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THE INSECT WORLD



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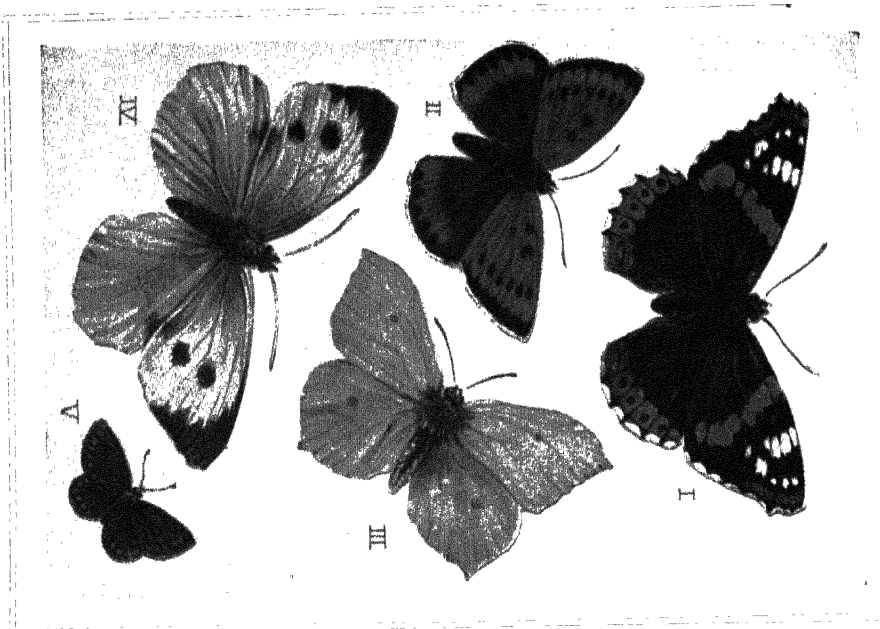
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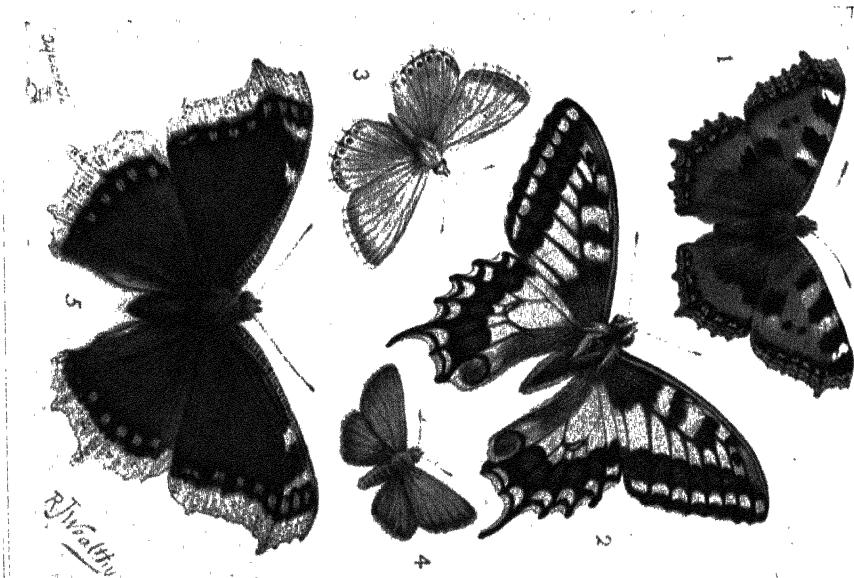
ANIMALS AT HOME

BIRD LIFE, REPTILES, AND AMPHIBIANS

THE INSECT WORLD



BRITISH BUTTERFLIES.—I. Red Admiral. II. Large Copper.
 III. Brimstone. IV. Large White. V. Brown Argus.



BRITISH BUTTERFLIES.—I. Small Tortoiseshell. II. Swallowtail.
 III. Chalk Hill Blue (Male). IV. Small Skipper (Male). V. Camberwell Beauty.

THE INSECT WORLD

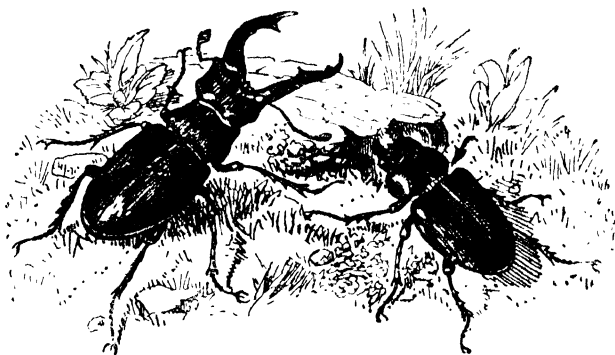
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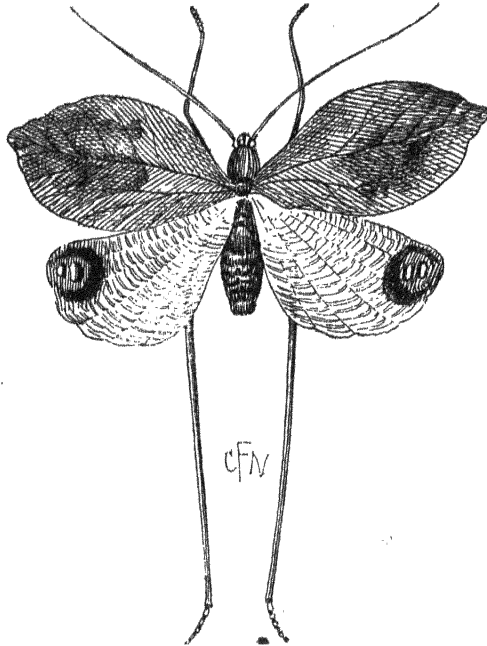


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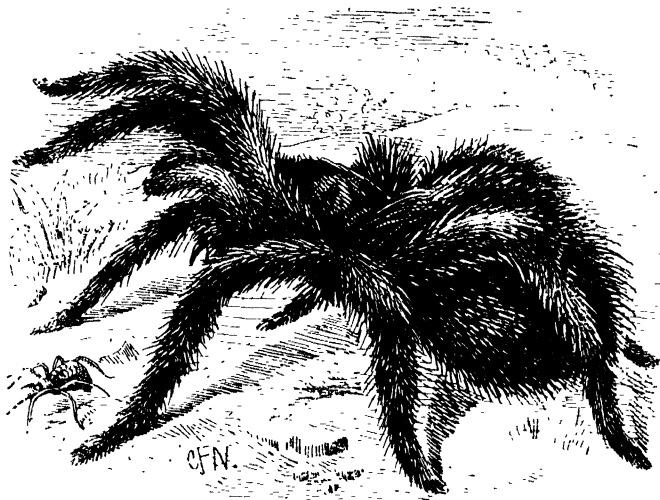
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LEAF MIMICKING GRASSHOPPER

The insects are illustrated life size, with the exception of the Stag Beetles, on the title page, which are about two-thirds of their natural size.



BIRD-CATCHING SPIDER.

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BRITISH BUTTERFLIES.

Red Admiral, Large Copper, Brimstone, Large White, Brown Argus, Small Tortoiseshell,
Swallow-tail, Chalk Hill Blue (male), Small Skipper (male), Camberwell Beauty .

Frontispiece

FOREIGN BUTTERFLIES.

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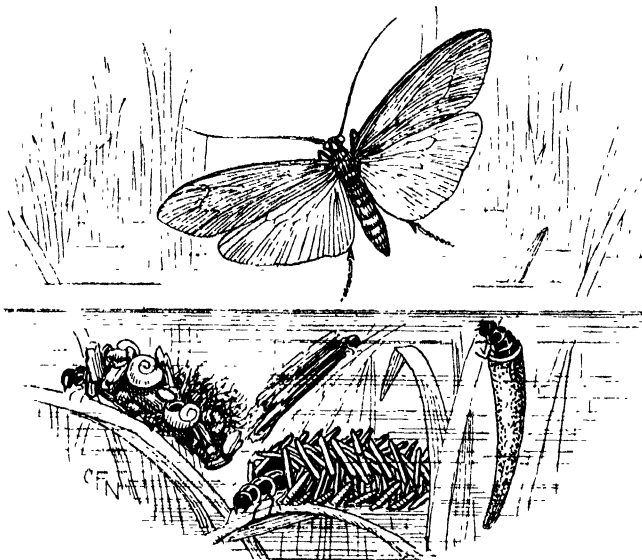
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BRITISH MOTHS.

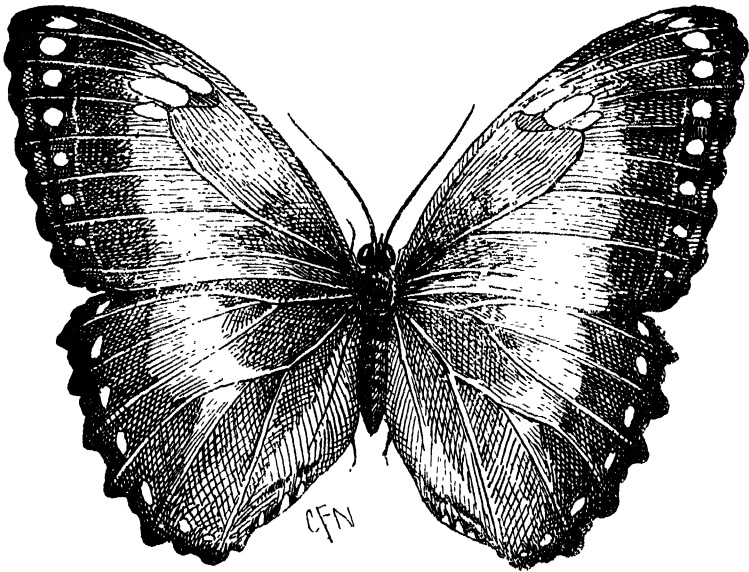
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CADDIS FLY AND LARVÆ (IN VARIOUSLY CONSTRUCTED "CASES").



MORPHO BUTTERFLY.

CHAPTER I.

BUTTERFLIES.

. . . hedgerows all alive
With birds, and gnats, and large white butterflies
Which look as though the May-flower had caught life
And palpitated forth upon the wind."

E. B. BROWNING.

AN ancient Greek myth relates how a beautiful princess, called Psyche, aroused the anger and jealousy of the goddess Venus, who sent her son, Cupid, to punish the poor maid for what was no fault of hers. Cupid was ordered to shoot her with his dart and then arrange that she should fall in love with some mean and unworthy person, and thus make her ridiculous in the eyes of her father's subjects. But the biter was bit, and Cupid, instead of injuring Psyche, fell in love with her, and he had her spirited away to a fine palace where she dwelt alone, waited upon by invisible hands. Every night she received a visit from

a mysterious being, whose face she was never permitted to see, and having nothing else with which to occupy herself, Psyche's thoughts continually dwelt upon the stranger when he was not with her. The end of it was that she learned to love this mysterious visitor, and all would have been well for her had she not been overcome with curiosity as to what his face would be like. She would have loved to have a peep, but he had sternly forbidden any such thing. At last the temptation became too strong for her ; she felt she must find out at any cost ; so, lighting her lamp, as he lay sleeping one night, she crept towards the bed, and, holding the light aloft, gazed upon his face. When she beheld the beautiful form of Cupid, for it was he, she was so startled that her hand shook, and a drop of hot oil fell from the lamp upon his shoulder. The slumberer was awakened, and hurled bitter reproaches at the princess for her disobedience and want of trust. Then, spreading his splendid pinions, he mounted up and up until he disappeared beyond the clouds.

Sad and alone, Psyche wept and waited for her lost love ; but he never returned, and at last she made up her mind to search until she found him. To and fro, over all the earth, she wandered ; but her quest was vain ; and at last, in despair, she decided to approach Venus, who must surely know the whereabouts of her son. Venus was delighted to get her enemy into her power, and behaved in a very cruel and unmerciful way. Psyche was set some terrible tasks to do—tasks so difficult that not even her great love could have enabled her to accomplish them without the aid of some of the gods.

Her last task was to journey to the infernal regions to bring back a casket from Proserpine, Queen of the Shades.

Psyche got there safely, and was joyously returning with her treasure, when, quite forgetting the bitter lesson her previous curiosity had taught her, she was again overcome by inquisitiveness. What on earth could be in that casket that, Venus should be so anxious to have it? Just one little peep, she reasoned, nobody would be the wiser. She pushed open the lid, and out glided a terrible deadly slumber which enveloped her and caused her to fall down lifeless.

Cupid, who had witnessed this, regretted his previous anger, and calling Psyche back to life, took her in his arms and mounted with her to the throne of Jupiter, the chief god, and entreated his protection. Jupiter took pity on the unfortunate girl and made her one of the immortals by giving her ambrosia to drink. She now could dwell with Cupid amongst the gods, and was happy. After a time Cupid and Psyche had a little daughter, a joyous creature, called Pleasure, who sometimes comes to dwell with mortals, even in our own time.

Now, the end of this story brings me to the beginning of mine, for Psyche

was represented by ancient Greek artists as a Butterfly, and it is with butterflies, the beautiful princesses of the insect world, that this chapter deals.

Naturalists, in their hard, unromantic way, call Butterflies and Moths "Lepidoptera" (which means "scale-winged"), because their wings differ from those of other insects in that they are covered on both sides with overlapping scales arranged like the tiles on the roof of a house. It takes a storm to blow the tiles off a roof, unless the jerry-builder has been at work; but the delicate scales of a butterfly rub off with the lightest touch, leaving a surface, thin and transparent, like the wing of a Bee. So it is easy to see that the beautiful colouring and velvety appearance are entirely due to the scales.

Caterpillars.—When a human baby is born, one can at once see that it very much resembles other human beings, only it is a smaller edition; it has features and limbs, and may even closely resemble papa or mamma, or sister Jane.

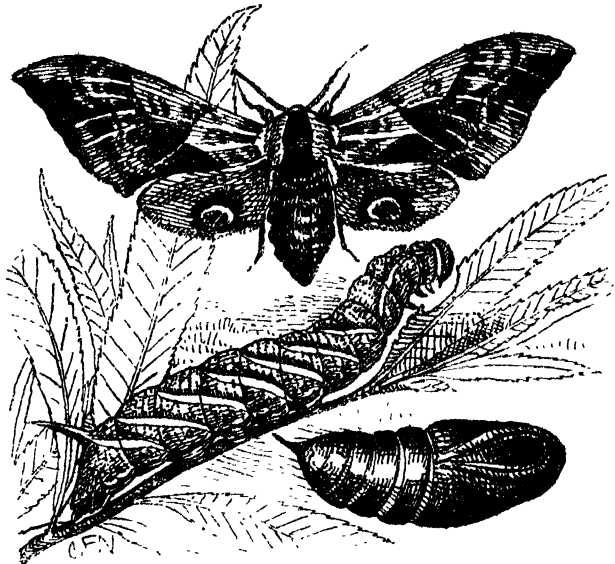
If pussy proudly shows you her new kittens, you can at once see that they are small cats; it would be impossible to mistake them for anything else.

In the insect world this resemblance between the young and the adult is not always the case.

Even wise men, who think of nothing but insects all day long, have been mistaken in regarding the young of some particular species as something quite different to what they really are, and only careful observation has pointed out their error.

Most insects pass through three distinct stages of growth.

In Butterfly-world, the first is the caterpillar or larva stage, a very ugly and greedy one, Every child with



EYED HAWK MOTH, LARVA, AND PUPA.

eyes in his head, so to speak, will have observed that the Caterpillar has a ringed, worm-like body, and great, strong jaws.

The ugly duckling was a bad-looking likeness of the swan ; but no one can find a hint of Madam Butterfly in plain Baby Caterpillar. Poor little creature ; it has not even a mother to be proud of it and say, " Plain children grow up handsome " ; for, after carefully selecting the plant which best suits her offspring, the parent deposits her eggs upon the leaves, and goes away to die.

As soon as the Caterpillar hatches out of the eggs, it sets about its life-work, to eat as much, and as quickly as possible, and the strong jaws, shaped like pincers, are kept busily at work, opening and shutting from side to side as it takes great bites out of the leaves. The first meal of the young larva usually consists of the walls of the egg that was its former home ; which conveys a moral : " Waste not, want not." It is fortunate for the Caterpillar that it does not have to pay its greengrocer, for in one month it eats about 40,000 times its own weight of food, and becomes 10,000 times heavier than it was when born. All good things come to an end, and presently our friend can eat no more ; it gets a sort of caterpillar indigestion, and its skin feels too tight. It wriggles and squirms until crack ! its skin bursts right down the back and drops off. This is not such a calamity as one would imagine, for, underneath the old skin, a new, nicely-fitting one has been formed. There is nothing at all wasteful about the Caterpillar, so it gobbles up the old coat before turning its attention to its diet of green stuff, which it can now attack with fresh energy after the little " rest-cure."

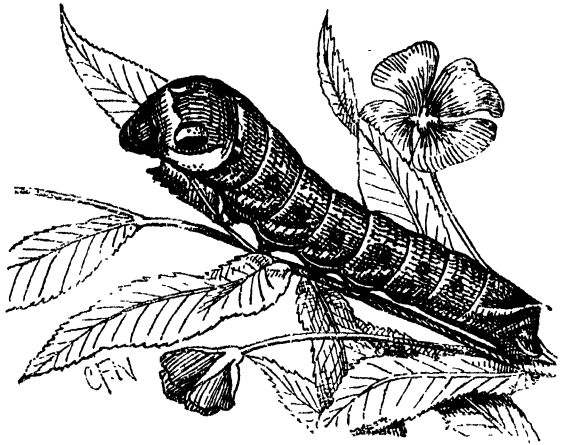
A Caterpillar has sixteen legs, six being true legs and the remainder assist it to hold on to the leaf. The skin is smooth in some varieties, in others it is covered with short hairs or has long branched spines.

The larva of the Elephant Hawk Moth is an artful dodger and does its best to deceive its enemies. When danger approaches it draws its head and the three first rings of its body into the next two rings, which have marks upon them resembling eyes. When these rings are bulged out, by the upper part of the body being drawn inside them, they look like the head of some weird animal with four great staring eyes, an alarming apparition, no doubt, to some of its foes.

Borneo boasts a strange Caterpillar which has spines running down its back, upon which it fixes small buds from its food plant, with threads of silk. The silk is not bought at the nearest shop, but is inexpensively obtained from its own mouth. When the creature has covered itself with all this finery it is impossible to distinguish it from the plant on which it rests.

The larva moults (changes its coat) about five times and then reaches the

second or pupa stage of its existence. After casting the last coat, the legs are bent together and the head folded over them, and the little creature settles off to sleep sometimes for days, sometimes for months. A gummy substance oozes from the insect, which hardens over the body, and forms a sort of coat. Moths generally cover their pupa with silk which they spin themselves.



LARVA OF ELEPHANT HAWK MOTH.

Butterflies.—More wonderful than any fairy tale is that magic slumber of the pupa, which changes the greedy Caterpillar into a Prince or Princess Charming, who lives amidst the blossoms in the summer sunshine, feasting upon the nectar of the flowers. The flowers honoured by such guests put forth their gayest tints and sweetest odours. The flowers are coquettes and endeavour to attract their Butterfly or other insect visitors by every artful device. Fearing that they might pass by without tasting the hidden store of nectar, some blossoms point out the path by means of spots or stripes, as can easily be observed in many garden flowers, such as the tiger-lily or nasturtium. In return for such hospitality the Butterfly bears the precious pollen (the powder that carries fresh life) from plant to plant, enriching the future seed, which requires this mixture of pollen for its formation.

This kind action is quite an unconscious one on the part of the butterfly, as the pollen sticks to its long, slender trunk (proboscis) when it is uncoiled to suck up the nectar from the flower cups and is again brushed off in the next blossom upon which it alights.

To see the Butterfly in all its glory one must journey to tropical and sub-tropical regions. There the huge-winged creatures rival the brilliant tropical flowers as they float above them in the sunshine, flashing like jewels.

Amongst the most gorgeous are the Bird-Wings, with wings that measure from three to nine inches across, and who can describe the glory of their colouring, the daring contrasts of their brilliant hues, their jewel-like sheen ?

The *Morphidæ* of Tropical America and the East Indies are another group of magnificent butterflies. Collectors will take no end of trouble and risk great danger to capture them. They are high fliers and seldom come nearer to earth than about twenty feet. Until aeroplanes have become more perfect, our only way of capturing these tempting prizes seems to be to reach them from a higher point than that at which they happen to be flying. To do this, men are let down over the edges of precipices by means of ropes, and a very uncomfortable experience it must be.

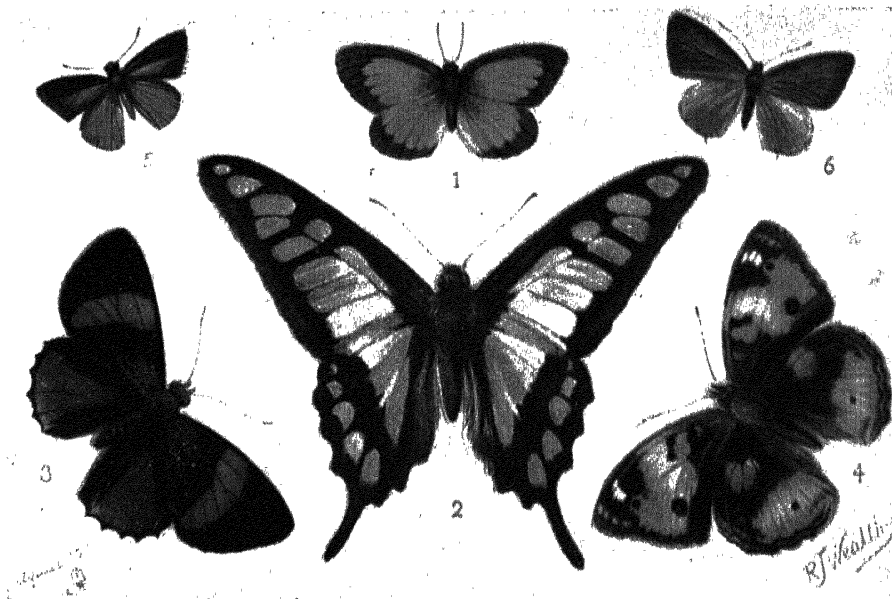
The lady Butterfly is frequently a modest, retiring creature, plainly clad and of a stay-at-home disposition. It is the husband dressed in gorgeous hues who disports himself in the sunshine, and meeting his pals in Butterfly Clubland proceeds to spend a riotous time. I regret to say even indulging freely in drink, should a muddy pool be within reach, this strong fare suiting them better than the nectar that is partaken of by their less gorgeous relatives.

Natural history does not relate whether the good stay-at-home spouse ever treats her husband to a lecture on the frivolity of his manners, when he returns at dusk ; but we do know that a Butterfly can show fight on occasion, although not pugnacious as a rule.

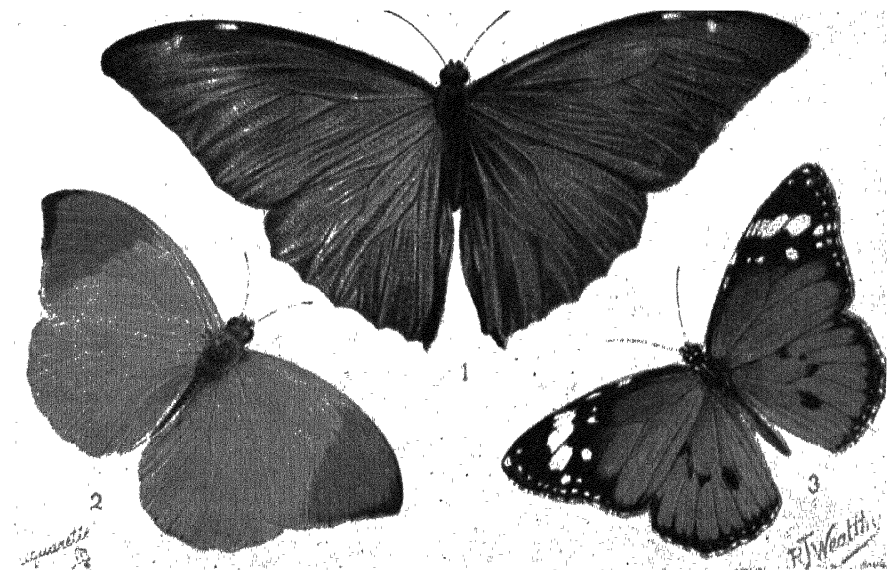
Let us suppose a Butterfly busily engaged in sucking nectar from a flower when up comes another variety, who settles beside him, anxious to share the good things. The first-comer says, "Here, this won't do, first come, first served, you know," and chases off the intruder. No sooner has he returned to his interrupted meal, than back again comes number two. "This is too much," says he, and this time in driving the other away they bump against each other with as much vigour as can be accomplished by such slender creatures. Away they go, up into the azure depths, and presently one of the combatants returns to the flower much bedraggled and generally the worse for the encounter.

One of the first necessities, in a community unprotected by police, soldiers or superior force of some kind, is to defend oneself from foes, who are ever on the wait to grab either oneself or one's possessions. This law governs the whole of the animal kingdom, and many and various are the means taken to achieve this result. Many Butterflies conceal themselves from watchful eyes by closely resembling the leaf or bark upon which they rest. Another device which is adopted by certain varieties is to resemble as closely as possible a class of Butterfly which is very distasteful to birds on account of their unpleasant odour, the pattern and colour of the latter are imitated by quite a dozen different Butterflies and Moths.

Butterflies would hardly appeal to a hungry school-boy as an article of diet ;



FOREIGN BUTTERFLIES.—I. *Terias pulchella*. II. *Papilio cloanthus*. III. *Catagramma parima*
 IV. *Junonia enone*. V. *Eurygona mys*. VI. *Jamides democritus*.



FOREIGN BUTTERFLIES—I. *Morpho Adonis* (Male).
 II. *Eronia leda* (Male). III. *Danaus chrysippus* (Male).

but there is an Australian species which is eaten and much relished by the natives, who eagerly look forward to certain seasons when the Bugongs (as they call them) arrive in great swarms and settle upon the rocks. They cook them on hot stones and pound them into lumps. The first time it is eaten by any one, the result is usually disastrous, "little Mary" refusing to tolerate such strange food ; but the natives declare that when one gets used to it, it is a delicious and fattening diet.

There is a species of small ringed Butterfly which is worshipped by the natives in a part of Africa. Everything it alights upon is considered holy, and in time of war they collect them, and put them upon those of their possessions that they treasure. These are then held sacred by the victorious tribe and no one will touch them.



KALLIMA BUTTERFLY. A. IN FLIGHT. B. AT REST, MIMICKING LEAF.



URANUS MOTH.

CHAPTER II.

MOTHS.

“ Kill not the moth nor butterfly,
For the last judgment draweth nigh.”

So spoke Blake in quaint rhyme, and we must be guided by the advice in the first line, not on account of the threat in the second, but because we may not wantonly destroy a beautiful and harmless thing.

If we wish to examine a Moth or Butterfly, let us catch it in our net, and gently turn it into a glass jar, from whence it can afterwards fly away to enjoy its short span of life. The simplest way to distinguish between a butterfly and a moth is by examining its horns (antennæ).

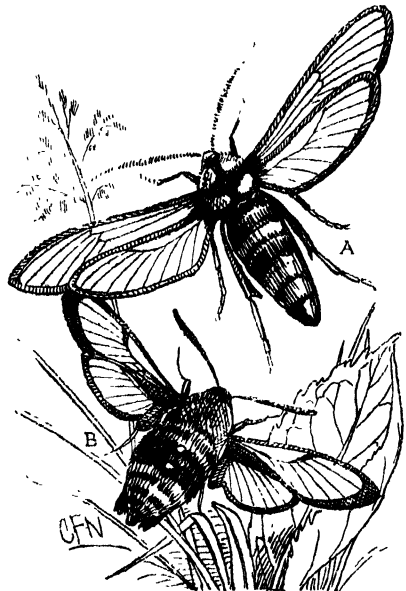
Butterflies belong to a class called "Rhopalocera" (club-horns, *i.e.* horns thickened at the tip like a drum stick). Moths, owing to their antennæ being variously formed (at times threadlike, or thickened in parts, or feathery, etc.), are called "Heterocera," which means different horns. This rule is by no means without exceptions, but will answer the purpose well enough for a young entomologist. Many Moths fly at night or in the twilight, but some of the most brilliantly coloured ones are not "born to blush unseen," for they are day-fliers.

Uraniidæ.—As the rose is queen of flowers, so the Moths (Uraniidæ) of tropical America can be regarded as the monarchs of the insect world. Their huge wings are superb harmonies of colour that glitter and sparkle like jewels with every change of light. The word *Urania* means heavenly, and was probably given to these moths on account of the great height at which they fly. They rarely come near enough to earth to be captured, and collectors who desire these treasures have to rear them from the Caterpillar.

Humming-Bird Hawk Moth.—When is a bird not a bird? The answer to this might be, when it is a Humming-Bird Hawk Moth, and this reply would be quite as sensible as those to many other riddles. This Moth bears a striking likeness to a Humming-bird, even having tufts of hair (really elongated scales) on the legs and at the end of the body. To complete the resemblance it makes a humming sound with its wings, and remains poised in the air when sucking nectar, thrusting its extraordinary, long, slender tongue into the neck of the flower just as a Humming-bird does.

Bates relates that in the Amazons the natives believe that the Moth changes into a bird, much in the same way as the Caterpillar changes into the Moth. He himself has shot these insects when they were flying, having mistaken them for the birds.

Hawk Moths.—The Hawk Moths are an artful family, for we find that the Clear-wing and Bee Hawk Moths have clear wings, and are just as like as twin



A. HORNET CLEAR-WING. B. NARROW-BORDERED BEE CLEAR-WING MOTH

brothers to wasps, bees and flies ; in fact, so closely do they resemble them that the "deceit" can only be detected upon close examination. The insects they imitate are always those which happen to be particularly distasteful to the birds that prey on these moths. Pine Hawk Moths are marked and coloured in such a way that when they settle on the bark of a tree it is most difficult to see them. There are many other examples of the ways and devices of these little creatures to protect themselves from the dangers that surround them, all of which point to a loving and guiding Hand, for it seems quite impossible for them to do for themselves that which we, with our higher intelligence, could not attain even in the course of ages and ages, namely to so completely change our appearance as to resemble some other animal.

Death's Head Hawk Moth.—The Death's Head Hawk Moth receives its name from a yellow mark on its hairy brown body which bears a resemblance to a skull and crossbones. One always imagines Butterflies and Moths to be silent creatures, but the Death's Head squeaks like a mouse if it be alarmed. Not only the Moth, but also the pupa has the power of squeaking, and the Caterpillar makes a grating noise when it is annoyed or frightened. Many learned men have tried to discover where that squeak comes from, but after searching everywhere, in and out and round about, the matter still remains wrapped in mystery. Given the opportunity, this moth is a bare-faced burglar, breaking into the bee-hive and robbing the poor hard-working bees of their honey. It is said that it gains unopposed entrance to the hive by squeaking like a queen bee, so that the bees on guard do not suspect a stranger in their midst, and make way for the marauder. Bee-keepers are often obliged to protect the hive entrance by wire netting, through the meshes of which the Moth is too large to pass.

Processionary Moth.—Imagine rows of Caterpillars walking in single file, each with its head buried in the tail of its front neighbour, all following the leader, stopping when it stops, and always keeping pace, and you will understand how the Caterpillar of the Processionary Moth goes to seek the repose it requires for the pupa stage. Should any accident cause a member to fall out of the procession, those behind hasten forward to fill up the gap, and so they march on, until sleeping accommodation is reached.

We are apt to regard the whole race of Caterpillars as a nuisance, especially when some of them have infested the garden and wrought havoc on the plants, but at least one larva has proved a boon and blessing to man (or, rather, woman), the one we call the "Silk-worm."

Silk-Worm Moth.—The Caterpillar of the Silk-worm Moth spins its fine

silken thread to make a nice cosy cocoon, in which to sleep during the pupa stage.

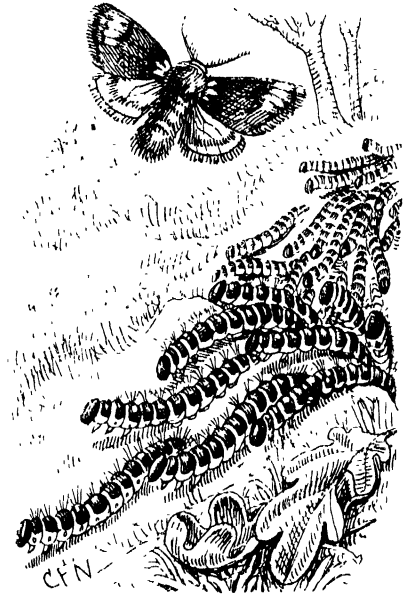
It takes about five days to spin the cocoon, which is about the size of a pigeon's egg, and we require about 10,000 of them to produce 5 lbs. of silk.

Many other species of caterpillars spin silk, but it is an inferior kind.

In ancient times the art of manufacturing silk was known only to the Chinese, and when the material was first brought to Europe, it was so expensive that even royalty could not afford to wear it. The Roman Emperor Aurelian refused to give his wife a silk dress because it cost too much.

It is said that King James of Scotland, and afterwards also of England, desiring to appear very smart when he received the English Ambassador, begged the loan of a pair of silk stockings from the Earl of Mar, saying, "Ye wadna hae your king appear as a scrub."

The Carpet Moth.—After talking about a useful Moth, it is fair to single out one which we find harmful, the Carpet Moth, although the damage it inflicts is usually due to our own carelessness. The Moth deposits its eggs, let us say, in some woollen garment, and presently the Caterpillars hatch out. We all must eat to live, and, as you already know, grubs live to eat, in addition. So they fall to work to get a meal from the fields and pastures which they inhabit. Also a habitation is necessary for comfort, so more wool is bitten off with the strong jaws, and each one makes a cosy case for himself; now only one thing more is required: a pathway over the field where a promenade can be indulged in. Strong jaws once more get to work, biting the material level, and, oh my! there's your garment full of holes and thin places. The grub has done its work, and as you shake the garment, out pops a moth from its pupa case, and to think that a brush and a shake could have prevented all the mischief, truly "a shake in time saves nine stitches, and many more."



PROCESSIONARY MOTH, AND CATERPILLARS ON THE MARCH.

What is it that has legs inside and none outside, and yet can hop, skip or jump? You give it up?

Why, the so-called "Jumping Bean," which no doubt most of you have seen some time or another, although it is not a native of this country.

The Jumping Bean.—When this bean (which is really *not* a bean at all, but one of three divisions, into which a certain Mexican fruit naturally divides) was first introduced into England in 1896 it aroused much curiosity.

"Here's a strange thing," said folks, "a bean that can jump an eighth of an inch or more from a level surface and is able to roll quite a distance, surely 'tis one of Nature's marvels," and a great deal of nonsense was written about it in some of the newspapers.

It was not long before scientific gentlemen set to work to find out why that bean jumped, and was always active when exposed to light or warmth, at which time a loud clicking noise proceeded from inside the mysterious object.

The "bean" was cut open, and there tucked away in its hollow bosom was a small caterpillar, looking very cosy, indeed, for it had lined the whole interior with silk of its own spinning.

It had eight pairs of legs, the hind pair being large and strong. On its head was a hard plate, which caused the clicking noise when knocked against the shell-wall.

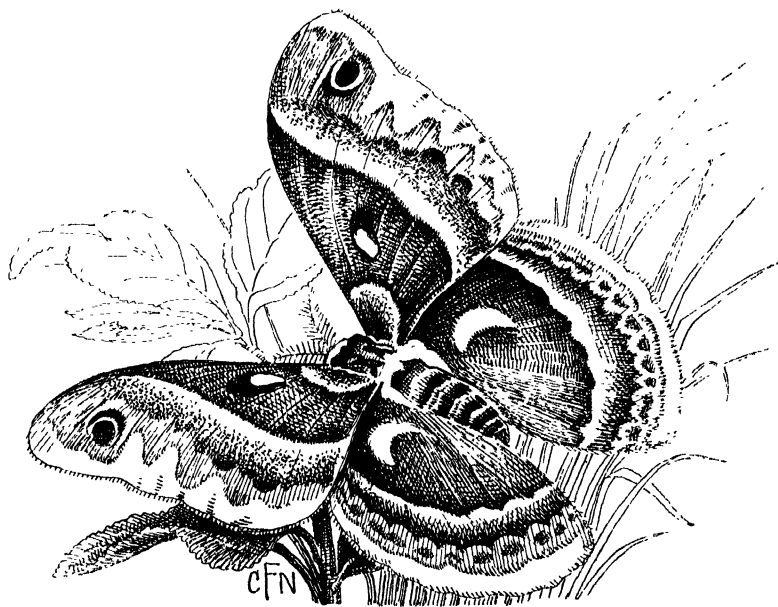
Now "the cat was out of the bag," another strange mystery solved, for as soon as light or warmth penetrates the thin shell the caterpillar appears to get lively (probably with a view to making its way to cooler quarters), and striking with its legs against the walls of its house, either overbalances the establishment, causing it to roll, or by alternately coiling and straightening its body, makes it jump into the air.

Now for mystery number two: how did the caterpillar get inside the bean? In the same way that jam gets inside a dough nut; it is put there when it is in the process of making.

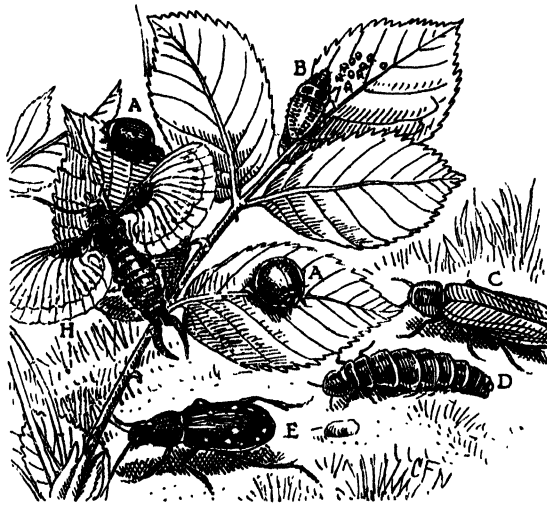
The moth lays its eggs in the flowerets of a shrub (*Euphorbiaceæ*) which grows in Mexico, and these slowly transform into a seed-pod, enclosing the egg entirely. Later, the egg changes into a grub, and the latter exists upon the ripe seed until it is full grown, when it changes into a chrysalis wrapped in the silken bag it has spun. Before retiring to rest it cuts a neat trap-door at the free end, which can be readily pushed open when the moment arrives for the moth to come out.

We placed two of the caterpillars in a little wax house to see what they would do.

One promptly killed the other, and placing it against the wall of the house, gave it decent burial by spinning a thick pall of silk over the body.



CECROPIA MOTH.
A NORTH AMERICAN EMPEROR-MOTH.



A. SEVEN-SPOT LADYBIRD BEETLE.
 B. LARVA OF SAME.
 C. GLOW-WORM (MALE).

D. GLOW-WORM (FEMALE).
 E. COMMON TIGER-BEETLE
 H. EARWIG.

CHAPTER III.

BETLES, GRASSHOPPERS, CRICKETS, LOCUSTS, WALKING-STICKS, THE PRAYING MANTIS.

“ Green little vaulters in the sunny grass,
 Oh, sweet and tiny cousins, that belong,
 One to the fields, the other to the hearth.
 Both have your sunshine, both though small are strong
 At your dear hearts ; and both seem given to earth
 To ring in thoughtful ears this natural song—
 Indoors and out, summer and winter, mirth.”

J. H. LEIGH HUNT.

Beetles are to be found pretty well everywhere we go, inside and out or round about, and it is not surprising, as there are 150,000 known species and ever so many more that manage to exist without being known at all.

Amongst so many different kinds there must be great diversity in size, habits, and appearance ; but there is one peculiarity that nearly all of them possess. This distinguishing feature is the elytra or leathery cases which protect the under-wings. The elytra are formed by the upper pair of wings, and have given the name “Coleoptera,” which means “sheath-wings,” to the whole order.

Amongst the great variety of these insects one finds giants that measure six inches in length and look like rich-hued patterned velvet, and tiny beetles that are mere specks. One finds beetles large and small that glitter and shine with beautiful metallic colouring ; others, again, are plain, or striped, or spotted ; ugly or handsome, with unpleasant odour, or scent as sweet as essence of roses.

Then there are useful beetles, and injurious pests that ruin crops and vegetation, or invade our very house and home to bore holes into woodwork and furniture, and destroy books and pictures.

The lady bird is as useful as she is pretty, for her larvæ have wonderful appetites for those ravagers of our gardens and orchards the Scale Insects and the Aphides, and many a crop of fruit has been saved by their efforts.

Those gleaming lamps of the summer night, the glow-worm and the fire-fly, are both beetles in spite of their names.

Beetles, that act as scavengers by eating decayed vegetable and animal matter, may be reckoned as the friends of man.

The Earwig.—The Earwig has been much maligned all over Europe for many generations without having done anything to deserve its bad reputation or the name by which it is known. Its supposed partiality for crawling into the human ear and causing death is merely a foolish superstition, and if we want to find fault with it we can discover a real reason without seeking farther than our own gardens. There the creature really is impertinent, making free with the very choicest flowers and biting great pieces out of them with its sharp little jaws.

Mrs. Earwig, however, has her good qualities. She is a most careful and affectionate mother, who fusses over her young ones and guards them like a hen with her chicks. She also has her own ideas of cleanliness, and can often be seen performing quite an elaborate toilet, putting first a fore-foot in her mouth, and then rubbing it all over her head, afterwards doing a like duty on her back with the hind-foot. The wings are beautiful, but one rarely sees them, as the earwig seldom flies in the daytime. The process of opening and closing the wings is rather complicated, and to aid the insect in this, it is provided with pincers at the end of the tail. When the wings are partly closed the tail shoots over the back and the pincers seize the former and tuck them safely inside the wing-cases.

The pincers are also capable of inflicting a sharp pinch, a fact which may be tested by the curious, upon whom, no doubt, it would make a considerable impression in more senses than one !

An Earwig seems a strange kind of pet, yet Romanes, in "Animal Intelligence," tells us of two children who used to give sugar to one, whom they named Tom.

It became quite tame, and used to crawl up the curtains regularly at the same hour every day, with the apparent expectation of getting its breakfast.

Grasshoppers.—Children are frequently told that they should be “seen but not heard,” which is unpleasant advice seldom followed by either small folks or grasshoppers; in fact the latter usually do just the reverse and make themselves heard when they cannot be seen.

The natives of South America keep grasshoppers captive in little cages so that they may enjoy their song, which is so loud and shrill that it can be heard at the other end of the village and is almost deafening close by.

The Katy-dids which are natives of America are so called because they make the sound, “Ka-ty-did, Ka-ty-did-did-she-didn’t” by rasping their wings several times in succession. These sounds are made very rapidly at the rate of about two hundred per minute, being quicker in warm weather than when it is cold. Some of them have a different note in the day-time to what they produce at night.

The Weta-punga of New Zealand is an unpleasant customer, he is about three inches long and has sharp spurs on his hind legs which can give a very nasty prick.

Crickets.—Own cousins to the grasshoppers are the crickets whose shrill chirp is a familiar sound to most people, either in the fields or indoors, where they love to conceal themselves in the cracks near the hearth.

The right-hand upper wing of the male cricket is notched like a file, and by rubbing this edge on the opposite wing (elytron) it produces its cheerful chirp, which on a quiet evening can be heard half-a-mile away.

Nathaniel Hawthorne referring to the chirp of the American Snowy Cricket says, “If moonlight could be heard it would sound like that.”

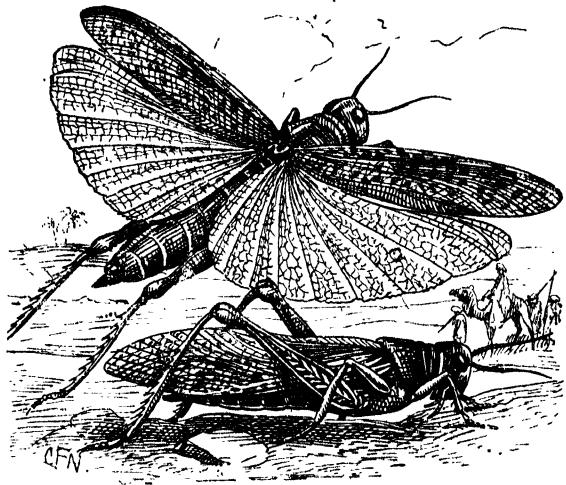
Although the chirp has such a cheery sound, crickets are by no means good-tempered and they fight terrible, deadly, battles with their relatives and neighbours. If some of them are placed together, there is a jump and a pounce, a biting and tearing, until very few of the combatants survive, and those that do are more or less in fragments.

Lady crickets are just as quarrelsome as their mates, and bite and scratch in a most unlady-like way.

New Zealand can boast of giant crickets even larger than their relatives the grasshoppers; great alarming creatures with huge legs set with rows of sharp spines like thorns. The natives fear to climb the trees on which these monsters live, for they bite most severely.

There is but little difference between grasshoppers and locusts; but the latter are more destructive as a rule.

The Locust mentioned in the Bible belongs to a species known as Migratory Locusts, so called for their habit of wandering away from their birth-place. They abound chiefly in warm countries, and uncountable numbers of them will rise in swarms, flying for miles and miles, across land and water, spreading ruin and devastation wherever they settle, not a single green growing thing is left in their pathway, for they devour everything.



MIGRATORY LOCUST.

They have been likened to a dense black cloud reaching from the ground, away up to the depths above, as far as the eye can see. In the words of the prophet Joel, "the land is as the Garden of Eden before them, and behind them a desolate wilderness." This, of course, is in reference to the terrible havoc they work when they settle.

Fortunately for those countries inflicted with such unwelcome visitors, they only appear at intervals of several years, otherwise these places would be rendered uninhabitable. During a visitation of locusts, thousands of human beings and animals have died of starvation; sometimes the people have been obliged to make a sort of bread of their tormentors, but these are almost as useless in death as they were in life, for they do not taste nice and are not nourishing. Of late years people have been better able to cope with these plagues by means of traps of many different kinds, and also the spread of knowledge has helped to show that with proper precautions they can be almost entirely exterminated.

We have seen that locusts are not useful; but must admit that they are sometimes very ornamental, and one is bound to pause in admiration before the delicate gauzy structure of the wings, brilliant in colour and varied in their markings. One finds the most gorgeous tints either separately or in wonderful combination, more especially on the underwings.

In Africa the "Voetgangers" or "travellers on foot" emigrate before they

have wings. It is surprising how rapidly they get over the ground by means of short, quick leaps. Nothing stays them, neither mountains nor streams; hop! hop! on they go and if they cannot find a crossing over a river they will make a living bridge by leaping into the water and forming a chain, one clinging to the other whilst their fellows cross over them. They hold fast to every support they can find and change places with one another so that none are too long in the water.

One can imagine how the farmers dread the approach of such an army and try to drive it off by every means in their power.

Locusts have many foes to contend against and certain kinds are protected to some extent, from the sharp eyes of birds, by closely resembling the green leaves, with their markings and veinings, upon which they rest.

Pliny mentions an "Indian locust which was three feet long with legs so strong that women used them as saws." I expect that this was an early version of our story of the great sea-serpent.

Phasmidæ.—Perhaps the most curious of all insects is the group Phasmidæ or Ghost-like, and which includes the Walking-stick and Walking-leaf insect.

Some of these are giants measuring as much as fifteen inches, and are thicker in the body than a man's finger; others are less than an inch long and quite thin; but large or small, their shapes are so extraordinary that it is sometimes difficult to believe that they are insects at all.

The Walking-stick is a most faithful representation of a twig. The long slender body is to all seeming just a stick and the legs mere tiny twigs not placed symmetrically as well-conducted insects' ought to be, but just here and there in order to heighten the deception.

The shapes assumed by some of these insects are most grotesque. I have one that is exactly like a piece of rotten wood over-grown with moss—not real moss, of course, but small green projections all over the body, and I doubt whether you or I would be sharp enough to distinguish it from the genuine article if we came across it anywhere apart from a collector's cabinet, where one expects all sorts of surprises.

A Peruvian Walking-Stick resembles a stem with thorns, thorns on its body, on its chest, and all over its legs—a very prickly customer indeed!

There are some beauties with large filmy brilliantly coloured wings which fold up fanwise beneath the wing cases when not in use, but opened seem as though a flower had come to life and was flitting over the trees.

Walking-leaves are walking-sticks in a new guise. The bodies are expanded with broad abdomen, the colour varying according to the foliage upon which they

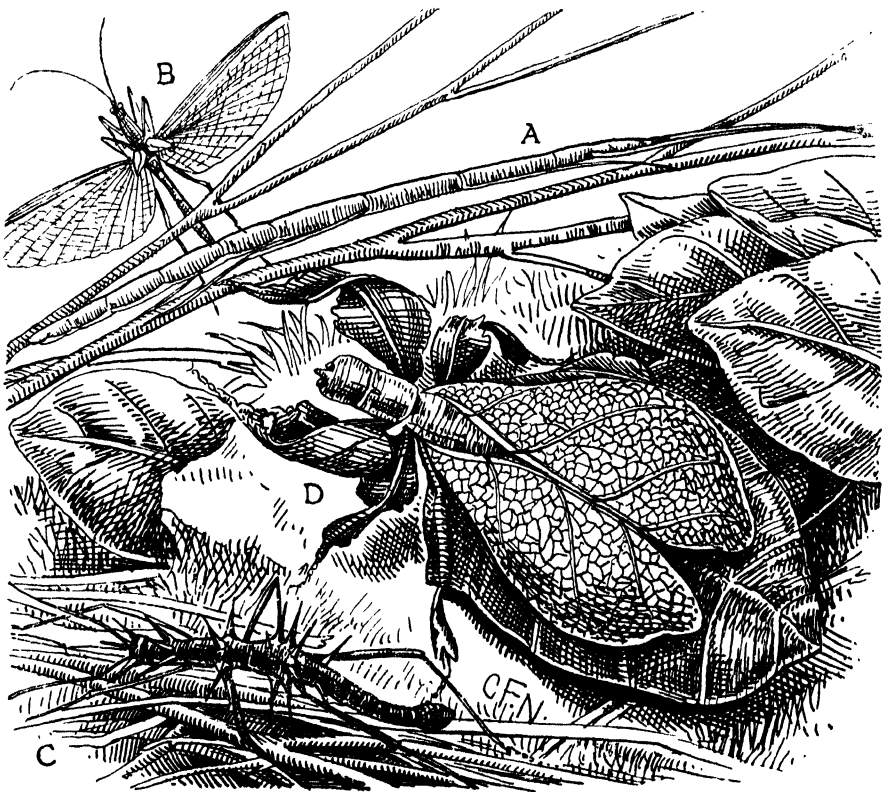
happen to be feeding. The wings are perfect imitations of green leaves and the feet spread out in the form of leaflets, the whole resembling a charming spray.

In the tropics where these insects are found the natives believe them to be part of the plant on which they live. They will assure you they grow like the other leaves on the plant and drop from it, when full grown, and fly away.

It is not surprising that such a belief exists amongst natives who have never had the advantage of education ; but what is astonishing is that, even at the end of the eighteenth century, scientists quoted this superstition as a solemn fact.

The Praying Mantis is another member of this strange family, and is seen in its glory in hot climates.

In the East the Mantis has the proud distinction of being considered a holy



A. WALKING-STICK INSECT.
C. THORN-STICK INSECT.

B. ONE OF THE PHASMIDÆ.
D. WALKING-LEAF INSECT.



PRAYING MANTIS.

insect, its reputation having been earned by its habit of resting for long periods without movement, the two fore-legs uplifted and clasped as if in prayer.

The Greeks gave it the name Mantis, which means prophet or fore-teller, and the Mohammedans have a legend that it prays with its face turned towards their holy city, Mecca, as they themselves always do.

An ancient tale tells us that Saint Francis Xavier once saw a Mantis

in its habitual attitude, and thinking it to be engaged in holy meditation, asked it to sing aloud, whereupon the insect commenced to chant; much to the good old man's edification.

Another story told by Mouffet, who lived in the reign of Queen Elizabeth, can be quoted in his own quaint words: "So divine a creature is this (the Mantis) esteemed, that if a childe aske the way to such a place, she will stretch out one of her feet and show him the right way, and seldom or never misse."

In France no peasant would injure a "Prie Dieu," as they call it, and they will even put themselves to considerable inconvenience to carry it out of harm's way.

A tribe of blacks in Africa regard the Mantis with the greatest reverence, and consider it a special sign of favour from their gods if it chances to alight on one of their fellows, this fortunate individual being ever after treated with respect.

I am sorry to say appearances are deceitful, and the Mantis with his prayerful attitude is just a wicked old scamp, who sits motionless on a leaf or twig, so that no one will notice him, whilst he meditates on his wily plans.

Watch one on a leaf; he is evidently engaged in prayer, no worldly thought crosses his mind; an insect alights quite close; slowly, cautiously, our holy one moves from his attitude and creeps along the leaf, his goggle eyes bulging as he

glowers on the unconscious victim. Slowly, slowly with the least possible movement he gets closer, then out shoots his foreleg, armed with cruel spikes, and, like a flash, the insect is caught and devoured almost before one could say "Jack Robinson," and in a few minutes the old sneak is again praying (or rather preying!) with a wary eye open for whatever may pass his way.

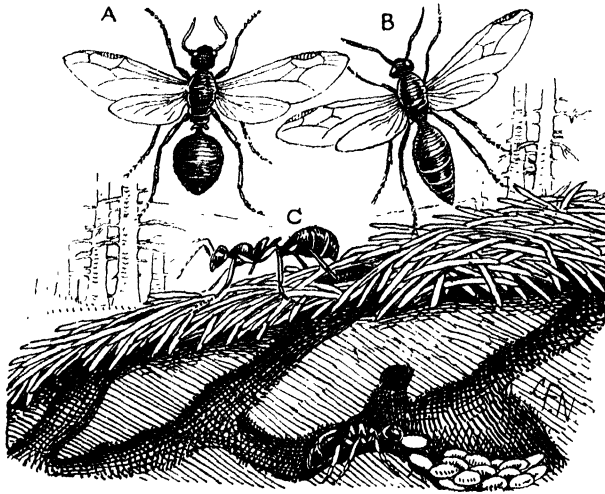
The Mantis not only mimics green leaves like the Walking-Leaf, but goes one better, and reproduces the likeness of a flower. One of the most beautiful comes from India. It has no wings, but in shape and colour resembles a pink orchid, and as it rests amongst the foliage the butterflies are attracted to seek nectar in the fine flower. No sooner have they settled upon it, than they disappear into the mouth of the supposed blossom.

The Mantis is dreadfully quarrelsome, and is always ready for a fight, the vanquished being promptly eaten, even if they be his own brothers and sisters; or it may happen that a lady tires of her husband, when he is apt to disappear in a mouthful or two.

The Celestial Chinaman, who is just about as celestial as the Mantis is prayerful, keeps the latter in bamboo cages, and has royal sport by putting two of them together. A fight to the finish invariably ensues, no self-respecting Mantis being able to stand the neighbourhood of any of his fellows.

The Chinaman bets on the result, backing one or another of the combatants according to his fancy, as people used to do in this country in the old days when cock-fighting was fashionable—bad, cruel old days those were in many respects. I trust you will never be cruel to any living thing, however much its habits may displease you, for "God saw every thing that He had made, and behold it was very good," and it is not for us to act as judges.

The Brazilians call the Mantis "The Devil's Riding Horse." Our own scientific name is *Raptatoria*, which means "Snatchers," and describes the creature better than its more popular appellation, the Praying Mantis.



WOOD-ANT: A. FEMALE, WINGED. B. MALE, WINGED. C. WORKER.
WITH NEST SHOWING GALLERIES, CHAMBERS, AND PUPÆ.

CHAPTER IV.

ANTS, TERMITES, DRAGON FLIES, ANT-LIONS.

“ Beautiful are the heralds
That stand at Nature's door,
Crying, ' oh traveller enter in,
And taste the Master's store.' ”—W. E. LITTLEWOOD.

Ants.—Let us be of those who enter “ with reverent steps and slow,” and, when we have passed the magic portal, a wider understanding is given us, even though we be but little children, and we can see for ourselves that man and his works are but a small part of the great universe. We learn that our globe contains many kingdoms whose history has never been written, many cities and colonies never indicated on any map.

Most of these colonies and cities are inhabited by a teeming population, and carry on their own industries and governments, neither knowing nor caring that Man is ruler of all the earth, and that he has made many rules and regulations. Of all these great communities those of the Ant surpass the others in intelligence, industry, and wise government. The ant-hill is a limited monarchy, the sovereign

being loved and served with loyalty so long as she does that which is regarded as her duty. Some nests have more than one queen, and when this is the case all dwell in peace and unity without jealousy or rivalry.

The queen usually occupies an apartment at the bottom of the nest, where she is waited upon by her faithful subjects, and guarded by sentries.

These two latter are called workers or neuters, being female Ants imperfectly developed. These workers do all the domestic work as well as collect food, and are skilled architects, builders, and in some species, engineers.

Some nests are guarded by large-sized workers known as "soldiers," who give the alarm when danger threatens, and are no doubt the forerunners of the "girl scouts," as they are *adepts* in that branch of work.

The queen's sole duty is to lay eggs, and she usually carries out this task most conscientiously throughout the summer; in the winter the whole nest becomes inactive.

Her majesty's attendants are most attentive to her, bringing her the choicest morsels of food, and showing their affection by stroking and caresses. They comb her with their own little combs, small toothed spurs on the forelegs, which are constantly in use to perform their toilet.

As the eggs are laid they are formed into little clusters by means of a sort of jelly, and are then taken up by the attendants to the rooms set apart for nurseries.

The ant is provided with a useful pair of arms, placed outside the mouth, which serve many purposes. As arms, they are used for carrying, and are strong enough to permit the insect to lift a burden 3000 times heavier than itself. These arms or mandibles (which is the proper name for them) are furnished with strong, sharp teeth, and can be used as jaws, as well as saws, to cut up food and building material.

The nurseries, like all the other rooms, are connected with one another by passages running up and down the nest and ending in a large entrance hall with a dome-shaped roof. The particular nest I am describing is that of the Great Hill Ant (*Formica Rufa*); there are hundreds of different kinds of ants, one species even making its home inside a large thorn. The Hill Ant constructs so carefully that no space or material is wasted. Walls and passages of ant-made bricks are supported by arches and pillars in a way that would do credit to a human architect. Sometimes pine needles are placed at different parts to give additional strength to the structure. Should any part of the building become damaged, the ant that discovers it rushes off to summon assistance, and the repair is commenced without delay. There are no strikes in this happy community,

for a "wont-work" would be treated with such scant courtesy by its comrades that its body would soon be reposing in the cemetery which is situated in the suburbs of Ant City under a clump of fern.

As soon as the eggs are taken to the nurseries they are placed in the care of special nurses, who tend them with the greatest devotion, constantly turning them over and keeping them moist. When the sun shines, the eggs and young ones are carried up to the top of the nest to enjoy the warmth, and as soon as evening approaches they are again conveyed to their own cosy quarters underground.

Should danger threaten, the precious charges are seized by their nurses and taken, if possible, to a place of safety, failing this the latter will die in defence of their little ones.

The second stage in the life-history of the Ant is that of a grub without any feet. Now the duties of the nurses become heavier, for each grub has a hungry little mouth which is ever agape for food.

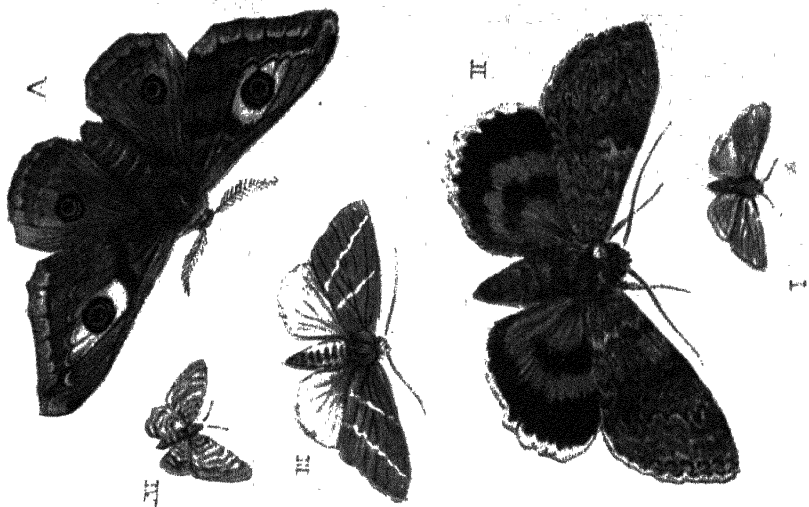
The nurses feed the babies through their own mouths, the girl grubs (future queens) receiving more than the boys and workers. They all are kept beautifully clean, no refuse being permitted anywhere in the nest, and they are washed and brushed every day, the nurse's mouth and mandibles taking the place of our brush, sponge, and water.

After a time the infants weave a nice little silk shawl in which they wrap themselves and go to sleep. That is the cocoon or pupa stage of their existence. The nurses still carry them up and down according to the warmth of the sun; but feeding is now unnecessary.

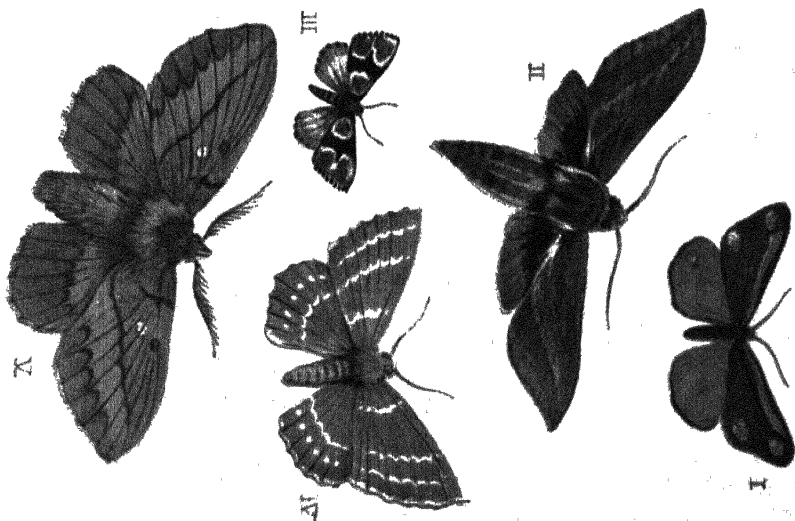
Carefully the nurses watch the little slumberers, and as soon as any of them stir, two or three of the former, rushing forward, stand upon the cocoon and begin to open it at the head. They cut the silk threads with their mandibles and make a hole through which they assist the prisoner to escape from the outer shawl and then help it remove an inner covering as well.

The last stage has been reached, for the slumberer has turned into a full-grown Ant; but still for a few hours it receives loving care, being fed and led about the nest by the nurses, and taught its way through the many intricate passages.

Soon the young one is able to take its part in the duties of a citizen, or it may be that fate destines it to be a princess or prince, whose beautiful wings must be carefully smoothed out by the attendants. Occasionally young royalty is taken for a walk round the nest, the girls and boys being carefully kept apart.



BRITISH MOTHS.—I. Forester. II. Red Underwing.
 III. Scarce Green Silver-Lines. IV. Small Yellow Wave. V. Emperor.



BRITISH MOTHS.—I. Cinnabar. II. Elephant Hawk.
 III. Marsh Carpet. IV. Large Emerald. V. Drinker.

At last the great day comes when at a given signal each prince and princess is fed for the last time and conducted to the top of the nest by its attendants. This is the wedding day of many royal couples, who shake out their gauzy wings and soar aloft. Many, many of the merry-makers, who dance in the clear air, never survive this day of days. Birds and spiders prey upon them, and every breeze that blows, wafts some victims away from their companions, perhaps to find a watery grave.

As soon as the short honeymoon is over, the pairs, that have escaped all dangers, unfasten their wings and go to found a new nest. The husband soon dies, and the lady settles herself down to the egg-laying business, her offspring being the founders and builders of the home.

Some queens return to the old nest, where they are heartily welcomed.

It is not all work and no play with Ants, for at times something very like a wrestling match takes place in the great entrance hall, the other workers crowding round to watch the sport with evident interest.

When the sun shines with extra warmth the little creatures can be seen dancing about and waving their antennæ and embracing one another, expressing, in their own way, their prayer of gratitude for the mercies that are granted to great and small alike.

In battle, with foes of another tribe or nest, the Ant can show herself both brave and fierce, and in a private quarrel the duel is to the death; but fortunately this is a rare occurrence.

Ants are the farmers of the insect world, and some species sow grain, whilst others are cow-keepers on a large scale. The "Agricultural Ant" sows grain and seed in the land it has prepared near the nest, and when ripe it is harvested and stored in granaries of its own making.

There are pastoral Ants, who have large herds of cattle on estates, consisting, perhaps, of a branch with several leaves, which are jealously guarded by their owners, who frequently erect a fence around them to keep off intruders.

The cows are the Aphides (plant-lice), and the Scale Insects which are too familiar to need much description. The Aphides suck the sap from leaves by means of a long tube which coils up underneath them, and they often drop a sweet liquid on the plant, which is known as honey-dew. The Ants love this, and lap it up eagerly, but it is only treasure trove, and to obtain the supply required for the nest it is necessary to milk the cows. The dairy-maid Ant approaches her cow and proceeds to tap it swiftly but gently with her antennæ, and the creature promptly exudes the sweet liquor, which is lapped up by the milker and carried home in her mouth.

The Aphides are sometimes cared for inside the nest ; and often the eggs are kept there over the winter to ensure a supply of cattle for the spring.

Some nests take in boarders ; other kinds of Ants and many varieties of Beetles are found living harmoniously with their little hostesses. It is not known what these guests pay for their entertainment ; but in the case of the beetles the aroma they have may be agreeable to the Ants, or they might be pets like our cats and dogs.

Platyarthaus Hoffmanseggi is a name considerably longer than the creature who bears it ; in fact, despite this high-sounding title, it is a sort of poor relation of lobsters, crabs, and shrimps, and it seems to be glad to work as scavenger in an Ant establishment in return for board and lodging. Should Ants leave their old nest, they remove these faithful servants to the new home, as carefully as they do the dear children themselves.

A race of ash-coloured Ants known as the " Amazons " are neither more nor less than slave-owners, and so far no Wilberforce among Ants has arisen to give the poor victims their freedom ! The Amazons make a raid in battle order upon a nest of Black Ants, who being less powerful are unable to repulse the enemy as a rule. The older members of the nest are killed and the infants are carried off to Amazon Castle to be brought up as slaves, who do all the work, including feeding their mistresses, cleaning them, carrying them about on their backs, and bringing up the children.

After a time the Amazons get so lazy that they even lose the power of feeding themselves, and if they are deprived of their slaves soon die of starvation, being unable to take the food even if it be within reach. This terrible state of affairs is the result of letting others do for them what they should do for themselves, and should convey a moral to us also.

There are Ants that sting and Ants that bite, and if you have tried either kind, a simple thing to do, you will find that your wounds smart considerably. This irritation is due to a liquid, that they exude, known as formic acid.

Formic acid has a peculiar, acrid odour, and is sometimes utilized for making vinegar ; but I don't think it can be very nice.

Cannibals are as rare in Ant Land as in Human Land ; but they are to be found. The Cannibal Ant will roam about after a battle, devouring the dead and dying, its own comrades as well as the enemy, with equal gusto. When hungry, it will eat its own children and enjoy them. Do not despise this creature too much before reading what follows, for it will show you that even in our own time there are human beings who know no better than this humble insect.

I was talking to an old Maori (native of New Zealand) one day, when he

told me with evident pride in his distinguished past, that before the white man took his country he used to be a cannibal. He related, that after a battle a feast was prepared where the choicest dish consisted of dead enemy. I shuddered, and remarked that it did not sound tempting. "No," said he, reflectively, "it was always tough; but young baby is 'kapai,'" which means "very good."

A queer spectacle is sometimes seen in Brazil; a row of Ants marching along, each holding a green umbrella.

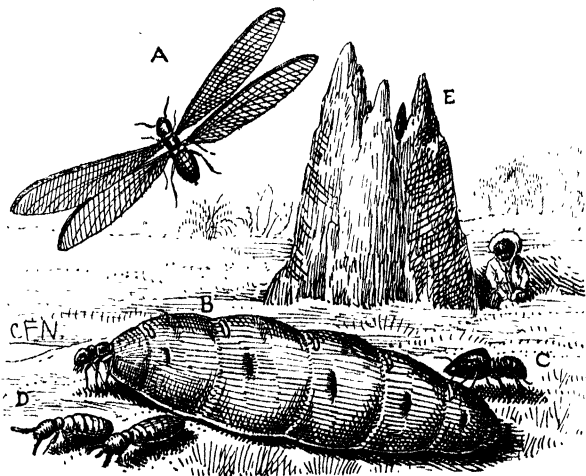
They call them "the pests" out there, for they always attack cultivated trees and absolutely denude them of their leaves. The nest of these ants is protected by a thatched roof made of circular pieces of leaves which they cut quite geometrically with their sharp jaws.

When engaged in cutting the leaves one company swarms up the tree and drops the circular pieces to another party waiting below. Each Ant picks up its piece of leaf, and marches along a well-constructed ant-road, holding its burden aloft to protect itself from the burning, tropical sun, until the nest is reached.

Termites.—Termites are commonly known as "White Ants," simply because they are not white and do not belong to the Ant family; two very excellent reasons, you must admit. No doubt they were so called because the grubs (young ones) are white, and in their habits and structure of nest the Termites closely resemble Ants.

A Termite city (or hillock, as it is called) is a magnificent affair, attaining sometimes an altitude of fifteen feet above ground, with underground passages piercing fully five feet into the earth. If we compare this with the work of man and take into consideration the difference between our size and theirs, we find this to be relatively quite eleven times as high as the Eiffel Tower in Paris (980 feet).

Termite City looks like a huge sugar-loaf



TERMITES. A. MALE, WINGED. B. QUEEN. C. SOLDIER.
D. WORKERS. E. TERMITE HILLOCK.

surrounded by many smaller ones, and is so strong that it will bear the weight of several men standing upon it at the same time. Drains are constructed to carry off surplus water, and large store houses, well stocked with provisions, are built into the walls. The outside of the hillock is nothing more than a thick wall, which protects the city from the extremes of heat and cold, as well as from the advances of an enemy. Inside this wall there are buildings, streets and squares, where there is a constant going and coming of busy inhabitants.

Cosy quarters are allotted to the infants underneath the domed roof which surmounts the City, but the centre of interest is the residence of the king and queen, which is situated on the ground floor; the other buildings being on galleries above it.

The apartment of the queen and her consort is surrounded by numbers of ante-rooms leading into one another, and here courtiers, attendants and soldiers are continually going to and fro. Those who have the privilege of entering the royal presence always keep their faces turned to their majesties in true court fashion; but no scientist has yet stated whether we have imitated them, or they us.

Above the state-rooms, and reaching up to the centre of the dome, fine arches supported by rows of pillars bring to mind some beautiful old cathedral.

Once the marriage-day is over, the royal pair spend an uneventful existence, walled in their own room, the doors and windows being only large enough for their subjects, who are much smaller, to pass through. The king is a poor down-trodden creature, who seems glad to spend his short life hidden from sight behind the portly body of his wife; for she, good soul, grows very unwieldy and quite unrecognizable from the slender young thing who had filmy wings when they went a-courting.

She often grows to over five inches in length, with a great white swollen-out abdomen, which looks a little like a sausage, tied round at intervals with cotton. Her head and thorax remain small, and altogether she is a curious-looking object.

Her subjects flatter, feast, and caress her, and she gets heavier and heavier, until her weight sometimes equals that of 30,000 of her attendants.

Like the queen Ant she is the mother of the nest, and is so expert at the egg-laying business that she can produce them at the rate of 60,000 a day, year in and year out. The attendants carry the eggs to the nurseries, where the temperature is always warm and moist, which is necessary for hatching the little ones. The walls of the nursery are specially prepared, being of wood mixed with gum, and make excellent soil in that humid atmosphere for growing

a kind of mushroom, on which the babies feed. There is no waiting for meal-time for them; they only have to "cut and come again" whenever they feel hungry.

Although Termites go through the usual stages of insect life (Metamorphosis), these are not very marked, and very soon after birth the young ones are able to do all the household work, as well as conduct the building operations.

The workers are blind, and are guarded and watched by soldiers, who are twice their size, with large heads and very strong mandibles. These soldiers lead a life of ease, except in times of war, when they defend the nest like heroes.

A limited number of workers grow into perfect winged insects, and have sight, and from these the royal couples are selected.

They usually choose a stormy night when they swarm from the nest for the marriage flight.

Soldiers are always on guard in the citadel, and give notice when danger approaches by striking the ground with their mandibles. This signal seems to be understood by the workers, who reply by making a whistling sound, and work with renewed energy. Whilst the soldiers make a bold defence, the workers cluster about the palace, and commence to block up the entrances to the ante-rooms, so that it is a difficult matter to find and reach the queen; in fact, this can only be done over the dead bodies of her faithful people.

Should any part of the nest require repairing, up rush the workers, each with a little clay brick in its mouth, ready to be placed in position. Soldiers both protect the workers, and carry out the duties of overseers. Should the enthusiasm of the builders flag ever so little, they thump on the ground with their heads, and the workers seem to redouble their efforts.

Termites travel astonishing distances in search of food, and as they prefer the dark, construct covered passages on the surface of the ground, as well as a little beneath the soil.

They are perhaps the most destructive creatures on earth, as far as man's belongings are concerned, and when they attack anything hard, they always perforate the outer layer, and set to work on the interior first. In this way they managed to undermine all the woodwork of the railway carriages in the Panama district. Chairs, tables, and suchlike furniture, which appear perfectly sound, frequently collapse owing to the whole interior having been eaten by the Termites; sometimes, for purposes of their own, they will strengthen, where necessary, the surface by building clay supports to replace the parts removed.

Furniture is often protected from their onslaughts by standing the legs in vessels containing water. A story is told of some corn in a granary being

surrounded by water; but the Termites were not to be foiled, for they actually built a kind of winding staircase from the roof downward to the grain.

In a single night they have been known to destroy a box of clothes with all its contents; and in a few months a deserted village entirely disappeared owing to their ravages—these marauders probably being only a party from one nest. “Out of evil good arises,” and so this destructiveness, although costly and unpleasant, leads to the well-being of the inhabitants of the Tropical Climates where the Termite dwells, for it is the scavenger who quickly clears away every scrap of putrid and pestilential matter, leaving sweetness and cleanliness in its place, a heavenly boon in those hot regions.

It will now be a change to talk about the Dragon-fly, whose habits are a great contrast to those of the busy Termites and the industrious little Ants. Jane Taylor, who was not a great naturalist, but a charming writer, has a quaint little poem about the Ant—

“Who taught the little ant the way
Its narrow hole to bore,
And labour all the summer day
To gather winter store?”

The Dragon-Fly.—They say that the hoot of the motor-car has driven the last of the fairies out of the country; that, search how you will, there's never a hob-goblin to be found. But for the glory of old England some dragons are left us still. Not a good old-fashioned fire-breathing fellow 'tis true, and at best only a pocket edition in size; but a ferocious dragon, nevertheless.

Look how his great round eyes bulge and stare as he pops out of a thicket; he is waiting for some stray damsel whom he can devour.

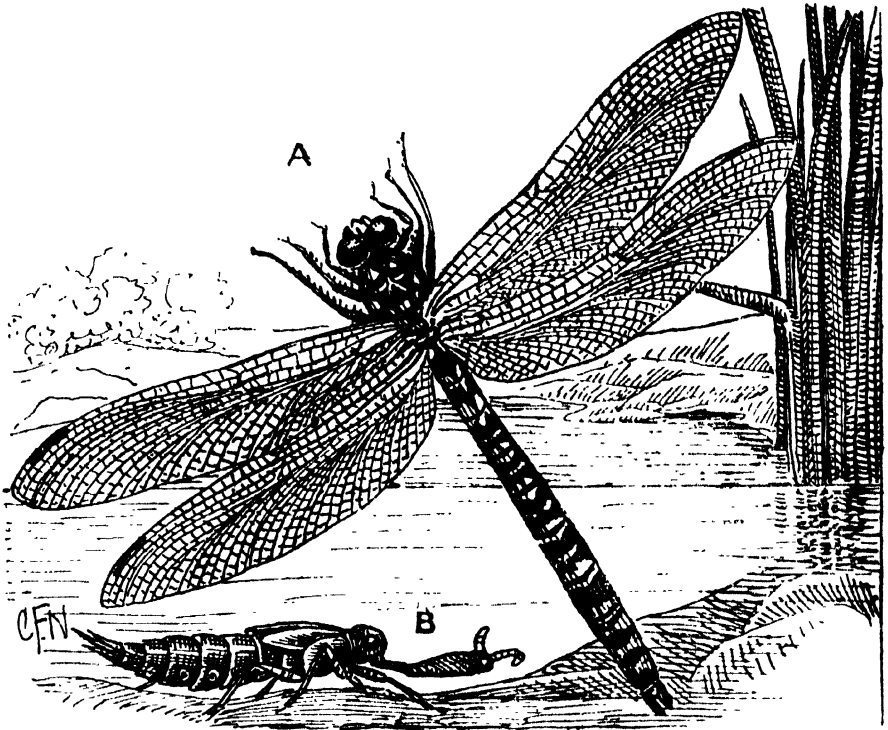
Come to the rescue, gallant knight, not with your good broad sword, but armed with bottle and net, and you may catch the wily monster—if you can! There he goes right into the net; but in a twinkling out he is again, flying backwards over the pond, and you are left panting on the other bank.

But a brave knight is not so easily beaten, especially when he is many sizes larger than the dragon, and at length the foe lies at the bottom of the net.

On closer acquaintance what a beautiful dragon it is: how brilliant are his great eyes, what shining bands of blue and green he has upon his slender body, and his wings are of the filmiest gauze.

“What a splendid fellow!” you cry. “Why call him by such a horrid name—he is handsome enough to be a fairy king?”

Alas! Sir Knight; “handsome is what handsome does,” and if you examine



DRAGON-FLY. A. PERFECT INSECT. B. LARVA.

him further you will see what a great, cruel mouth he has, and he is ever and always on the look-out for victims to crunch up within it, just like a real dragon. In addition to his two great eyes, he has three small ones in a groove on his head. The large eyes are like a honey-comb, each cell (facet) of which has a lens (roughly, there are about 10,000 of them), and every lens reflects the object on which he gazes. He is the hungriest, greediest monster that ever was, and is constantly on the watch, not only for fair maidens of Insect Land, but also for their mammas and papas, as well as their brothers, cousins and aunts. This appetite runs through the family, for the Termites are cousins of his, and we know that they are pretty hearty at their meals.

Our Dragon-fly is usually a married man, and Mrs. D. is just as greedy as her spouse: but at least she does do some work once in her life, for she goes down under the water and searches until she finds some suitable reed or water-plant upon which to lay her eggs.

This job makes her very tired—and when it is finished she just goes away and dies.

Her husband does not care a scrap, but goes on gorging himself until he dies also.

Presently the little orphans come out of the eggs which were so securely fastened to the leaf, and they are just as ugly as they well can be, with great big stomachs and long tongues. They do not resemble their parents, except in having voracious appetites.

They eat anything and everything that comes their way, even one another, if they can manage it, and they grow fatter and fatter until their skins burst, and that ought to be the end of them, but it isn't, because there's always a new one ready underneath. After they have shed a number of these skins they begin to get very quiet, their appetites forsake them, and the water becomes so heavy and uncomfortable that they feel they must go and see what it is like up higher. So they rise up and up until they reach the surface of the water, and while resting there, crack! bang! their skins have burst again, and out come the Dragon-flies in all their splendour, but with folded wings. The following beautiful lines by Lord Tennyson describe the birth of the Dragon-fly from its pupa :—

“ To-day I saw the Dragon-fly
Come from the cells where he did lie;

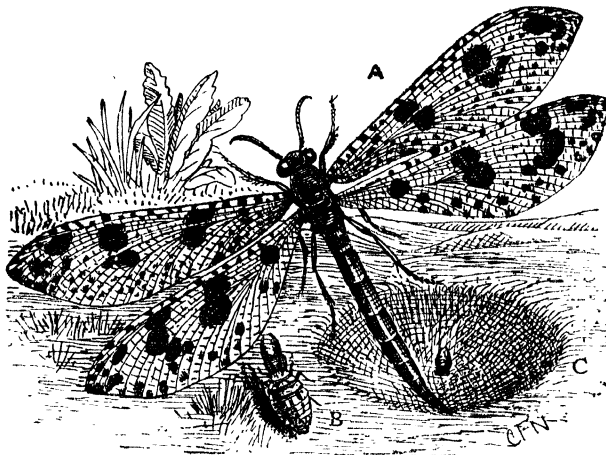
“ An inward impulse rent the veil
Of his old husk ; from head to tail
Came out clear plates of sapphire mail.

“ He dried his wings, like gauze they grew ;
Through crofts and pastures wet with dew,
A living flash of light he flew.”

The Ant-Lion.—The Ant-lion is not a very large lion at all, as you may guess when you hear that it is a near relative of the Dragon-fly. The young ones (larvæ) have feeding bottles, not glass ones with rubber teats, but the bodies of ants and other small insects from which they suck the juices, leaving only the empty skins. They are clever children, and construct their own traps to catch their food. Suppose a young Ant-lion just starting out in life ; the first thing he would do is to trace a circle in the sand where he lives, and then he gets inside the line and commences to dig a pit with a wide top and narrow at the bottom. The sand is dug out with one leg and heaped on to its head, then, with a sudden jerk, the burden is dislodged and thrown some distance away.

When the pit is finished, the larva lies low at the bottom, and very soon some curious insect comes to investigate the sand heap which has been thrown outside

the pit. Hop! plop! over the edge he tumbles, and the more he struggles to climb up the sloping sides, the faster the larva throws sand over him, using both head and mandibles as spades. Very soon the hapless insect is overwhelmed, and the cute baby sucks its bottle contentedly.



ANT LION.

A. PERFECT INSECT. B. LARVA. C. PIT DUG BY LARVA, WHICH IS BURIED IN SAND AT BOTTOM WITH HEAD ONLY SHOWING.



LEAF-CUTTER BEE.

A. FEMALE, ENLARGED. B. MALE, ENLARGED. C. FEMALE, NATURAL SIZE. D. NEST.
E. ROSE LEAF WITH PIECES CUT OUT.

CHAPTER V.

THE HONEY BEE. SOLITARY BEES AND WASPS.

“ So work the honey bees,
Creatures that by a rule in nature teach
The art of order to a peopled kingdom.”—SHAKESPEARE.

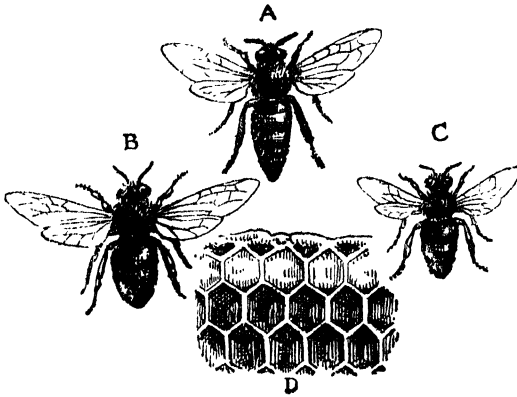
The Honey Bee.—Bees have long been the little friends of man, and particularly of children who have a sweet tooth, although the honey we take from them is not gathered for our benefit, but is their wise provision for their own needs in a time of scarcity. This honey is the nectar of flowers which is gathered by the bee by means of a slender trunk, something like an elephant's in miniature, which darts into the chalice of the blossom and coiling up, conveys the sweet syrup to its mouth, and from thence it enters a sort of first stomach, called a honey-sac. Here the nectar undergoes a mysterious change, and turns into honey. Every respectable Bee has only one notion, and that is *the good of the hive*; its own personal desires and feelings, if it has any, do not in the least matter; its whole existence is spent for the welfare of others. The little honey Bee sets us all an example of unquestioning attention to duty without hope of reward. Of course, it takes all sorts to make a world, and sometimes a Bee will take to evil courses, and turn

freebooter, robbing honest Bees of the burden they are so unselfishly carrying home to the hive, and eating it all up, there and then. In addition to the nectar, the Bee takes its toll of flower dust or pollen when it visits a flower, and this also is carried back to the hive for the benefit of the queen and the children. The pollen is made into bee-bread, a wonderful sort of food, "the finest thing out" for Bee-babies, and then there is an extra special kind, a most superior quality, which is given to certain favoured children, and makes them grow into princesses. The difference between the Worker-bees, who are small and do not lay eggs, and the queens, large and stately, with crossed wings, who are the mothers of the hives, and who can produce eggs at the rate of 1000 a day, is all due to the superfine quality of the bee-bread on which they are fed. You cannot carry flour home without a receptacle of some kind, neither can the Bee; so nature has provided it with little hairy grooves on its hind legs which make cunning baskets.

Laden with spoil, the Bee returns to the hive and deposits the honey in one wax cell and the pollen in another, and these are sealed over as soon as they are full. Of course, some of the provisions are used to feed all the indoor-workers of the hive, and there are great numbers of these, so the honey-gatherers have to work very hard. The comb, with its symmetrical six-sided cells, and many passages, is made of wax, the whole being designed by a Bee architect, who superintends her work-people and sees that everything is done properly. The work-people are of two classes, wax-makers and sculptors. Wax-makers produce wax, by a sort of conjuring trick, from the honey they have previously eaten. When wax is wanted, they make a hearty meal of honey, and then hang themselves up for twenty-four hours by their legs, after which time tiny plates of wax pop out of eight little pockets under the body.

The sculptors, with the help of the architect, model these plates into rows of cells. These are used as store-houses, whilst certain of them are set aside for nurseries; the large ones with extra thick walls being intended for royal children, and there is a special one for the residence of Her Majesty the Queen. Every chink and crack except the entrance to the hive, is stopped up with a sort of cement called propolis, which is made from the sticky syrup of certain plants such as pine-trees. M. de Réaumur, who wrote a great deal about Bees, relates how he once fastened the glass of a hive with pasted paper before the Bees went in. They soon discovered his unworkmanlike job, and seemed quite indignant. No time was lost by them in tearing away the paper, and very soon the space was filled in with a firm cement of propolis.

When a nursery cell is empty, the queen deposits an egg in it, being screened meanwhile from the "vulgar gaze" of her subjects by her ladies-in-waiting, who



HONEY BEE: A. QUEEN. B. MALE. C. WORKER.
HONEY COMB SHOWING EMPTY AND COVERED CELLS.

form in a cluster about her ; being always careful to keep their faces turned towards her, all Bees showing their respect for royalty in this manner.

The eggs and little ones are cared for by nurses who feed the latter with bee-bread, which they themselves digest and then bring back to the mouth. When the baby gets big and fat it spins a fine silk cocoon and snuggles down for a long

sleep, the nurse covering over its cell with a wax lid. This pupa stage lasts about a week and the baby has, meanwhile, changed into an "imago" or perfect Bee ; all the workers are female, the male Bees are called drones. After biting its way through the waxen cover, the young Bee is ready to be instructed by its nurses in the duties of the hive. The queen never lays more than one royal egg in a day as for the sake of peace and quietness only one princess is allowed at large at the same time. If by some accident two princesses should meet they fight until one of them dies.

When a princess arrives at the "imago" stage she wants to get out of her cell just like any little commoner ; but the nurses prevent her from doing so by piling on more wax as soon as she has bitten her way through the cover.

She is kept prisoner for a couple of days so that her wings can grow strong enough for her to fly as soon as she comes out of the nursery, for she must leave the hive without delay, or the queen would sting her to death out of jealousy.

All the time the princess is kept prisoner she gives vent to loud angry cries which disturb the queen, who rushes off to the cell with a view of getting rid of her.

If the princess is to become a queen the Worker-bees firmly, but respectfully, prevent the old queen from harming her ; but if no more monarchs are required she is permitted to fall on the hapless victim and sting her to death.

When a hive becomes crowded, numbers of Bee-workers of all kinds and ages go away to found a new colony elsewhere. This is called a swarm, and in a well-filled hive several swarms take place during the season.

The first swarm is headed by the old queen, those that leave later have to be satisfied with a young one but lately emerged from the nursery. Many days before swarming takes place Bee scouts are sent out to select a suitable spot for the new home, and there is a great going to and fro and much consultation before a place is decided upon. When an old queen has left the hive a princess is at once set at liberty and permitted her one day of freedom. Away she soars up, up, towards the sun without a glance at the flaunting flowers that supply her and all the hive with every necessity for life. She is accompanied in her flight by a company of drones, and this is the great hour of their lives also. Towards dusk the princess returns to her subjects an acknowledged queen, and still escorted by the drones enters the hive, which she always finds again no matter how high she soars.

The time has now come for her to settle down to lay eggs, morning, noon and night, sleeping and waking, as long as summer lasts; it is her great interest in life, her only accomplishment.

A queen Bee can live for several years, doing nothing but lay eggs; even her food is put into her mouth by the untiring workers who die in a few weeks.

The drones being male creatures of no occupation become a nuisance about an establishment which is kept up entirely by female workers. These latter soon get tired of the lazy fellows and either sting them to death or turn them out of house and home to die of starvation.

The Bees keep their hives very clean, removing every scrap of refuse, and they ventilate it in quite an original way, rows of Bees stand from the entrance to the interior flapping their wings to and fro, thus creating a current of air.

The entrance is guarded by sentinels who give notice of approaching danger; these are changed at regular intervals, as also the ventilating Bees, for all must sleep as well as work.

It is thought that the horns (antennæ) on either side of the head are the organs of hearing and also serve to give the Bee a sense of direction by which it guides itself. They must also be used as a means of communication, for Bees touch one another constantly with their antennæ, and if any message is to be carried it appears to be done in that way.

At the root of the sting there is a small bag of poison and it is this which causes most of the pain and inflammation when a Bee has attacked you. A slice of onion applied to the part is a simple and effectual remedy after the sting has been extracted.

Country folk have many superstitions about Bees, one is that of "telling the Bees," the ceremony observed being a simple one. If a marriage or birth occurs

in the household, a member of the family must whisper it outside the beehive, and in the case of death a piece of black crape is tied to the top. It is thought that if this is not done the Bees will be offended and bring bad luck.

Wild Bees.—Hive-bees and Wild Bees living in colonies are called "Social Bees," but the original wild stock of all these as well as many other kinds dwelling in pairs only, are known as "solitary." Want of space prevents dealing with many of these interesting insects, but the Two-Horned *Osmia* must be mentioned.

The Two-Horned *Osmia*.—She bores a tunnel in the soil and makes a wax cell at the bottom. Here she deposits an egg and surrounding it with bee-bread covers the whole over with wax. Another cell is constructed above it in the same way, and so on till the tunnel is full. When the imago is hatched, the lower ones, who naturally came out first, have to wait their turn before getting out of the cell until the upper ones have flown away. If any of them happen to be small they try to slip past their big sisters and brothers who sleep above.

The Leaf Cutter Bee.—The Leaf Cutter Bee usually leaves its traces on the rose bushes from the leaves of which it cuts neat little semi-circular pieces to line its nest.

The Carder Bee.—The Carder Bee is still more luxurious, for it makes a kind of soft wool, from moss or the fibres of plants, with which it lines its dome-shaped home.

Although they have their faults sometimes, like the rest of us, we can regard Bees as shining examples of hard-working unselfishness, and one cannot but wonder at and admire the perfection of their laws which are made for the welfare of the whole community, and if some poor creatures are martyrs for this great cause, they seem to make the sacrifice most willingly and cheerfully.

Wasps.—Happening to mention wasps to a farmer recently, he eyed me angrily and said, "Don't mention them wasps to me, 'tis regular pests they are; just ye look at this," and he held up what appeared to be a fine rosy-cheeked apple. On closer examination it became manifest that the whole interior had been eaten by these insects and nothing but the shell remained. Almost half the fruit in the orchard had been treated in the same manner, and always the choicest was selected by the knowing creatures.

The farmer was himself to blame, for had he looked for and destroyed the nests last season, they could never have reached such numbers when the fruit was ripe.

Like the Hive-bees, the queen wasp is sovereign and mother of the nest; but unlike them she alone survives the winter, sleeping in some cosy crack or corner

until the spring sunshine awakens her. All alone in the wide, wide world, she creeps out and looks for a convenient hole in the ground in which to make a nest. Having found it, she proceeds to manufacture a quantity of papery-looking material out of tiny shreds of wood and some glue-like substance from her own body. She first makes



PLAN OF NEST OF COMMON WASP.

a roof of this and then builds a few cells (not unlike those of the Bee in shape), and as soon as they are finished lays an egg in each one.

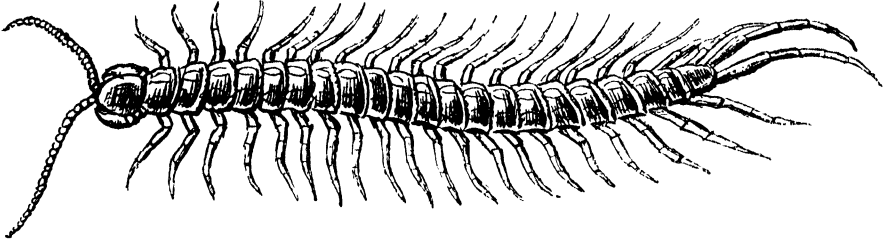
This done, more cells are built, until in a week or so her labours further increase by having to care for and feed several babies (grubs) that have hatched out of the eggs.

In a month the children have gone through the usual insect changes (Metamorphosis) and are full-grown wasps. They are now able to assist mother in the building of the house and tending the younger children who are constantly being hatched out. The family, as soon as they are able, all help in building rows and rows of nurseries all opening downward, and each floor (resembling a plate with the cells underneath) is strengthened by a supporting pillar. As fast as the cells are finished they each receive an egg, for no store-houses are wanted, as with the bees, for when food is scarce, wasps are scarcer still. The nest is now made warm and comfortable by the addition of a thick roof which comes down at the sides and covers the whole.

As soon as there are enough workers full grown, mamma retires into private life and spends her days in laying eggs. Perhaps she also occupies herself with recollections of the pleasant days when the children were young and she had time to see something of the world ; who knows ?

Late in the summer, queen and drone eggs are hatched, the young queens becoming the mothers of new hives next season.

A wasp will not sting unless it be alarmed ; if it is chased it stings in self-defence and loses not only its reputation but its life.



CENTIPEDE.

CHAPTER VI.

CENTIPEDES, MILLEPEDES, SCORPIONS, SPIDERS.

“ ‘ Will you walk into my parlour ? ’ said the spider to the fly.
‘ Tis the prettiest little parlour that ever you did spy, ’ ”—

MARY HOWITT.

ALL insects belong to a sub-kingdom called Arthropoda, their family name being Insecta.

Centipedes and Millepedes.—Spiders, Scorpions, Centipedes, and Millepedes are of the same sub-kingdom, but belong to quite different families. Spiders and Scorpions are of the class Arachnida, and Centipedes and Millepedes represent the Myriopoda. Centipedes look rather like worms with lots and lots of legs, and although they undergo a certain metamorphosis in their infancy, it is quite different from that of insects. They feed on worms and insects, and Millepedes on vegetable matter. This is the chief difference between them. Millepedes are dull, sluggish creatures, and the more legs they have more slowly they seem to move. In the Tropics they grow very long, sometimes measuring more than a foot, so you can imagine that a great many more legs go to that foot than you have feet to your legs—which reminds me of a verse I once read, and I repeat it with apologies to the poet :

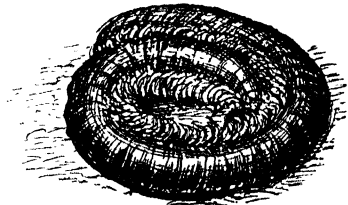
“The Centipede was happy, quite
 Until the Toad for fun,
 Asked him which leg came before which,
 Which worked his mind to such a pitch,
 He lay distracted in a ditch
 Considering how to run.”

Spiders.—There are few things in the world so delicately fine and yet so strong as a thread spun by a Spider. Often it is not more than a 20,000th of an inch in diameter, and yet it is strong enough to permit the spider to reach the ground from a height, with no other support. The difference between a Spider, which is not really an insect at all, and an insect lies in its having eight legs instead of six, and a body consisting of two pieces instead of three. It has six little sacs called spinnerettes from which the threads are drawn, rather fluid at first, but hardening on contact with the air.

There are many different kinds of webs, and some Spiders do not make them at all, but use their silk as a lining for nests or burrows.

The most beautiful web is the round one, made up of radiating and circular threads forming a geometrical pattern. Here and there little beads can be observed upon the web. These are globules of gum with which the threads are stuck together, and both are manufactured in the interior of the Spider. The Spider is blessed with a healthy appetite, and in order to appease it, makes her web to ensnare unwary passers-by, belonging to the insect world. As a rule she discreetly keeps herself out of sight, and before she has waited very long a victim is entangled in the net. In a trice out she pounces, kills the struggling creature, and either sucks the blood out there and then, or carries it to the larder under a neighbouring leaf for future use.

Frequently a large insect may be caught and its struggles tear the web in all directions. Nothing daunted, the Spider sets to work to repair the damage, and is soon at her old games again. Miss Spider has usually a great many admirers; but she is apt to be coquettish, nay, even scornful of the gentlemen, who are considerably smaller than herself. Probably she would settle down sooner were it not for an irresistible inclination that overcomes her, to pounce upon her adorers and stow them away in her larder. If a gentleman is fairly quick in his movements he is able to let himself down by a thread and escape, for the lady is too weighty to follow in the same rapid way; but alas! it often



MILLEPEDE COILED UP.

happens that he is sucked dry before he has even had time to express his affection.

In spite of these dangers, fresh lovers claim her attention, and at last one of them is regarded with favour—the others remain to furnish the wedding feast, and no doubt make excellent eating.

After a short spell of domestic happiness, the husband frequently goes the way of his former rivals, and he too is an inmate of that terrible larder.

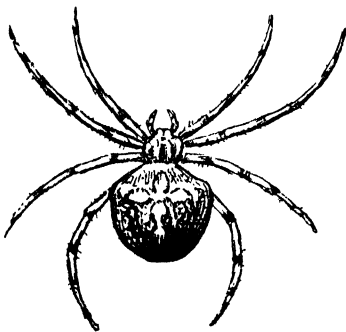
Meanwhile the widow is much taken up with the cares of an ever-increasing family who are stowed away in a row of silk bags fastened to the web like little balloons. Each balloon contains a large number of eggs, and presently the young Spiders come out of the first one, and, under the mother's watchful eye, spend a happy childhood playing about the web.

One by one the other balloons discharge their contents, and then the trouble commences, for the elder ones eat up all the little brothers and sisters who are not strong enough to defend themselves, until out of a family of over a hundred only half-a-dozen remain.

These soon leave home, and the girls set up housekeeping on their own account, their first webs being somewhat irregular and untidy; but they soon gain experience and are able to make quite as good a web as dear mother did at home; but that cannibalistic old person does not take any interest in the matter, as she is dead and pretty well forgotten.

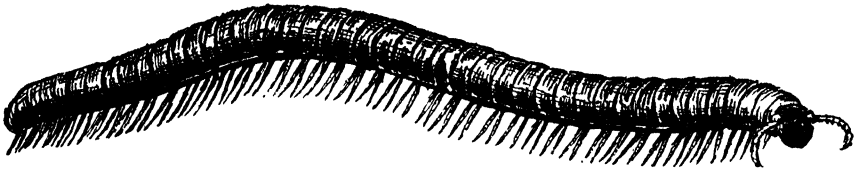
In the Tropics, Spiders grow very large, some of the webs being so strong that birds get entangled in them.

Scorpions.—Scorpions are much dreaded in those countries as their sting, which is at the end of their tail, is poisonous, and can cause death. They resemble Spiders, but have curved foot-jaws like the claws of a crab.



SPIDER.

Bates, in his interesting book about the Amazons, relates that he saw some Indian children leading an immense Spider (*Mygales*) about the house secured by a cord round its waist. In parts of Italy if any one had the misfortune to be bitten by a Spider, called the Tarantula, they immediately began a wild kind of a dance which was accompanied by music, this treatment was supposed to ward off an attack of madness. The superstition no longer exists; but the memory of



MILLEPEDE.

it remains in the charming music that has been written under the name Tarantella.

Talking of superstitions reminds me that in Ireland it is considered very unlucky to kill a Spider, and the reason for this belief is founded on the following old legend.

The heathen Danes were pursuing St. Patrick, for they had taken a mighty oath in the name of their gods to destroy all the Christians in Ireland. The good saint sought refuge in a cave on the rocky sea coast, the entrance to which was high up, above the reach of the waves. He passed most of his time praying for his people; but the cave was dark and cold, and he would frequently sit inside near the entrance to enjoy the warmth of the sun. As he was sitting there one day he heard a Spider talking to a little white Daisy which grew in a crevice near by the rock, and as he could understand the language of all living things, he listened with interest to what they were saying.

“You are very busy this morning,” said the Daisy, spreading out her white frock in the sunshine, and watching the spider spinning her web right across the entrance to the cave.

“I should rather think I am busy,” chuckled the Spider. “I am saving St. Patrick from the Danes.”

“Much good your slender threads can do,” replied the Daisy.

“If, instead of talking so much, you would help me, it would be more to the purpose,” grumbled the Spider, who was looking for a place to fasten her thread.

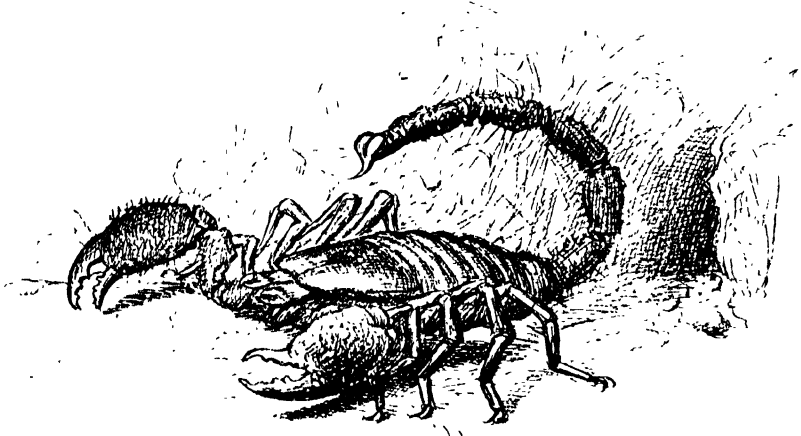
“I am quite willing to help,” said the Daisy, “if you will tell me how. Why don’t you fasten your thread to my stalk?”

“Thank you,” replied the busy weaver, “I will, and I would be much obliged for some little bits of dead leaves to put in the web, which will look like insects that have been sucked dry.”

No sooner said than done, and the beautiful web was quite finished.

Round the corner came the Danes searching every nook and cranny for the saint; they soon espied the cave, and were going to enter, when they saw the Spider’s web.

"It is no use going in there," they said, "for there is a Spider's web across the entrance, and as it is an old one, he could not have got in without breaking it," and off they went, the sound of their footsteps soon dying away in the distance. The good old saint was very grateful to the Spider and the Daisy, and before leaving he blessed them both. From that day on, no good people in Ireland would kill a Spider; and as to the little Daisy, it blushed so red that its petals have ever since been tinged with pink.



SCORPION.

