had for its subject the family of the Rubiaceæ, of which it showed all the genera, distributed and described as the author intended they should be in the new edition which he then projected of the *Genera Plantarum*, for which he was constantly collecting materials. This last work, published at the age of seventy-two, is worthy of that of 1789: we find there the same order, the same clearness of ideas, the same simple and precise arrangement.

From this period, Antoine Laurent De Jussieu, whose sight had so much failed him as to render it necessary he should confine himself to studying the labours of others, and renounce the examination of nature, has only furnished the science with some articles inserted in the *Dictionnaire des Sciences Naturelles*, both upon families and upon plants cited by travellers under their vulgar name, and which he had applied himself to restoring to their genus or their family. The materials he has deposited in this collection were what he had been a long time employed in obtaining, and in which we still recognise a man who joins an acquaintance with nature to an erudition the most extensive.

We ought to point out in this collection the article *Méthode Naturelle*, published in 1824, in which the same great naturalist has displayed, with his usual clearness, the history of the natural method in botany, and the principles upon which it rests.

At length, in the later years of his life, from the year 1826, a son worthy of himself having supplied his place in the functions he exercised in the Muséum d'Histoire Naturelle, he passed a great part of the year in the country, and divided his time between the perusal of the most modern works upon botany, and the arrangement and analysis of those among his works which appeared to him most important to the science.

Combining recent discoveries with the knowledge acquired during his long career, he made them the subject of a new edition of the *Introduction* to his *Genera Plantarum*.

We find in this Proœmium, written in the clear and elegant Latin of the introduction to the *Genera*, a part of the ideas

held by its author in 1789, especially with regard to classification ; but we see that he has remained a stranger to none of the discoveries of modern anatomy and physiology ; for he thought that all should concur to the completion of the natural method, to which all parts of vegetable organisation could serve as a basis. Even to the last days of his life, he occupied himself in retouching this work, which carried him back to his past studies, and was a pleasant occupation of mind. At this period, his extremely weakened sight being no longer able to direct his fingers, he was often obliged to have recourse to another's hand : but he did not cease his employment.

We are persuaded that this last work of so illustrious a man, written at the age of eighty-three and eighty-four years, and notwithstanding worthy of its author's best years, will be read with interest by naturalists, who will take pleasure in comparing this final performance with that which serves as an introduction to the *Genera* of 1789. It is, besides, a homage due to the memory of one of those men who have contributed most to render our country illustrious ; and we are happy to be able to append this production to the present notice.

If the works of M. De Jussieu place him in the first rank among men of science, we may also cite him as a model for the sweetness of his character. Full of kindness for all those who gave themselves up to the study of science, encouraging those who distinguished themselves there, entirely devoted to the progress of botany, seeking only truth, acknowledging his own errors with candour, and pointing out those of others without bitterness, he was never drawn into the polemics of science ; we cannot quote, either in his principal work or his numerous published papers, an expression which might be wounding to any of his contemporaries ; and yet he has done more for the advancement of science than many of those who have engaged in contest in support of their ideas. His were true : they had no need to be vehemently upheld : left to themselves, they have penetrated by little and little into science, and have ended by being every where admitted. By this means, he had the happiness of joining to the respect which his superiority as a naturalist merited the friendship of all the men who could appreciate it ; and the young, for whom he was full of benevolence, showed a veneration truly filial.

Surrounded with testimonies of respect and regard, entirely devoted to the study of science, and never extending his ambition beyond this circle ; happy in the bosom of a numerous family, and seeing himself revive, as it were, in a son who sustained his name worthily, and who, during his lifetime, had

become his colleague and successor, he ran his long career with a prosperity which he owed as much to himself as to the circumstances in which he was placed; until, at the age of eighty-eight years, a short and scarcely painful illness closed, without effort, a life so well and peacefully spent, on the 15th of September, 1836.

ART. II. *On the Snake-like Proteus (Prôteus anguinus Lam.*)*

By VIATOR.

As I think a sketch of that most singular and rare amphibious animal, the Snake-like Proteus, would not be altogether devoid of interest to some of the readers of the *Magazine of Natural History*, I will therefore make no apology for sending it to you.

Cuvier, in his first edition (1817) of the *Animal Kingdom*, placed the genus *Prôteus* among the frog-like animals "les Batraciens," which constitute the fourth order of his third class of Vertebrata, Reptiles.

I, however, consider that this arrangement is liable to many objections, not only in the application of the term reptile to this animal, but also for other reasons, which I need not here detail at length. I propose classing it in a fourth division of Vertebrata, under the old Linnæan name *Amphibia*, instead of referring it to that of the *Reptilia Cuv.*; thus: —

VERTEBRATA. — Class IV. AMPHIBIA.

Order Manentibranchia *Mihi*.

Branchiæ permanent.

Family Protëidæ *Mihi*.

Genus *Prôteus Laurenti*.

Before I give any account of my own observations on this remarkable animal, which may be properly termed, "branchipneumonian" (i. e. gill-lunged, breathing both by gills and lungs), I will add the following accurate description, which the same illustrious anatomist has given at p. 102. of the *Règne Animal*, and which I have translated as follows: —

"This genus is formed, at present, by only a single species, the *Prôteus anguinus Laur.*, or *Siren anguina Schn.* The animal is more than a foot in length, about equal to a finger in thickness, having its tail compressed vertically, with four little legs, of which the fore feet have three, and the hinder only two, toes. Besides internal lungs, it bears, like the larvæ

* The author of this article upon the Proteus has not made us acquainted with his name; and we would assign this as a reason to him for having so long postponed its insertion. Should he favour us with any more communications, we hope he will not wish them to appear *anonymously*; especially if, like the present, characters are introduced with "*Mihi*" appended to them.

or young of the salamander (*Salamándra Brong.*), three branchiæ, or gills, upon each of its sides, in the form of tufts, which it evidently retains during the whole of its life. The cartilaginous arcs, and the membranous lid, are also the same as in those larvæ. Its muzzle is elongate and flattened; both jaws furnished with teeth; its tongue is capable of being a little moved, and is loose in the fore part. The eye is excessively small, and nearly hidden by the skin, as is the case with the mole-rat (*Mús typhlus*); its ear is likewise covered by the skin, like that of the salamander. The skin is smooth and nearly white. It is only to be found in the subterraneous waters which communicate with some of the lakes in Carniola. The skeleton of the *Proteus* resembles that of the salamander, with the exception of its having a good many more vertebræ, but fewer rudiments of ribs. Its bony head, indeed, is altogether different in its general conformation from that of the *Salamándridæ*."

Next, the characters I will briefly state somewhat thus:—

Protëidæ Mihi. Body much lengthened, with a tail. Legs four; fore feet having three toes, hind feet only two.

Prôteus. Tail compressed vertically. Both jaws with teeth. Eyes extremely minute, scarcely visible.

Prôteus anguinus. Body quite smooth, naked, very long, serpentiform, yellowish-white, tinged more or less with pink. Branchiæ ramified, crimson.

Hab. In deep waters amongst subterranean caverns and grottoes of the limestone mountains in Carniola and Illyria, in Central Europe.

It was in the subterraneous pools in the beautiful Magdalen Grotto, distant about two miles from Adelsberg, in the province of Carniola, about half-way between Laybach and Trieste, that Dr. Laurenti discovered this strange creature. He bestowed on it the names of *Prôteus anguinus*, and first made it known to the naturalists of that day. After that learned zoologist, it has been described by Scopoli, Hermann, Linnæus, Schneider, Schreibers, Rudolphi, Cuvier, Rusconi, Configliacchi, Davy, Agapito, and others. But of these, I believe, Rudolphi, Schreibers, Cuvier, and Configliacchi have examined its internal conformation by means of skilful dissections, and thus have they most carefully ascertained its anatomical structure.

In general appearance, the *Proteus* resembles a lizard; but is much longer, and more serpentiform; the hind legs farther apart from the fore legs, the body more cylindrical, about an inch in diameter, and nearly all of the same thickness. Its head is rather flattened, with the muzzle elongated, obtuse, and compressed, wherein it is not unlike that of a pike. The mouth is large; both the upper and lower jaw are furnished

with little teeth; the eyes so small, that they are scarcely to be discerned, without looking close on the head; when two black specks are perceptible, and which are covered with the skin. Six branchiæ, or gills, through which it breathes like a fish, are fixed on the sides; three on one side of the occiput, and three on the other. In form, these are like to little plants, or pieces of coral, and constitute a sort of semicircular crest at the back of the head. Under the gills, on each side, there are two narrow branchial apertures. The fore feet are rather stouter and firmer than the hind: they each have three little toes; but the hind feet are more slender and shorter, and have each only two toes. All the toes are without claws or nails. The body is usually about a foot long, and is a little compressed on the sides, but thickest towards the tail, which is much flattened vertically, and is in the shape of a spatula, with the skin terminating in a membranaceous edge. Its colour is of a yellowish white, tinged with flesh-colour: on the sides of the body, and especially on the tail, the pink inclines to violet. The branchial tufts are much ramified, of a red or crimson colour, and varying greatly in intenseness. The skin is remarkably transparent, smooth, and entirely lubricated with a viscid mucus, and sometimes covered with minute reddish dots. The pink hue on the body of this animal changes and becomes violet-brown, more or less quickly in proportion as it is exposed to the light. Its food principally consists of snails, small Mollusca, worms, slugs, and water insects. In its motions it is nearly allied to the common eel. It is greatly affected by the changes of weather, and is said in the winter to become torpid, rolling itself in holes and crevices of the rocks, and, perhaps, burrowing under the mud.

From their being so susceptible of atmospheric variations, the Benedictine Monks at Sittich (where it is sometimes found) used to keep several *Protei* in glasses, in the place of barometers, for the purpose of indicating the state of the weather; because in fine weather they are very lively, and swim about a good deal, putting their noses and mouths out of the water, as if to inhale the air into their lungs; whilst in bad weather they keep at the bottoms of the glasses and remain perfectly quiet. The vast depth below ground at which the *Protei* are wont to live will readily account for their being so remarkably capable of feeling the changes of the weather, when they are brought upon the surface of the earth; for it is chiefly in a small lake, about 40 ft. in width, which is supposed to terminate the innermost extremity of the Magdalen Grotto, at the depth of about 1200 ft., that they are most commonly found, and are caught by means of

a bag-net fixed to the end of a long pole. The smallest so fished up hardly exceed more than 3 in. ; and the largest are about 15 in. in length. In diameter they likewise vary from a quarter of an inch to about one inch and a quarter. But it is not yet ascertained what size they attain when very old, or even the number of years they may live.

When at Grætz, the curator of the museum (Johanneum) showed me a fine living specimen of the *Proteus*. It was in a tub of water, with a piece of tufa at the bottom, under which it was fond of hiding itself. The tub, covered with a piece of board, was placed in a dark closet. On being exposed to the daylight, the animal retreated under the cellular tufa ; and, on being taken out of the water and handled, it displayed every symptom of fear and dislike ; and its branchiæ then became of a very vivid and beautiful crimson, or deep red coral-colour. It was only kept out of the water two or three minutes at a time. The curator informed me that it had been so confined for six years, and that it had never eaten any thing ; but, in some freshly caught specimens, when opened after death, the bellies contained the remains of snails. The water was occasionally changed ; and it doubtless subsisted on the animalcula therein contained. The size of its mouth, and the number of its teeth, show that it actually devours and masticates some creatures much larger than the infusoria that usually are found in all waters. This *Proteus* appeared, however, to me to be somewhat benumbed or asleep, as, even when touched by the hand, it moved very gently ; but the day, being a damp, cold, and foggy one (November 9.), might, perhaps, much affect it, and so render it more dull and torpid.

It is therefore impossible from this specimen, although so long in confinement, and constantly watched by the curator, to draw any correct ideas of its true habits and modes of catching and eating its prey, whatever it may generally consist of. But I am inclined to say that, in its natural abode, in dark pools and lakes, many hundred feet below the earth, it is not only an active creature, swimming with great ease, and running on its four feet with agility upon the mud, but it also commits great destruction among slugs, snails, and other fluviatile Mollusca ; perhaps even devouring the fry and spawn of frogs, and of fishes, &c., which may be carried into those subterraneous lakes by the rivers Poick, Wippach, &c., that run into and communicate under ground, amongst the numerous caverns and fissures of that cellular limestone district.

The *Proteus*, though branchipneumonian, and possessing a double apparatus for breathing, I have been told, cannot

live long out of the water: indeed, the one in the museum at Grætz was never kept more than three minutes at a time out of that element. Hence, this fact will go far to prove the statement of some physiologists; that its lungs are only imperfectly formed. But I am inclined to suppose that its lungs are sufficiently developed for the purpose of allowing the animal to respire, when out of the water, in its natural habitation, and adapted to the state of the atmospheric air at a great depth below the earth, and may nevertheless be insufficient for the respiration of the air at the earth's surface; at least, I think it highly probable that it can breathe by its lungs alone, for a longer time, when out of the water in its subterranean cavern, than it can do, when brought out of that element upon or above the earth. In this respect, the *Proteus* differs greatly from another animal of the same order; namely, the lizard-like siren (*Siren lacertina*), which can live for many hours, with as much ease, out of the water, as in it. But the latter is not a subterranean, but a terrestrial, animal, and inhabits the marshes of South Carolina, in America; and, consequently, the lungs of the siren are doubtless more fully suited to the respiration of the air upon the surface of the earth. The *Proteus*, also, unlike the siren, which makes a croaking noise like a frog, has only been known to make a sort of hissing sound, somewhat similar to that of a snake.

For many years, the *Proteus* was a subject of controversy among naturalists, whether or not it was only the fry or larva of some other creature; but this has now been finally settled; and the retention of all its legs and branchiæ during life makes the affirmative side of that supposition perfectly inconsistent with its being merely in a state of metamorphosis.

It has even been thought by some to be deprived of the power of vision; but this has also been ascertained to be incorrect, since the minute eyes are themselves discernible; and the fact of the animal being always so much agitated when exposed to the daylight, clearly demonstrates that it does possess that sense, in a degree adapted to its living in total darkness.

Its ears being covered, like the eyes, with a skin, would, perhaps, induce us to conclude that its faculty of hearing is either dull, or, what is more probable, that it is merely protected by that film, or skin. Its nasal organs being large, probably assist it in discovering its prey, by means of an acute scent. In swimming, it uses its legs and toes, which, although not webbed, afford it great service in the water;

and its tail, which is surrounded by a prolongation of the skin, giving it the form of the caudal fin of the eel, serves it for a similar purpose. In its permanent gills, the *Proteus* comes nearest in affinity to the characters of fish; and, according to Cuvier, its spinal structure is analogous to that of one of the fossil saurians which have been discovered in certain secondary formations. It is oviparous; and well-defined ovaria have been found within it.

The Slavonian inhabitants name the *Proteus*, from its colour being like that of the human flesh, and from its legs, chiefly the fore legs and toes, so exactly resembling little arms and fingers, “zhloveska riba,” which literally signifies a human fish.

Report once stated that it had been discovered in some subterraneous caverns in the Island of Sicily; but this, of late, has not been confirmed; and I understand the only country in which it has as yet been found is Illyria.

I will conclude by observing that I much desire that zoologists would discover some methods whereby they may obtain more accurate knowledge of the natural manners and economy of the *Proteus*, in the deep and dark grottoes of its native district; for, when we consider its singularly mixed affinities, and its purely subterranean habits, we cannot hesitate in pronouncing it to be one of the most anomalous and remarkable creatures existing at this day, within the whole range of the animal kingdom.

London, April 21. 1837.

ART. III. *Description of a new Species of Sirex discovered to attack and destroy the Spruce Fir (Pinus nigra).* By W. E. SHUCKARD, V.P.E.S., Librarian to the Royal Society.

ALTHOUGH this insect is no new discovery, yet, from its having been incorrectly attributed to two distinct Fabrician species, it is, as yet, without a name; and, as I am in possession of some facts derived from its natural history which fully confirm its specific individuality, which is still further corroborated by the female, until now unknown or unnoticed, I hasten to communicate all the particulars to those interested in the subject. Its very close resemblance, in both sexes, to the sexes of *Sirex juvencus* Linn. has, without doubt, been the cause, on the one hand, of its being overlooked; and the imperfect specific diagnosis of Fabricius's *Sirex nigricornis* has, on the other hand, occasioned its male to have been treated as this Fabrician species. That it cannot be the latter is fully proved by referring to Fabricius's original description, published in 1781, in his *Species Insectorum*, t. i. p. 418—423,

made from a North American specimen, in the collection of Mr. Yeats of London, and which was a female. This specific description he only again repeats in his *Entomologia Systematica*, 1793, vol. ii. p. 125.; and, as his other works contain merely the original imperfect specific character, which incorporates no notice of the sex of his insect, and which, happening to agree very well (or as well as the majority of Fabrician diagnostics agree in general) with the male of the insect to be described below, it has been thus erroneously presumed to be Fabricius's American species. There still exists a possibility of its being a Fabrician, and also an American, species, namely, his *Sirex cyaneus*, as the *Pinus nigra* is an American fir; yet, as Fabricius's description is not fully determinate, less confusion, I think, is likely to result from considering this a new species, than treating it as another Fabrician one, which the recovery of the original specimen, formerly in Mr. Yeats's collection, may further prove to be incorrect. That Klüg, and subsequently Hartig, following Klüg, are both wrong in considering ours only as a variety of the *Sirex juvencus* Linn., the following description will, I think, satisfactorily show:—

SIREX DU'PLEX Shuck.

Fœm. Nitidus, capite thoraceque viridi-æneo; pedibus flavo-ferrugineis; abdomine cyaneo, aculeo toto abdomine corniculoque longior, dimidio exserto corniculo fere triplo longior. Long., aculeo incluso, 9—14 lines.

? *Sirex cyaneus* Fab. *Sp. In.*, t. 1. 419. 8.; *Mant.*, 2. 58. 10.; *Ent. Syst.*, 2. 127. 11.; *Piez.*, 50. 11.

? *Sirex juvencus* Klüg. *Mon. Sir. Ger.*, pt. iv. f. 1.

Mas. Nitidus, capite thoraceque viridi-æneo; pedibus flavo-ferrugineis; tibiis et tarsis posticis atro-cyaneis; abdomine toto, basi excepta, ferrugineo. Long., 4½—13 lines.

Sirex nigricornis Ludwig, in *Sachsen Entdeckten Insecten*, p. 56.; *Newman, Ent. Mag.*; *Curtis's Guide*, 1837, 481. 2 b.

Sirex juvencus ♂ *Christ. Bienen und Wespen*, pt. xlvii. f. 4.; *Klug. Mon. Siric. German.*, var. iv. p. 38.; pt. iv. f. 3. ? var.; *Hartig Blatt und Holzwespen*, vol. iii. p. 384.

Head and thorax much punctured, pubescent, of a greenish bronzy tint; the legs yellowish, ferrugineous, excepting the coxæ and trochanters, which, as well as the entire abdomen, are of a beautiful steel blue, exclusive only of the extreme bar of the ovipositor, or rather the cap of its sheath, which is also ferrugineous: the wings subhyaline; their margins obscure, and nervures and stigma pitchy black, excepting the costal nervure, which, as far as the stigma, is ferrugineous, and with a dark cloud upon the first submarginal cell. The entire aculeus is longer than the abdomen; and the exserted half nearly three times as long as the corniculus, which is exceedingly acuminate and serrate ♀.

The ♂ differs in having the abdomen entirely ferrugineous,

excepting the two, or sometimes three, basal segments, which are cyaneous, and there is a very conspicuous violet reflexion upon the ferrugineous portion; the posterior tibiæ and tarsi are of a deep dark blue; as are also the intermediate pair, either entirely, excepting only the joints, or merely externally; the wings are ferrugineous, with their nervures and stigma deeply so. It occasionally, but rarely, varies in having the basal joints of the antennæ, or the posterior tarsi, ferrugineous.

This species inhabits the spruce fir (*Pinus nigra*); and the time of its developement is the latter end of May, and the beginning of June, after which it is not found; and they last about a fortnight. This is the observation of the person who captured the present species in Cambridgeshire this year. Twenty-seven males and sixteen females I have had the opportunity of inspecting, and which, excepting the difference of size, and the slight ones arising, probably, from immaturity, noticed at the end of the description of the male, are all exactly alike. A comparison of this insect with the *Sirex juvencus* offers very marked distinctions: in the first place, in its habits, as above noticed; for the same person captured the *juvencus* in a neighbouring plantation of Scotch fir (*Pinus sylvestris*), and only there; and the time of its developement is towards the end of July, and never earlier. This fully concurs with all the German accounts of it; but, should these differences not be admitted, those resulting from a comparison of structure and colour will settle the question. In *Sirex duplex* ♂, the terminal segment of the abdomen is considerably more acuminate than in the *juvencus*; and the posterior tibiæ and tarsi are larger; and, in the female *S. duplex* the aculeus is the great distinction, which is considerably longer, and the corniculus more acuminate; but the wings, also, in both sexes of the latter species are much darker. It is exceedingly interesting to find two insects so very closely resembling; and it would suggest many hypotheses, had I time, at the present moment, to indulge in them; yet I cannot suppress one question, which it is for the botanist to determine; and this is, How far does this tend to connect the *Pinus sylvestris* and *Pinus nigra* more closely and intimately together?

This notice being upon the genus *Sirex*, I may observe that Fabricius's *Sirex albicornis*, which he, in his *Systema Piezatorum*, fancies may be an *Orýssus*, is certainly a true *Sirex*; for I have it: and that it is so, the description of the aculeus and corniculus evidently proves. He, probably, may not have seen the insect, after he first described it in 1781: yet it is no excuse for not knowing its genus.

Chelsea, Nov. 26. 1837.

ART. IV. *Notes of Observations made on the Night of Nov. 12.*
1837. By the Rev. W. B. CLARKE, A.M., F.G.S.

(Read at the Meteorological Society.)

THE night of the 12—13th of November, being the annual epoch of the supposed regular meteoric display so much commented on of late, I carefully noticed the state of the sky from sunset to sunrise; and the results of my observations are embodied in the following note.

Nov. 12. A most splendid sunset succeeded a calm mild day.—About 11 A. M. and 3 P. M., and again at 5 P. M., there was appearance of rain falling in the west, along the ridge of Purbeck; but it was evidently absorbed before it reached the earth; betokening, I conceive, an atmosphere milder below than above. The western horizon, at sunset, was bright and red; and, in the midst of the golden light that spread around, the planet Venus was shining with intense brilliancy. The moon (full on the 12th) was also shining in the east perfectly cloudless; and the whole heavens presented the appearance of a *summer*, rather than an autumnal, night. About ten minutes after the sun-light had faded, there appeared in the west a light rosy-hued cloud, which seemed instantaneously to communicate the same rosy colour to some thin transparent flakes of vapour (before invisible) in different portions of the sky from the west to the east, passing under the zenith, where there was also a spot of red. To remove all idea of this being a lunar rainbow (as was conjectured by some, of the similar phenomenon of Feb. 18. 1836 (of which I communicated a notice to the Meteorological Society), I may mention that thin lenticular rays of light, first white, then red, shot up to the zenith from the western cloud, evidently of the auroral character.—5 h. 30 m. A cloud just the width of, and over, Ursa Major, and on a level with that constellation, shot out a red light, gradually extending to the east, sending streaks to the zenith.—5 h. 55 m. The streaks had become concentric arches from north to south, red *below*, as if from light reflected *from the earth*. At this time there was a small falling star in the N. E. of no duration.—About 7 h. 20 m. there was a gentle puff of wind, lasting 7 or 8 minutes, from the N.W. This was succeeded by red pillars, from the magnetic, which, as they came into the line of the zenith and magnetic east, tinged with a deeper red colour all the white clouds, through which the stars shone clear, but rather yellower than usual. At eight o'clock, the clouds from the N. W. had extended themselves across the sky, till they had formed a series of *parallel* bands, but *optically* converging to the S. E.; the former arch

from N. to S. having taken the same direction.—At 8 h. 30 m. the red hue had disappeared.—At 9 h. there were two columns in N., the clouds in S. S. E. all coloured *underneath*, first bright red, then dull red: a small meteor in the north. — At 9 h. 25 m. the red colour disappeared; the white clouds breaking up, and drawing towards isolated masses of vapour, still, however, bounded by distinct lines of clear sky, well defined on the east side; to the west streaking and jagged, as if attracted without direction.—9 h. 45 m. White clouds rising all round the horizon. The zenith appeared as if a thin veil covered the stars. — 10 h. 5 m. Clouds rapidly clearing away, as if partly *absorbed*. Red spots in the N.W., and in the very middle of the arch in the *magnetic* east. — 10 h. 55 m. Wispy clouds, sending out streaks from arch to arch, as if those arches were changing their direction.—12 h. Calm; *heavy dew*, the clouds in thick fleecy folds, still in arches converging to S. E. covering the sky. — A halo forming round the moon. — From 12 P. M. to 4 A. M., 13th, no particular change, save the completion of the largest halo I ever saw.—6 A. M. Clouded all over.—9 A. M. *Warm*, fine rain falling, which continued from N. W. all day till 11 P. M.—12 P. M. Scattered clouds, very high, over the whole heavens. No meteor seen this night. — 14th. Rainbow at 10 A.M. in the north, light air, and gentle rain.

As far as my observations go, therefore, there has been this year *no display* of meteors on the 12th or 13th of November; but its place has been occupied by a phenomenon of frequent recurrence of late years, and which is, if I mistake not, of a decided auroral character. Should my hypothesis eventually prove correct, that the meteoric display itself is nothing but an *electrical* phenomenon, consequent upon certain terrestrial and atmospherical derangements at a peculiar season, the occurrence of this fresh example of *red clouds* on the night of the 12th of November will be alleged in argument: but, at present, no conclusions can be drawn as to the occurrence, or not, of any meteoric display, till we have received accounts from other quarters of the globe. I would, however, suggest that this *red* light appears to be electrical, from its auroral character, and its evident connexion with magnetic curves and halos; which latter are, in my opinion, of electrical origin; and, further, that such *red* lights have often been seen before, after, and during earthquakes; examples of which may be found in the *Philosophical Transactions*, and elsewhere. Whether the earth is, or not, affected from the *earthquake cause* (whatever it is) periodically, is more than problematical. At any rate, the preceding two months have evidenced that the earth has been in a violent state of excitement, and the phenomena consequent upon that excitement

have been furious gales, heavy tropical rains, and snow, thunder, and lightning, unusual in these latitudes at such a late season. I give a few examples. — Sept. 3. Very heavy shocks of earthquake in Zante, Cephalonia, and the coast of Greece. — Sept. 22. Three shocks at Agram. On the 24th, a heavy shock at Barbadoes, *contemporaneous* with a most desolating thunder-storm and tempest of wind on the skirts of Vesuvius. (Does this not imply that there was some corresponding excitement in that mountain? *) From the 1st to 7th of October, continual shocks at Agram, destroying the place. On the 18th, there was an aurora at Geneva (the same day of a similar phenomenon at the same place in 1836); and from the 23d of October to the 2d of November, a succession of most violent storms in Belgium, France, Scotland, Denmark, England, &c.; followed by an aurora on the 5th at London.

Stanley Green, Nov. 15. 1837.

ART. V. *Notice of Aurora Borealis, as seen at Brookfield, near Manchester.* By J. H. STANWAY, Esq.

I SEND you the accompanying notices of an Aurora Borealis which was visible here on Sunday evening, for insertion in your *Magazine of Natural History*, if you deem them to be possessed of sufficient interest. The appearances were more than ordinarily brilliant, and were accompanied, as you will see, by constantly varying indications of the needle.

The extent of the latter was ascertained by a variation transit instrument, made for me by Mr. Simms of Fleet Street, the correct adjustment of which, with reference to the meridian, had been verified by repeated observations of high and low stars, and by which the variations at this place for the month of October, from a mean of eighty-one observations, had been shown to be $26^{\circ} 49' 9''$; and for November, from a mean of thirty-one observations, $26^{\circ} 48' 45''$.

My attention was also last night directed by the oscillations of the needle, to the existence of an Aurora Borealis; but, by reason of the interference of clouds, it was not long visible.

The variations noted were as below: —

H.	M.		H.	M.	
11	15	28° 25'	12	30	28° 30'
	45	27° 24'		45	25° 26'

At half-past twelve, a patch of the most intense blood-red colours which I have ever seen was visible, free from the

* The state of the mountain on the 12th of September was such as to lead to the idea of a speedy eruption.

interposition of clouds. The whole of the sky had an awful appearance; for the tinge of red which pervaded *the whole expanse*, assumed, in many points, from the depth of colours above, and the density of the clouds below, the dark copper tint which is seen on the disc of the moon during a lunar eclipse.

Hours. P. M.	Variation.	
5 5		A splendid arch of a blood-red colour, extending from the east, south of α Aurigæ, by Perseus and the polar star, to near α Coronæ Borealis, in the west, where a dense cloud intervened, and rendered the termination of the arch at the horizon invisible.
5 30	26° 57'	The same appearance continues.
5 35	26 54	The colour extending to the zenith, and beyond to α Aquilæ.
5 45	26 59	} Numerous streamers, which, but for the light of the moon, would have been exceedingly brilliant. The red colours now less intense.
5 50	26 53	
5 55	26 54	The colour almost disappeared in the N. E.
6 0	26 51	} The altitude of the arch greatly reduced; the colour very intense, near to the stars ϵ , ζ , η Ursæ Majoris.
6 5	26 54	
6 10	26 57	Streamers from the west, forming eventually an arch of white light, from the horizon to the meridian, a little south of α Aquilæ, and onwards until interfered with by the light of the moon.
6 20	26 58	} The colour now generally faint.
6 30	26 58	
6 35	27 9	} The colour very much more visible, especially in Lyra; streaming from the west to and beyond α Lyræ; and a beam of red light from the west by south, to α Serpentis.
6 40	27 6	
6 45	27 0	The light, which is now less vivid, though deepening at intervals, is more diffused, and is a band 55° in breadth, from the zenith towards the magnetic north.
6 50	27 6	The coloured light in the north scarcely visible, but streamers of red and white light intermixed from the west to within 10° of the meridian.
6 55	27 18	A brilliant streamer of red light from the west to the meridian, 18° south of the zenith.

Hours.	Variation.	
7 0	27 21	} The red light scarcely perceptible.
7 5	27 20	
7 10	27 16	
		Brilliant streamers from the w. s. w. to the meridian, 25° south of the zenith.
7 15	27 18	No appearance of Aurora.
7 23	27 19	A splendid beam of blood-red light near α Aquilæ.
7 30	27 15	A most brilliant blending of white and deep red light, radiating, as it were, from a centre on the meridian 30° south of the zenith, and extending due south nearly to the equator, and to the horizon, both eastward and westward. For a few moments, the prismatic colours were certainly visible.
7 37	27 12	A bright patch of red light, south of west, extending upwards.
7 45	27 15	No appearance of Aurora.
8 0	27 13	A diffused faint red light in the N. E.
8 15	27 15	The red light still visible, faint in the N. N. E. but very perceptible in the w. by s.
8 30	27 11	An elongated patch of red light, of which α Aquilæ is the centre.
8 45	27 13	} The oscillations of the needle continue, but clouds prevent appearance of Aurora.
9 0	27 10	
9 30	26 54	Clear, but no indications of Aurora. The needle stationary.
10 0	26 54	
11 0	26 52	
12 0	26 52	
13 0	26 51	

Brookfield, near Manchester, Nov. 15. 1837.

ART. VI. *Observations made on the Night of November 12. 1837.*
By Mr. W. H. WHITE, M.B.S., Secretary to the Meteorological Society.

THIS being the anniversary of the return of those meteoric displays which have occupied the attention of men of science for several years past, I very carefully watched the appearance of the heavens from sunset, which was one of the most brilliant I had witnessed for some time past; and found myself amply repaid, not with witnessing any meteoric display, but one of those singularly electric phenomena that seldom become visible in this latitude, and which, in colour, greatly resembled the rosy-hued band of light that stretched itself across the heavens on February 18. 1836.

The full moon rose majestically, if I may use the expression, and gave that summer-like effect to the evening which is rarely witnessed at so advanced a period in autumn. One of my sons, at half-past five o'clock, called my attention to what he took to be a lunar rainbow: this was a band of reddish-coloured light, stretching across the heavens below Ursa Major, from w. to e. This lasted only a few minutes; and the tinge became, as it were, transferred to some thin and previously transparent clouds, which followed each other from n. to s. in quick and wavelike succession. Bands of white and red clouds rapidly succeeded each other. At six p. m., the western part of the heavens appeared as if reddened by the reflection from some distant conflagration. At a quarter-past eight, the red light began gradually to fade away, and to assume a yellowish tinge; the clouds forming themselves into parallel bands, about the magnetic meridian. At nine p. m., no tinge of colour was perceptible; but the white clouds still maintained their parallel positions, till past eleven o'clock, when a beautiful corona formed round the moon, which exhibited the prismatic colours in the greatest perfection I ever witnessed on similar occasions. At half-past eleven, thick clouds collected in the s. e., and soon completely hid the moon from view. The magnetic north appeared like the early dawn of a summer's morning, which, at midnight, was no longer visible, in consequence of clouds. This beautiful phenomenon has amply made amends for the absence of a meteoric display. As there appeared a decided connexion with the magnetic curves, I apprehend this to have been an electrical phenomenon; and, as similar phenomena are frequently witnessed in higher latitudes previously to the occurrence of terrestrial disturbances, as earthquakes, hurricanes, &c., may we not consider this phenomenon to have been in some way connected with the late storms of thunder and lightning, and the furious gales that characterised the commencement of the present month, and which are so unusual at this advanced period of the year?

London, Nov. 17. 1837.

ART. VII. *Extract from the "Proceedings of the Zoological Society" relating to the Habits of the Vultur Aura.**

March 14. 1837. — A PAPER was read, "On the habits of the *Vultur Aura*," by Mr. W. Sells, with notes of dissections of the heads of two specimens, by Mr. R. Owen.

* As the power of smell in the carrion vulture has been a subject of discussion in the *Magazine of Natural History*, the remarks of Mr. Sells are deserving of attention. — Ed.

The writer states that this bird is found in great abundance in the Island of Jamaica, where it is known by the name of *John Crow*; and so valuable are its services in the removal of carrion and animal filth, that the legislature have imposed a fine of 5*l.* upon any one destroying it within a stated distance of the principal towns. Its ordinary food is carrion; but, when hard pressed with hunger, it will seize upon young fowls, rats, and snakes. After noticing the highly offensive odour emitted from the eggs of this bird when broken, Mr. Sells relates the following instances which have come under his own personal observation, for the purpose of proving that the *Vultur Aura* possesses the sense of smell in a very acute degree.

“It has been questioned whether the vulture discovers its food by means of the organ of smell or that of sight. I apprehend that its powers of vision are very considerable, and of most important use to the bird in that point of view; but that it is principally from highly organised olfactories that it so speedily receives intelligence of where the savoury morsel is to be found will plainly appear by the following facts:—In hot climates, the burial of the dead commonly takes place in about twenty-four hours after death, and that necessarily, so rapidly does decomposition take place. On one occasion, I had to make a post-mortem examination of a body within twenty hours after death, in a mill-house, completely concealed; and while so engaged the roof of the mill-house was thickly studded with these birds. Another instance was that of an old patient and much valued friend who died at midnight. The family had to send for necessaries for the funeral to Spanish Town, distant thirty miles; so that the interment could not take place until noon of the second day, or thirty-six hours after his decease; long before which time, and a most painful sight it was, the ridge of a shingled roof of his house, a large mansion of but one floor, had a number of these melancholy-looking heralds of death perched thereon, besides many more which had settled in trees in its immediate vicinity. In these cases the birds must have been directed by smell alone, as sight was totally out of the question.

“In opposition to the above opinion, it has been stated by M. Audubon that vultures and other birds of prey possess the sense of smell in a very inferior degree to carnivorous quadrupeds, and that, so far from guiding them to their prey from a distance, it affords them no indication of its presence, even when close at hand. In confirmation of this opinion, he relates that he stuffed the skin of a deer full of hay, and placed it in a field. In a few minutes, a vulture alighted near it and directly proceeded to attack it; but, finding no eatable food, he at length quitted it. And he further relates that a

dead dog was concealed in a narrow ravine, 20 ft. below the surface of the earth around it, and filled with briars and high canes; that many vultures were seen sailing in all directions over the spot, but none discovered it. I may remark upon the above experiments, that, in the first case, the stag was doubtless *seen* by the birds; but it does not follow that they might not also have smelt the hide, although inodorous to the human nose. In the second case, the birds had undoubtedly been attracted by *smell*, however embarrassed they might have been by the concealment of the object which caused it. I have, in many hundred instances, seen the vulture feeding upon small objects under rocks, bushes, and in other situations where it was utterly impossible that the bird could have discovered it but through the sense of smell; and we are to recollect that the habit of the vulture is that of soaring aloft in the air, and not that of foraging upon the ground."

Mr. Sells's communication was accompanied by the following letter from Mr. Owen, addressed to the secretary, W. Yarrell, Esq.

"Dear Sir, I received the heads of the John Crow, which I suppose to be the *Vultur Aura*, or turkey buzzard; and have dissected the olfactory nerves in both; as also in a turkey which seemed to me to be a good subject for comparison, being of the same size, and one in which the olfactory sense may be supposed to be as low as in the vulture, on the supposition that this bird is as independent of assistance from smell in finding his food as the experiments of Audubon appear to show. There is, however, a striking difference between the turkey vulture and the turkey in this part of their organisation. The olfactory nerves in the vulture arise by two oval ganglions at the anterior apices of the hemispheres, from which they are continued $1\frac{1}{2}$ line in transverse diameter, and 2 lines in vertical diameter, and are distributed over well-developed superior and middle spongy bones, the latter being twice the dimensions of the former. The nose is also supplied by a large division of the supraorbital branch of the 5th pair, which ascends from the orbit, passes into the nose, crossing obliquely over the outer side of the olfactory nerve, extending between the superior spongy bone and the membrane covering the middle spongy bone; then descending, and, after supplying the inferior and anterior spongy bone, escaping from the nasal cavity to supply the parts covering the upper mandible. This olfactory branch of the 5th pair is about $\frac{1}{4}$ th the size of the true olfactory nerve.

"In the turkey, the olfactory branch of the 5th nerve is about the same size as in the vulture, and is superior in size

to the true olfactory nerve, which is only about $\frac{1}{2}$ the size of that in the vulture. The olfactory nerve does not form a ganglion at its commencement, but is continued as a small round chord from the anterior apex of each hemisphere, and is ramified on a small middle spongy bone, there being no extension of the pituitary membrane over a superior turbinated bone, as in the vulture. Indeed, the difference in the developement of the nasal cavity is well marked in the different forms of the head in these two species. In the vulture, there is a space between the upper parts of the orbits, in which the olfactory ganglions and nerves are situated; and the nasal cavity anterior to these is of a much greater breadth and also longer, as well as exhibiting internally a greater extent of pituitary surface, than in the turkey. In this bird, the olfactory nerves are compressed within a narrow interorbital space, which would not admit of the lodgement of ganglions: the olfactory nerves, after passing through this space, then diverge to the nasal cavity.

"In the goose, the olfactory nerves are developed to the same size as in the vulture, and expand upon superior spongy bones of similar form, but placed wider apart; and these supply the middle spongy bones, which are longer, but not so broad, as in the turkey. The olfactory branch of the 5th pair is double the size of that in the vulture or turkey; it gives, however, not a greater proportion of filament to the nose than in those birds, but is mainly expended upon the membrane covering the upper mandible.

"The above notes show that the vulture has a well-developed organ of smell; but whether he finds his prey by that sense alone, or in what degree it assists, anatomy is not so well calculated to explain as experiment.

"I will bring my preparations showing the above at next meeting; and am truly yours,

"R. OWEN."

"*Royal College of Surgeons, March 7.*"

SHORT COMMUNICATIONS.

WE beg to call the attention of our readers to the following letter from the Rev. F. O. Morris, upon the subject of our late censure of the conduct of certain parties connected with the *Naturalist*:—

"SIR, In your present (October) Number, there are two statements, *the very reverse*, each of them, of fact, which when shown to be such, you will not hesitate, I feel sure, to retract,

and to undo, as far as lays in your power, the false impression which they must have created. Certainly, till you pointed it out, it never occurred to me to notice the coincidence between the withdrawal of the paragraph to which you allude from the cover of the *Naturalist*, and the publishing of the work having been undertaken by Messrs. Whittaker and Co. I fully admit that there was some ground, there being this coincidence, for your *surmising* that some connexion existed between these two facts; but, at the same time, unless you had certainly known that it was so, you should have been very cautious before you ventured to make an *assertion*, which, if it had been based on fact, would, I should myself be the very first person to admit, have afforded ground for a charge, to say the least of it, of a dishonest stratagem. But the fact is, that Messrs. Whittaker and Co. had nothing to do with the removal of the paragraph in question, and, most likely, were not even aware of its existence: most certainly, they never mentioned it to me in any way whatever, or to any other person that I am aware of. It was *I* who caused it to be withdrawn, inserted as it was, in the first instance, without my knowledge; and, immediately on seeing it, I strongly remonstrated, and persevered in urging its removal, until I succeeded. I repeat again, that Messrs. Whittaker and Co.'s at this time undertaking the publishing of the work had nothing to do with the withdrawing of the paragraph in question; nor had I even observed the coincidence, till you pointed it out, or drew your, I must say, hasty and erroneous conclusion from it.

"With regard to the sale of any work but your own, nothing can be known by you, except by resorting to a system of intrigue and espionage, which, I am convinced, you would shrink from practising. I have never thought of practising this with respect to yours, or any other work, perfectly satisfied as I am with the steady increase in the sale of the *Naturalist* (the past month alone having witnessed an increase in it of sixty copies and upwards); nearly, if not quite, half of the entire sale being conducted through private channels in the country, of which by no possibility could you know anything.

"In calling upon you to remark on the former statement, as I think I have a right to expect, I rely and depend on the supposition that I am addressing a gentleman who will feel bound, by a sense of honour, to make the only reparation in his power, for an injury committed through an ignorance of facts. I remain, Sir, your very humble servant, — Francis Orpen Morris. October 2. 1837.

"I beg that you will insert the above in your next Number.

" P.S. I have sent Mr. Wood the above, who adds the following: —

" " P.S. I have not yet seen the *Magazine of Natural History* for October, but *presume* that the "paragraph" alluded to is that relating to *advertisements*. It may therefore be necessary to state, in a few words, that Messrs. Whittaker and Co. have *nothing whatever* to do, directly or indirectly, with the editorship of the *Naturalist*; and that I ALONE am the responsible conductor of the work. — *Neville Wood. October 3. 1837.*"

It appears from the above, that Mr. Morris fully admits the culpable conduct of another party; the purport of this letter being to exonerate himself, and to show that the credit of removing the mistatement from the cover of the *Naturalist* is due to his interference, and not, as we naturally supposed, to Messrs. Whittaker and Co. How far Mr. Morris, as proprietor of the *Naturalist*, can deem it consistent with his character as a clergyman, to employ an editor who has been month after month reprinting a falsehood, and who, in the most unblushing manner, comes forward to take upon himself the sole responsibility of so doing, is a matter which we leave to Mr. Morris and his conscience to settle.

We, perhaps, ought to apologise to our readers, for introducing into the pages of the *Magazine of Natural History* the following letter from Mr. Holl (ex-editor of the *Naturalist*, and joint editor with Mr. Neville Wood of the *Analyst*); but, under all the circumstances of the case, we have no other course to adopt:—

" SIR, I have this moment had the *Magazine of Natural History* for October placed in my hands; and, on glancing my eye over the contents, I perceive you have thought proper to publish a letter (of which I disclaim all previous knowledge) with my name attached.

" To your scurrility and abuse I am perfectly indifferent; and I am doubtful whether a man who has made himself so *thoroughly contemptible* is worth the trouble of addressing; but, as you *know perfectly well* I have had no interest or connexion, either directly or indirectly, with the *Naturalist*, since the publication of the sixth number, your mixing up my name in your animadversions on the work evinces conduct so vindictive, base, and dishonourable, that it will be matter for future consideration whether I shall not take further notice of your proceedings.

" I shall transmit a copy of this communication to Mr. London, whose kindness of heart and gentlemanly feeling (quali-

ties, it is very obvious, you do not possess) will, I feel assured, instantly repudiate the disingenuous and disreputable conduct of his Editor. Your's obediently,—*W. Holl. 57. Pall-Mall, Thursday, 3 o'Clock.*"

We are aware that Mr. Holl found the attempt to establish the *Naturalist* a most unfortunate speculation; and, in starting a two-shilling monthly Magazine of Natural History, it is more than probable that he did not calculate upon the issue of a New Series of Mr. Loudon's. It is easy, therefore, to understand why the present conductor of this Journal should be deemed "*thoroughly contemptible*" in the estimation of Mr. Holl, and, perhaps, of some of the "eminent scientific" sub-editors acting under him. The present occasion, however, is certainly ill selected for the expression of this opinion; for, if the editor of the *Analyst* is so truly unfortunate as to have fixed upon an associate who can surreptitiously attach his name to a circular, he (Mr. Holl) must thank his own want of judgement and discretion for the consequences, and not attempt to involve us in the responsibility. The fact of Mr. Holl having no connexion with the *Naturalist*, as at present carried on, is a circumstance not at all affecting the general question; because the circular refers to the sale of the *back* numbers; and, even if we had for a moment suspected that his name had been appended without his knowledge or sanction, we could not have mutilated the document, by omitting the signature. The style and tone of Mr. Holl's disclaimer will injure no one's reputation but his own; and the epithets, "dishonourable," "disreputable," "disingenuous," "base," &c., will occasion us about as much uneasiness, as if we were spit at by the llama in the Zoological Gardens.

So far as Mr. Neville Wood is concerned, the *exposé* elicited by our late remarks is, perhaps, without a parallel. Two most serious charges are admitted against this gentleman: in one instance, by the proprietor of the Magazine which he (Mr. Wood) edits; and, in the other, by an individual with whom he is even more immediately associated; and these charges are sent for insertion in the columns of a contemporary periodical! We will not, however, dilate further upon a subject which we have been most reluctantly compelled to advert to in any way, and which the parties who are implicated in the transaction have, by their own conduct, forced upon the public. — *Ed.*

Wildgeese in Germany. — There occur two species of wild-geese in the inland parts of this country. The great grey goose, called *märzgan* (A'nsér cinereus, the grey lag goose of Bewick), and the *saatgans*, or *moorgans* (A'nas ségetum, the

bean goose of Bewick). The former breeds in different localities of Northern Germany; e. g. on the Lake of Bades, in the duchy of Anhalt Zerbst, where M. Pannier of Zerbst has observed them for the last thirty years. This species commonly arrives about the beginning of March, in little flocks, and migrates to the south in August. During the winter, it has been observed on the lakes of Switzerland. Pennant says that, when taken young, these geese are easily made tame; and they will even breed, and become quite domesticated, as proved by an instance at Sandersleben, in Zerbst, where M. Mathei has kept and reared many for the last twenty years. They yield, when paired with the tame goose, hybrids that are capable of propagating their variety; but a tame gander can more easily be associated with a wild-goose than *vice versâ*. It is probable that the tame goose has originated from this species. The second species of wild-goose that is found in Germany does not breed there. It arrives with the beginning of wintry weather, often as early as October, in large flocks, alighting in the corn fields to feed upon the green blade; and, if the winter is mild, stays till March; if not, migrates farther to the south. It passes the nights on the ice of lakes and swamps, where sometimes thousands of oval-shaped depressions may be found together, caused by the heat of the birds. Those that have been caught old have never bred in captivity. — *W. Weissenborn. Weimar, July 18. 1837.*

Coal-finding. — In the mysterious business of coal-finding, we are warranted in making any reasonable experiments which may lead to a recovery of the range of the whole series of coal-measures, and in drawing inferences for our guidance in the choice of places of trial, from the most remote phenomena which seem to favour our purpose; for the seemingly abrupt terminations of some of our coalfields are certainly the most difficult problems in geology. Here, the practical man, with a vast field of experience by the side of him, is at a loss how to proceed. What, therefore, has he to do but to seek out all the analogous cases, and, even if not strictly analogous, to learn, if he can, by the known the way to the unknown.

Now, there are certain *partial interruptions* to the regular courses of the coal-beds in the great northern run of the coal-measures which extends through Derbyshire and Yorkshire, which may help to elucidate the mysteries at the two extremities of that long coal district, and to satisfy us whether they really are terminations, or only great and unusual deflections in the ranges of those strata, deeply hidden and unexplored, and which, better known (perhaps only by experiment), may

enable us to judge of the probability of uniting or extending our coalfields.

For solving these important questions on our coalfields, some few years since noticed by Mr. Coneybeare in a very general way (not altogether correct), I think much may be deduced, both from the observations of the geological phenomena, and from experience.

Some are certainly not extricable in the direction of their ranges, while others appear to be so; and, therefore, there is a probability of some of them being united.

Some of the coalfields, particularly in the middle of the island, seem not yet wrought to any well defined limits of the coal series; and, consequently, in such cases there is good ground for expecting an extension; and especially as geology, by its settled order of superposition in the rocks, does away old erroneous notions of cut-offs, &c., by the red rock, and by the interposition of faults or dikes.

From the numerous instances of now well-ascertained undulations across the general ranges of the strata, by which their planes are formed into caverns, and, intermediately, in the reverse of these forms, so that the strata of coal may rise on one side up to an unconformable covering, cut off by the red marl or red rock, there may be good reason to expect the coal-measures to go down again on the other side of the so-called anticlinal line at no great distance; and especially where it can be ascertained that such lateral rise of the strata has not brought up the deepest part of the coal series; but, where the millstone grit or mountain limestone appears, there, with certain exceptions, the case may be decisive.

That there are such opposite lateral rises and dips in the strata, where the coal-measures are deeply unconformably covered by the red marl, is well known in the extensively wrought collieries of Somersetshire (where I commenced my studies of geology); and, consequently, the planes of the coal are subject to hollows and ridges, though the extent of these irregularities may not yet be known.

We see that the strata, in part, or in whole series of strata in their superficial exposures, form such natural hollows and ridges to a great extent, chiefly across the bearings of their ranges; and, therefore, *we have a right to expect such forms in them, even where they are deeply covered.*

The broad and very long coalfield of South Wales terminates north and south with opposite rises in the strata.

The coal in Durham rises, in its southward boundary, nearer to the surface; so that good coal is found at no great depth beneath its unconformable cover of magnesian limestone.

The northernmost coal of Yorkshire rises northward beneath a cover of the same limestone, and ranges E. and W.; forming, with its south-western boundary, a westerly pointed figure, widening and deepening south-eastward.

The question of an east or northeasterly continuation of the coal-measures can only be entertained at the easterly end of the east and west range, before-mentioned; but we must previously turn to other places, to see, by analogy, how far any subterraneous deflection in the range of the coal-measures may be thereabout expected.

Along the westerly edge of the coal-measures, both in Yorkshire and Derbyshire, there are well-known irregularities occasioned by elevations and depressions across the general range of the series, causing sinuosities in the marginal edges of the coalfields. The lands eastward, over the ridges, contract, and those westward, in the hollows, expand the width of the coal-measures; so that the first rise in the north side of the Dun causes a vacant space between Sheffield and Chapel-town; and the second rise south of Sheffield, and in Derbyshire, causes a vacant space in the productive coal-measures between the high part of Sheffield Park and Coal Aston; and in the hollow between these two ridges the coal is thrown back under Sheffield. But there is a greater westward receding in the Dronfield trough, one side of which, rising to the north, causes a long east and west range through Coal Aston.

We have therefore, north and south of the Dun, two east and west ranging lines of the coal-measures (similar to, but much shorter than, that on the north side of the Yorkshire coal-field), from which two east and west ranging lines the coal is known, in both cases, to return and resume its regular course.

That in Derbyshire, from Eckington to Stubby, is several miles in extent: but it is not from the magnitude, but from the similarity, of these irregularities that we may infer the probability of the coal-measures, in class of the most northerly works in Yorkshire, continuing easterly, or resuming a north or north-easterly range, though it may be at a great distance beneath their unconformably covering strata. — *William Smith. Scarborough, Sept. 29. 1837.*

Notice of a Meteor, in a Letter to Professor Silliman. — Rochester (North America), August 7. 1837. You have probably seen some account of the meteor that appeared in this region on Wednesday, the 5th ult. I had the satisfaction of seeing it myself as I was walking in the street betwixt seven and eight o'clock in the evening. It first made its appearance from behind a dark cloud, a little to the south-west of this place, and flashed along through the heavens with great

majesty and splendour. Its course was to the north, or a little north-west, inclining to the horizon. Its elevation above the horizon was about thirty degrees. Its size was about that of the sun in its zenith, and its colour that of iron heated to whiteness. It was visible about a minute, and exploded, as it was passing out of sight. Many fragments fell from it, throwing out an intense light of beautiful colours. Many say they heard a report as of distant cannon, though I did not. A long track was left behind it of a greyish colour, which continued waving and expanding for some minutes, and then vanished gradually away. (*American Journal of Science and Arts.*)

Valuable Addition to the Menagerie of the Zoological Society. — Such of our readers as may not have seen the circumstance mentioned in the public papers, will be gratified at learning that the Zoological Society has just added by purchase to the collection in the Regent's Park a female orang, brought to this country by a sailor from Borneo. The animal does not appear to have suffered much from her long voyage, and is exceedingly docile, and particularly fond of being noticed and caressed. Great hopes are entertained, from the apparent good state of health in which she is at present, that it may be long before it will be necessary to shift her quarters from the *menagerie* to the *museum*. — *Ed.*

Portrait of Dr. William Smith. — A very highly finished and admirable likeness of Dr. William Smith, author of *Strata identified by their Fossils*, and now in his 69th year, has been executed on steel by Ackerman of the Strand. — *Ed.*

Literary Notice.

IN the press, and speedily will be published, in one vol. 12mo, *The Wonders of Geology*, with numerous engravings, and a beautifully illustrated frontispiece, representing the country of the Iguanodon, engraved in mezzotinto on steel, by J. Martin, Esq. From the geological discoveries of Dr. Mantell, in Tilgate Forest. By Gideon Mantell, Esq., LL.D., F.R.S. London: Relfe and Fletcher, 17. Cornhill.

GENERAL INDEX.

- ACANTHODEUS** scabrösus, supposed to be a larva only, 145.
- Achatina** clavata described, 487.
- Acherontia** A'tropos, erratic habits of, 137.
- Actinæ**, observations on the habits of, 474.
- Acélon**, description of, 287.
- Africa**, expedition into the interior of, 98; enumeration of the objects in natural history collected by the exploring party, 102.
- Alcyonium** digitatum, description of, 475.
- Aluco** stridula, changes of plumage, 306.
- Alfsum** calycinum, sudden appearance of in a particular locality, 447.
- Ancistrocercus**, characters of the group, 494.
- Anemonal** curves, observations on, 211.
- Animal** life, compared with vegetable, 28.
- Anóstoma** (new gen. in entom.), 143; **A. australasiæ** figured and described, 143; **A. Hérbstii** figured, 144; observations upon, 485.
- Antennæ** of insects, observations on, 257.
- Apes**, fossil remains of, 437.
- Argonaut**, experiments of Mrs. Power upon the shell and eggs of, detailed, 394; description of the Octopus when just hatched, 395; observations of Mr. Smith upon the animal and its shell, 396; opinion of Mr. Gray respecting the nucleus of the shell, 397; experiments of Captain Rang upon the shell, 397; position of the Ocythoe with respect to the shell, 398; description of the manner in which the Ocythoe crawls along the bottom of the sea, 399; observations of Mr. Cranche upon, 530; observations upon fractured specimens repaired with true shell, 527; on the parasitic nature of the animal, 247.
- Armadillo**, specimen stolen from the Zoological Gardens, 434.
- Athalia** centifoliæ, subject of a prize essay, 547.
- Atractodon** elegans figured and described, 219.
- Aurora**, notices of, 221. 633. 635. 637.
- Ballard** Head, geological observations upon the chalk of, 414.
- Basalt**, experiments upon the fusion of, 147.
- Bear**, fossil remains of, 125.
- Bees**, migrative impulse displayed, 134.
- Belemnite**-Madrepore, 161.
- Bettongia** penicillata, rufescens, setösus, described, 564.
- Bétula** álba, observation upon, 447.
- Binana**, characters of, 525.
- Birds**, genera and species of indicated by their nests, 4; late singing of, 53; list of those found in Devonshire, 113; list of the rarer species killed in Suffolk and the borders of Norfolk and Essex, 116.
- Black Jack** caterpillar. See **Athalia** centifoliæ.
- Black-throated** loon, changes of plumage, 301.
- Blue Skate**, capture of an immense specimen, 435.
- Bos** brachyceros described, 587.
- Botanical** specimens, preservation of from insects, 311.
- Bottletit**, common, observations on the habits of, 199; figured and described, 204; account of a brood reared in confinement, 205.
- Bramble**, common, nests of the **Osmia leucomelana** occurring in, 491.
- Bramblefinch**, changes of plumage noticed, 132.
- Brady**, Captain Samuel, history and exploits, 158.
- Bridlington** tertiary bed, notice of, 504.
- Buccinum** undatum, fact relative to the enlargement of its eggs, 247.
- Calamophilus** biarmicus, variation of plumage, 303.
- Campontia** eruciformis, 279.
- Canary**, power of imitating the human voice, 548.
- Canis** chrysurus (fulvous-tailed dog) described, 577.
- Canis** procyonoides (raccoon-faced dog) described, 578.
- Capercailzie**, formerly known in Scotland, 119.
- Carcharias** megalodon, occurrence of the fossil teeth in the crag, 225.
- Cassida** obsolèta, remarks relating to, 576.
- Cassis**, distinctions between it and **Cypræassis**, 214; testiculus, animal of, figured and described, 472.
- Cat** captures a swallow by feigning death, 5; instance of its sagacity in discovering its home, 133.
- Centenus** variegatus described, 581.
- Chalk**, sections of, on the Dorsetshire coast, 417.
- Chætura** pelagica, limited geographical range, 137.
- Chaffinch**, changes of plumage noticed, 132.
- Chaunodius** Sahnii described, 487.
- Cheirópoda**, characters of, 525.
- Chimpanzee**, its innate dread of the large **Fèles**, quoted in relation to instinct, 2.
- Chiton**, fossil, described, 162.
- Cinnabar**, notice of a large specimen, 157.
- Circus** cineræus, changes of plumage, 302.
- Colour**, on the changes of in the fur of **Mam. malians** and the feathers of birds, 259.
- Colymbide** improperly placed beside the **Rasores**, 329.
- Colymbus** glaciælis, changes of plumage, 306.
- Conopatus** Humboldtii described, 581.
- Congeria**. See **Myltilus polymorphus**.
- Corrosive** solution, valuable in the preservation of botanical specimens, 311.
- Córvus** Córnix, occurrence of black varieties, 81; its pairing with the black crow, 82.
- Cows**, statistics relating to the births of the sexes, 84.
- Crag**, fossils of, 35. 90. 218. 225.
- Crocodile**, fossil, figured, 532.
- Crossbill**, notes on the habits of, 164; remarkable dissimilarity in the plumage, 165.
- Crow**, carrion, on the habits of, as observed in Scotland, 118.
- Crow**, Royston, on the habits of, as observed in Scotland, 118.
- Cùlla**, observations upon, 488.
- Cuckoo**, observation upon, 554.
- Currèca** cinèra. See **Whitethroat**.
- Cylindroides** (new genus in entom.) 141; **Campbellii** figured and described, 142.
- Cynogale** Bennettii described, 579.
- Cynthia** cardui, extensive geographical range, 137.
- Cypræassis**, characters of the genus, 211; distinctions between it and **Cypræa**, 215; notice of the habits of the animal, 216; additional observations upon, 431; additional remarks by M. Stutchbury, 470; objections to the admission of the genus, 367. 387.
- Death**, simulation of, remarks upon, 508.
- Deposits**, semi-tertiary, 161.

- Deposits, tertiary, divided zoologically into three groups, 12; elevation of, 13; on the errors which may arise in computing their relative age by the percentage test, 235.
- Diētāmus ālbūs*, supposed electrical properties, 241.
- Didēlphidæ*, characters of, 525.
- Divergence in vegetables, letter from Golding Bird on, 181.
- Diary of a Naturalist, extracts from, 157.
- Dog, remarks upon the organ of time in, 53.
- Dreissēna cyānea*. See *Mýtīlus polymórphus*.
- Dromedary, birth of one at the gardens of the Zoological Society, 548.
- Duck, changes in plumage, 262.
- Dumfriesshire snake, existence, as distinct from the common viper, doubted, 187.
- Eagle, instance of its choosing an inaccessible spot to build in, 119; nest of in Loch Skene, 443.
- Electric currents in vegetable structures, 240.
- Electrical phenomenon, 220.
- Elephant, anecdote of the recapture of a tame individual, 8; fossil remains of, 125.
- Endosmosis, explanation of the term, 59.
- Eptzooty, its effect, 134.
- Exosmosis, explanation of the term, 59.
- Fālcō cyāneus*. See Ring-tailed Gledie.
- Farrington, sponge-bed noticed, 237.
- Fēdia carināta*, locality for, 439.
- Fēlis chinēnsis*, inconspicua, pulchēlla, ornāta, described, 577.
- Felspar, experiments upon the fusion of, 147.
- Fieldfares breeding in Scotland, 339.
- Fox, instances of its feigning death, 5; observations on the natural habits of, 509.
- Fringillidæ, description of a new form belonging to, 535.
- Geese, wild, protected in Loch Naver, 120.
- Geosaurus, description of, 290.
- Germination, on the electric currents developed in, 243; physiological and chemical changes proper to, 293.
- Gibbon. See Ape.
- Gironde, basin of, 14.
- Giridæ, characters of, 525.
- Gnāthodon figured and described 376.
- Golūnda Eliōti; Meltāda, described, 586.
- Goldfish, manner of taking their food, 44.
- Granite, experiment upon the fusion of, 147.
- Gravel, character of, in Norfolk and Suffolk, 145.
- Greenshanks, changes of plumage in, 479.
- Greenstone, experiments upon the fusion of, 147.
- Grouse, black, plentiful in Selkirkshire, 119.
- Grouse, red, on the habits of, as observed in Selkirkshire, 120.
- Gryllotalpa, found in New Holland, 142.
- Guillemot, plumage of, 477.
- Gypsum, deposition going forward in the island of Ascension, 277.
- Haimatūrus ālbūs*, *Derbiānus*, *dorsālis*, *Eugēnii*, *Pārryi*, *ualabālis*, described, 583.
- Hapālophus cōbia* described, 489.
- Hare taking water, 279.
- Hēlix memorālis*, remarks upon the different coloured bands of the shell, 530; observations on the genus, 484; virgāta, occurrence in vast numbers near Norwich, 223.
- Hemirāmpus, record of a species captured on the Suffolk coast, 505; described and figured, 507.
- Hénicus Stōllii* figured and described, 144.
- Hērpestēs Bennētii*, *brachyūrus*, *nepalēnsis*, *Smithii*, described, 578.
- Heteronēmia, remark upon the genus, 144.
- Hippārchia*, rarity of the larvæ belonging to that genus noticed, 19.
- Hippopotāmus*, premium offered for a living specimen by the Zoological Society, 333.
- Honey buzzard, observations on, 537; habits of a tame individual, 538.
- Hornblende, experiments upon the fusion of, 147.
- House-sparrow, fact relating to the habits of, 168.
- Hybridism, remarks on, 81. 358.
- Hyères, description of its position, and general character of the place, 191; botany of, 193; orangeries of described, 194; islands of, 196; insects collected there, 198.
- Hypsiprīmnus minor* described, 584.
- Ichthyosādrus*, description of, 342.
- Icones Plantarum, notice respecting the colouring the plates, 385.
- Idiocy, existence of, in sheep and poultry, 139.
- Iguānodon, description of, 341.
- Ignis fatuus*, remarks on its origin, 548. 551, 552; supposition that it is an insect, 3. 3.
- Impatiēns Balsamina*, irritability in the valves of the seed-vessel, 58. 61.
- Infant instinctively takes the breast, 3.
- Instinct, definition of, 1.
- Irritability shown in the stems of many plants when divided, 57; attempt to explain it by physical causes, 58. 62.
- Jackdaw, changes of plumage, 301.
- Jack-o'-lantern. See *Ignis fatuus*.
- Jersey, notices of rare plants collected there, 25; general character of the island, 26.
- Kangaroo, description of the membranes of a fetus, 481.
- Kingfisher, manner of taking its food, 48.
- Kent, degradation of the coast noticed, 123; action of the tides upon, 124.
- Lacerta Neptūnia*, description of, 292.
- Lagopus salicēti*, changes in the plumage of, 262.
- Lāmīum ālbū*, experiments upon the irritability of, 59; intermedium, locality for, 439.
- Lantade, remarks upon, 487.
- Lānius Collūrio*, changes of plumage, 300.
- Larks, plumage often varying according to the soil, 135.
- Lārus argentātus*, changes of plumage, 301.
- Leggāda Boōdūga* described, 586.
- Lemūridæ*, characters of, 525.
- Lepidosāurus*, description of, 291.
- Lēptonyx Weddēllii* described, 582.
- Lēpus californicus*, *Douglāssii*, *longicaudātus*, described, 586.
- Leucōjum vērnum*, observation upon, 447.
- Lima, observations on its mode of progression, 23; description of the animal, 24; queries respecting its affinities, 24.
- Linnets, female, assuming the male plumage, 480.
- Lithōdomus dāctylus*, manner of procuring it in the harbour of Malta, 23.
- Lizard, notice of an undescribed variety, 189.
- Locusta monstrōsa*. See *Anōstoma Hērbstii*.
- Lōxia cuvirōstra*. See Crossbill.
- Luminous appearance at Birmingham, 222.
- Lunar hornet sphinx. See *Trochilium crabroniformis*.
- Lūtra californica*, *chinēnsis*, *indica*, described, 580.
- Lutrāria* figured and described, 374.
- Mācropus mājor Shawi*, described, 582.
- Macrospōndylus*, description of, 291.
- Māctradæ*, arrangement of the family, 335.
- Māctra* figured and described, 371.
- Madrépora Caryophyllia*, on the habits of, 475.
- Mailed gurnard captured off Plymouth, 17.
- Malacōnotus* noticed, 488.
- Mallard, mode of changing plumage, 260.
- Mammālia*, fossil remains of, noticed on the Kentish Coast, 122.
- Man, comparison of his intellectual powers with those of animals, 78.
- Manticora latipennis* described and figured, 503.
- Marpūtius*, description of the genus, 581.
- Mastodonsāurus*, description of, 291.
- Megalosāurus*, description of, 341.
- Mephitis mexicanā*, variāns, described, 581.
- Mermaid, description of a supposed specimen, 110.
- Meteors, observations upon, 151.
- Meteorological error, 448; retrospect, 153;

