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MAN AND HIS ANCESTRY

MAN

AND HIS ANCESTRY

ALAN HOUGHTON BRODRICK



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Introduction

A hundred years ago hardly anyone suspected the great antiquity of Man. A generation ago the evidence was still patchy and confusing; but in recent years it has accumulated with almost bewildering rapidity. There have been at least five capital discoveries in the past four or five years. In fact, we have reached the point where we have to face up to the question 'What is a Man and what is not?'

'Man and his ancestry' begins by describing the famous *Gigantopithecus* of south China who was recently held by some to be an ape and by others to be a Man. The reasoning behind the present classification as an ape is explained and the genealogy of apes is then traced. Detailed consideration is given to the Australopithecines, Primates who stood upright, made and used tools, and lived over 1,000,000 years ago in southern Africa. The author then describes in detail the remains of the Pithecanthropoids, who are now known to have been scattered throughout the Old World, the Neanderthaloids and their close relations *Homo sapiens*, showing that different types of men were living on this earth at the same time. Only one sort has survived and our history is now thought to stretch back maybe 200,000 years. The story of Man and his ancestry is taken up to those ancestors of ours who, perhaps more than 25,000 years ago, made the first art and the first symbolical representations.

The story of the evolution of Man is one that has been much beset with prejudice, misrepresentation and wishful thinking. We still have to read and hear of our 'tree-dwelling forbears', 'Missing Links' and 'completely man-like creatures' that lived, maybe, 20,000,000 years ago. Attempts are still made to assign to *Homo sapiens* an immense antiquity and to exaggerate the differences between him and other sorts of Man now extinct. But here in 'Man and his ancestry' the author has endeavoured to set forth the evidence clearly, simply and without prejudice.

In a book such as this, which must draw very largely upon other men's works and writings, there is hardly place for detailed acknowledgement of each source of information. I should, however, like to

mention my debt to my friends Professor Leroi-Gourhan of the Sorbonne, M. Pierre Champion and Mr Harper Kelley of the *Musée de l'Homme* in Paris. I have consulted, with much profit, the writings of Professor C. Arambourg, lately of the *Muséum d'Histoire Naturelle*, and of Dr Vallois, lately director of the *Musée de l'Homme*. Among the works in English those of Professor Sir W. E. Le Gros Clark and of Dr Kenneth P. Oakley of the British Museum (Natural History) stand out for their authority and clarity.

I should like to thank Mlle Alimen for permission to use Plates II, IX(a), XIII and XIV, which illustrations appeared in 'The Prehistory of Africa', Dr L. S. Palmer for Plates III(a), VII(a), VIII, XI(b), XII and XV(b), which appeared in his book 'Man's Journey Through Time', and the *Musée de l'Homme* for Plates IV(b) and V. I wish also to express my thanks to Miss J. Trubshawe for the great care she has given to this book in the various stages of its evolution.

A. H. B.

Paris/London

I

What is a man?

TIEN LUNG WANG SSU, 'The Temple of the Heavenly Dragon King', is the bold inscription on the façade of a cave-shrine. This cave is high up in the face of a precipitous column of rock, one of several isolated buttes that rise abruptly from the plain like strange islands from an empty sea. The landscape has the quality of Chinese paintings in which the incredible cliffs, perched pagodas, contorted trees and cloud-capped summits seem as though the artists must have drawn their dreams. But such limestone peaks, pitted with caves, are among the most striking natural features of the Chinese south-west and especially of the province of Kwangsi.

Twenty years ago I followed the line of the new railway cutting from Langson, through the 'Little Gate of China' to Nanning on the upper reaches of the West River. On either side of the Gate a miniature Wall of China dipped and twisted over the hills into the distance. A bright valley, glowing with that inward radiance that is so often entrancing in the Chinese scene, carried the ancient Mandarin Way—the Tribute Road—leading into the subjected lands of the 'Pacified South' that is now called Vietnam. The red earth of the cuttings stood out bright vermilion against the intense pale blue sky, and as we penetrated into one of the wildest and least populated of the Chinese provinces the cliffs of the isolated limestone hills jutted up from the plain.

Here and there, with curling eaves and an inscription in large characters, were the little entrances to the shrines made in caves that had been cleared of their fillings. Dragons[1] were supposed to have lived in these caves and because 'dragons' bones' have been found for ages

[1] The Chinese dragon of legend seems originally to have been some sort of water-beast (alligator? sturgeon?) since in the earlier of his representations he is depicted with fins. The modern form (so familiar to us from pottery and embroidery) dates only from Ming times (1368–1644) a period of active formation of 'ancient traditions'.

past in such caverns there was a practical inducement to clear out the cave-fillings.

DRAGONS' BONES

From at least as far back as the Han dynasties (206 B.C. to A.D. 220) dragons' bones have been prescribed as a sedative, a styptic and for employment in surgery, gynaecology and pediatrics. In the sixth century of our era the physician Tao Hungching described how and where the precious bones might be discovered. In the eleventh century a learned man called Shan Kuo offered an explanation for the fossilization of animal bones, while Li Shihchen (1518–1593) set forth in his classical work *Pen Ts'ao Kang Mu* (The Compendium of Materia Medica) their nature and action.

'Dragons' bones', we may read in an apothecary's vade-mecum published during the reign of the Ch'ienlung Emperor (1735–1798), 'are efficacious in heart affections and in those of the intestines and liver. The bones are also recommended to those who are nervous and suffer from high blood pressure. The bones are specific in cases of constipation, nightmare, epilepsy, disorders of the bladder, fevers, dysentery, piles, consumption, ulcers and difficulty in breathing. . . .'

Compared with such powerful and mysterious remedies, our European cure-alls seem commonplace enough. '*Lignum vitae* . . . healeth the French Pockes and also helpeth the gout in the feete, the stoone, the palsey, lepree, dropsy, fallynge euyll and other diseases' as is stated in an English translation of a German treatise (1519).

To this day, even in the New China, dragons' bones and teeth form a part of the regular stock-in-trade of the druggists and not only are such things specific for many ills and ailments, but the bones of the dragon enter into the manufacture of the complicated, traditional, Chinese aphrodisiacs.

'Dragons' bones', as a matter of fact, are not those of any sort of reptile but are the fossilized remains of mammals—often enough of mammals now extinct in China, such as antelope (for China was once, as Africa is now, a great antelope 'province'), sabre-toothed felines, hyena, elephant (which lingered on in central China until at least Shang times, say 1300 B.C.), rhinoceros (which survived even longer than elephant and were much sought after for their horns) and *Hipparion*—the three-toed horse which also flourished in the New World as in other parts of the Old. So abundant are *Hipparion* remains

in China that the words '*Hipparion* fauna' are generally used to designate an assemblage made up of various other fossil remains as well as *Hipparion*.

Hipparion teeth have for long been popular and the 'prime quality' dragons' bones consist very largely of the dark-coloured fossil teeth of this ancient type of horse. Then, in descending scale of popularity, come the teeth of porcupine, those of tapir and Malayan bear, together with those of the so-called 'bamboo-bear', better known to us as the 'Giant Panda'.

It was among a collection of dragons' bones bought in Peking that Max Schlosser (see page 124) found a tooth he attributed to a 'man-like ape' or an 'ape-like man'.

However, it is to the Dutch palaeontologist G. R. von Königswald that the credit must go for a regular (and as it proved very fruitful) search for Primates' teeth among dragons' bones. In 1931 he obtained from a Chinese druggist in Bandoeng (Java) a prescription for such 'medicine'—which, generally speaking, the Chinese apothecaries are unwilling to sell to foreigners. Armed with this prescription Königswald began a search in Java, in San Francisco, in Canton, in Hong Kong and in the far-famed Mott, Pell and Dyer streets of down-town New York's Chinese section.

What he was able to purchase—and in considerable abundance—were the fossil teeth of apes and nearly all of them those of extinct orang-utans probably from southern China. These were teeth which indicated an ape larger than the extant Red Apes of Sumatra and Borneo.[1]

Teeth are the most resistant part of any animal's structure. They are impregnated with lime salts while the hard dentine and enamel may survive conditions which would reduce any other bones to mud or dust. Furthermore, teeth are more useful, for classificatory purposes, than almost any other portion of the body, though (as the *Gigantopithecus* story shows) teeth alone are not always enough to tell us whether their possessors fell into the class we call hominid.

THE RED APE

Since orang-utans turn up rather frequently in the *Gigantopithecus* tale we may, perhaps, glance at the Red Ape's story, as far as we know it.

[1] About the same time the late Teilhard de Chardin was also buying fossil orang-utan teeth in Chinese druggists' shops.

For the Red Ape, although we are often told he is less like us than are gorillas or chimpanzees, is the aristocrat among the anthropoids. He has a pedigree, which is more than can be said for the gorilla or chimpanzee.

If we watch a Red Ape in captivity (and we must arm ourselves with patience, for often he will sit for hours close up to a wall staring at it like a Zen ascetic) he seems a very slow-moving but dignified and rather nonchalant fellow, in fact a good deal less fussy and fidgety than a chimpanzee—and maybe, also, like many dignified people, rather less bright than more restless relations. Some orang-utans, especially the light-skinned sort, and those that have lost some of their body-hair, have most uncannily human-looking backs so that if we are not lucky enough to catch the orang-utan looking over his shoulder from his contemplation of the wall we may get the hallucinating feeling that one of our own kind is veiling his face from visitors.

In his native forests, however, even if the Red Ape is inclined to be a contemplative, the 'Man of the Woods' or *mias* is remarkably agile and swings along from branch to branch more quickly than a man can push through the jungle below. In proportion to the rest of his body, his arms are longer than those of any other ape. When he wants to, he can stand (and he may be five and a half feet tall) with his knuckles on the ground. His canine teeth are formidable but he is, as are all apes, a vegetarian. Indeed, he likes delicate fruits and his favourite foods are the perfumed mangosteens and the delicious flesh of the durian, whose stinking outer rind he rips off with his stout fangs.

Among the bones recovered from Chinese druggists' stores and from cave-fillings in Kwangsi the Red Ape's teeth (dating from maybe 300,000 years ago) seem to indicate two sorts of orang-utan—a large form and a smaller one perhaps not much bigger, if at all, than the present-day *mias* of Sumatra and Borneo. It is, of course, just possible that these two types of teeth may belong to males and females of the same species. Still, although 'sexual dimorphism'—in this case difference in size—as between males and females is a characteristic of the Primates as a whole, these fossil teeth may indicate two different forms or species. Nevertheless, it must be confessed that there is no satisfactory method known (as yet) for 'sexing' teeth.

Then again, we cannot say whether the Mid Pleistocene Chinese orang-utans had such relatively long arms and such large cheek-ridges as their living representatives. Maybe these antique Chinese Red Apes were not even red. Bones tell us nothing about hair or skin

colour and we may never know the shade of hue of Neanderthaloids' eyes.

Living forms of any sort of animal are, so to speak, terminal forms, although this does not mean that these forms are destined to die out very soon. As 'terminal' products of evolution they must be studied like documents that tell us the evolution of place-names or the alteration in a language, that is to say, the living forms must be regarded as part of a record largely composed of fossil forms.

Generally speaking, among the Primates the most specialized forms are the largest, but although the living orang-utans are (at least for tree-dwelling) the most specialized of all apes they are exceeded in size by gorillas. But as the present-day red apes are inhabitants of islands only (and insular forms always tend to be smaller than the equivalent continental ones, e.g. Sumatran elephants) it is probable that the Mid Pleistocene southern Chinese orang-utans were very much like the ones we can today see in most zoological gardens, though larger—at least as large as the living gorillas.

Fossil orang-utan teeth from Java (where the animal has been extinct for long ages) and from Indo-China, are also of a larger type; larger, that is, than those of extant orang-utans.

The fossil orang-utan material from southern China seems to be associated with that of highly evolved elephants and also with such 'Malayan' forms as an early sort of tapir, gibbons and Malay bear. In fact this fauna may well have been an original Chinese one which was forced south by climate-change and must have reached Indonesia by means of land-bridges.

GIANT MAN OR GIANT APE?

Among the very first 'dragons' bones' that Königswald bought at Hong Kong in 1935 was a lower last molar, larger than that of his orang-utan teeth. This molar had also a coarser crown-relief than the ape teeth. It was, furthermore, so large that it exeeded in size the corresponding tooth of any known gorilla and was, in diameter, about twice as big as the equivalent tooth in *Homo sapiens*. Such a molar, then, must have belonged to some Primate of very considerable size—or, at least, to one with a very large face and huge jaws.

The tooth was so much worn down and flattened that by no means all of those to whom the discoverer showed it would admit that it was the tooth of a Primate at all. Some opined it belonged to some sort of

pig (there are pig-teeth which are distressingly like our own), but Königswald maintained, and rightly as it has turned out, that the fossil had undoubtedly belonged to some sort of ape.

A little later on, the same researcher discovered, in Chinese druggists' shops, three other teeth belonging apparently to the same sort of Primate. Two of these were molars, but little worn (and much resembled hominid teeth) while the third was an upper canine. This canine had a straight root whereas in all the existing apes the canines have roots which are markedly curved. No definite information could be extracted as to the place of origin of these specimens, but from various indications it looked as though they had come from the province of Kwangsi and from cave-deposits. Königswald by this time felt that he had enough evidence to postulate the existence in Pleistocene times of a giant ape which he named *Gigantopithecus blacki*.[1]

The discoverer put the date (more or less by dead-reckoning) of his *Gigantopithecus* in the Mid Pleistocene [that is to say, about 400,000 to 500,000 years ago]. Thus, the *Gigantopithecus* would have been the contemporary both of the extinct southern Chinese orang-utans and also of the Asiatic Pithecanthropoids (see page 110).

In his collections of dragons' bones Königswald identified a number of hominid[2] teeth. Some were of *Homo sapiens* (and of these there were a few which tallied well enough with Haberer's find, see page 124) others were of a Pithecanthropoid (not identical, it would seem, with either the Pithecanthropoids of Java or with *Pithecanthropus pekinensis* —see pages 121 and 128)—to which he gave the name of *Pithecanthropus officinalis*. So, the pithecanthropoid type of Man flourished not only in Java and northern China but also in southern China. In fact, at one time, it must have been widespread in eastern Asia.

By the eve of the 1939–45 war, well over fifty *Gigantopithecus* teeth had been collected. During the war Königswald was interned in Java by the Japanese and when the late Franz Weidenreich[3] came to examine the *Gigantopithecus* teeth—or some of them—in New York, he concluded that they had belonged not to a sort of ape at all but to a giant

[1] In memory of Davidson Black (see page 124) who on the strength of a single tooth presumed the existence of a type of fossil man to which he gave the name *Sinanthropus*, now called *Pithecanthropus pekinensis*.

[2] 'Hominid', that is any form of Man (see page 26). The word is less controversial than 'human' and is now generally used in anthropology.

[3] Franz Weidenreich (1873–1948) was a German by birth. After having held chairs at Heidelberg and Frankfort, he left Germany in 1933 for a lecture tour in the United States and as he was a Jew he never returned to his native country. See 'Franz Weidenreich' by A. J. van Bork-Feltkamp. *Kon. Vereeniging Indisch Instituut Med.* LXXXI *Afd. Volkenkunde* number 30 1948.

form of hominid. As Weidenreich's authority was widely respected *Gigantopithecus* became, for a time, *Giganthropus*, no giant ape but a giant man, maybe ten or more feet tall! Weidenreich, indeed, on the strength of the *Meganthropus* evidence (from Java, page 120) had put forward the theory that Man during his evolution had passed through a giant phase. Quite understandably he was pleased enough to discover what he thought was further proof of his hypothesis.

Weidenreich died in 1948 and Königswald, after his release from internment, returned to Holland. So, for a few years, not much was heard of *Gigantopithecus* although it was generally agreed that the discoverer had been right and that Weidenreich had been wrong; that is to say, the teeth were those of a giant ape.

THE LENGHAI HILL

Until 1949 China was rent by civil war and of course little or no palaeontological prospecting could be done. However, after 1949 the Chinese central government launched an 'educational campaign' designed to impress upon the minds of the mass of the population the value, significance and importance of fossil bones. As a result of this campaign several tons of fossils were collected from caves in Kwangsi province. The bones were sold to a central organization in Nanning (capital of Kwangsi).

Among the fossils bought by the 'Kwangsi Federation of Supplies and Markets Co-operative' were remains of *Ailuropus* (Giant Panda), *Stegodon* ('roof-toothed' or stegodont elephant), rhinoceros, *Megatapirus* (an extinctgiant form of tapir), boar and deer. There were also seven *Gigantopithecus* teeth (all larger than those discovered by Königswald), perhaps as much as three times the size of the corresponding teeth in modern *Homo sapiens*; about seven hundred teeth of fossil orang-utans (*Pongo pygmaeus*) and scores of (smaller) teeth of an 'ape-like man'. This is apparently not a pithecanthropoid form. Later on thirty more *Gigantopithecus* teeth were recognized among fossils gathered together at Canton.

On 26th March 1950 three *Gigantopithecus* teeth—the first to be found *in situ*—were unearthed in a cavern of Tahsin county by Pei Wênchung (Dr Pei was the discoverer of the first *Pithecanthropus pekinensis* skull, see page 127). It was then clear that the stories about the teeth having come from Kwangsi were true enough. The geological level in this cave appears to be more or less of the same age as the strata

in which the *Pithecanthropus pekinensis* remains were found at Choukoutien (page 126). The three teeth were embedded in a layer of red loam beneath hard breccia containing fossil bones of Giant Panda, of orang-utan and other mammals. After the discovery of the three *Gigantopithecus* teeth Pei's team explored no fewer than three hundred caves in Kwangsi during a period of three months.

It was not however until 17th February 1957, at a meeting of the Palaeontological Society of China, that Pei displayed a fossil *Gigantopithecus* lower jaw with twelve teeth in place. This mandible had been found, during the summer of 1956, by one Chin Hsiuhuai, a farmer living at Liucheng in Kwangsi. He had come across the fossil as he was digging out earth from the floor of a cave in Lenghai hill near his village. Whether Chin was just carting away 'medicine' or fertilizer or whether he had been fired by the 'educational campaign' is not clear.

From Chin at Liucheng the mandible found its way to the Laboratory of Vertebrate Palaeontology of the Academy of Science in Peking. As soon as the discovery was known the laboratory's team which had been investigating earlier finds of *Gigantopithecus* teeth in the hills of Tahsin transferred its activities to Lenghai hill. In June 1957 Pei announced that in this same Liucheng region several isolated *Gigantopithecus* teeth had been found together with a second mandible—complete except for the last molars—which was possibly that of a young male. Now (1959) there are in all three mandibles.

Lenghai hill is an isolated columnar eminence of Karst limestone, typical of the Chinese south-west, and the two entrances to the cave are 297 feet above the level of the surrounding plain. No significant modification of the landscape seems to have occurred since Mid Pleistocene times. Therefore the cave was, and still is, inaccessible except to creatures that are good climbers—or can fly. The cave-filling deposits contained a mass of fossil bones. The predominant faunal assemblage was *Stegodon-Ailuropus* (typical of the Chinese Mid Pleistocene) with remains of boar and deer, plenty of tapirs' bones and a few of elephant. Obviously none of these animals could scale a cliff nearly three hundred feet high and there are no signs in the cave of water-erosion, as there would be had the bones been washed into the grotto.

The presumption is, then, that some other animal killed these creatures, or at the least, hauled their remains up to the cave. There is no trace of any hominid, there are no artefacts, no stone implements, no traces of fire. Nothing, indeed, to indicate who was the most ancient householder—except for the lower jaw of a *Gigantopithecus.*

At the back of the cavern the filling was from six to seven feet deep. The mandible was unearthed from the lowest level which was also that of very numerous fragments of fossil bones of animals whose mandibles indicated that either they were very young (i.e. still showing milk teeth) or aged (i.e. with teeth greatly worn down). The *Gigantopithecus* teeth belong to the rather smaller type among those already known. The jaw, then, may well be that of a female, and probably, moreover, of a middle-aged or even fairly old female. The teeth were, in fact, so worn down that, because of the blurring of their pattern, they appear more hominid than do most of the isolated *Gigantopithecus* teeth or, indeed, those of the second jaw (page 18).

It looks very probable, then, that we have here evidence for the existence in southern China several hundred thousand years ago of a very large flesh-eating ape.



FIG. 1. Sketch map of China, showing principal sites which have yielded Primate remains

THE FOOD OF APES

The existing apes, in their natural conditions, seem to be exclusively vegetarian, though in captivity some anthropoids have been known to develop a taste for meat . . . but then the beasts we see shuffling about in their cages (for all captive apes have stiff joints), sitting staring mournfully at their silly visitors or swinging lazily from poles and shelves and bars are unlike their agile, tree-dwelling fellows in their native forests.[1] But the evidence, such as we have, seems to show that *Gigantopithecus* was a flesh-eating ape and that is a creature new to us since what few indications we possess tend to show that other fossil apes were vegetarians and fruit-eaters. A flesh-eating ape seems to be rather more like us than one living on vegetables alone.

All sorts of men eat meat, if and when they can get it. It is true that we have kept the long gut of the herbivores and that we are the only specimens of the *Hominoidea* to eat meat regularly and in considerable quantities. As Byron says:

> 'But man is a carnivorous production
> Although his anatomical construction
> Bears vegetables in a grumbling way. . . .'

Meat-eating must have played an important part in Man's development, since, to obtain a given quantity of energy, a carnivore needs a smaller volume of food than a herbivore which, indeed, must spend much of its life doing nothing else but eating—as we may well see if we watch a herd of cows. Still, it is a good deal more difficult to catch and kill tapir, boar and deer than it is to sit down and munch grass, so, maybe, the time spent in finding meat was as considerable as that passed by the herbivore in chewing plants. But the qualities of skill, patience, resource, cunning and foresight necessary in a hunter are altogether different from the qualities needful for finding vegetable food.

[1] The taste for meat displayed by some captive apes has been attributed to a change in the intestinal flora and fauna of the animals in captivity. The intestines of a free ape are usually rich in ciliate protozoa (*Infusoria*) which aid in the digestion of cellulose. Reichenow says that with captive apes the *Infusoria* are ingested and with their disappearance the animal develops an abnormal appetite and may take to meat and come to prefer it to vegetables and fruits. This seems to be especially true of gorillas. Mammalian behaviour is modified in response to environmental and especially to biotopic change, thus one sort of macaque seeks out and eats crabs but the habit is not common to all species of *Macaca*. The only monkey (not ape) to live regularly in the open is the baboon and he will prey on lambs and other small animals when times are hard and his bite is more terrible than that of almost any other wild animal. His great sabre-like canines are weapons first and foremost.

It could not have been much easier for *Gigantopithecus* to seize his prey than it was for his contemporaries the Pithecanthropoids. However, there the evidence is, and as there is no trace of any other sort of Primate[1] at these Kwangsi sites we must suppose that *Gigantopithecus* would tear his prey apart on the ground and then carry off the titbits to his lair. We need not think, of course, that these meat-eating apes were exclusively carnivorous. Maybe they were like us and enjoyed a mixed diet. It may be, also, that on occasion, *Gigantopithecus* ate his own kind. If he did this, then he must have been a very superior sort of ape since cannibalism is a distinctly hominid practice.

So, we may think, if we will, that the *Gigantopithecus* jaw is that of an ageing female who was eaten by her friends and relations, either when she had died a natural death or had been knocked off.

Of course, we cannot say with complete confidence that the Lenghai meat-eating ape *was* a female, but the 'sexing' of the remains is not of any great importance (at this stage in our knowledge) since we have nothing but the size of the jaw and the teeth to go on for an estimate of the general bodily appearance of *Gigantopithecus*. Nevertheless, at least one enthusiast has claimed that the 'Abominable Snowman' of the Himalayan heights is a tardy *Gigantopithecus* lingering on in a cold climate! However, all the *Hominoidea* are warmth-loving animals and that includes ourselves, although we have learned to transport our own little private climate about with us.

THE SIZE OF GIGANTOPITHECUS

Although the *Gigantopithecus* teeth may be over twice as big as the corresponding teeth of a full-grown man of today, we are certainly not justified in thinking that the giant ape of southern China was fifteen feet high because his teeth were two and a half times as large as those of a six-feet tall *Homo sapiens*.

Still *Gigantopithecus* was either a very large ape indeed or he was an ape with a very large head for his body. The probability is that he was big and bulky, a good deal bigger and bulkier than the largest gorilla recorded. And what his muscular strength may have been (if we bear in mind his mixed diet) can only be guessed. 'Bobby', the lowland gorilla who lived for a number of years in the Berlin Zoological Gardens, although a captive, was of prodigious power (see plate 1a). He would pick up casually, with one of his feet, a large, hard German cabbage, and

[1] Save the indirect evidence of the 'ape-like man' (see page 17).

without any apparent effort and by a flip of the foot he would crush the vegetable into a mash.

For some years before the 1939 war there was, in the Jardin des Plantes at Paris, a female gorilla who, in her youth, had suffered a slight attack of poliomyelitis which left her lame and, indeed, partially paralysed on her right side. In the summer evenings she would be taken for a walk in the gardens (after closing hours) and if she did not want to go back to her cage when her keepers thought the time had come, it would take four or five men to drag her along. We may imagine, then, what is the strength of a gorilla in its native forest before its limbs have become weak for lack of exercise and its joints stiff.

So we may conclude that *Gigantopithecus* had not much difficulty in scrambling nimbly up the steep, cliff-like sides of Lenghai Hill and in dragging along a good deal of meat.

TEETH

In *Homo sapiens*, generally speaking, the first molar is the largest, and the third (the wisdom tooth) the smallest, while the wisdom teeth on the upper jaw are, as a rule, smaller than those in the lower jaw. However, in some *Homines sapientes* the last molar (wisdom tooth) is nearly as large as the first.

The upper molars in *Homo sapiens* have three roots (two lateral and one mesial so that it is easy to see what was the position of the tooth in the mouth) while the lower, or mandibular molars have two roots only. The grinding surfaces of the crowns of the upper molars have three or four cusps while the grinding surfaces of the crowns of the lower molars have four or five cusps. The third and fourth premolars (or the first and second as we count them, though the real first and second disappeared from the Old World Primates very long ago) became early on 'bicuspid' (and our dentists call these teeth 'bicuspids'), that is to say, a second cusp or point developed and the teeth became more complicated in pattern. Of these two cusps the larger is the external and the smaller the internal. These generally have only one root, though in *Homo sapiens* the first upper premolar may have two roots.

In modern apes, generally speaking, the second and third premolars have more pointed cusps than in *Homo sapiens* while the first premolar is a tooth altogether different in men and apes. In all apes—both extant and fossil—this premolar is a strong pointed tooth with the main point of the crown formed by a large, conical cusp. Further-

more, it is bent backwards and acts so as to work effectively against the powerful upper canine that comes to rest between the premolar and the lower canine.

MAN OR APE?

We might say, or we might have said until recently, that we can recognize at a glance whether any given jaw belongs to an ape or to a man, or rather to a creature hitherto classed as an anthropoid or a hominid. However, when we look closely into the question we find that we are up against a fundamental problem: the problem of what we may call 'frontiers'. Or in other words, 'where do we draw the line?'

If we take the lower jaw, the mandible, of any ape recognized as such until recently (living or extinct), and place it flat upon a table the jaw presents a U-shaped ground-plan, indeed, one that is almost oblong if account be taken of the projecting canine teeth. If we place the mandible of a hominid before us in a similar way we see that in plan it splays out from front to back so that the distance between the eye-teeth is much less than the distance between the wisdom-teeth. In other words, the two horizontal rami of an ape's mandible are more or less parallel whereas in a hominid they are divergent (see plate 1b).

But in defining this essential difference we are, really, defining something by itself . . . 'an ape is a creature with a jaw we agree to recognize as that of an ape' . . . stated thus, our definition does not look so good, but it is of the kind that we get more often than we realize—or care to admit.

Now the plan of the dental arch in *Gigantopithecus* is considerably wider between the last molars than between the eye-teeth or canines. Thus the *Gigantopithecus* jaw differs strikingly from the jaws of all other known apes and resembles that of the hominids, though the dental arcade of the *Gigantopithecus* is not quite so parabolic as those of the recognized hominids.

Furthermore, in *Gigantopithecus* the canine teeth do not (as they do in all other apes) project much above the level of the other teeth, nor do these canines have the conical form we consider characteristic of apes' teeth.[1]

[1] Although we are inclined to think that the shape and form of teeth indicate the sort of food eaten by the owner of them, this view is really not justified. As we have seen, all apes are vegetarians, despite their fang-like eye-teeth, while the hominids have insignificant canines though they must have been flesh-eaters for very long and, indeed, raw-flesh eaters.

Again, while in the apes, the canines nearly always have markedly curved roots, those of *Gigantopithecus* are as straight as in the hominids. Nevertheless, the *Gigantopithecus* canines are fairly large (compared with the other teeth) and do project a little above the level of the premolars, thus lending the dental arcade a slightly more 'squared' appearance than is to be seen in the hominids. Still, these eye-teeth are in shape more like incisors than the formidable canines of the apes, extinct and living.

Again, the first premolar in the lower jaw of *Gigantopithecus* is not 'sectorial' (i.e. consisting of one pointed tip) as in all other apes, and it is set upright and not slanting as in the apes with whom this tooth (as we have noted), allows for the accommodation of the tip of the canine in the upper jaw.

The crown-patterns of the *Gigantopithecus* teeth are surprisingly like those of the hominids, though the molars increase in size from front to back so that the third molar is the largest. As we have seen, in *Homo sapiens* the increase in size is from back to front. Furthermore, in *Gigantopithecus* the first premolar is large in relation to the other teeth and to those of the hominids; it is more like that in the living apes than that of the Java form of *Meganthropus* (see page 120) which we must class as a hominid. Even the dentition of the australopithecine *Paranthropus* (see page 70) is, generally speaking, more hominid than that of *Gigantopithecus.*

We cannot tell from the material we have whether the *Gigantopithecus* had a *diastema* or 'gap' in the upper jaw (see page 119), which used to be considered a characteristic of the anthropoids, although there is a gap in the maxillary fragment of *Pithecanthropus modjokertensis* (see page 119) which is certainly a hominid form.

What, then, we may say, induces us to class *Gigantopithecus* as an ape when most of the features of his jaws and teeth can be matched in forms that are recognized as hominid? Well, it is mainly the existence of the 'simian shelf', that is to say, a bony slope below the incisors within the mouth. This is held to be a specifically anthropoid feature, though the 'shelf' is much more marked in living apes than in some fossil forms (e.g. those of Kenya, see page 48). The *Gigantopithecus* simian shelf, maybe, is less pronounced than in some of the existing apes, but the 'shelf' is there without any doubt. We may note that such a 'slope' or 'shelf' is *not* found in the South African Australopithecines (see page 64) for long regarded as aberrant apes but now, generally

admitted to be hominids, especially since proof is forthcoming (see page 86) of their having fashioned stone tools.

A good deal has been written about the possibility of deducing from a fossil jaw whether its owner could or could not 'speak'. But it may be questioned whether there is anything in a fossil ape's jaw (including the 'simian shelf') which would preclude its uttering articulate sounds. After all, a parrot's beak, if we had it as a fossil and knew nothing about talking birds, would hardly suggest the uttering of articulate sounds, although, of course, a parrot does not 'talk': it imitates sounds. Furthermore, it may be questioned whether there is anything either lacking or present in an ape's lips, larynx and tongue which prevents him from uttering articulate sounds. In any case, as we have not the 'soft parts' of any fossil ape—including *Gigantopithecus*—we cannot say whether these were or were not comparable with those of the existing apes.

There is, also, in the *Gigantopithecus* jaw, no trace of the *spina mentalis* or *tuberculum geniale*, a bony protuberance to which some tongue-muscles are attached, but in some cases even of *Homo sapiens* skulls the *spina* was cartilaginous and has not been preserved. The *spina* however is present in the Mauer jaw, in *Pithecanthropus pekinensis* and also in *Meganthropus palaeojavanicus*.

The hindrance to speech lies above all in the brain. Although it is hazardous to read too much into the 'imprints' on the inside of skulls (see page 78) still, the 'speech centres' of the brain are perhaps indicated in some early hominid forms. After all, speaking is an act of conceptual creation, although it is sometimes difficult for us to realize this.

CLASSIFICATION

In order to study and interpret any mass of material we must try to classify it. However, the classification of creatures now living and those of which we have only the fossils, must be, to a great extent, a matter of convenience and convention, that is to say, we must not expect nature to fit nicely into our man-made classifications.

We all spend a good deal of our time classifying—ourselves (maybe with a good deal of indulgence) and others (maybe with less indulgence). Of course, much of our classifying of ourselves and our fellows is based on cultural considerations and these do not concern us here. Still, some of our classification is provoked, and sustained, by apparent

physical differences between one man and another. But many of the features which induce us to classify living beings are lacking when we come to classify men long since dead and extinct. We know nothing of the skin-colour, of the details of flesh-contours, of the type of hair, for instance, of the Pithecanthropoids, and doubtless we never shall know anything. There is no colour-bar in fossils.

The taxonomy, or classification, of living creatures dates, in its essentials, back to times when little or nothing was suspected of what we call Evolution. Linnaeus, the father of zoological classification, thought, as did most, if not all, of his contemporaries, that 'species' and 'classes' were fixed and had been 'created' as such.

. . . . . .

Animals of the Class *Mammalia*, to which we belong, are now classified as follows:—

(a) Class	*Mammalia*
(b) Order	*Primates*[1]
(c) Sub-Order	*Anthropoidea*
(d) Sub-Division (or Super-Family, divided into	*Hominoidea*
	(a) *Pongidae*, that is fossil and living apes
	(b) *Hominidae*, that is fossil and living men

Further, we have (for our own line) Genus: *Homo*, and Species: *Homo sapiens* and all animals are referred to in like manner by a generic name followed by a specific one.[2]

It is clear that when we are dealing with living specimens there can be no confusion between apes and men. Moreover, as there is now but one species of Man in existence, we lump together in the 'human' class all kinds of human beings who, to tell the truth, do look as though they fell into a number of groups which, in the case of other animals, we should call 'species'.

[1] The Order of *Primates* includes also the Sub-Order of the *Prosimii* (with three Infra-Orders) and the Sub-Order of the New and Old World monkeys.

[2] This classification is, of course, not that of Linnaeus, it is the most recent product of the taxonomists (among the most eminent of whom is the American G. G. Simpson) but the leading indicatory words are a legacy from Linnaeus and the earlier taxonomists.

SPECIES

The word 'species' is a most useful one for no satisfactory definition of it can be given. Darwin long since wrote, in effect, that a 'species' is what any competent taxonomist considers it to be. Tate Regan put it rather more long windedly, a species is 'a community, or a number of related communities, whose distinctive morphological characters are, in the opinion of a competent systematist, sufficiently definite to entitle it or them to a specific name.'[1]

In other words, there is no satisfactory definition. It is true that a 'species' might be defined (but it is not) as 'a group of animals whose members cannot interbreed with the members of any other group'. Some would further limit this definition by inserting between 'cannot' and 'interbreed' the words 'in the wild state', but if the members of two such groups can interbreed in captivity, obviously they *can* also in the wild state. If we put 'will' for 'can' then we are assuming a knowledge we have not got, that is to say, how animals may behave in all circumstances. Other taxonomists have suggested that animals could be considered to belong to the same species only if their offspring is itself fertile.

But we cannot say what 'species' did or did not, or could or could not, interbreed, say, in Pliocene times. Furthermore, we do not know much about interbreeding in the wild at the present day. Lions and tigers do interbreed in captivity. No case of a feral lion-tiger hybrid has been reported, though it may be objected that nowhere, except possibly in north-western India, do lions and tigers live in the same district. Still, lions and tigers seem to be no more distant relatives than dogs and jackals, and these appear to interbreed in the wild, anyway in North America (i.e. dogs and coyotes). Dog-wolf hybrids are easily procured and are fully fertile, but dog-vixen hybrids have not been reported. Horses and asses are interfertile (though their offspring are not), horses and zebras are, however, apparently not interfertile at all.

Again, where can we draw the line of discontinuity? Where is the dividing line between sheep and goats (literally as well as metaphorically)? The Tuareg sheep-goats of the arid, jagged Hoggar mountains in the central Sahara may be either sheep or goats, according as we may feel inclined to stress one feature at the expense of another. Anyway, these beasts have hairy, not woolly, coats. Where is the dividing line between horses and asses? between dogs and jackals?

[1] Those readers who find this discussion of 'Species' rather destructive might consult 'The Species Concept in Paleontology' (Systematic Association: 1956).

The further we go back in time, when we come to deal with fossil material, the more blurred become the dividing lines even between the Classes. None of us today could mistake a bird for a reptile, but the famed *Archaeopteryx* (a creature of the Jurassic Period, say, 150,000,000 years ago), although it could fly and had feathers, was, in many respects, rather a flying reptile than a bird and we will never know whether it was warm-blooded or not. If, then, there is a point where even Classes become confused, how much more may this be so in the case of Orders, Sub-Orders and Sub-Divisions?

With existing forms it is often puzzling to decide what are the variations that separate 'species' from 'species' (mainly because the term 'species' is so vague), what represents 'normal' variability within a 'species' (i.e. variations due to age or to sex) and what represents 'abnormal' variability (i.e. that associated with pathological states, etc.).

If this be true of living animals we may imagine how much greater are the difficulties when we are confronted with fossil material, always scanty, often imperfect. In determining features which are 'specific' we may rely upon characters which would be almost if not quite imperceptible in a living animal. Probably the 'cave-lion' that lived in European caverns twenty or thirty thousand years ago did have a mane (for in some engravings of the beast, as at Lascaux, there appears to be a mane figured)[1] but, of course, nothing is apparent from a cave-lion's bones to show us whether he had a mane or not (and some sorts of living male lions have no mane), or whether he had a thick coat or a short-haired one. Moreover, a lion without a mane and with rufous fur and black stripes would look very like a tiger indeed. A tiger with a mane and a tawny skin would seem for all the world like a lion. We should not heed very much someone who told us that lions and tigers can be distinguished by the conformation of their nasal bones.

So, the existence of a 'canine fossa' (a groove in the bone of the skull under the eyes) is stated to be characteristic of *Homo sapiens* (though some 'modern' men do not have the fossa at all, or at least have it very slightly marked), while the Neanderthaloids were lacking in this sign of 'superior humanity' (though some neanderthaloid skulls, or let us say skulls which on other grounds we would class as neanderthaloid, do show a canine fossa). But who would poke about on a man's face in an endeavour to find a canine fossa (quite a difficult feat on a living subject) and thus discover whether he was *Homo sapiens* or not?

[1] Though A. Laming in 'Lascaux' (1959) states that no mane can be recognized in the engravings of felines at this site.

RACE

'Race' is a term of everyday speech, while 'species' is more or less a specialist's concept. Scientific vocabulary is of modern invention, and those disciplines which owe little to prejudice and pre-scientific and deductive reasoning have for the most part escaped the imprecision of terms which clogs our minds when we discuss human beings. We are all liable to feel deeply and violently about those things we can define the least well. It is the vague and imprecise which really move us. Moreover, we are inclined, if pressed, to agree that any given term must (*a*) mean something definite and (*b*) describe something having a 'real' existence. Of course neither of these propositions is necessarily true.

The fact is that the word 'race' should be left to 'racists' and not used in speaking or writing about anthropological matters. There is only one race of men, the human race.

MAN CROSS-BRED

Every sort and kind of *Homo sapiens* now on this earth can breed freely with every other sort and kind. In fact, Man is cross-bred and has been so for a long time.

Since, from time to time, there appears in the Press some yarn or other about offspring between apes and women, it may be worth while stressing that although apes and men are distantly related there is no possibility at all of securing offspring between men and apes. There is 'chromosomal disaffinity', that is, the chromosomes just will not link up.

MEN AND APES

An ape's skeleton differs only quantitively from our own. Our skeleton contains exactly the same number of bones as those of a gorilla or chimpanzee. The differences between the structure of the ape and hominid hand are ones of degree only. The chemical composition of the blood in apes and men is the same. Both families suffer from the same microbial maladies. The 'mammary ridge' occurs in Man as in other mammalian embryos.

The main differences between the bodies of *Homo sapiens* and of the existing apes are: (*a*) the plan of the dentition and the shape and crown-pattern of the teeth; (*b*) the habitual upright position of *Homo sapiens*; (*c*) his brain, which is considerably larger than that of any ape.

But no structure of an ape's brain is lacking in Man and the *sapiens* brain has no formation, in any part, not to be found in the brain of a gorilla or a chimpanzee.[1] Man's brain, before birth, is very comparable with that of a gorilla, but a young gorilla's sutures close up early on and its brain develops little compared with ours. The hominid brain grows steadily through our prolonged, helpless childhood. However, it looks as though there was an overlap in brain-size between the early *Hominidae* and the contemporary *Pongidae*. But it is not brain size alone, or even indeed brain quality that establishes the real difference between early men and apes.

Although apes can, on occasion, stand on their hind legs, their anatomy is predominately that of quadrupeds. Their pelvic region, their spinal column and their forward-projecting heads all indicate that their normal position is on 'all fours'. If we watch a gorilla, for instance, we shall see that he walks about very much in the same way as a baboon, though the ape's arms are longer, so that when he is on all fours his body slopes down from the shoulders to the buttocks, so elongated are his arms.

Our 'all fours' is 'hands and knees'; no one but an acrobat can walk on his hands and feet, but could we do this our bodies would slope up very sharply from our shoulders to our buttocks, in fact the whole proportion of our limbs is different from that of an ape. 'Buttocks, not brains', it has been well said, are what distinguish us from gorillas or chimpanzees. It was man's upright posture and not his 'high intelligence' which first gave him his great advantage over the ape.

The hominid adaptation to the upright position is a very ancient one, and maybe it was an adaptation achieved in a comparatively short space of time. The Australopithecines (see page 66) a million years ago, and maybe more, walked as upright as we do, though their heads and faces were pretty ape-like. Already in these South African hominids the spinal column is different from that of the apes. The pelvis is not the same, while a forward position of the *foramen magnum* (the 'hole' into the skull from the spinal column) allowed the head to be balanced on the top of the spine.

Homo sapiens and the existing apes are creatures which, in the course of time, have diverged more and more from their common, but very remote, ancestors.

The apes, in their lengthened arms and shortened legs, show a

[1] An excellent exposition of the whole question is given in 'Man as an Animal' by W. C. Osman Hill (Hutchinson, London, 1957).

fitness for an arboreal life (all existing apes are more or less tree-dwellers, though it seems that old male gorillas are often too bulky and heavy to do much tree-climbing); in fact the anthropoids are specialized. Moreover, their snouts and large canines look like evidence of specialization. Perhaps the formation, or the enlargement of the 'simian shelf', was related to the increase in the size of eye-teeth and the development of very massive jaws, since some fossil ape-forms (e.g. those of Kenya, see page 48) do not display these features as markedly as do the existing anthropoids.

The marked ridges and crests on some existing apes' skulls (to which powerful muscles are attached) as well as the displacement upwards of the inion (a protuberance at the back of the skull), and the great increase in the nape area of the occiput are all features not so marked, it would seem, in fossil apes as in existing ones, though the fossil ape material is so scanty that it is imprudent to be too certain of this.

The long arms of the apes are fitted for an arboreal and as it is called a 'brachiating' life, but it may be as well to add that we cannot say that the arms are 'adapted' for such an existence. We still often read a good deal of rather sloppy writing about 'protective coloration', 'adaptation' to environment and so forth, together with the expressed or implied suggestion that animals in some mysterious way become 'adapted' to surroundings. That is to say (though the matter is not often so frankly stated) that there is inheritance of acquired characters. The older naturalists and even some distinguished 'evolutionists' believed firmly in such an inheritance, which idea, furthermore, fitted in nicely with a good deal of prejudice—social, theological and pseudo-scientific.

There is, it need hardly be said, no evidence for such an inheritance and it is, indeed, not easy to conceive how such an inheritance of acquired characters could take place. But there is still a good deal of sturdy prejudice which would have it that acquired characters can be inherited, yet if one ventures to suggest that Jews have been circumcized for thousands of years but still little Jewish boys are born with foreskins, one is met with some such indefinite remark as that 'the time hasn't been long enough'. The fact is that Siberian tigers have not long coats because they live in Siberia, but that they live in Siberia because they have long coats.

New characters appear by mutations (most of them useless or harmful), and some of these mutations (which are hereditary) are

'useful' in the sense that they enable the animal with the mutation to live in new conditions. Apes do not have long arms because they live in trees, they live in trees because they have long arms.

WHAT IS A MAN?

This sounds a silly question, but is it?

Let us see. We class the *Gigantopithecus* of southern China as an ape. He was the contemporary, it seems, of the Java and north China *Pithecanthropi*, of some other sort of man, an 'ape-man' (maybe comparable with the South African *Telanthropus* or Australopithecines) whose teeth have been found also in southern China. There were, therefore, hominids at large in the world when the giant ape was climbing the hill up to its lair in Kwangsi. We class the *Gigantopithecus* as an ape because its jaws show features we have not as yet found in any subjects we choose to class as hominid. That is the matter in a nutshell.

What, then, are the determining characteristics, what are the absolute criteria of a hominid?

We shall see, when we come to consider the exciting story of the South African 'ape-men' (see page 66), that these creatures walked as upright as we do. In fact an animal can either walk on two legs or it cannot, for apes do not 'walk', they shuffle along, helped by their arms, though some apes can stand upright for a short time, especially if they have something to lean against. (Gibbons can walk for some distance, balanced by their exceeding long arms.) Maybe, then, we should say that a hominid is a Primate that can and habitually does walk as we do.

What should we say, however, were we to discover the long bones and the pelvis of *Gigantopithecus* and find that he walked upright? Should we have to class him as a hominid? as a sort of Man?

Well, hardly. But why not?

What, after years of discussion, clinched the matter of the Australopithecines' status and caused them to be placed in the hominid group was not the finding of bones that showed these nimble little fellows could walk and run on two legs, but the proof that they made and used chipped stone implements.

It may be argued, indeed, that any mammal that walks is at a grave disadvantage if he cannot eke out his own strength and agility with tools and weapons, for he cannot run as fast as his four-footed enemies.

But 'tools and weapons' does not necessarily mean chipped stone implements. Tree-branches as cudgels, bones, horns and antlers are all 'tools and weapons' and were undoubtedly used for long ages by hominids—in fact they still are so used.

Supposing our *Gigantopithecus* walked upright and laid about him with improvised weapons, could we say he was not a hominid, because we had no proof that he could—or would—engage in stone-knapping? We might even find in a *Gigantopithecus* lair some bones or horns which might have been used as weapons. It must be admitted that in the (unlikely) case of our ever getting proof of a weapon-wielding, upright *Gigantopithecus*, we should be rather disconcerted and should fall back on the objection that to be a 'hominid' a Primate must not only walk upright but must also chip stones . . . and this would be rather like begging the question.

And if ever a creature with what we are pleased to call an anthropoid (or 'semi-anthropoid') lower jaw as *Gigantopithecus* had, is convicted of having manufactured a chipped stone, then we should side-step again and add, 'Ah, but, in addition to the upright position and the ability to make tools, a hominid must be able to talk, must be possessed of articulate speech.'

But what proof have we that, for instance, the Australopithecines, who made and used chipped stone artefacts, were talkers? Not much proof, or none at all, except indirect and of the nature of guesswork. Because the Australopithecines were knappers they must have been able to speak so as to tell one another about what they were doing. Plausible, of course, but not decisive. Still, the whole mental effort and concentration of thought—and forethought—demanded for the fabrication of artefacts are such that it is hard to imagine any such fabricators who could not communicate with each other in words. Speech concepts mean transmission of culture and natural selection must rapidly have encouraged types which could transmit culture.

Were we able to read from endocrine casts whether the possessor of the skull had been able to speak during his lifetime, we should be on firmer ground. But we cannot read the 'bumps' thus. If we were able to state confidently that such and such a physical conformation of jaws quite precluded articulate speech we should again be on firmer ground. Undoubtedly the uttering of what we call 'speech-sounds' and the use of what we call 'language' do depend upon the development of certain areas of the brain. And we have no brain (and never shall have) of any fossil Primate.

What is a Man?

Well, he is a Primate that walks as we do, can use his hands to fashion objects, has jaws more like ours than like an ape's—and that is about all we can say. We are always at liberty to add 'and is possessed of articulate speech (or can learn to talk after a certain age)' . . . especially as this latter proviso most conveniently allows of our disqualifying any claimant to the rank of 'Man' other than *Homo sapiens* . . . in fact, our proviso is nonsense.

It was one of Benjamin Franklin's wise and pithy sayings that Man is a 'tool-making animal', and the definition is as true today as when he coined the phrase.

DATING

Maybe the first question we want to ask about any relic of the past is 'What's it worth?' a reasonable enough enquiry even if the reply we have to give is not one of £ s. d. or dollars and cents but one in terms of knowledge, understanding and general enlightenment. In any case, a second question is almost certain to be 'How old is it?' For unless we can shuffle our material about and sort it out chronologically what we have is a collection of curios.

Anthropological research has long been bedevilled by dating difficulties, and it is only within quite recent years that we have begun to get some fairly reliable dating. First of all, however, we should agree upon what we mean by 'dating'. For remote geological periods—which interest the geologist first and foremost—and then the palaeontologist —approximate dating is good enough. In fact, geologists may well take a million years (or more) as their unit. And, as a passing thought to sober us, we may bear in mind that what we mean when we attempt to describe phenomena occurring before there were men on the earth to witness them, is this: 'Things would have seemed as we present them, had there been men, with the same perceptions as ourselves, to witness such events.'

The methods used to measure the real age of rocks depend upon the ponderable relationship between a radioactive element and one of the products of its disintegration. Radium, indeed, disintegrates into lead at a rate which can be determined. This rate is constant so that the radioactive process gives us a 'clock' which can neither gain time nor lose it. Thus, rocks containing uranium minerals allow of an absolute determination of age by an estimate of their content of radiogenic lead

or of helium. The lead methods (uranium, thorium) were the first to be devised and are applicable to less ancient rocks than those amenable to the strontium method. The isotopic ratio (i.e. by strontium) as applied to sulphates and carbonates serves to indicate the age of marine sediments from the Cambrian onwards and may be accurate to within a million years.

Uraniferous rocks are known only for certain points in the time-scale, but the duration of the main periods has been evaluated by plotting the dates of the uraniferous rocks as abscissae, and the maximum world thickness of the strata of each period, as ordinates, and then drawing a curve through the control points.

However, such methods as these (which we mention simply to show how the dates for remote geological ages are arrived at) are not nearly accurate enough for us when we come to consider the story of Man, for the limit of age-estimates based on uranium-lead or helium computations lies some million years behind us, that is to say at a point in time when our hominid ancestors were just getting into their stride.

We have the radiocarbon method which is valid for organic substances of less than 70,000 years of age; we have the new and promising potassium-argon method (see page 40) which looks as though it might help us to fill in the gap between 70,000 years ago and 1,000,000 years ago. And then we have the fluorine method for determining, not the absolute, but the relative age of fossil bones (see page 106).

Although for periods up to about 70,000 years ago all methods rank after the radiocarbon datings (see page 197), we should not forget the excellent work done by pioneers in other methods which still have their value. It is not so very long ago since Douglass invented 'dendrochronology', that is dating by means of tree-rings which established a reliable calendar in North America for the past 1,500 years, so that an exact date can be given to any structure whose materials include wooden beams. De Geer's varve-analysis based on the counting of the annual deposits (varves) of silt in glacial lakes, provides an absolute chronology for the last 15,000 years, with a (largely conventional) date of about 8000 B.C. (actually 7912!) for the end of the last phase of the Würmian glaciation, that is to say for a date at which the Scandinavian glaciers had reached their present extension, though, of course, we have no proof that we are now in an Interglacial after the Würmian. The phase through which men have lived for the last 10,000 years or so may well be but an interstadial, or warm interlude, in a Glacial Epoch.

Towards the end of the prolonged calm of the Secondary Era—the 'Age of Reptiles'—there began a phenomenon which was to develop greatly in Tertiary times. Angiosperms, or flowering plants, made their appearance. They spread rapidly and altered the face of our globe since flowers provided energy to sustain the high consumption of oxygen demanded by the more active brains of warm-blooded creatures—that is mammals and birds.

In contrast to the Secondary Era, the Tertiary swept up into earth-movements which culminated in the profound changes during the Miocene Period by the end of which the world had assumed, to a great extent, the face it still presents, though disruptive incidents towards the end of the Tertiary modified many regions. 'Modern' trees and flowering plants spread all over the world and also a new liveliness was lent to the landscape by birds, butterflies and all kinds of winged insects. Moreover, the earth-convulsions, the epeirogenic, the continent-making upheavals of the Miocene, provided a changing background for mutations and the evolution of mammalian forms. And this period of intense mammalian evolution especially affected the Primates.

During the Miocene, indeed, the land-surface of the globe was scored by immense mountain-ridges which form the spine of Eurasia from Morocco (geologically a part of Europe) to Malaya and which occupied the place of the ancient 'Tethys' or super-Mediterranean, which cut through an earlier world from west to east. It was in the Miocene, too, that the backbone of the Americas, from the Aleutians to Cape Horn, was raised. On the Eurasian continent the mountain-barrier separated the northern plains from regions lying north of the tropical forest-belt. Modern weather and modern climates were established in which the evolution of animal forms went forward.

Generally speaking, we can say that (compared with present-day conditions in any given zone of western Europe) the climate of the Lower Eocene was temperate while that of the Mid and Upper Eocene was hot. The Oligocene climate was again temperate, but, during the rest of the Tertiary, the climate showed a number of oscillations with a tendency towards cooler conditions, until, at the end of the Pliocene, there was a transition into the Villafranchian marked by a further cooling of climate and (especially in Europe) by minor advances of ice in the mountainous regions—the precursors of the great Glaciations of the Mid and Late Pleistocene.

ICE AGES

These Glaciations are particularly marked in western Europe and in North America. There is, however, no reason to think that a succession of 'Ice Ages' was peculiar to the Pleistocene. There are traces of ice-caps and marine 'transgressions' in the Infra-Cambrian, maybe 500,000,000 years ago, whereas, at the other end of time, so to speak, during the Villafranchian or Lower Pleistocene, the 'Danubian' or 'Donau' glaciation was a prelude to the first 'classical' Ice Age, the Günz. It is, then, quite possible that a succession of glaciations has been a permanent feature in the history of the globe.

It was between 1902 and 1909 that the Germans Penck and Brückner published a Pleistocene chronology-scheme with four ice phases they named Günz, Mindel, Riss and Würm (from sites in the Alps chosen because the words follow on each other in alphabetical order), and advanced the idea that Man 'appeared' in the Mindel-Riss Interglacial and not, as had been held, during the Riss-Würm Interglacial—or warm epoch extending between two phases of glaciation. So, as late as a year or so before the First World War hominids were held by many responsible prehistorians and geologists to be but two or three hundred thousand years old, though it is fair to add that, in those days Pithecanthropoids were not generally held to be hominids at all and even Neanderthaloids were sometimes excluded from the hominid category. Now we know that by the Günz-Mindel Interglacial, if not earlier, men were spread over the Old World where climate and conditions were favourable.

However, the whole subject of Pleistocene glaciation looks a good deal more complicated than it did only a few years ago. When the evidence for European glaciation was first recognized, it was thought that there was one 'Ice Age' which lasted a very long time. Then came Penck and Brückner's classical view that there were four 'Ice Ages' or glaciations. Later on, it was seen that there were oscillations during these glaciations, that is to say periods when the climate was relatively mild and again periods when the cold became more intense. Today, some specialists would hold that there were only two glaciations, the Günz-Mindel and the Riss-Würm with a long Interglacial (the Mindel-Riss) dividing them. It does seem certain that the Mindel-Riss was the longest of the Interglacials, and, maybe, much the longest.

If the two glaciations view be held, then the Interglacial between Günz and Mindel would be only an 'Interstadial' (that is a warm phase

in a glaciation), and the Interglacial between Riss and Würm would also be an Interstadial.

Glacial maxima occurred in North America, and although differently named they appear to correspond to the European phases.

THE PHASES OF GLACIATION

The successive phases can be summarized as follows.

1. Heavy snowfall in mountains and polar regions piling up as ice. To produce these great snowfalls there must have been an increase, not a decrease, in solar heat received, for there must have been increase in evaporation from the seas.

2. A decrease in heat from sun caused by cloudy weather lowers maximum temperature of the earth. Sea-level sinks. A period of dry cold sets in, the glaciers retreat, deserts spread in the tropics, winds heap up sand blown from surface of the clay laid bare when the glaciers retreat.

3. Conditions improve, sea-level rises, rain falls in temperate zones, and we have an interglacial, damp in the temperate zones and dry in the tropics.

4. Streams which had deepened their beds as the sea-level sank fill them up again as it rises.

DISTRIBUTION OF GLACIATION

Though the recognized glaciated areas may not seem very extensive if we regard the whole surface of the globe, still, at times, in western Europe, the ice spread over vast areas—three-quarters of England were affected and the Rhone glacier reached as far as Lyons. There were ice-caps on the *massif central* of France, on the Pyrenees, the Guadarrama, the Sierra Nevada, and even the Serra da Estrella in Portugal, though there the ice-caps seem to have been small. Moreover the climate of the regions bounded by the ice, say France, was exceedingly harsh and rude and probably rather like that of the Siberian tundra today. In North America the line of the Ohio and Missouri rivers marks roughly the extreme southern extension of the ice.

It would seem that conditions favouring an Ice Age, that is to say an extensive glaciation comparable with that at the peak of the Riss or Würm, would occur if the average temperature of our present temperate zone were to fall by as little as 10 degrees or even less.

Although much of North America and of western Europe was more or less ice-bound during the Ice Ages there is no clear evidence for similar conditions in south-eastern Europe or indeed in most of Asia, although in Africa the ebb and flow of the great glaciers seems to be reflected in a succession of Pluvials and Arids.

But of course any number of local features contribute to create what are called 'microclimates'; London lies on the same meridian as Labrador and Kamchatka, Peking on the same as Naples. There is no sort of resemblance between the climates of these two pairs of areas. Mountains, sea-currents, winds and rains may make all the difference.

OUR OWN ICE AGE

One tenth of our earth's surface is covered with ice and this ice is a major source of cold air. If all the ice still stored as glaciers was to be melted, the sea-level would rise by more than 300 feet and a good many human problems would be solved since most of France, Britain, Russia and the United States would be drowned. In any case, the Arctic is warming up a little.

SEA-LEVELS

Since the beginning of the Mid Pleistocene, that is to say of the Günz glaciation, maybe 500,000 years ago, the level of the sea has continued to drop compared with that of the continents. However, since the onset of the Günz the outline and relief of the continents and of the ocean beds has remained more or less the same; furthermore, quite obviously there has been no diminution in the amount of water on the globe. It would seem then that the level of the land must have risen.

TIME SCALE

In 1948 the International Geological Congress voted a recommendation that the Villafranchian period[1] which had, up to that year, been considered as the final phase of the Tertiary Period, should be included in the Quaternary or Pleistocene. The Quaternary, then, is now much lengthened. The former Lower Pleistocene becomes the Mid Pleistocene.

The new classification is justified since it was during the Villafranchian that true elephants (*Elephas*), true oxen (*Bos*) and true horses

[1] So called from the type-deposits in northern Italy at Villafranca.

(*Equus*) appear whereas few, if any, typically Tertiary forms have survived unchanged until today. However, the phenomena which were looked upon as characteristic of the Pleistocene, that is to say the succession of the four glaciations or Ice Ages (Günz, Mindel, Riss, Würm, see page 37) must be considered as having covered less than half the length of the Pleistocene.

In these circumstances, it is important to bear in mind when we consult all books published before 1948 (and many issued since then) that what is in them termed 'Lower Pleistocene', is now known as 'Mid Pleistocene'.

The most plausible dating for the Pleistocene (though it is far from being wholly satisfactory) is that associated principally with the name of the Yugoslav scientist Milankovitch. He elaborated a curve showing the amount of solar heat received in each latitude during the last 600,000 years and by taking into account variations in the elliptical orbit of the earth round the sun, the position in space of the rotatory axis and variations in the reflection of the sun's rays.

The calculations are highly complicated, but they give about the following figures:

Beginning of the Würmian Glaciation	126,000 years ago
Duration of the Riss-Würm Interglacial from	190,000 to 126,000
Riss Glaciation from	240,000 to 190,000
Mindel-Riss Interglacial	440,000 to 240,000
Mindel Glaciation	480,000 to 440,000
Günz-Mindel Interglacial	550,000 to 480,000
Günz Glaciation	600,000 to 550,000

The last Interglacial (Riss-Würm) must have lasted a good deal longer than the lapse of time since the end of the last Glaciation. The Riss Glaciation had two phases and the Mindel-Riss Interglacial was by far the longest of any in the Pleistocene (say, 200,000 years). The Mindel Glaciation also comprised two 'peaks' or phases, as did the Günz Glaciation, the onset of which may be set at about 600,000 years ago. There are several pre-Günz 'stages' of glaciation, the last of which is called the 'Donau' or 'Danubian'. By the time of the Günz-Mindel Interglacial hominids seem to have been widely distributed over the earth.

Quite recently a method has been devised of dating Pleistocene events by means of a Potassium-Argon test as applied to volcanic formations (potassium–40 breaks down into argon–40), and a pre-

liminary report of this method[1] gives for the Mindel glaciation a mean date of about 450,000 years. This figure is greater than that generally assumed up to now and it agrees very well with the Milankovitch figures. Their possible accuracy cannot, then, be ignored.

TIME SCALE		
Holocene or Recent	from about 10,000 B.C. to the present	
Quaternary or Pleistocene say -2,000,000 to O	Upper Pleistocene	Würm Glaciation and later
	Middle Pleistocene	Riss, Mindel and Günz Glaciations
	Lower Pleistocene (formerly Villafranchian)	
Tertiary	Pliocene	− 15,000,000 to − 2,000,000
	Miocene	− 35,000,000 to − 15,000,000
	Oligocene	− 45,000,000 to − 35,000,000
	Eocene	− 60,000,000 to − 45,000,000
	Palaeocene	− 70,000,000 to − 60,000,000
Secondary	Cretaceous	− 140,000,000 to − 70,000,000
	Jurassic	− 175,000,000 to − 140,000,000
	Triassic	− 200,000,000 to − 175,000,000
Primary	Permian	− 220,000,000 to − 200,000,000
	Carboniferous	− 280,000,000 to − 220,000,000
	Devonian	− 320,000,000 to − 280,000,000
	Silurian	− 350,000,000 to − 320,000,000
	Ordovician	− 400,000,000 to − 350,000,000
	Cambrian	− 500,000,000 to − 400,000,000

[1] Evernden, J. F., Curtis, G. H., and Kistler, R. (of Berkeley University, California) 'Potassium Argon Dating of Pleistocene Volcanics' in *Quaternana*, volume IV 1957, Rome). Potassium-40 breaks down in two ways (1) into Calcium-40 and (2) into Argon-40.

These figures for the Primary, Secondary and Tertiary are, of course, very approximate only. We may, however, set the beginning of the Pleistocene (that is of the Villafranchian) at about two or possibly three million years ago.

Since there is good reason to think that 450,000 years ago the Mindel Glaciation reigned in Europe, the beginning of the Günz Glaciation must be set at about 600,000 years ago (see page 40).

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2

The Genealogy of the Apes

Multaque tum interiisse animantum saecla necessest
Nec potuere propagando procudere prolem[1]

ALTHOUGH the fossil ape material is relatively scanty, the general history of these Primates is fairly clear. However, while some twenty different fossil anthropoid forms are known, their bones are, mostly, in a fragmentary state and made up teeth and jaws, some long bones and foot bones.

In Palaeocene times—say, 70,000,000 years ago—there was a great proliferation of mammals and among these were the early Primates, the 'prosimians', which spread over a great part both of the Old World and the New and gave rise to many different lines. It is generally agreed that the first Primates were tree-dwelling, shrew-like creatures. Thus the *Anthropoidea* (as well as the monkeys) would be descended from forms which are today represented by the little tree-dwelling spectral tarsier.

In the latter part of the Eocene (60,000,000 to 40,000,000 years ago) and in the early Oligocene (40,000,000 to 30,000,000 years ago), the number of 'prosimian' types decreased. This reduction in numbers was due, no doubt, not only to increased competition from other sorts of animals, but also to the progressive lowering of the temperature and thus to the establishment of conditions rather unfavourable for Primates since they are essentially (ourselves included) semi-tropical animals.

The course of Primate evolution may have been in one line to the Old and New World monkeys and another line to the apes (or perhaps the New World monkeys developed *sur place* since, from Eocene to late Pliocene times South America was an island). The early cercopithecoid monkeys have teeth so different from those of the existing anthropoid apes, that the line of the monkeys may well have diverged from that of

[1] 'And many races of living things must have died out and been unable to beget and continue their breed.'

Lucretius, V, 855

the apes as early as the Oligocene (35,000,000 to 45,000,000 years ago).

There are forms from Burma (e.g. *Amphipithecus*) which may represent ancestral monkey forms. However, the earlier members of the ape line must have been a good deal more cercopithecoid than anthropoid. In other words, on the evidence as we have it, it is difficult to decide whether any Oligocene Primate is 'monkey' or 'ape'. In fact, we are confronted with the question, 'What is an Ape?' We are on the border-line where clear-cut definition is uneasy. Nevertheless, it is possible that the Oligocene fragmentary mandibles from Egypt (see page 45) are those of early apes.

By the Miocene a variety of ape-like animals had spread over Africa and Asia. There is a fairly abundant Miocene fossil material from Kenya and also a Pliocene material from north-west India (the Siwālik areas).

Most of the bones (generally in a fragmentary condition) of these ancient apes approximate to the comparable bones in the modern apes, but some of the fossil forms had smaller incisors, a narrower symphysial region of the lower jaw and no simian shelf (see page 24). There is also a considerable variation in the size of the eye-teeth (some of which are smaller than in the existing apes) and there are minor differences in the molars.[1] The few limb-bones which have survived of these fossil apes are less specialized on the whole, that is they indicate much less a 'brachiating' (see page 57), mode of life. But these fossil limb-bones rather resemble the long-bones of Old World monkeys—and not those of hominids.

EOCENE FOSSIL PRIMATES FROM BURMA

Amphipithecus mogaungensis (described by Colbert in 1937) from the Upper Eocene of Burma is represented by a fragmentary mandible which is obviously that of a Primate. It contains three premolars, although the first is very small and has a diminutive root. Practically all we can say about *Amphipithecus* is that it is a primitive sort of Primate,

[1] It seems probable that the common ancestor of all placental mammals had a set of forty-four teeth, six incisors, two canines, four premolars and three molars in each jaw. Early on, most primates lost one incisor on each side in both upper and lower jaws. Fairly early on, also, in primate evolution, the first two premolars diminished in size whereas the third and fourth became relatively speaking enlarged. Then the first premolar disappeared from all Primates and then the second premolar from the Old World monkeys, apes and hominids (the New World monkeys have retained six premolars in each jaw). What therefore we call the first and second premolars are, 'historically' speaking, the third and the fourth.

as is also *Pondaungia* (likewise from the Eocene of Burma) described by Pilgrim in 1927 and represented by a mandibular fragment with molars.

OLIGOCENE FOSSIL PRIMATES FROM EGYPT

Three fragments of small mandibles belonging apparently to three different types were recovered in 1920 from Oligocene deposits of the Fayūm in Egypt. The relics were found (in the same levels as the earliest known remains of *Elephas*) by one Markgraf, a professional musician who collected fossils for museums.

Of these three fragmentary jaws that of *Parapithecus* (other Primates such as *Apidium* and *Moeripithecus*, more or less contemporary with *Parapithecus*, are known only from teeth) may be considered to fall into the family of *Hominoidea* (that is, apes and men), since the cusp-pattern of the molars resembles that of the *Hylobatinae* (i.e. the gibbons). The dentition of *Parapithecus*, indeed, seems more evolved than that of *Amphipithecus* (see above) and that despite two premolars of simple construction and the small, short, spatulate canine tooth. However, the widely divergent horizontal rami and the shape and proportions of the ascending ramus suggest affinities with the tarsioids.

Propliopithecus (also from the Egyptian Oligocene) must have been a small animal, possibly not more than fifteen inches high, and may, perhaps, have been an early ape, though it might also have been a cercopithecoid monkey (see page 45), possibly of gibbon type. Moreover, if we suggest that in their dentition *Parapithecus* and *Propliopithecus* indicate a trend toward the *Hominoidea* that does not imply these Primates did not in limb-structure, in general bodily proportions and, maybe, in brains, resemble rather monkeys than apes.

However, it has been held that *Propliopithecus* looks like a link between *Parapithecus* on the one hand and the *Limnopithecus* group of undoubted apes on the other hand (see below). Indeed, the cusp-patterns of the lower molar teeth in *Parapithecus*, *Propliopithecus* and *Limnopithecus* are so similar that, taken alone, these patterns would suggest putting all three forms into the same genus.

THE KENYA APES

The mass of the African continent consists of a plateau surrounded by a comparatively narrow strip. Despite some changes of the shore-contours during the course of ages, the general aspect of Africa has not

changed much (but see below) since the Miocene epoch when the central and northern parts of the continent were subjected to a vertical uplift which formed the so-called 'Great Miocene Peneplain'. However, this movement, which affected about one-third of Africa, was completed without any very great folding of the crust. Africa is, indeed, a very ancient land-mass and most of it has not been under the sea since Secondary times.

However, the formation of the Great Rift Valley, some 3,000 feet deep, and the sinking of the Red Sea trough are comparatively recent phenomena. East Africa and Arabia were for long united and the former anyway was at one time a fruitful breeding-ground for apes, and it is not unlikely that important palaeontological evidence may be locked up in the Arabian wastes which were, for long ages in the past, well watered and full of animals.

Throughout the Pliocene tropical Africa was exceptionally dry, but during the Miocene conditions seem to have favoured Primate evolution.

Fragments of gibbon-like apes and of *Dryopithecus* (see page 53) have been recovered from northern Egyptian Miocene strata and Miocene anthropoid remains were found by Hopwood in 1926 at the Koru site (Kenya). It was in 1931 and 1932 that Leakey and his fellow-workers dug out more fossil ape material from what are apparently Lower Miocene deposits on Rusinga Island at the mouth of the Kavirondo Gulf in the north-west corner of Lake Victoria Nyanza. In 1932 also further material was discovered at Songhor and in 1935 still more fossil apes at both Rusinga and Songhor.

Among these fossils Hopwood recognized three different types of apes which he named *Proconsul* (after 'Consul', then a popular chimpanzee at the London Zoo), *Xenopithecus* and *Limnopithecus*. He regarded the first as being related to the chimpanzees and the last as of a stock ancestral to the gibbons. One of these creatures may have been about the size of the existing chimpanzees, one smaller, and another about as big as a gorilla.[1]

It is now generally held that there are three main types of Kenya fossil apes—*Limnopithecus*, *Proconsul* (evidently fairly common) and *Sivapithecus*. Of the latter only portions of three subjects are known, and they are so called because hardly distinguishable from the Siwālik, Indian genus of the same name (see page 51). Similar types are also known from Spain.

[1] The types are now often referred to as (1) *Proconsul major*, (2) *P. nyanzae* and *P. africanus*.

In 1942 Leakey recovered from supposed Lower Miocene beds on Rusinga a jaw of *Proconsul* and, about fifteen feet away, a jaw of *Xenopithecus*. On one side the *Proconsul* jaw had lost most of the ascending ramus but on the other side only the coronoid process was missing and the condyle was intact. This mandible is a good deal less like the jaw of the modern chimpanzees than would have been thought from the fragments found earlier. The chin-region is less oblique. There is no simian shelf, and the shape of the condyle is rather more hominid than pongid.

In October 1948 Mrs Leakey found a lower jaw, the face and a large part of the skull of a *Proconsul* together with a natural cast of the parietal and occipital regions. In some circles, and for a time, it was mooted that here we had an 'ancestral form of the hominids'. However, the interpretation of the Kenya fossil ape evidence leads to other conclusions.

We may admit that these Kenya apes—or rather *Proconsul* among them for it is only of this form that we have any portion of the calvaria —lack the very heavy supraorbital ridge of the living apes. It is true also that the teeth of the Kenya anthropoids are somewhat more 'generalized' than those of the chimpanzee, the gorilla or the orang-utan. But these are conditions we should rather expect in ancestral apes not so specialized and suited to a forest-dwelling existence as the extant apes.

It is a general rule that holds good for the evolution of most mammalian lines that highly specialized forms (i.e. those suited to life in one peculiar set of conditions) are derived from ones that are less specialized. We have from the evidence, such as it is, fairly good reason for thinking that the ancestors of the present-day apes were creatures not only less specialized and less suited for life among the trees (all living apes are more or less arboreal), but also less specialized in their teeth and dentition.[1]

We may say that the *Proconsul* skull (it was much crushed and as the parietal and occipital bones are missing no estimate of cranial capacity can be made) has no marked 'supraorbital torus' (or projecting and heavy brow-ridges characteristic of the present-day apes), and

[1] e.g. with rather smaller canines though those of the Rusinga jaw are pretty big. The great eye-teeth of the existing apes are not suitable for a carnivorous diet (since as we have seen all apes are vegetarians) but are at least as useful for cracking open nuts and hard-shelled tropical fruits as for tearing flesh. Of course these formidable canines can also be quite handy when it comes to fighting. The range of variation in the canines of the Miocene and Pliocene apes is considerable. In some specimens the canines are much less pointed and projecting than in modern apes.

that the angle of the orbital plane is less frontal and more lateral than in the living anthropoids. The shape of the nasal aperture is also different, resembling more closely that of the existing monkeys. There is no simian shelf—which would tend to show either that this feature is a later development or that some lines of apes had it and some did not, anyway it cannot be regarded as a specific character of all apes (see page 24).[1] It looks as though the Kenya Miocene apes are more like forms intermediate between monkey and ape than between ape and hominid.[2]

Judging from the long bones which have been recovered, the general dimensions of the limbs appear to be more like those of monkeys than of apes. Certainly these Kenya apes do not show that they led a 'brachiating' life, i.e. that they spent all their time in trees and in swinging about from branch to branch. They were nimble creatures, able to run on the ground as well.

There are several species of *Proconsul* but in all of them the teeth of the lower jaw resemble those of *Dryopithecus*. The maxillary teeth of *Proconsul* show more distinctive features: there is a marked internal cingulum very like that in the *Dryopithecus* upper jaws. But there is no approximation to any hominid condition.

Limnopithecus (from its dental morphology) can be referred to the *Hylobatinae* (that is the gibbons): two species of *Limnopithecus* are known and they seem to offer a *morphological* link joining *Parapithecus* and *Propliopithecus* (see page 45) to the modern gibbons, but we cannot, of course, say that this morphological sequence represents an actual evolutionary one. In any case, the *Limnopithecus* limb-bones indicate that it was not suited to an arboreal life like that led by the existing gibbons.

MAN'S 'TREE-DWELLING' ANCESTORS

The legend dies hard that the hominids are derived from tree-dwelling forms. In 1958 an eminent British physician was reported as having said in a speech that 'the close association between vision and control of

[1] The simian shelf is incipient in *Dryopithecus fontani* (see page 53). The development of this feature seems to have been associated with hypertrophy of the incisors and consequent widening of the symphysial region.

[2] To be a little more technical: *Proconsul africanus* has a good many cercopithecoid features, e.g. a very sharply defined and relatively deep subarcuate fossa which accommodates the petrosal lobe of the cerebellum. The 'cerebral relief' (to judge from the imprint in the rock-matrix) looks more like that of a monkey than an ape.

hands—so essential for the leaping from swaying tree-branch to swaying tree-branch—laid the groundwork for the physical dexterity of Man. When the ape-man finally descended to earth he retained and developed his new-found faculty.'

Now, there is no evidence, anatomical or palaeontological, that the direct ancestors of the hominids, or the hominids themselves, were ever tree-dwellers. Indeed, everything points to the fact that the 'adaptation' of the apes to tree-dwelling is a specialization. In any case, if our ancestors had 'lept from swaying tree-branch to swaying tree-branch' we should have arms as relatively long as those of gibbons or chimpanzees for we could not expect any regression back to 'short arms' from 'long arms'. Moreover for an animal that walks upright to have arms that reach almost to the ground as it walks would be a great disadvantage, if not an impossibility.

Of course the picture of our ancestors jumping about in trees and shying coconuts at each other is a pleasing one for the caricaturists (who are never at a loss to show 'early Man' wandering about with dinosaurs in the background!), but it is a picture even more fanciful and improbable than that of the shaggy, shambling Neanderthaloids with heads lolling on their chests (see page 155).

THE AGE OF THE KENYA APES

Rocks containing uranium minerals (see page 108) can be dated, on the absolute scale, by determining how much radiogenic lead or helium they contain. There are no such rocks near the Kenya lake-beds but basaltic lavas (correlated with Lower Miocene fossil-beds in Germany) have a radiogenic helium content indicating they are about thirty-two million years old.

The *Proconsul* remains are, no doubt, of the same age as the ancient lake-beds in which they were found. The other fossil mammal remains in these beds are all of extinct forms typical of the Miocene—Mastodon, small *Dinotherium*, proto-pig and 'primitive' carnivores—a comparison with like faunas elsewhere suggests that *Proconsul* lived in the fairly early Miocene, let us say roughly 25,000,000 years ago. The Kenya Miocene, indeed, on the evidence of the fauna, is of 'Burdigalian' age (that is the second oldest of the subdivisions of the Miocene) and so Lower Miocene, though this dating may not be true for all the Kenya fossil ape-sites.

On the evidence from Kenya, then, we may say that by the

Burdigalian age, the cercopithecoid monkeys were already differentiated from the *Hominoidea*. Furthermore, also from the fairly early Miocene, there existed a variety of apes ranging in size from that of a small gibbon to that of a large gorilla.

THE SIGNIFICANCE OF THE KENYA APES

Such Kenya forms as *Proconsul* or *Sivapithecus* lie on the line of anthropoid (i.e. ape) development. The projection of the face, the lengthening of the jaws, the parallelism of the dental series with predominance of the region of the incisors and the canines, all are features opposed to those of the hominids. Rather than the Miocene Kenya apes we may, perhaps, regard the Oligocene Egyptian *Parapithecus* and *Propliopithecus* as representing forms ancestral both to the anthropoids and the hominids. The Oligocene Primates have short jaws, a dental arch in a wide-open V and poorly developed canines.

It does not seem, indeed, that we can set the divergence of the hominid and pongid lines at much later than the Oligocene, since, in the early Miocene there existed in East Africa anthropoids almost as differentiated as are the extant species. Such specialization rules out the Kenya apes as representing types ancestral to the hominids.

THE SIWĀLIKS

From a distance the great arc of the Himalaya appears to rise abruptly from the alluvial plains of the Ganges and the Brahmaputra. But these recent mountains—recent in the geological sense since they were formed during the earth-shaking movements of the Miocene—have foothills high enough to gradate the transition from the flat lands to the chaos of summits called 'the Abode of Snow'.

In the north-west of the old United Provinces (a region of which the Dehra Valley or the *Dehra Dun* may be considered the centre) and in the south-west of the Punjab, lie the foothills known as the Siwāliks. They make up a range varying in height from two to three thousand feet, and they run from Hardwar on the Ganges banks to the line of the Beas River—a length of some two hundred miles. The hills are of sandstone or conglomerate and display low, rounded eminences very unlike the bold, jagged and majestic mountains against which they are set. The Siwāliks, however, belong to the same Miocene formations as the Himalaya itself and the hills doubtless owe their origin to the

solidification and then to the uplift of detritus brought down from the Himalayan chain.

The classical site of what are known as the Siwālik deposits is on the north-west of the range and faces the plains. These deposits have yielded a rich fossil fauna. The Siwālik region was, above all, certainly a favourite home of apes.

As long ago as 1834 a Scottish physician named Hugh Falconer (see page 97) recovered fossils from the Siwāliks while, in the years before 1914, the late G. E. Pilgrim devoted several seasons' work to a re-examination of the Siwālik sites. He brought back with him an extensive collection of fossils described by him in the 'Records of the Geological Survey of India' (volume XLV, 1915) under the title of 'New Siwālik Primates'.

In 1836 Falconer and Cautley unearthed the first fossil ape remains in the region (and suggested the part the uplift of the Himalaya might have played in the development of the Primates. From then until 1937 no less than eight genera and twenty-two species of apes had been described from the Siwāliks, and it is now generally recognized that both genera and species were too lavishly multiplied in the classification of these fossil Primates.

The Pliocene ape material from the Siwālik Hills is not only of later date than that from Kenya, but the former consists, almost entirely, of lower jaws and teeth. There are no skulls and, practically speaking, no portions of long bones.

The Siwālik fossil apes have been given a number of different rather fancy names (such as *Ramapithecus*, *Sugrivapithecus*, *Brahmapithecus*, *Sivapithecus*, etc.). But the most interesting feature of these anthropoids is that the *Dryopithecus* tooth-pattern is common among them. *Ramapithecus* especially has upper premolars and molars that look rather hominid as do the contour of the upper dental arcade, the small size of the canines, the lack of a diastema, the flat wear of the lower molars and the relatively slight degree of prognathism. But the 'hominid' features to be noted in this *Ramapithecus* (as also in *Sugrivapithecus*, *Sivapithecus*, etc.) may well be due to what is known as 'homoplastic convergence' such as is sometimes seen in organisms which are very distinct from one another, although derived from a common ancestry often very distant indeed.[1] The Siwālik *Sivapithecus*,

[1] The *Ramapithecus* remains come from the Tatrot and uppermost Chinji zones of the Siwāliks and (according to Colbert, 1935) are of late Lower Pliocene and Mid Pliocene dating.

we may note, is so like a form from Kenya and another from Spain that they have all three been classed in the same species.

CLIMATE AND EVOLUTION

The hypothesis that the evolution of apes and indeed their evolution towards hominid forms may have been encouraged by the uplift of the Himalaya was, at one time, rather extensively canvassed. One American scientist[1] held even that the evidence from the Siwāliks pointed to a migration of late Tertiary mammals from north-western India to south-eastern Asia. Pilgrim himself thought that a Siwālik primate he named *Sivapithecus* might have been ancestral to Man (this *Sivapithecus* seems to have existed also in a giant form).

However, such ideas now appear to be over-simplified. The uplift of the Himalaya and the peak-period of the Siwālik apes do not coincide in time, and the greatest abundance of ape-forms appears to date from long after the mid-Tertiary mountain-building movements.

Climate is, of course, one of the main causes we should invoke to explain changes in faunal forms, and the whole climate of the world (see page 36) was profoundly modified by the emergence in Miocene times of the earth's vast barrier that reaches from Morocco to Malaya. Climate, no doubt, played its part in the extinction of the Siwālik Primates. The palaeontological and geological evidence seems to indicate that there was, coinciding with the extinction of the Siwālik apes, a retreat of the tropical climate (from what is now a temperate zone), and we may suppose the Siwālik fauna needed those tropical conditions; these are not only those of heat (for at certain seasons of the year the Siwālik area is very hot), but those of more or less unvarying heat and of damp, and damp presupposes rich vegetation and the trees that apes must have. The tropics are not so very hot (the highest temperatures have been recorded in 'temperate' lands, e.g. Libya) but unchanging and humid. By the Mid Pleistocene, say in Mindel-Riss times, the climate of India may have reached more or less its present state.

As the Siwālik fossil apes are known only from their teeth and jaws, we cannot say whether the Indian anthropoids of the Tertiary were tree-dwellers or ground-apes, but it may well be that apes so relatively late in the time-scale (they may be 10,000,000 years or more younger than the Kenya fossil anthropoids) were already tree-dwellers. The

[1] Helmut de Terra in 'The Siwāliks of India and Early Man'.

dating of the Siwālik material is still no easy task, though it seems probable that these fossils are of Pliocene date although they may be fairly early Pliocene.

The earlier known European fossil apes are those from the Lower Pliocene of Greece (Pikermi near Athens). Gibbon-like *Pliopithecus* forms have also been found in Europe, and during the Mindel-Riss Interglacial there were apes all over Europe from Gibraltar to southern Germany with macaques (these of course monkeys) in Britain, France, Italy and Holland. Monkeys (as distinguished from apes) can, at least some of them, stand a fairly cold climate, e.g. that of Japan.

THE DRYOPITHECUS

Probably the most 'generalized' form of fossil ape among the Siwālik material is *Dryopithecus* which appears, moreover, to have been widely distributed throughout the Old World. *Dryopithecus* remains have been found in Spain, East Africa, France, Germany, Egypt and India. The *Dryopithecus* material consists almost entirely of teeth and portions of mandibles.

It was in 1856 that Edouard Lartet (see page 101) was given the mandible and humerus of a fossil ape which had been dug up near Saint-Gaudens.[1] Lartet described the remains and called the animal they had come from *Dryopithecus fontani* since the discoverer's name was Fontaine, and he had dug up the bones near some oak-trees (*drus* being the Greek for 'oak-tree').

Fontaine's find was another capital discovery in our western Europe where we have samples and specimens of nearly all our, let us say, collaterial ancestors. Not that *Dryopithecus* was our real ancestor, though at one time many people were prepared to accept him as such. So seriously, indeed, did some take the *Dryopithecus* 'ancestry' of Man that not long before the Second World War a patriotic German palaeontologist (Abel) would have it that the 'cradle of mankind' lay somewhere between Rhine and Danube since portions of a fossil dryopithecine form '*Paidopithecus rhenanus*' as it was named, were discovered in Pliocene formations of the Rhineland.

After the first discovery near Saint-Gaudens, *Dryopithecus* teeth were unearthed from the granular limonite of the Swabian Alps (Branco, 1898), though they were of another sort of *Dryopithecus.* These apes

[1] Saint-Gaudens is in the French department of the Haute-Garonne and not far from the foothills of the Pyrenees. The region is rich in prehistoric sites.

formed a group divided into several species, local varieties showing some variation in the arrangement of the molars' cusp-pattern. The various 'species' of *Dryopithecus* have been classified according to the local variations they show of the five-cusped arrangement. But it may be noted that all the Miocene and Pliocene apes have sharp, overlapping canines and more or less 'sectorial' first lower premolars very different from any hominid arrangement. The Swabian *Dryopithecus* molars indeed, look uncommonly like those of a hominid, and it was this feature of the tooth-structure that first attracted attention to the dryopithecine apes as a group.

The *Dryopithecus* pattern of the molars' crowns is like the five-cusped pattern common in hominids. The *Pithecanthropus pekinensis* as well as some of the Neanderthaloids (especially the Ehringsdorf immature subject) display cusp-patterns of the dryopithecine type. This five-cusped molar pattern also occurs in *Homo sapiens.*

There are, in fact, two main cusp-patterns which may be regarded as 'normal' in anthropoids and hominids. The first is the so-called *Dryopithecus.* The second is the 'plus' or 'cross' pattern, with the cusps evenly placed and the depression between them forming a cross. But these patterns are not mutually exclusive, that is one may find in a gorilla's jaw one molar with the *Dryopithecus* arrangement and another with the 'cruciate' arrangement.

THE OREOPITHECUS

Grosseto, the old capital of the ill-famed Maremma, stands on the level of the Ombrone's plain and had once so evil a reputation that the popular saying ran *Grosseto ingrossa* since those who tarried there grew bloated with malaria. Not far off lies Rosella on its hill, the ancient Etruscan city of Russelae. But the mosquitoes have now been controlled and the countryside is not so deserted as it was a hundred years ago when travellers described it as a wilderness of harsh, thorny *marruca*, or buckthorn, gay with bright yellow blooms. Still, this coastal plain is not one of the more attractive parts of Italy though, for a time, it offered that fuel-starved land,[1] the resources of its brown-coal or lignite deposits laid down millions of years ago when the area was one of dense forests. These Tuscan mines are no longer worth while exploiting. One by one they have closed down and now there remains only that worked by a miners' co-operative.

[1] Before the discovery of oil in Sicily.

As long ago as 1869 fragments of bones of a Primate were recovered from the lignite of the Grosseto region. The deposits are of what is known as 'Pontian' type and may be referred to the early Pliocene—say 10,000,000 years ago.

In 1872 Cocchi found a lower jaw (complete with teeth) of the same type as the fossils already discovered in the region. This mandible is now in the palaeontological collection of the Paris *Muséum d'Histoire naturelle* (in the Jardin des Plantes). The jaw was studied by Paul Gervais (1816–1879) who noted in it a combination of features, some suggesting those of the apes and others those of monkeys. He named the primate *Oreopithecus bamboli.* He chose the term 'Mountain Ape' because the remains had been found at *Monte* Bamboli. Fossils do get the oddest names tacked on to them but we have no more reason for thinking that *Oreopithecus* dwelt on mountain-tops than that *Dryopithecus* (see page 53) perched on oak-trees.

A good many years after Paul Gervais's description of this fossil jaw, Max Schlosser of Munich (see page 124) concluded that *Oreopithecus* was not an ape but a monkey, and his finding met with general acceptance. As the years went on, there turned up from time to time, in the Grosseto region, fossil bones or fragments of bones which could be attributed to *Oreopithecus.* In 1946 some geologists recovered still further material, and in 1948 Johannes Hürzeler (now Director of the Basle Natural History Museum) received, from a friend in Florence, a lower jaw of *Oreopithecus* also found near Grosseto. Hürzeler concluded, from a study of this specimen, that the Primate was rather an ape than a monkey.

The dating of these fossils presents some difficulty. They all occurred in sand or coal sediments which Hürzeler maintained were 'known to have been deposited in Upper Miocene times, that is from 15,000,000 to 10,000,000 years ago'. Furthermore he attributed to these 'Pontian' brown-coal seams the same age as 'the French Upper Miocene'. However, the Miocene dating of the Grosseto lignite deposits is by no means generally accepted, and the consensus of opinion is rather that of Strauss (1953) who dates the Tuscan 'Pontian' to the Lower Pliocene.

During the ten years following 1948 Hürzeler spent his holidays near Grosseto. He had no funds for excavation but he examined carefully the debris thrown up during mining operations. Thus he was able to collect a good deal more *Oreopithecus* material, so that by August 1958 there were known of this fossil Primate the mandible, the maxilla, some part of the malar bones, portions of the left collar-bone, of the

left humerus, of the left femur, of the sacrum, of the ulna, as well as some bones of the left hand, portions of the pelvis, a left patella and portions of the tibia and fibula—of course, of a number of different individuals. It was quite a remarkable collection and presented more material than that available for any other fossil ape.

Hürzeler claimed that the jaw he got from Florence displayed 'definite hominid features'—especially in the form of the canines and incisors. In March 1956 he read a communication before a meeting, called together by the Wenner-Gren Foundation for Anthropological Research in New York, when he cited as 'hominid features' a 'high' mental foramen, a rounded symphysial region of the lower jaw, the vertical position of the upper eye-teeth (see page 23), a 'short and vertical jaw', the anterior position of the malar bones as well as the fact that the second premolars are as large as (if not larger than) the first premolars and that the latter have only one cusp. He concluded that *Oreopithecus* must be classed among the ancestors of the hominids.

From this statement it would be fair to state that in 1956 Hürzeler thought that forms directly ancestral to hominids existed at the same time as the Kenya Miocene apes (e.g. *Proconsul*)—that is to say when the ape and hominid lines seen to have been distinct—if we accept Hürzeler's dating of the 'Pontian' lignite to the Miocene (though admittedly the Miocene lasted a long time, some 20,000,000 years maybe). Hürzeler was quoted as having said that hominid and pongid stocks had diverged from a common ancestry 'far earlier than had hitherto been believed'. We may accept this statement as applying to some opinions, but it is coming more and more to be thought that the divergence between the two lines of apes and men took place perhaps in the Oligocene (see page 62).

Before dawn on 2nd August 1958 two miners on a night-shift in the Bacinello mine struck the fossilized skeleton of a Primate. It was six hundred feet below the surface of the earth. On 4th August Hürzeler recovered the greater part of the skeleton about four feet long. A most remarkable point is that the skeleton was in anatomical connection, that is, the bones were more or less in their 'right' place. After a considerable delay caused by objections to the removal of the fossil from Italy, the *Oreopithecus* was taken to Basle for study.

Apart from any other considerations, the discovery of a nearly complete Primate skeleton of at least early Pliocene date is a most significant event. The skeleton is unique in the sense that we have nothing like a complete skeleton of any Primate of comparable age. So,

quite apart from any extravagant claims which may have been made in some quarters, the date of 1st August 1958 is a memorable one in palaeontological annals.

From a preliminary report is is clear that *Oreopithecus* was no ancestor of the hominids, though the *Oreopithecus* cranium has a relatively short face and is less prognathous than is that of the existing anthropoids. Moreover there is a jutting nasal spine (a very hominid feature), and the short canines and the pattern of the lower premolars also suggest hominid forms.

The pelvis is broader than in the existing apes but *Oreopithecus* was certainly not a monkey; the long bones (and their articulations) are of distinctly anthropoid-hominid type. The long arms fit for 'brachiating activities' (i.e. swinging about on tree branches), though comparable with those of the apes, do not necessarily indicate that *Oreopithecus* had not an independent ancestry, parallel to that of the apes. Such features as these long arms may be due to 'homoplastic convergence' (see page 48). However, the proportions of the limb-bones shows that *Oreopithecus* was a tree-dweller, or, let us say, he had the long arms that would have enabled him to swing about in the 'lignite' forests of Tuscany a good many million years ago.

Oreopithecus indeed must have been on a line of parallel development with the hominids (Hürzeler himself now declares that the Bacinello ape represents a 'blind alley' form), this Primate's long arms would alone be enough to rule it out as an ancestral form to Man.

EVOLUTION

'Scarcely a day passes without the appearance of new evidence confirming the truth of the theory of evolution up to the hilt, and it is now universally accepted except by those who are too ignorant or too obsessed by irrational considerations to follow scientific evidence wherever it may lead.'[1]

The announcement of Hürzeler's discovery at Bacinello was accompanied, in certain newspapers, by such sensational headlines as 'Darwinism contraverted'. It is always good copy to take a fling at Darwin, although few of the writers and the people they write for know much about what Darwin propounded and suggested.

It must be admitted that Hürzeler himself was reported as having

[1] Sir Gavin de Beer in his Hertz Lecture for the British Academy on a 'Master Mind'.

declared that 'an entirely man-like creature lived in central Italy in Miocene times'. It is difficult to believe that any responsible scientist could, on the evidence available, have made such a statement and Hürzeler was, no doubt, misquoted.

This book is no place to deal with the modalities of evolution. There is an abundant literature on the subject (see the bibliography on page 62), much of it of quite recent date, and it presents the case for evolution as it is understood today.

The metaphysical dogma explaining the nature and diversity of forms of living creatures and initiated by Aristotle was replaced fairly early on in our era by the 'Christian' hypothesis—that of static patterns in living beings which had been independently 'created'. This belief went unchallenged and unverified for centuries in Europe. The old Scale of Beings postulated by Cuvier and his disciples was broken by 'catastrophes' up into successive and separate 'creations'. There was also conceived the existence of a transcendental 'progressionist' plan which, in accordance with orthodox theology, dictated the sequences of creations. Combined with all this was a belief in the inheritance of acquired characters, a belief that was shared by nearly all 'naturalists' from Buffon to Darwin until the experiments of the geneticians rendered the belief untenable.

But between the non-evolutionists, such as Cuvier, and evolutionists, such as Lamarck and Buffon, there was a great gulf fixed, although the latter had no inkling of the natural principle of selection. The recognition of this principle was Darwin's capital contribution to human thought.

The earlier naturalists, indeed, did put forward evolutionary theories, and it may be worth while noting that Lamarck, to whom is generally attributed the misinterpreted phrase *influence du milieu*, did not coin it. But Geoffroy Saint-Hilaire did. What Lamarck wrote in his *Philosophie zoölogique* (1809) was:

'The influence of *circumstances* effectively, at all times and everywhere, acts upon bodies which enjoy life, but what renders for us this influence difficult to perceive is that its effects become apparent or recognizable (especially in animals) only after a long lapse of time.'

One of the favourite arguments of the anti-evolutionists is, still, that we cannot see around us 'any sign of evolution'. Well, no . . . admittedly the formation of morphologically cognate groups which, however, can be recognized as distinct, takes a very long time. No new

genus of European mammal has appeared since the Riss-Würm interglacial. That may seem a long time ago to us, say, 100,000 years, but it is a very short space if compared with the millions of years during which we can follow, for instance, the story of the horse's development. Moreover, evolution appears to occur rather jerkily with long periods of apparent quiescence interrupted by periods of comparatively rapid differentiation. . . . 'Its effects become apparent . . . only after a long lapse of time.'

Mutations (which are changes in the chemical molecules called 'genes') occur spontaneously (but are no doubt in part, at least, provoked by different types of radiations) and bear no sort of relation to the circumstances in which the organisms affected happen to live. That is to say mutations are not 'adaptive'. As acquired characters are not inherited the supply of what variation there is (owing to mutations) must be regarded as quite haphazard and indeterminate. Natural selection channels these random transmissible variations into directions which *are* 'adaptive'; that is to say, mutations which are useful tend to be selected. Thus an appearance of purposive change is given.

As Simpson has put it (1952) the modern theory of evolution is that natural selection is 'differential reproduction plus the complex interplay, in such reproduction, of heredity, of genetic variation and of all the other features which affect selection and determine its results'.

Individual members of any plant or animal group are not quite identical. They vary. The parents of a new generation are, mostly, those best adapted to the conditions in which they must live, thus variations suited to these conditions are preserved and accentuated.

We need not of course think that the function any organ now performs is necessarily that which natural selection originally favoured. We may regard our fingers as being especially useful for playing a typewriter! Luckily, as rather unspecialized animals, we are able to turn our hands to almost anything, so to speak.

'Anti-evolutionists' often advance that delicate adjustments, and what seem admirable adaptations in plants and animals, must be due to 'guidance', to some sort of Providence. If this be so, then the 'guidance' is, in the long run, deadly, for highly specialized adaptations inevitably lead to the extinction of those animals which display them, since organisms, adjusted and adapted in such a way as to enjoy one set of conditions, can never readapt themselves to different ones—of climate, surroundings, flora and so forth. It is lucky for us men that we are rather unspecialized animals.

The general pattern of life is this: new types arise, others die out' types full of vitality evolve. As Sir G. de Beer has put it, 'the natural selection of mutant and recombined genes is the mechanism whereby the evolution of plants and animals in Nature has been brought about'.

FAMILY BUSHES

Most family trees, as we know well enough, are highly fanciful and not very reliable. Those which have been fabricated for other animals than men and for far greater lengths of time than those covered by our pedigrees, are not much more reliable—as a rule. The whole question of lines of descent is still too often bedevilled by prejudice. What we know of evolution in general makes us think it is unlikely that we shall ever be able to pin-point the species or even the genus that will show us the beginning of an evolutionary phase, but we can observe those phases themselves, and also note how they link up and succeed one another.

Every fossil specimen we have of an animal form is but one out of many millions spread, maybe, over half the world, and showing individual variations as well as those due to sex and those variations more common in one geographical area than in another.

DIFFERENT RATES OF EVOLUTION

We may well ask what causes, or combination of causes, make for different rates of evolution in animal lines derived from common ancestors. The problem is a complicated one, but of this we can be certain: at any given period and for countless ages past there have been 'progressive' lines and 'conservative' ones.

Modern crocodiles are very like their ancestors of Jurassic times (say, 150,000,000 years ago or more). The coelacanth fish have gone on being coelacanth for longer than that. The Miocene Sumatran rhinoceros (about 25,000,000 years ago) much resembled the Sumatran rhinoceros of today. But the horse of the Miocene (e.g. *Protohippus*) was quite unlike any sort of horse which has lived on this earth for many ages past. Yet horse and rhinoceros belong to the same Sub-Order of Perissodactyla.

There used to appear in works on evolution a 'pedigree' of the genus *Hippus*. From this genealogical table (in which were present both Old

and New World forms) it might have been concluded that the lower Eocene mammal called *Hyrocotherium* (about the size of a small dog) and generally recognized as the earliest known form of 'horse', begot the *Orohippus* of the Mid Eocene, which begot the *Mesohippus* of the Oligocene, which begot the three-toed *Hipparion* (see page 12) of the early Pliocene, which begot *Pliohippus* which was the father of *Equus*, the 'true' horse which makes its appearance at the beginning of the Pleistocene (i.e. as now understood, that is to say, the Villafranchian). But if, for instance, we note three-toed horses in this pedigree we must not assume that, at one given period, all the three-toed horses began to have one-toed offspring. Stated, indeed, as bluntly as that, the very idea seems ridiculous. What is suggested, on the contrary, is that in a population of three-toed horses there appeared 'mutants', individuals with one toe on each foot, which were, maybe, better adapted than three-toed beasts to a certain environment, in this case, that of hard, grassy plains. Natural selection did the rest and gradually caused the replacement of three-toed horses by the descendants of the more 'efficient' mutants.

The 'family trees' of the mammals are much more like bushy shrubs with twigs and shoots pushing out here and there, crossing and entangled, some cut off short, other shooting out far and upwards. G. G. Simpson has provided an excellent example of such a 'burning bush', for the *Equidae* and this suggests very pertinently what our own 'family bush' may be. Nature plays any number of variations on one theme and can play them all at once.

Homo sapiens has survived his cousins among the hominids and has proliferated at so alarming a rate that he now represents by far the most numerous group of large mammals. Indeed, he is engaged in so rapidly exterminating all other wild animals, including our nearest relations the great apes, that this work of destruction, in the geological record, would seem as though it had taken place overnight. It may be that our descendants will have to go to a museum to get an idea of what a horse, a giraffe or a bear looked like—and then, as likely as not, these men will say that they 'don't believe it'.

THE DESCENT OF MAN

Although, for long, 'Darwinism' was wilfully misrepresented as postulating the descent of Man from apes, Darwin himself clearly expressed his opinion when he wrote that men must have descended from a

creature 'which would have been classed among the *Quadrumana* . . . but we must not fall into the error of supposing that the early progenitor of the whole simian stock, including Man, was identical with, or even closely resembled, any existing ape or monkey'.

These words are as true today as when they were written.

Men and apes are distant relations and their relationship is obvious (see page 56) though the common ancestors of the two forms may have lived in early Miocene times (say 25,000,000 years ago) or in the Oligocene, maybe 40,000,000 years ago. The marvel is that with a common ancestry so remote the apes and ourselves should be so much alike.[1]

If we think of two main lines or trends among the *hominoidea*, one trend towards the hominids and the other trend towards the pongids (or apes), we shall soon realize that an abundance of different forms is likely, and that they did not follow on one after the other as in a genealogy. That is to say A did not give rise to B and B to C, but rather A would give rise to some more As and to some Bs in a succession of cousinage, which would cause there to be a number of more or less closely related types existing at the same time.

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[1] It was Haeckel's (see page 111) contention that an individual during its uterine development undergoes a succession of phases resembling those of its adult ancestors of different types. The fact is however that these early stages resemble not adult ancestral forms but immature ones. The hominids in general and *Homo sapiens* in particular show distinct signs of what has been called 'neoteny' that is to say the retention in adult forms of structures confined to the embryos of its ancestors. As was first pointed out by Bolk, *Homo sapiens* much more resembles a young ape than an adult one as we may all see by going to a zoological gardens when there are baby chimpanzees on show.

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3

The Australopithecines

As I am writing this chapter I have on my desk before me a faded photograph. It was taken in the early 'sixties of the last century at a spot very near the now famed Sterkfontein site where so many remains have been found of the *Australopithecinae*, the South African ape-men or men-apes as they were called until quite recently.

The Bushveld rises southwards from Pretoria into the Highveld, an open grassland which stretches as far as the eye can see and has few trees save in the watercourses. Until about sixty or seventy years ago this prairie swarmed with game of all sorts. The picture I have mentioned shows my grandfather, his waggon outspanned and decked with hunting trophies of buck, antelope, leopard, lion and monkey while half a dozen 'Kaffir' boys are sitting or lounging about. Such a group would now look like a circus! But less than a hundred years ago, maybe, the countryside was probably little changed from the way it had been a million years or so earlier, when the Australopithecines flourished on this Highveld.

We have no remains of hominid—or even proto-hominid as we might call them—more ancient than those of these Australopithecines. They must represent a type of very early hominid, perhaps lingering on in the blind alley of South Africa. Our pedigree, in a sense, begins with them, although of course it is not suggested that they were our direct forefathers but merely that they probably represent a type which was that of our ancestors in one phase of their evolution.

The Australopithecines were completely bipedal, that is to say, they stood and walked and ran as we do. They ranged in size (for the group comprised several varieties) from that of a small chimpanzee to that, maybe, of a present-day orang-utan. Their brains were relatively (and perhaps absolutely) more voluminous than those of the existing apes; their dentition was almost, though not quite, 'hominid', and they

chipped 'Pebble Culture' stone implements. Indeed, these very archaic-looking Primates display nearly all the main tendencies which differentiate hominids from pongids, men from apes—a considerable development of the skull, canine teeth which are not jutting up or prominent and a hominid pattern of molars and premolars.

Furthermore, the *Telanthropus* (see page 71) whose remains have been found at the Australopithecines' sites (and which must be separated from the mass of the Australopithecines) looks uncommonly like what we should expect a 'proto-Pithecanthropoid' to be.

AFRICAN CLIMATES

Africa is a very ancient land-mass, and the only major change in the face of the continent, since Tertiary times, has been the sinking of the Great Rift Valley, a trough that, in fact, reaches from Palestine to the northern part of southern Africa and scores the continent from north to south. Moreover, most of Africa is a plateau which, in the southern part, rises from three to six thousand feet in height and is surrounded with a narrow coastal plain.

We shall see, a little later on, what climatic evidence can be deduced from the australopithecine sites. However, we may note here that there is a series of indications, from nearly all over Africa, of a succession of wet phases—'Pluvials'—and dry phases— Arids'—which may correspond, more or less, with the Glaciations and Interglacials of western Europe and North America. (Indications of these phases are particularly well marked in eastern Africa and the type-names have been taken from sites in that region.)

The succession is as follows:

CLIMATIC PHASE	INDUSTRY
Fourth Arid	
Gamblian Pluvial (Würm?)	Aurignacian
Third Arid	and
Kanjeran Pluvial (Riss?)	Levalloisian
Second Arid (with tectonic movements)	
Kamasian Pluvial (Mindel?)	
First Arid	Abbevillian to Acheulian (with some Clactonian and Levalloisian)
Kageran Pluvial (Günz?)	Pebble Culture

Later there is a number of minor phases ('Makalian' and 'Nakuran' Pluvials), especially marked in East Africa. The industries given above are shown with their European names (since African and European types are, in the main, similar), though there is for Africa a special nomenclature for artefacts.

It looks today as though desiccation were spreading in many parts of Africa and, in any case, we may bear in mind that not once only, but several times in the course of the last million years or so, the continent was barred not only by a super-Sahara in the north, but also by a much enlarged Kalahari in the south. This latter barrage of sands and desert must, on occasion, have almost isolated southern Africa from regions farther north.

With the ebb and flow of the Arids and Pluvials the fauna shifted both north and south of the equatorial rain-forest. Moreover, what we know today suggests that the continent was, in the past, a remarkable differentiation centre for Primates. Years ago, Darwin, in one of his shrewd guesses, suggested that Africa may well have been the region where the early history of our kind was played out.

THE BRECCIA KOPJES

Limestone is rather rare in South Africa which is predominantly a land of sandstone, gneiss and granite. Therefore, any source of limestone is worked, including the tufas deposited by springs and the solidified cave-fillings.

Most of the sites where the Australopithecines' remains have been found are kopjes or hillocks rising from the yellowish-green of the veld. These were formerly fillings of caves, but the original hills have in many cases almost or entirely weathered away. The ancient cave-fillings contain not only australopithecine material but also the fossil bones of many other animals. The whole collection indeed looks like the remains of meals. With these animal fossils is a quantity of fine sand and dolomite fragments, all cemented together so as to form a very hard breccia—in most cases a good deal harder than the fossil bones it encloses so that the task of isolating the bones is no easy one.

TAUNG[1]

The first australopithecine fossil was discovered at the Buxton lime-works, some six miles south-west of Taung overlooking the dry course

[1] Formerly written 'Taungs'.

of the Hartz River (a tributary of the Orange) and about fifteen miles inside 'British' Bechuanaland from the Transvaal border.

Towards the end of 1924 one of the quarrymen, after the detonation of a blast-charge, found the face and the base of the skull (together with a natural endocranial cast in the limestone) of a fossil Primate. The cranium was that of an immature subject whose milk teeth were still present but whose first molars were beginning to erupt. The cave which yielded the Taung cranium used to open on to a cliff of glittering white limestone (the deposit has now been almost all quarried away). The caverns, for there were many of them, contained a reddish, sandy deposit of lime and, in some of the strata, fossil mammalian bones had been found from the beginning of quarrying operations in 1910. From the same deposit as that of the Taung skull abundant remains of mammalian fauna, including baboon skulls, were recovered. Many of these showed traces of perforations and blows inflicted, apparently, by some implement, probably made of stone.

The cranial fragments were submitted to R. A. Dart of the Witwatersrand University in Johannesburg. He concluded that the remains were those of a 'primitive hominid'—a very prescient conjecture.

He named the specimen *Australopithecus africanus* and, in so doing, saddled us not only with a clumsy name but with one that is also tendentious. It is to be regretted that 'inventors', that is discoverers (or, more often, first describers) of new forms cannot be content to use a geographical designation (as was done in the instance of the Neanderthaloids, though that name is, as it happens, rather a mouthful) instead of fabricating a fancy name which, as often as not, becomes nonsensical as knowledge increases. It would be more convenient if we could refer to the 'Australopithecines' as 'Taungs'.

Few, at the time of the Taung discovery, would adopt Dart's view that the skull was that of an early type of hominid. It was generally conceded that the fossil was that of an immature ape and that its supposed hominid appearance was due to youth. Mature specimens of the same type would, it was argued, be quite recognizably anthropoid.

By 1929 Dart had removed the mandible from its matrix and revealed the occlusal ('top') surfaces of the milk molars—which, we may remember, occupy the place to be taken, later on, by the permanent *pre*molars. These milk molars appeared more hominid in character than those of any known ape, fossil or extant. However, in contrast with the small milk molars and the canines, the first permanent molars (which

had just erupted) were considerably larger than those of a present-day chimpanzee at an apparently similar age.

Still, the profile of the lower jaw was less ape-like than that of any ape of our day. The forehead was fuller and less receding. The heavy ridge over the eyes (the 'supraorbital torus') was lacking, though this is generally present in quite young apes of the sorts now living. Moreover the Taung skull was dolichocephalic (i.e. 'long from back to front', see page 159), which is a characteristic of all early hominids, whereas modern apes' skulls (we have little fossil ape material for com-

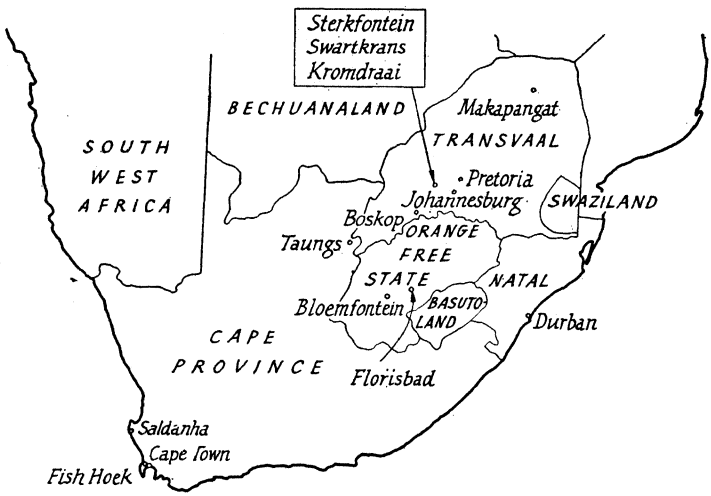


FIG. 2. Sketch map of Southern Africa showing sites which have yielded Hominid remains

parison, see page 41) are mostly short or 'brachycephalic'. The cranial capacity (i.e. roughly speaking the brain-volume, though see page 78) of the Taung specimen was possibly greater than that of a chimpanzee of comparable apparent age.

STERKFONTEIN

Sterkfontein (the name of a farm) had long been famed for its beautiful stalactite caves. The site (with those of Swartkrans and Kromdraai, for they are all close together) lies some seven miles to the north-east of Krugersdorp, which itself is twenty-one miles north-west of

Johannesburg. The Sterkfontein-Kromdraai-Swartkrans assemblage is situated approximately a hundred and eighty miles as the crow flies north-east of Taung.

Some years after the first discovery of Australopithecines at Taung, Barlow, the overseer of the blasting operations there, was transferred to Sterkfontein where the limestone deposits had been worked from 1895. From that year until 1935 almost continuous quarrying went on, and no doubt plenty of Australopithecines' remains were smashed up and reduced to powder. However, Barlow, no doubt alerted by the Taung find, kept a sharp look-out for fossils. And he found a good many, especially of baboons, which he would sell to visitors who came to the caves. Indeed, this little side-line of his did so well that in a Johannesburg guide-book there was printed an advertisement: 'Come to Sterkfontein and find the Missing Link.'

It was not, however, until 1936 that the late Robert Broom recovered australopithecine fossils at the site. The first Sterkfontein specimen comprised about two-thirds of the front portion of a braincase in excellent preservation together with the base of the skull, parts of the sides and a natural cast of the top, a few isolated teeth and the distal extremity of a femur. Broom considered that the fossils were those of a type different enough from that of the Taung specimen to warrant a special name and he called the Sterkfontein Australopithecine *Plesianthropus transvaalensis*, although it is generally now conceded that with the exception of *Telanthropus*, the Australopithecines fall into two main groups only, that of *Australopithecus* and that of *Paranthropus*.

During the years which followed, the remains of a considerable number of individuals were disengaged from the breccia and the fossils comprised portions of skulls, jaws and pelvic bones (these latter surprisingly hominid in form) and teeth.

In April 1947 an almost complete skull (maybe of an aged female) was recovered. In August of the same year, Broom and Robinson found part of a (female) skeleton with a perfect innominate bone, much of a femur and tibia, some ribs and vertebrae and parts of other skulls. In 1948 the lower jaw of a child *Australopithecus* was recovered. Altogether there is enough *Plesianthropus* material to reconstruct, fairly satisfactorily, most of the skeleton. (Plate IIa.)

The *Plesianthropus* had, apparently, a larger cranial capacity than any existing chimpanzee, the teeth were relatively delicate and the maxillary arch almost hominid. The height of the females may not have

exceeded four feet while the males may have been a foot higher. And the *Plesianthropus*, like all the other Australopithecines, stood upright, walked, and was in fact as bipedal as we are. For, if we come to think of it, there is no possibility of being more or less bipedal. Either an animal can and does walk on its hind legs, so to speak, or it does not.

In 1957 Brain recovered worked pebbles embedded in the Sterkfontein breccia, and later Robinson and Mason found split pebbles of quartzite and dolerite together with teeth of Australopithecines at the same site (see page 86).

It is curious that with the exception of the Swartkrans site all the australopithecine fossils discovered at any one site have been of the same kind and apparently peculiar to that site.

KROMDRAAI

At Kromdraai, near to Sterkfontein, the first discovery was made by a schoolboy, Gert Terblanche, in 1938. The site was explored by R. Broom in 1941. A considerable amount of material was recovered, enough, indeed, to give a very good idea of the skull, the pelvic region, the teeth, lower jaw, some of the long bones and the hand bones of another type of Australopithecines that was named *Paranthropus robustus* (Broom). (Plate IIb.)

SWARTKRANS

It was in 1938 that Broom pieced together the fragment of an australopithecine skull from Swartkrans, another 'fossil' hill whose calcined fissure is a small rift in grey dolomite rock about thirty feet high and filled with limestone layers, some red and some white. This skull Broom assigned to a 'new genus and species' and he named it *Paranthropus crassidens* because of the great size of the teeth. During the last twenty years, or so, much more material has been forthcoming from Swartkrans (of more than thirty individuals in all) including portions of the long bones.

In 1953 A. R. Hughes found a mandible [with teeth] which is but little, if at all, larger than a pithecanthropoid jaw, though the Swartkrans bone was more massive.

The pelvic bones of *Paranthropus crassidens* indicate that he stood upright.

TELANTHROPUS

However, the most surprising, and indeed exciting, find at Swartkrans was that of *Telanthropus* which is now generally thought of not as an australopithecine at all, but as a proto-pithecanthropoid form. By 1953 portions of five individuals of this type had been recovered. The nasal aperture is distinctly hominid.

The *Telanthropus* fossil bones (lower jaw, fragment of an upper jaw, proximal of a radius and premolars) seem to have been embedded in a pocket which sagged, so to speak, into the breccia containing the australopithecine remains. Moreover, this 'pocket' was of a breccia slightly different in type from that of the rest of the filling. It was, therefore, thought at first that *Telanthropus* was of later date than *Paranthropus crassidens* at Swartkrans. However, the view now of the South African palaeontologists is that the two breccias are practically contemporary. The *Telanthropus* mandible and maxilla show features which are less 'primitive' than those of the Australopithecines.

Robinson was inclined to think that the Sterkfontein tools (but see page 86) were made and used by *Telanthropus* who may have killed and eaten the Australopithecines, for the old cave fillings do certainly look like the fossil lairs of some carnivorous creature. But now that we have proof that the Australopithecines were tool-users, there seems no need to suppose the existence of another sort of hominid who ate them. Probably they just ate one another, and in so doing gave another proof of their hominid status, for cannibalism is a most ancient custom of our kind (see page 193). Robinson (and he is by no means alone) regards *Telanthropus* as a 'real' hominid of a type nearer to the pithecanthropoid sequence than the Australopithecines, a sort of big, bad cousin in fact.

And, as matters stand today, it does look very tempting to see in *Telanthropus* (although we need more material) a form intermediate (morphologically) between the Australopithecines as a group and the Pithecanthropoids as a group.

MAKAPANSGAT

Makapansgat is named after Makapan, the native South African leader who massacred a number of men and women of the Voortrekkers in the valley. This, apparently the most ancient of the australopithecine sites (though Sterkfontein is now thought by some to be older), is a vale not far from Potgietersrust and some hundred miles north of

Pretoria. The countryside, dotted with euphorbia bush and lead-wood, is that of the veld where it begins to slope down to the course of the 'great, grey, greasy Limpopo River', which the Voortrekkers thought was the Nile.

The valley's sides are pierced with a number of caves, the most famous of which is the 'Limeworks' which has yielded a number of fossils. The fossiliferous deposits of the Makapan dale were laid down, it would seem, during the later phase of a wet period (possibly the African First Pluvial or 'Kageran'). If, then, the Makapan sites are earlier than those in the central Transvaal, it is remarkable that the Australopithecines from the former are more 'unspecialized', more hominid-looking than those from the latter.

Dart assigned the Makapan fossils to an *Australopithecus prometheus* since he thought he had found evidence of hearths in the layers with australopithecine bones. But the black substance in these strata turned out to be manganese, so we have a designation which is rather misleading. Up to now, indeed, no evidence for the use of fire has been found at any australopithecine site, the earliest hearths are found at Choukoutien with the bones of the Chinese Pithecanthropoids (see page 133).

At Christmas 1958 James Kitching discovered a complete australopithecine skull (the best preserved to be found as yet) embedded in a vast collection of debris left by the limestone quarry-workers. With the skull was that of a baboon. Dart stated in June 1959 that these two crania were the only ones to be found among the tons and tons of rubbish examined and 'this shows that the man-ape to which the skull belonged was killed along with the baboon to feed another ape'.

'ZINJANTHROPUS BOISEI'

At the Léopoldville meeting of the 4th Pan-African Congress of Prehistory (August 1959), Dr L. S. B. Leakey announced that his wife and himself had unearthed on 17th of the preceding July at the Olduvai Gorge (Tanganyika) the greater part of the skull of a Primate. Leakey was quoted in both British and foreign Press as having stated that this skull was that of the 'Missing Link', though, no doubt, if he did, indeed, use such a phrase it was intended merely to stress the find's importance, which is, in fact, considerable.

The Olduvai Gorge (page 142) was first prospected in 1911 by a

German entomologist—Tanganyika was then 'German East Africa'—and in 1913 an expedition was sent out (at the instance of the German Emperor) to investigate the site.

The gorge presents the peculiarity of displaying a cut through sediments which are exposed like the layers of a cake, and these layers contain a rich mammalian fossil fauna and a great number of artefacts ranging from chipped pebbles to highly evolved stone implements.

It was at Olduvai that Hans Reck discovered a complete hominid skeleton associated with Aurignacian-type artefacts. As the remains were obviously of *Homo sapiens* and as a remote dating was assigned to them, it was held by some that this Olduvai evidence proved the existence of men like ourselves in early Mid Pleistocene times. The Olduvai skeleton is now recognized as being of Upper Pleistocene dating.

In July 1959, after the discovery of the first cranial fragment (a portion of a temporal bone), the Leakeys screened the scree beneath the site and recovered a great many further fragments making up the greater part of a skull (minus the mandible). A tibia was also found. Both skull and tibia indicate a hominid with an upright posture.

The bones came from a well-defined 'living-floor' or camp-site which had been used by the makers of 'Oldowan' type pre-Chellean chipped pebble-tools of which a hammer-stone and waste flakes were found associated with the bones of birds, reptiles and young mammals and many of them had been intentionally fractured.

The skull seems to be that of a male subject aged possibly about eighteen years at the time of death. The most immediately striking feature about the cranium is a marked sagittal crest, almost as marked as in some gorillas and more developed than in any other hominid known. More marked even than in *Paranthropus* (see page 70). The mastoid processes are very prominent as are the zygomatic bones. Behind the powerful supraorbital torus the forehead is depressed and the cranial capacity might be 600–700 c.c. The maxilla is broad and long. The canines are relatively small and the incisors (in almost a straight line) are very small compared with the huge premolars and molars. Of these latter the third is smaller than the second. The face is long and the nasal bones rather different from those noted for the South African Australopithecines.

However, this new Olduvai skull is undoubtedly that of an Australopithecine, though one probably of greater size than those noted

from southern Africa. We have, then, evidence that the australopithecine type was widely spread in Africa. There was already (page 84) some evidence for this, not only in the Pebble Culture tools (for the equation of one sort of industry with one sort of hominid is hardly justified), but also in the Laetolil specimen (page 120) from Garusi, the so-called *Meganthropus africanus*, which one is now inclined to class with the Australopithecines. In any case the crude chipped artefacts at Garusi are comparable with those at Sterkfontein in the Transvaal.

The dating of the Olduvai deposit where the 'Zinjanthropus' skull was found can be fixed, with fair confidence, to the beginning of the Mid Pleistocene or the end of the Lower Pleistocene, i.e. 500,000 to 600,000 years ago, and this date might take us back into the ages when the South African Australopithecines flourished. But there is no justification for seeing in any of these australopithecine forms the direct ancestors of later hominids. The former represent, no doubt, an evolutionary phase through which our forefathers passed.

The South African *Telanthropus*, indeed, still looks more like a transitional form between the Australopithecines and the Pithecanthropoids.

The Olduvai discovery is, however, a capital one, for it confirms what was already evident at Sterkfontein, namely that the Australopithecines not only had bodies and limbs very much like our own but that they also fashioned tools. The Olduvai artefacts are of quartzite (brought from some distance), and this Australopithecine anyway was *Homo faber*. It is a little difficult to understand why there is so much reluctance to admit that a hominid with a cranial capacity of 700–600 c.c. could be a fashioner of tools. He had hands very like our own and that means to say that he used them as hands, i.e. to fiddle about with objects and now and then to hit on something useful.

The Australopithecines, then, walked as we do, held themselves as we do, made tools, very probably had some form of speech (for the need to communicate by sounds becomes urgent when manufacture starts up) and in the shape of their heads and faces they looked very like apes. What is a Man?

CLASSIFICATION OF THE AUSTRALOPITHECINES

The first thing that strikes us about the Australopithecines is that they show a wide range of variability. However, as we have mentioned, they do fall into two main classes:

(a) *Australopithecus africanus* (Taung 1925)
Australopithecus transvaalensis later renamed *Plesianthropus transvaalensis* (Sterkfontein 1936)
Australopithecus prometheus (Makapansgat 1949)

(b) *Paranthropus robustus* (Kromdraai 1938)
Paranthropus crassidens (Swartkrans 1949)

This is leaving on one side *Telanthropus capensis* (Swartkrans 1949) and also 'Zinjanthropus boisei' from Olduvai (1959).

AUSTRALOPITHECINE CHARACTERS COMMON TO THE WHOLE GROUP

There can be now no doubt that in the general pattern of their bones the Australopithecines resemble more the hominid line than the ape line. If, indeed, the Sterkfontein (female) *Plesianthropus* (see plate II)

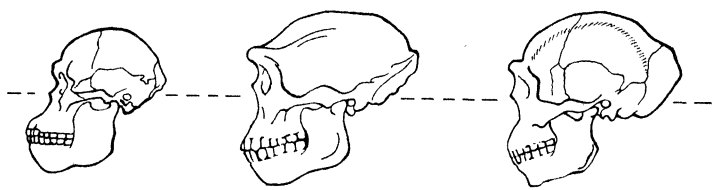


FIG. 3. Comparison of skulls of *Australopithecus*, *Pithecanthropus erectus* and *Pithecanthropus pekinensis*.

skull had been found minus all the frontal bones beneath the eyebrow ridge it might well (except perhaps for its small size) have been taken for the cranium of a Pithecanthropoid.

One eminent anatomist (Professor Sir W. E. Le Gros Clark of Oxford) has listed no fewer than fifteen hominid features in the skulls and teeth of the Australopithecines and has stressed the 'almost human' character of the hip-, ankle- and arm-bones. In the opinion of Dr Ernst Mayr (a veterbrate taxonomist of great experience), there are no morphological differences which justify the separation of the australopithecine fossils (and *a fortiori* of the pithecanthropoid) from those of the genus *Homo*.

Such views of the australopithecine evidence were reached slowly and not until after the discovery of pelvic and limb-bones which indicate an upright posture.

The main characters of the australopithecine group as a whole are:

1. Small brain-volume (*Paranthropus crassidens* has the largest skull) about equal to that of the larger existing anthropoid apes, though, in some cases, the volume of the Australopithecines' brains is larger.

2. General proportions of the skull ape-like—massive, projecting jaws whose contour however (not size) suggests that of the hominids, as do also the shape of the forehead and the construction of the bony region of the ear. Complete stereoscopic vision is evident from the disposition of the eye region.[1]

3. *Foramen magnum* well forward indicating that the skull did not tilt as in existing apes. The forward position of the bony surfaces that articulate with the upper end of the spine also indicate an upright posture. The mastoid process is as well developed as in *Homo sapiens.*

4. Rather short, slender arms (this is true for *Australopithecus africanus* and *Paranthropus crassidens* only, since arm-bones are lacking for the other forms). Pelvic and limb-bones on hominid pattern showing bipedal, upright posture and ability to walk on two feet, though these bones do display some significant differences from those of *Homo sapiens.* One of the australopithecine pelvic bones was found *in situ* in the limestone matrix a few feet from several skulls and limb-bones. Most of the Australopithecines seem to have stood about four feet high, but some of the later forms were taller.

5. The teeth and dentition of the Australopithecines are essentially the same as those of the Pithecanthropoids. Isolated australopithecine teeth, indeed, are difficult to distinguish from pithecanthropoid. There is no fundamental character in which australopithecine teeth are non-hominid, though we may always bear in mind that the ape-like proportions of the skull, the heavy, massive jaws and even the size of the teeth are not what we should generally call 'hominid'.

The teeth form an arcade (see page 28) and not a parallelogram as in the known apes. The canines are small and level with the grinding teeth (even in the earliest stages of wear and even in males). Although the Australopithecines had pongid nasal apertures they had a more hominid anterior dentition than had the Pithecanthropoids who had a completely hominid nasal aperture.

Not only is the contour of the dental arch parabolic but there is no

[1] Two of the Swartkrans skulls (*Paranthropus* which is on the whole less hominid-looking than the other Australopithecines) have gorilla-like median crests but these crests are accompanied by no nuchal (nape) crest (as e.g. in the gorilla). Skull-crests never occur in gibbons and rarely in old male chimpanzees, they are normal in male orang-utans and not only male but sometimes female gorillas display them.

marked diastema (which exists in *Pithecanthropus modjokertensis*, an undoubted hominid, see page 119) as there is in the upper jaw of all apes, [though in *Paranthropus* there does seem to be a slight diastema]. The australopithecine incisors are not 'haplodont' (i.e., 'peg-like') but spatulate though the molars and premolars are large compared with the relatively small incisors and canines, the latter projecting very little above the level of the front teeth. In *Telanthropus* the first lower premolar (with two cusps as in *Homo*) is smaller than the second (a distinctly hominid character) but this, as we have seen, is a more 'advanced' form than the Australopithecines in the strict sense. The australopithecine teeth wore down flat and the molars, despite their large size, have a cusp-pattern (as well as a wear) that is rather hominid than anthropoid, or let us say, is unlike that of any ape except *Giganthropithecus* (see page 22).

In fact, the Australopithecines had teeth definitely of the general hominid pattern.

There is another trend in the Australopithecines which does not look so hominid. The hominids' evolution has been towards types with larger brains and smaller teeth, whereas the small Australopithecines have small teeth and small brains and the larger types have large teeth and larger brains.

AUSTRALOPITHECINE BRAINS

The cranial capacity of the australopithecine skulls seems to vary from about 400 c.c. to perhaps 750 c.c. (certainly not more). If we compare these figures with those for the living great apes, we shall see that relatively and probably absolutely, the Australopithecines had 'bigger brains' than the apes of today.

The average for a chimpanzee is about 393 c.c. with a maximum of 480 c.c. The average for a gorilla is about 500 c.c. with a recorded maximum of 685 c.c. though the smallest gorilla capacity recorded is only 340 c.c.

The range for *Homo sapiens* is from about 830 c.c. to 2,100 c.c. (Australian aborigine females having some of the smallest brains). However, the only australopithecine skull sufficiently well preserved for its brain-volume to be really satisfactorily computed is that of the (female) *Plesianthropus*, and this would appear to be about 482 c.c. which would be a good figure for a chimpanzee. We have not full details for the 1958 Makapansgat find.

Of course, mental capacity depends much more upon the quality of the brain's cortical association-areas than on mere size. To take only existing apes, chimpanzees (who have smaller brains) seem, on the whole, to be more intelligent than gorillas who have bigger brains. Brain size in the Primates is pretty well linked with body size. The bigger the body, the bigger the brain, but by no means the more the intelligent creature.

When it comes to reading endocranial casts and endeavouring to deduce from them the nature of the brain they once enclosed, we should also remember the truth of Weidenreich's comment, that an interpretation of endocranial casts is not much more reliable than any other sort of phrenology. It has been claimed that the 'speech-association area' was already differentiated in the Australopithecines' brains. This may be true, and then also it may not be true. In any case, if the area was 'differentiated' was it capable of functioning so as to express (and thus create) conceptual thought?[1]

On the other hand, if the cranial capacity of the Australopithecines is comparable rather with that of the modern anthropoids than with that of the Pithecanthropoids, the actual cranial structure of the Australopithecines does seem to show a definite hominid trend—in the expansion of the frontal and parietal areas, for instance. Still, a child of Man today begins, generally, to speak when it is about two years of age and when it may well have a brain volume of not more than 650 c.c. So, it is unsafe, judging by mere volume, to assume that adult Australopithecines had not some form of language, especially as we have good evidence for the tool-making capacity of these primitive hominids for, as we know, language waits upon *manu*facture.[2]

DEVELOPMENT OF THE BRAIN

It seems undoubted that the various portions of the hominid brain developed irregularly during a general increase in volume. The volume of the Neanderthaloids' brains (see page 159) equalled, if it did not surpass, that of *Homo sapiens sapiens*. However, the relatively small size

[1] The third convolution of the prefrontal area of the brain is regarded as the 'localization area' of language. The frontal lobes area is that for the association of ideas, the fundamental basis for thought. Language allows of naming objects, chanelling the process of 'ideation', association of ideas, and furnishing material (with the development of language) for 'reasoning'.

[2] See Schepers on endocranial casts (1950). He would have it that australopithecine skulls show 'cortex structures that are clearly hominid'. But an endocranial cast gives a blurred and veiled image of the surface of the brain itself.

of the formers' anterior region as compared with the posterior areas of the skull suggest that the quality of *some*, at least, of the Neanderthaloids' brains was not up to that of *some* of those of *Homo sapiens sapiens*. On rather vague evidence, in fact, it has been held that the number and complication of some neanderthaloid brains' convolutions were less than ours.

But we have an enormously abundant material on which to base our appreciation of 'modern' Man and his brain. For we can examine brains of *Homo sapiens* and we cannot those of the Neanderthaloids. So, maybe, as far as Neanderthaloids and 'modern' men are concerned (and they were, as we shall see, closely related, page 160), we may say that some at least of the former were not inferior in potential apprehension, conception and reasoning powers to some of the latter.

Over-emphasis on mere brain-bulk has probably been induced, to some extent, by a desire to discover, once more, some fool-proof criterion for what is and is not 'human'. But who can tell just where the line must be drawn between brain-bulk that is hominid and brain-bulk that is not? Years ago Keith (a rather dogmatic anthropologist) established what has been called a 'Rubicon', an arbitrary figure of 750 c.c. as a limit. A brain of 749 c.c. was not that of a 'Man'. For brain-size, as for so much else, we cannot lay down hard and fast rules.

The fact of the matter is that in anthropology we do not need to set up more fences, what is needful is to assemble the evidence and to strive to interpret it dispassionately, inductively. We may remember that there have been plenty of exceptionally able men with brains of relatively small volume and millions of average fools with voluminous brains.

FREE FORELIMBS

The upright posture freed the forelimbs and those forelimbs terminated in hands. Thus men were able to fashion objects. The upright posture would be of no use to an animal whose forelimbs terminated in hooves. Neither would a highly developed brain be of much use to an animal which could not walk upright. We still 'think with our hands' and have always done so. Thus upright carriage, the evidence shows, the freeing of the forelimbs and the freeing of the hands, came before any great development of the brain or reduction of the snouty visage to what we

like to think of as 'human' proportions. It was the upright posture which favoured those types developing towards a bigger and 'better' brain.[1]

We may stress that it is upright posture *with freeing of forelimbs that terminate in hands.* Many of the warm-blooded animals on this earth—ourselves and the birds—walk on two feet, but if you have to use your forelimbs for flight (or for practically nothing at all as in the case of the penguins), then you cannot have hands to make things.

AUSTRALOPITHECINES AS ANCESTORS

It appears certain that the Australopithecines, of which we have the remains, represent a group, more or less, at the tail-end of its history, and it is not suggested that the southern African forms were directly ancestral to, say, the Pithecanthropoids. The dating alone (see page 88) would rule out that. Still hominid groups of a type ancestral to the Pithecanthropoids cannot in their bodies and bones have been very different from the Australopithecines, whereas it is not fanciful to see in *Telanthropus* a type that looks very like a 'proto-Pithecanthropoid'. In fact, the earliest members of the hominid line must have been creatures whose fossil remains it would be difficult to assign with certainty either to the hominids or the pongids.

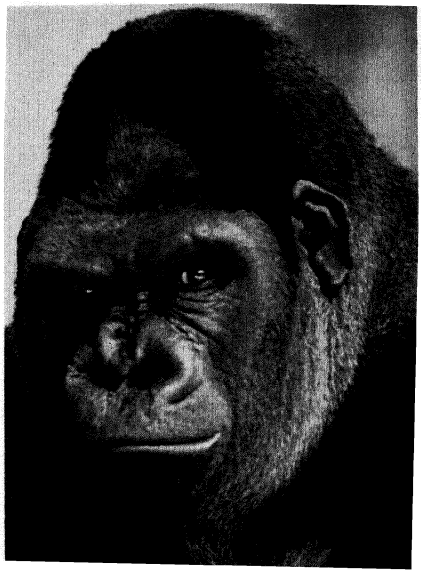
HOMO SAPIENS

It has been objected that the australopithecine type cannot be regarded as ancestral to the pithecanthropoid type, because some of the Australopithecines show teeth-peculiarities which appear to be 'hyper-human': reduction of size of first premolar and of canine-incisor series, advanced 'molarization' of the milk dentition, etc. But these characters seem to occur in only one australopithecine type (*Paranthropus crassidens*), and what we have in this ancient southern African sort of hominid is, no doubt, a population, perhaps more or less isolated, certainly archaic and in which there must have been a good deal of local variation.

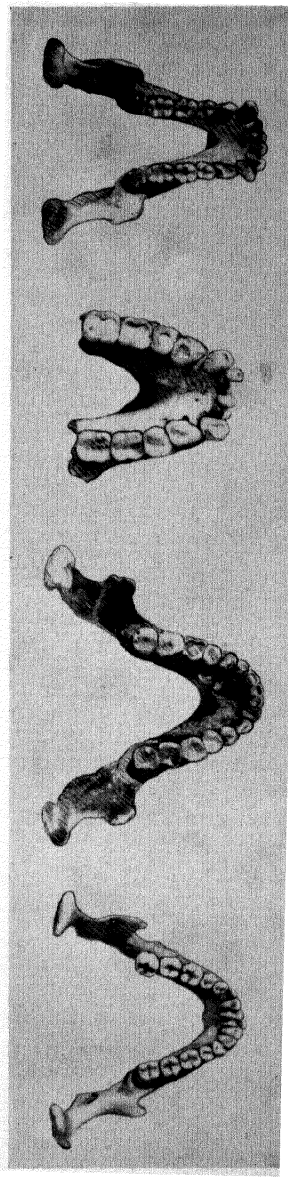
The fact is that the Australopithecines are so far advanced in a

[1] My presentation of the australopithecine evidence owes much to the work of Sir W. E. Le Gros Clark, to whom more than to any other scientist we are indebted for the classification of the Australopithecines as hominids and that long before the accumulation of all the evidence we have now and notably the proof that these early hominids made and used stone implements.

(a)



(b)



(1)

(2)

(3)

(4)

PLATE I

(a) Head of lowland gorilla

(b) Lower jaws of:
(1) Female gorilla
(2) *Gigantopithecus*
(3) Male *Pithecanthropus pekinensis*
(4) *Homo sapiens*

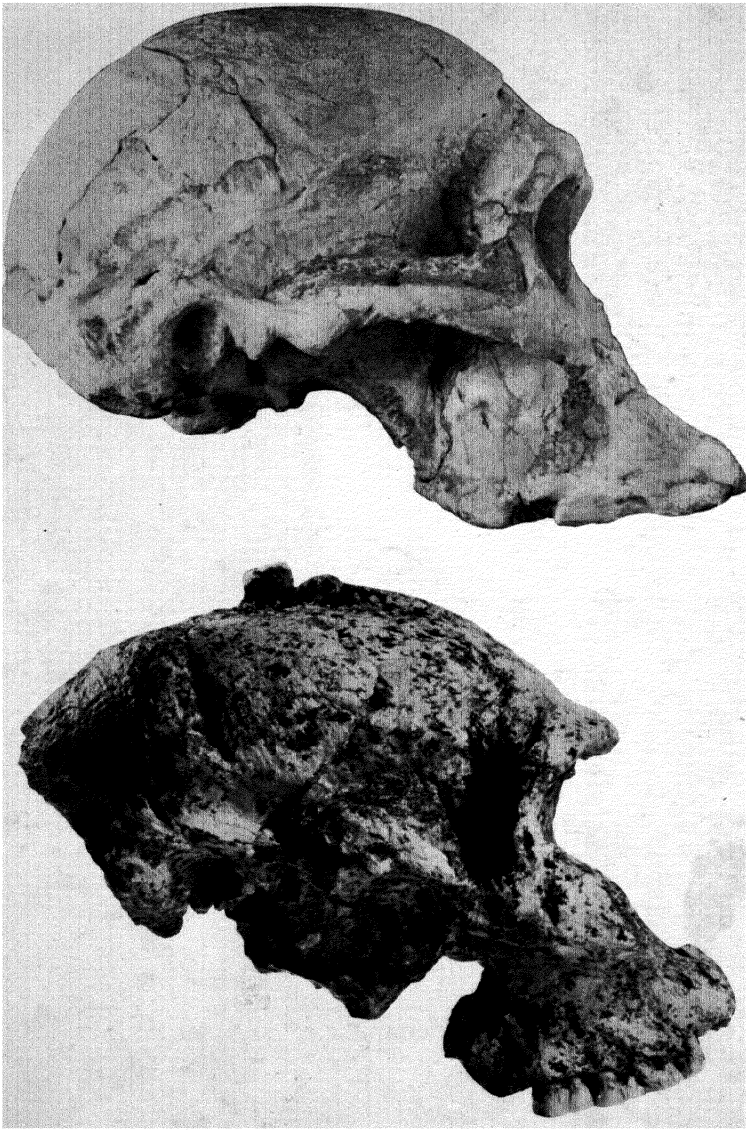


PLATE II

Above: *Plesianthropus transvaalensis*

Below: *Paranthropus crassidens*

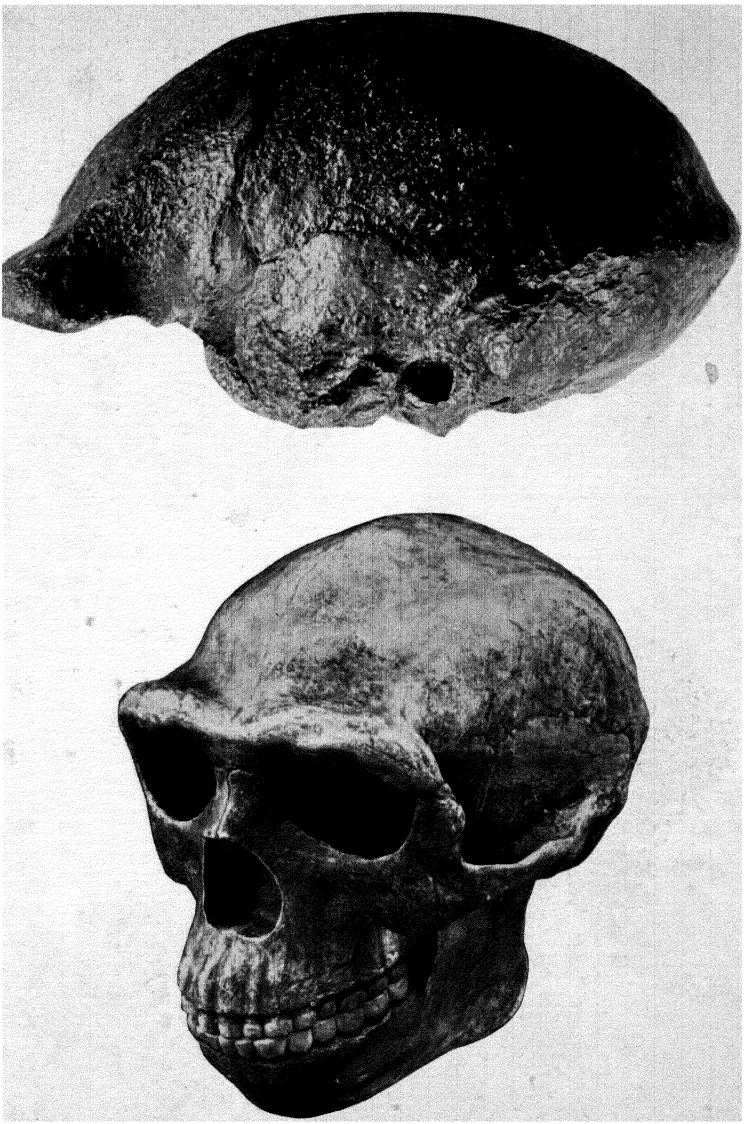


PLATE III

Above: *Pithecanthropus erectus II*

Below: Reconstructed skull of *Pithecanthropus pekinensis* (female)

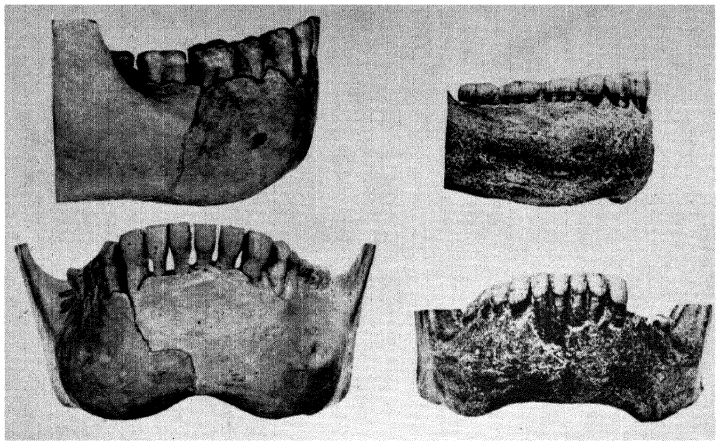


PLATE IV (a)
Left: *Meganthropus palaeojavanicus*
Right: Portion of Mauer jaw. *Homo Heidelbergensis*

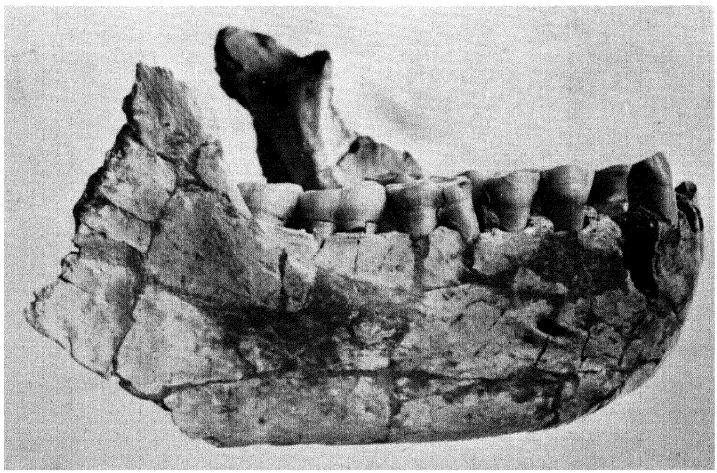


PLATE IV (b)
Atlanthropus mauritanicus: (male?) *No. III*

hominid direction that they suggest they were representatives of a branch of the Primates that broke off from the main stem at least as early as the beginning of the Miocene.[1]

Maybe the best way to regard the Australopithecines is to see in them creatures constituting a side-branch of the proto-hominid stock, a side-branch that persisted in South Africa after the main stem of the Hominidae had reached the level of say *Pithecanthropus robustus* of Java. This, naturally, does not imply that the *Pithecanthropus robustus* (see page 120) whose remains we have was the ancestor of, say, the Neanderthaloids or still less *Homo sapiens*. What is suggested is that *Pithecanthropus robustus* represents a type in hominid evolution, a type which in our family tree may be set farther back than the Java 'ape-men', first found by Dubois (see page 111).

THE MOSAIC CHARACTER OF THE EVOLUTIONARY PROCESS

It is said that one candidate for Divinity School honours damaged his chances badly when, in a paper designed to prove the Mosaic authorship of the Pentateuch, he spelled the word consistently 'mosaic'. We may then note (as with Primates and primates) that if we speak of the 'mosaic' character of evolutionary processes, the adjective must be spelled with a small 'm'.

The significance of a 'mosaic' type of evolution as a general principle was clearly recognized by D. M. S. Watson in 1919 and G. de Beer has proposed to call the 'mosaic' mode 'Watson's rule'. It is most probable, indeed, that the evolutionary process whereby animals of one type were transformed into animals of another type was a process which affected some parts of the animal and not others 'with the result that some parts were similar to those of one type, others being similar to the other type, and few or no parts intermediate in structure'.

Thus, animals undergoing evolutionary change may be thought of as 'mosaics', in which the pieces could be replaced one by one, so that the intermediate stages present a jumble of characters. And this holds as good for the hominids as for any other lines. In the case of the great transitions (e.g. from fish to Amphibia, from Amphibia to reptiles and

[1] Hürzeler (see page 55), Straus (1949) and Robinson (1956) all for different reasons hold that the hominid line crystallized from a 'pre-pongid, pre-simian' complex in the Oligocene. Le Gros Clark, on the other hand (1955), considers that the hominids and the existing pongids had a common ancestry as late as the Mid Miocene if not later.

from reptiles to mammals) fossils are known which, though not of animals directly ancestral to the rest of the animals on the plane to which evolution was progressing, still are so closely related to them that they may be regarded as examples of animals in transition.

HOW TO KILL

et manum mira freti virtute pedumque
consectabantur silvestris saecla ferarum
missilibus saxis et magno pondere clavae.[1]

How to kill and how best to benefit from killing are the problems all carnivorous animals must solve or die. But if all animals which eat meat must be able to kill, animals which walk on two feet and have free fore-limbs need more than their teeth or claws or hands to help them kill, for such bipedal creatures are at a disadvantage when it comes to keeping pace with most four-footed beasts.

So an animal that walks upright must use implements and also its brains for the preparation of snares and traps and for driving beasts over precipices to their death. It is, indeed, difficult to conceive of a creature which must always walk on two feet not being also a user of tools and weapons. He need not, of course, know how to chip stones but he must wield something.

No doubt, as we have already noted, the earliest implements used by hominids were wooden sticks and clubs and animals' bones and horns. Most of such perishable objects have long since crumbled away, but they were certainly used for long ages after chipped artefacts had been made from stone. These artefacts were for the most part rather tools and implements than weapons, though there can be little doubt that many stone artefacts were, from very early times, hafted or otherwise affixed to a wooden holder, in fact, a chipped stone with a wooden handle is a substitute for, or an imitation of, let us say a beast's jaw or a stag's horn. Wooden implements have, of course, survived to our own days, 'coshes', knobkerries and bludgeons are very effective arms of offence. In 1911 the late S. H. Warren discovered the 'Clacton spear', a wooden artefact in the 'Elephant Bed' at Clacton-on-Sea in Essex (England). The implement was in association with an industry of flint

[1] 'And trusting to the marvellous power of their hands and feet, they would pursue the forest-haunting races of wild beasts with showers of stone and club of ponderous weight.' (Lucretius, v, lines 966 *et seq.*)

flakes and chopper-cores. An exactly parallel object (even to the yew-wood used) was found in 1950 among the ribs of an *Elephas antiquus* near Hanover (Germany).[1]

EOLITHS

What, however, are the most ancient stone artefacts? Well, we might begin by mentioning what are not ancient artefacts. For years discussion raged about the so-called 'eoliths', some of which occur in what are, undoubtedly, Eocene deposits which were laid down at a time when, so far as we know, the only Primates existing were small tarsier-like creatures. Those, then, who maintained that Eocene 'eoliths' were the work of hominids ran directly counter to what we know of the history of the Primates. Nevertheless, these Eocene (and Oligocene) 'eoliths' look as much—or as little—'artificial' as do those of some much later deposits.[2]

As long ago as 1867 Louis Bourgeois alleged that he had found scrapers, knives and borers in fresh-water Upper Oligocene deposits in the Loir-et-Cher department of France. Similar 'chipped flints' were reported from the Lower Eocene of Clermont (Oise department of France), from Upper Oligocene gravels at Boncelles in Belgium, in 'Upper Miocene' (now recognized as Lower Pliocene) deposits in the Cantal department, in so-called 'Pliocene' gravels of the North Downs in Kent and within and below the East Anglian 'Red Crag' formation (England). Since 1900 large numbers of flaked flints—some looking very like artefacts—have been found in the 'Stone Bed' under Norwich (England), and in the 'Bone Beds' beneath the Red Crag formation in Suffolk (England). These stones are rather different from the general run of Tertiary 'eoliths' and some of the rostro-carinates, core-like and scraper-like flakes in the museum at Norwich, do look very much as though they might have been fashioned by Man, but these are selected specimens and when seen in the mass the 'Sub-Crag' stones are less convincing. The late A. S. Barnes, indeed, demonstrated by a statistical analysis that the 'Crag' flaking was of the high-angled type characteristic of natural fractures.

Flint, in certain circumstances, fractures easily enough, and some of the 'eoliths' in Tertiary gravels seem very like flints which have been

[1] See K. D. Adam *Der Waldelefant von Lehringen* in *Quatär* v 1951.

[2] Much of the evidence presented here (and elsewhere in this book) is based upon the writings of Dr K. P. Oakley who has done so much to elucidate the story of early Man.

broken in the swirling waters of chalk-mills. Pressure is exerted when flint-bearing strata founder through the solution of underlying chalk (or other calcareous formations), hence, probably, the Oise 'eoliths', whereas the Kent 'eoliths' were mainly produced by great friction of one stone on another in soil-creep, especially in subglacial conditions.

Of course, we may admit readily enough that Man's first attempts to chip stones may have resulted in producing things hardly distinguishable from naturally fractured pebbles. Indeed, such pebbles may well have been the first stone tools. To this day some Australian aborigines manage to cut quite well with sharp bits of stone picked up by the wayside.

However, as all the palaeontological evidence is against the possibility of any stone-chipping animal having existed, at the very earliest before the late Pliocene,we may dismiss the 'eoliths' as freaks of nature.

PEBBLE-CULTURE

What then are the most ancient man-made implements since there is no 'Cromerian Industry'?

If you or I were to attempt to fashion some sort of cutting instrument out of a pebble what we might produce—if we were lucky—and at the cost of a good many crushed fingers would be what is called a 'Pebble Industry' tool, easy to handle and fairly efficacious for cutting up flesh, chopping at bits of wood and possibly even skinning a small animal. Such an artefact is just a pebble with one end chipped into a rough cutting-edge. In fact we should have produced something like a 'Kafuan' artefact.

Such artefacts are very common in Africa from the centre to the south, and they were first identified in the high river-terraces of Uganda—on and near the Kafu River—hence the name. These apparently Man-made implements have been by some optimistically dated right back to early Pleistocene times, that is, to what was formerly known as the Pliocene 'Villafranchian'. The late V. R. Lowe claimed that he and E. J. Wayland could trace the evolution of rostro-carinates from simple split pebbles up to Abbevillian hand-axes. The 'Kafuan' is typical in the 270-foot terrace of the Kafu, and pebbles of the same type are found even under a laterite layer at the base of this terrace, which is either Pliocene or very early Pleistocene. If these things really were man-made then they would support the idea of a very slow evolution of

over half a million years or more from the end of the Pliocene to the first known hand-axes.

However, a good deal of doubt hangs over these very early Kafuan chipped pebbles. Some Kafuan-like flaking is produced when gravel is carried over waterfalls and soil-creep and solifluxion can occur to produce secondary chipping in tropical as well as in glacial conditions.

We may take it then that the earliest Man-made implements are those of, or related to, the Oldowan culture of East Africa (the 'advanced Kafuan' of some authors), which from the associated fauna may be dated to the early Mid Pleistocene.

THE IMPLICATIONS OF TOOL-MAKING

The use of tools and weapons is certainly not confined to hominids; monkeys throw pebbles and sticks. Baboons may use stones to crack open scorpions. Also, mammals, other than Primates, employ implements; sea-otters will smash open a sea-urchin with a pebble.

The prehensile hands of the less specialized monkeys even would serve quite well (though the thumbs are not fully opposable as with us) for the making and using of some sorts of tools, were the animals' brains adequate to make the necessary effort at conceptual thought. For some degree of abstract or 'conceptual' thought must exist in the regular maker of implements. He must be able to 'see' the finished article in the rough stone; in fact, in a humble way, he must be able to think as the sculptor does when he perceives his statue in a shapeless block of marble.

In this connection the classical experiments of Madame Kohts of Moscow were illuminating. Some of the apes observed by her used sticks as levers, for digging up hidden objects or for extending the reach of their arms. Her chimpanzee would pull a loose board from a case and use it, but if the case's surface was unbroken he could not see a possible stick in it. There is, then, in such apes' brains an inkling of conceptual thought, but it fades very rapidly from their minds.

The making of implements is something altogether different from the use of them. Chimpanzees (and in captivity) are the only non-hominids known to 'make' tools. Köhler's 'Sultan' shoved one stick into a smaller one in order to reach a bunch of bananas. Also on one occasion when he was feeling particularly bright he filed, with his teeth, a piece of wood to a point and then fitted it into one of the canes he had. As Köhler wrote:

'The time in which the chimpanzee lives is limited in past and future . . . it is in the extremely narrow limits in this direction that the chief difference is to be found between the anthropoids and the most primitive human beings. The lack of an invaluable technical aid (speech) and a great limitation of those very important components of thought, the so-called "images", would therefore prevent the chimpanzee' from attaining the most rudimentary 'thought' in our sense of the word.

For there can be no conceptual or abstract thought without language.

By the way, if the Australopithecines still existed today, would the killing of them be regarded as murder or sport? If there were several different sorts of 'men' on this globe, men differing from one another as much as Pithecanthropoids and *Homo sapiens*, how would our homicide laws be framed? Maybe more or less as in early medieval times when one paid much less for killing a serf than a freeman.

THE IMPLEMENTS OF THE AUSTRALOPITHECINES

Plenty of the baboon bones associated with australopithecine remains show the skulls crushed at the tops or sides and scooped wide open at the base (presumably for the removal of the brain); other monkey skulls have round or triangular holes made by some sharp-pointed implement—and therefore by a hominid. Several of the long bones were split—presumably for the extraction of the marrow. Some smashed australopithecine skulls look as though they had been dented by double ridged bone clubs.

The Makapansgat Limeworks has been a prolific source of bones, some of them australopithecine, but most of them fossils of other animals which presumably had been eaten and whose bones, jaws, teeth and horn-cores the Australopithecines used as weapons and implements. Antelope long bones have been identified as clubs and daggers, upper jaws as scrapers, lower jaws as blades, saws and knives, shoulder-blades and pelvic bones as chopping tools—in fact, a whole collection of the earliest sorts of implements used by the hominids. R. A. Dart compared bone implements from Kalkbank (about seventy miles from Makapansgat) of South African Middle Stone Age and dated (by radiocarbon tests) to about 15,000 years ago, with australopithecine implements from Makapansgat and found the treatment of the bones comparable at the two sites.

However, the grey bone-bearing Makapansgat breccias have as yet

(1960) yielded no stone artefacts, although (up to March 1958) some five tons of the deposits had been examined and well over 28,000 fragments of bone extracted. Dart has made a statistical analysis of these bone, teeth and horn fragments and is of the opinion that the Australopithecines used as weapons the horns, teeth and bones of the animals they killed. It was Dart also who first remarked on the chipped stones found at some Australopithecine sites (though nowhere in association with Australopithecine bones) and suggested that these primates were not only animal hunters but also bone-breaking and stone-chipping creatures.

However, as long ago as March 1953, the discovery of 'advanced' Kafuan (or better, early Oldowan) type artefacts in the calcified surface-layers of the Basal Older Gravels of the Vaal River's 200-foot terrace, showed clearly that tool-makers existed in South Africa during the dry climatic phase which followed on the First African Pluvial (Kageran, see page 65), that is to say at a period when the cave-deposits were laid down, in which have been found australopithecine remains. Until 1956, however, the most reasonable interpretation of this evidence seemed to be that the Vaal Pebble Culture was the work of some more or less pithecanthropoid type of hominid (e.g. *Telanthropus*) at a period when the Australopithecines were still flourishing.

In May 1956 C. K. Brain found undoubted Pebble Culture tools of 'Oldowan' type in the upper layers of the fossiliferous breccias at Sterkfontein from which australopithecine remains had been extracted. Still, these artefacts were not discovered in association with hominid fossils. However, in 1957 and early in 1958, J. T. Robinson and R. Mason confirmed that the artefacts found by Brain were part of an industry other specimens of which were discovered *in situ* in a breccia layer with the teeth of Australopithecine.

There seems no doubt, then, that the Australopithecines not only walked as we do but also fashioned implements.

What is a Man?

Well, one definition might be 'a primate that eats his own kind' (see page 193). It is, of course, possible that the Australopithecines may have been killed and eaten by another sort of hominid, or that they may have been the prey of carnivores which liked to retire into a lair and there devour their meat in peace and quiet. We should, in fact, imagine, *a priori*, that the nimble little Australopithecines would have avoided caves, since, apparently, they did not know the use of fire. Still, that the Australopithecines themselves were carnivorous is suggested by

animal bones and eggshell fragments forming a sort of midden in the Taung cave.

Again, if we except the *Pithecanthropus pekinensis* site at Choukoutien (where the evidence is that the hominids had been killed possibly elsewhere and dragged into the caves where they were eaten), and the australopithecine sites in South Africa, the remains of toolmakers are rare at the sites where we find the tools. It may well be, indeed, that until we come to the Neanderthaloids what remains of fossil men we have are either those of individuals who were drowned or eaten. But when we say eaten that does not necessarily imply eaten by another sort of man.

The abundance of the australopithecine bones (which is of the magnitude we expect rather to encounter with the relics of non-hominid mammals) led Broom to suppose that the Sterkfontein cave was originally a carnivores' den rather than the living place of any hominid. The red-brown breccia (containing artefacts and a few isolated teeth and some animal remains) would have been accumulated at a time when the cave had become temporarily a site of hominid occupation.

The breccia at the nearby site of Swartkrans (accumulated apparently later than the Sterkfontein breccia) contained not only numerous remains of the aberrant Australopithecine *Paranthropus* (see page 70), but also a lower jaw of the possibly more hominid *Telanthropus* who might have been the devourer of the Australopithecines.

THE DATING OF THE AUSTRALOPITHECINES

The bone-bearing breccias in which the australopithecine remains have been found are rocks composed of grains of quartz and chert which were wind-swept into caves and there consolidated. The quartz grains (most of which show a 'frosted' surface) came from some distance, while the chert grain derived from the surrounding dolomite limestone.

Now, in the arid Transvaal of today, soils show a constant ratio between quartz and chert components. The presumption, then, is that in formations where this ratio is different from that of today, the difference was caused by climatic conditions other than those prevailing now. The drier the climate, the higher would be the proportion of quartz—since winds would sweep along more quartz, while there would be less water to dissolve the dolomite. That is to say, the wetter the weather the lower would be the proportion of quartz in the soil.

Specimens of sand from soils in dolomite areas where the rainfall is known today were compared with samples of breccia from the various levels in the australopithecine sites. Thus the humidity or the dryness of past climates was deduced. As the sequence of Pluvials and Arids (see page 65) is well established for some parts of Africa, a correlation between this evidence and that from the australopithecine breccias allows us to date these latter with some degree of confidence.

What now appear to be the oldest australopithecine remains found in the central Transvaal are those of the Sterkfontein breccias which bear witness to a dry climatic phase followed by a wetter one. The conditions are, indeed, similar to those indicated in the levels at Taung where the first australopithecine skull was discovered. It lay in a calcified mass of wind-blown sand which filled a small cave in the limestone cliffs, a formation which was accumulated at a time when the springs from the dolomite scarp were very copious. In fact the Taung site seems to date from a dry climatic phase which followed after a period when the conditions were much wetter than they are now.

So, the evidence tends to show that the greatest possible age for these australopithecine remains is late Villafranchian, that is to say, in the now accepted nomenclature, late Lower Pleistocene.

If we reflect that the Australopithecines, in their later stages anyway, were probably the contemporaries of the Pithecanthropoids in North Africa and in Eastern Asia, we have additional reasons for thinking of *our* Australopithecines as the survivors of a very ancient line of hominids.

Some of the fauna associated with australopithecine remains looks, it must be admitted, archaic, e.g., *Chalicotherium* and *Dinotherium*, which became extinct in Europe maybe 10,000,000 years ago, but these animals occur in Mid-Pleistocene deposits (perhaps not more than 500,000 years old) of the Serengeti Plains (see page 142) of East Africa (e.g. at Olduvai). Animal forms become extinct in different places at very different times and Africa retained for long faunas which had died out elsewhere . . . we have no rhinoceros or hippopotamus wandering about the Thames Valley at the present time.

The number of extinct mammalian species is, indeed, considerable at all the australopithecine sites—e.g., *Hyaenictis*, *Lycyaena* and various *Machairodontinae* or 'sabre-toothed tigers'.[1] Broom, in fact, was in-

[1] Sabre-toothed fossil bones from Creswell Crags in Derbyshire and from Kent's Cavern in Devon, show that some species of *Machairodontinae* (e.g. *Machairodus latidens*) were still living in Britain maybe less than 100,000 years ago.

clined to attribute at least the Taung, Sterkfontein and Swartkrans australopithecine layers well back into the Pliocene. But he was, like many precursors, apt to overestimate the antiquity of his finds, furthermore he had not at his disposal the evidence now available.

On the other hand, if much of the fauna is archaic, true horse (*Equus*) is present at Swartkrans, Kromdraai and possibly at Sterkfontein, and the presence of the true horse is regarded as a sure indication of Villafranchian dating. Moreover, the fauna associated with the australopithecine remains at Sterkfontein is distinctly Villafranchian as regards rodents and carnivores. We may always bear in mind that the correlation of South African (and indeed of any African) fossil data with that of Europe is made difficult because it is doubtful whether the African Pluvials can be exactly equated with the European glacial epochs in the Pleistocene. G. G. Simpson, for instance, would place the peak-pluvial conditions in Africa a phase later than the glacial maxima in western Europe. The fauna of southern Africa may well have retained a 'Villafranchian' aspect long after the replacement of 'early' by 'middle' Pleistocene fauna in Europe, a movement which began in the latter part of the Günz-Mindel Interglacial. All the faunal remains found with australopithecine fossils indicate animals living in the open country—grass veld or Bushveld.

The general consensus of opinion now is that most of the australopithecine sites date from the time of the First African Pluvial which may antedate the Günz Glaciation in Europe. In any case, we can say that the Australopithecines flourished in early Pleistocene times, let us say a million years ago, and that their history extended farther back in time and that they probably survived until the Günz-Mindel Interglacial—if not until later.

NINE DIFFERENT SORTS OF HOMINIDS

It is, perhaps, not going beyond what the evidence indicates to state that during the Günz-Mindel Interglacial there were in existence on this earth at least nine different sorts of hominids: three types of Australopithecines, the *Telanthropus* in South Africa, *Pithecanthropus modjokertensis* (see page 119), *Pithecanthropus dubius* (see page 121), *Meganthropus* (see page 120), *Pithecanthropus erectus* (see page 111), *Pithecanthropus pekinensis* (see page 128), *Pithecanthropus pekinensis officinalis* (see page 16), and *Atlanthropus* (see page 139). Also possibly the 'ape-like man' from Kwangsi (see page 17). And these, even if we

class all the pithecanthropoid forms together, give us four types whose relationship to each other must have been that of rather distant cousinage.

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4

The Discovery of Man's Antiquity

IF WE drive from London through Dartford, past Swanscombe and on to Dover, then put our car on the Channel ferry and continue from Calais through Abbeville and Amiens to Paris, we pass, in a few hours, through places that have not only yielded some of the most spectacular evidence concerning Man's antiquity but also those where that antiquity was first realized and proclaimed.

In fact, although in recent times the fossil bones of early men have been found mostly in Asia and in Africa, we have here, quite near to us, in our western Europe, not only an unrivalled collection of ancient artefacts and implements, but also specimens of every sort of ancient hominid (except the Australopithecines) as well as the finest examples of prehistoric art.

In the Thames Valley gravels (see page 203) has been found much of the skull of what may well be the most ancient type of *Homo sapiens*, and in the Somme Valley, particularly rich in Old Stone Age artefacts, is Abbeville where lived Boucher de Perthes, the first 'inventor' of ancient stone implements.

It is now well over a hundred years ago since Boucher de Crèvecœur de Perthes described his finds of man-fashioned flints from the Somme Valley gravels in north-eastern France. In that year—it was 1846—Ceselli also announced his discovery in the Tiber's gravels of stone tools (of a sort now known as 'Mousterian', see page 101) associated with the remains of animals long extinct in Italy.

But these men had forerunners. Mercator (1512–1594) seems to have realized that the 'thunder-stones' of Europe were very like the polished stone axes and flints or obsidian arrow-heads of the native Amerindians. A faint flicker of interest in Man's past was indeed aroused by the exploration of the Americas where some Europeans

were inclined to see an idyllic picture of what Man had been in an age of innocence.

However, in Europe anyway (and in Asia no people, not even the Chinese, was concerned with any human origins other than cultural) the whole subject of our early history was obscured and neglected since religious prejudice and dogma prevailed over any sort of evidence—and there was precious little of that.

It is curious to note that as long ago as 1655 one Isaac de la Peyrère got himself into a lot of trouble by his book 'Praeadamitae' (which ran through a number of editions). Isaac was by birth a Protestant and a man of Bordeaux who was led, from his study of Holy Writ, to formulate the theory that there had been *Primi homines ante Adamum.* The scriptural foundation for this daring suggestion was contained in Chapter V of St Paul's Epistle to the Romans, 14th verse, '*in eos etiam qui non peccaverunt ad trangressionis Adami similitudinem*'. We may be inclined to find the text rather insecure a foundation for Isaac's 'theological system from the pre-Adamite hypothesis'. So, apparently, did the French Church authorities, for the author had to flee to the Low Countries; his book was, by order of the Paris *parlement*, burned by the common hangman, and in 1656 Isaac himself was arrested at Brussels but released on condition that he signed a retractation at Rome before the Pope and abjured Protestantism. Isaac bowed to the storm and ended his days as librarian to the Prince de Condé.

The 'pre-Adamite hypothesis' presented two separate creations: (1) that of the world in general and (2) that of Adam and the Jews. The Flood was only partial. It is just possible that Isaac de la Peyrère's work may have served to arouse some curiosity about man's remote history.

In 1723 Jussieu, the botanist, read to the French Academy of Science a paper entitled 'The Origin and Use of Thunder-Stones', and in it he compared modern artefacts from Canada and the West Indies with European 'thunder-stones'—the name generally then given to prehistoric (and historic) worked stone implements. The use of stone knives (mostly for ritual purposes since all ritual is conservative) survived for long in advanced civilizations. Herodotus mentions the stone knives used by Egyptian embalmers and we know from other evidence that such implements were utilized in ceremonial acts. In the Bible story stone knives are employed for circumcision. Livy tells of flint knives used to slaughter the victims sacrificed before the combat of the Horatii.

Conyers in England in 1700 had found a chipped flint axe together

with elephant bones (in London), but the implement was held to be that of an 'ancient Briton' who had fallen fighting against the armies of the Emperor Claudius. After all, Hannibal had led elephants, it was said, across the Alps, why should not Claudius' legions have transported elephants to southern England?

John Frere in 1797 discovered in the brick-earth at Hoxne in Suffolk (four or five miles east of Diss) not only implements of chipped flint but also the bones of large pachyderms and shells of fresh-water molluscs (which he took to be those of marine fauna). Frere made so bold as to advance that these artefacts had been 'used by a people who had not the use of metals', and that they 'belonged to a very ancient period, even before that of the present world'. There was then current an idea that our globe had suffered a series of 'catastrophes' which had wiped out life and left the way clear for new 'creations' of living beings. The famous Cuvier (1789–1832) was to the end of his life a proponent of the 'catastrophic' theory (see page 58). Frere's report, published by the London Society of Antiquaries, attracted no attention from the 'naturalists' and 'antiquaries' of the time.

In the early nineteenth century, Schmerling in Belgium, Buckland and MacEnery in England, Jouannet, Saussure, Tournol, Dumas and Christol in France all thought they had found Man's bones or man-made tools in association with the remains of extinct or long-migrated animals. These men's observations were only in part justified, for disturbance of the deposits had often jumbled together the relics of different ages. Insofar as they called forth any response at all, these researchers' finds aroused much adverse comment. The existence of pottery in some of the deposits was held (rightly) to indicate a late dating, since pottery was an invention of neolithic times.

Many other, and mostly quite invalid, arguments were put forward against the significance of the evidence. The prejudices of the time were strongly opposed to a belief that Man could have existed in remote epochs or that his bones could possibly be of the same age as those of European rhinoceros and hippopotamus. Cuvier, especially, was stout in his declaration that there was not, and 'could not be' any such thing as 'fossil Man'.

Strangely enough, even with those who were, it would seem, but little influenced by theological considerations, the biblical Flood appeared as an undoubted fact. In any case, the prejudices of the time were all in favour of the 'uniqueness' of Man. We must, however, remember that in the earlier part of the last century practically nothing

was known about the archaeology of the Near East, there were no fossil remains of ancient Man available and there was no sort of established chronology for past epochs of the world's history.

BOUCHER DE CRÈVECŒUR DE PERTHES

Boucher de Crèvecœur de Perthes not only bore a curious, and almost improbable, name, but his was a curious life which perhaps accounted in some measure for the disapproval with which his discoveries were regarded. He was, in fact, no naturalist, but an amateur man of letters whose official position was that of head of the Customs House at Abbeville, for in the time of the later Bourbons and Louis Philippe there were still inland Customs houses in France. Jacques Boucher was the son of a father who was an amateur botanist and also director of the *Douane* at Abbeville. Jacques was born at Rethel in 1788 and his mother claimed to be descended from one of Joan of Arc's brothers.

Jacques Boucher de Perthes' own scientific activities occupied only a part of his time. He was man-about-town, novelist, poet and 'metaphysician' as well as civil servant. At seventeen years of age he met, at Genoa, Pauline Bonaparte, the highly temperamental sister of the Emperor, and years later (in 1852 and thus under the Second Empire) he published as *Quelques Lettres de Femme* love-letters supposedly exchanged during this romantic interlude in his life. But all Boucher's writings were inclined to be imaginative and his memoirs *Sous Dix Rois* are, if regarded as sober history, highly suspect. He died in 1868 at the ripe age of eighty. Such, then, was the strange career of the man to whom, after all, we owe the foundation of the science of prehistory and the proof of the immense antiquity of Man.

At Abbeville Boucher was surrounded by friends who were, for those days, excellent naturalists, the members of the local *Société Polymathique.* Boucher de Perthes' archaeological researches began in 1837. Queen Victoria had just ascended the throne of Great Britain. Louis-Philippe was still King of the French. Van Buren was President of the United States in a time of financial panic.

Boucher had observed that neolithic remains were being thrown up by a dredger along the Somme canal. There were broken bones, chipped flints and polished axes—one of the latter hafted in stag's horn. His friend Picard had aroused his interest in 'Celtic remains', and Boucher began to collect the chipped flints unearthed by workmen in the Moulin-Quignon and Menchécourt quarries at the gates of the town. From 1837

onwards Boucher devoted much of his time and thought and, it must be confessed, his considerable natural ability, to the problems presented by these ancient artefacts. Among them were what we should now call 'Chelleo-Acheulian' hand-axes in the high terrace of the river.

Boucher first announced his discoveries in 1838. In 1846 he repeated his claim that he had found man-made flint tools in the Somme gravels. In 1847 he published his *Antiquités Celtiques et Antidiluviennes*—whose very title indicates how far he was from rejecting some of the traditional dogmas about Man's history. The book pleased no one. Some of the scientists of the time were put off by Boucher's preconceptions about a Flood while of course the 'fundamentalists' would not hear of Boucher's discoveries at all.

Few declared outright that Boucher was a liar or a forger, but they maintained he had been fooled by his workmen and that his enthusiasm had got the better of his judgement. And, as a matter of fact, he was often deceived by the workmen who, encouraged by the rewards he offered, fabricated 'artefacts' and, in one notorious instance, introduced (probably from a cemetery) a jaw-bone into the gravels at Abbeville. The fraud was, in a way, an early version of the famed Piltdown fake, for this Moulin-Quignon mandible (1863), though of quite *sapiens* type, was, until comparatively lately, held by some to prove that men like ourselves inhabited northern France in very remote epochs.[1] But together with the fakes were real, authentic ancient man-made stone implements discovered in the same deposits as the bones of long extinct mammals.

PREHISTORY AS A SCIENCE

By 1854 Boucher had made an important convert. A Dr Rigollet of Amiens, a noted naturalist in his day, went out to confound Boucher at the Saint-Acheul gravel-pits[2] near Amiens, but there he himself found stone 'axes' in the 'diluvial' gravels of the old Somme's course. Little by little, some of the more enlightened French scientists came round to Boucher's point of view—Geoffroy Saint-Hilaire, Quatrefages, and Littré—and to realize that Boucher had stumbled upon evidence for the existence of Man, not just before the biblical Flood, but in times so

[1] Fluorine tests applied to the jaw (see page 106) have shown conclusively that it is quite modern, though it is of course possible that during the Mindel-Riss Interglacial (see page 40) there lived men much more like ourselves than anyone would have dared to maintain until a comparatively short time ago.

[2] From which place was derived later on the term 'Acheulian' for one type of ancient hand-axes (see page 99).

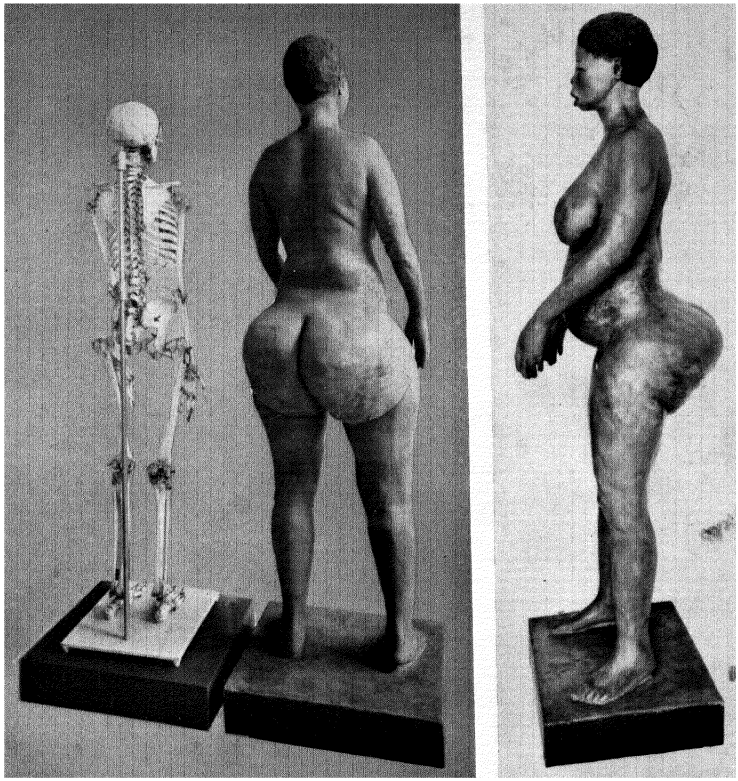


PLATE V

The Hottentot Venus

Right: Cast of body

Left: Cast compared with skeleton

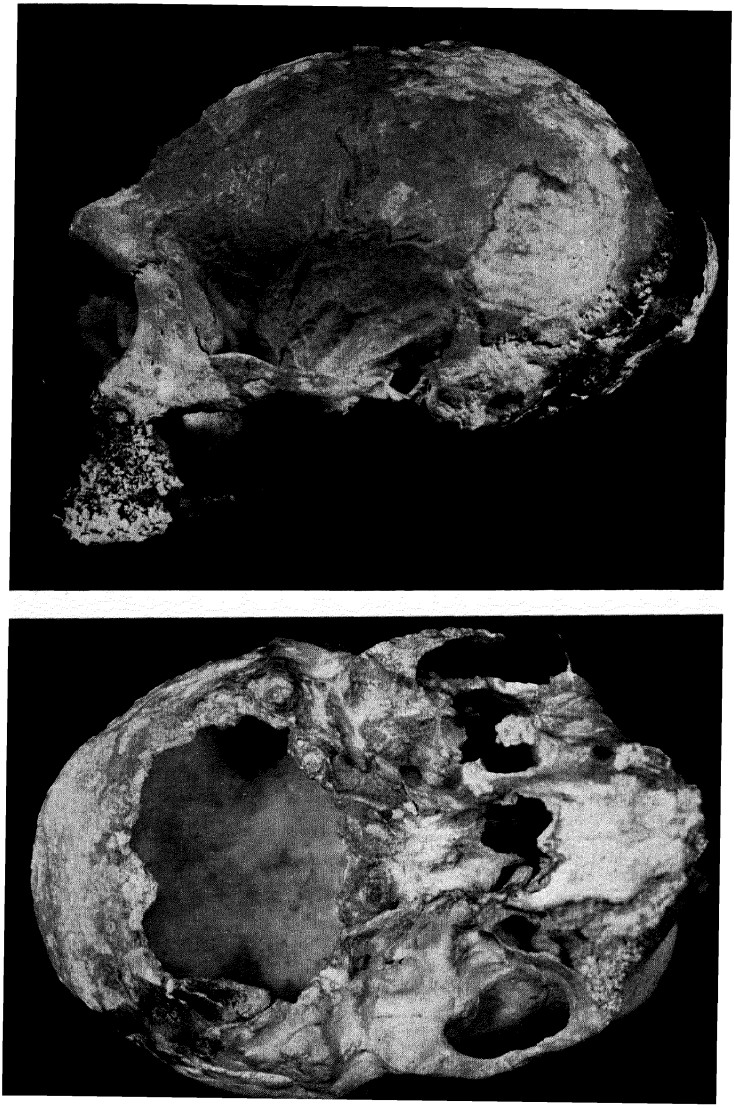


PLATE VI

Above: Monte Circeo skull, left side

Below: Monte Circeo skull, base

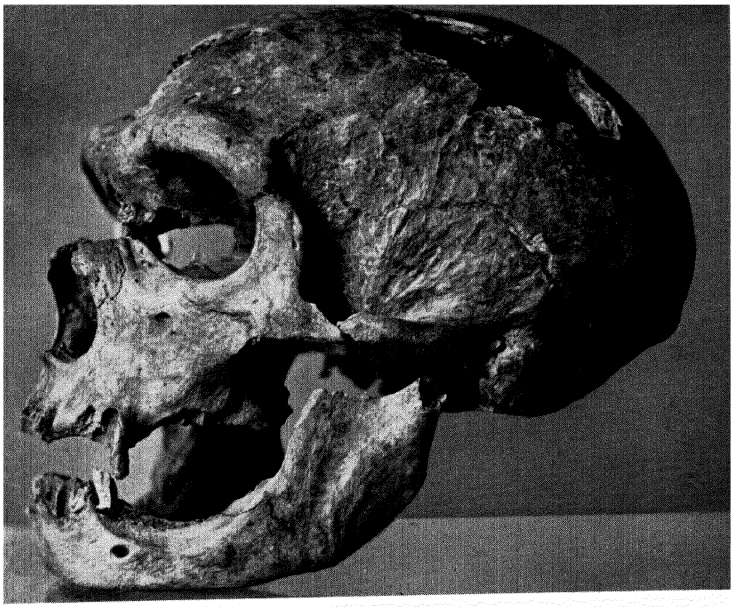




PLATE VII

Above: La Chapelle-aux-Saints skull

Below: Neanderthaloid jaw from Monte Circeo



PLATE VIII (a)
Tana della Básura footprint, probably neanderthaloid



PLATE VIII (b)
Aldène cave footprint of *Homo sapiens*

remote that to fit them into the world's record all the current ideas about Man's history must be revised.

Despite, however, the favourable impression produced upon some French authorities, the authenticity of Boucher's discoveries was, in fact, established by British men of science. In 1859 Prestwich, a noted geologist, Falconer, Flower and a young archaeologist named John Evans went over to Abbeville and Saint-Acheul in order to test Boucher's claims. They themselves unearthed artefacts *in situ* and they left for England, convinced that Boucher was right. Then in the Thames Valley gravels they discovered analogous artefacts.

The science of Prehistory had been founded.

THE WAYS OF MAKING A STONE IMPLEMENT

There are just two ways of making an implement out of a piece of stone. And both ways, as we can prove to ourselves if we sit down on the beach and experiment a little, present endless difficulties. It cannot be too much stressed that stone-knapping, the fashioning of stone artefacts by our remote ancestors, was an art that demanded a long apprenticeship and long practice. Even the so-called 'primitive' types, such as Acheulian cores call for a high degree of skill in their preparation, whereas such beautiful objects as the famed 'laurel-leaf' blades of the Upper Palaeolithic (Solutrean) are works of art whose makers were very skilled craftsmen.

The two ways of making a stone implement are (1) by chipping away bits of the stone so as to leave a more or less sharp-edged core and (2) by striking a flake off the stone and using the flake.

Core and flake implements are found together from very early times, though it is possible that the core-implements of the 'Pebble Culture' type (see page 84) were the first of stone artefacts.

FLINTS

Flint is the most satisfactory of all stones for knapping, but when early Man could not find flint he used all sorts of other stones—quartz, quartzite, chert, chalcedony, obsidian and so forth. Flints do not occur by any means everywhere and flint may well have been one of Man's earliest imports and exports—sometimes bartered maybe for objects of magical significance.

Flint is a very hard and homogeneous siliceous material, it retains

a sharp edge for a long time, yet by a skilled knapper it can be readily chipped. It occurs as nodules in chalky formations. The nodule itself may be used as an implement after flakes have been struck off until the desired shape has been obtained. Again, what is much more common, the flakes themselves are used as implements. Flakes were frequently retouched after they were detached.

In the Lower Palaeolithic classical sites in the Somme River terraces (Abbeville, Saint-Acheul, etc.) there are many 'hand-axes' (*coups de poing*) though flakes were also used.[1] Of these artefacts the 'Abbevillian' (formerly 'Chellean') were the more crude, the Acheulian more carefully finished.[2] Of the Lower Palaeolithic flakes, 'Clactonian' and 'Levalloisian', the latter consist of a large thin flake struck from a prepared core.[3]

In late Riss-Würm and early Würm glaciation times in Europe, flake tools carefully shaped by retouching (and with traces of other techniques) form the so-called Mousterian complex. It is, therefore, tempting to equate Neanderthaloids with Mousterian culture, that is to hold that the Neanderthaloids alone made and used such artefacts and that they employed no others. But this view seems much too simplified now. 'Mousterian' occurs in Palestine, in Turkestan, in Siberia (with Levalloisian flakes) and is widespread in Africa, but in many parts of Asia no Mousterian is recorded, though that does not mean that there were no Neanderthaloids in those regions.

Furthermore, the whole subject of artefacts and their classification is more or less in the melting-pot, and we are inclined to spend less time over this matter (in a book primarily about man's body and not his works) than we should have been tempted to do only a few years ago.

TWO ANCIENT PROVINCES

In early palaeolithic times the Eurasiatic continent seems to have been divided into two vast provinces. To the north of the great mountain barrier that scores the double-continent from west to east

[1] The word 'hand-axe' is particularly unsuitable since many, if not most, of them are chipped all round so that they could not possibly be held in the hand. No doubt they were hafted in some way.

[2] Acheulian *coups de poing* appear to have lasted for a very long time and are found in Africa, western Europe, southern Asia, etc.

[3] In India, Burma and China during Mid Pleistocene times massive, crude choppers were common and may be proof of the presence of Pithecanthropoids (see page 122).

we find flakes. South of this Great Divide flakes and cores appear together.

ACHEULIAN CULTURES

It is possible that during the rigours of the Mindel glaciation Europeans, with their Abbevillian culture, retreated to Africa since there is a great Eurafrican core-province over which is distributed a generalized type of Abbevillian tool. These hand-axes last long in Africa, and types merge into one another with an unbroken continuity, suggesting no great climatic changes involving the disappearance and reappearance of populations.

After the end of the Mindel glaciation we find in Europe a new sort of artefact, the so-called 'Lower Acheulian', fully developed, and Acheulian core-production lasted in Europe until it was caught up by and integrated into the Mousterian complex.

During the Great Interglacial (the Mindel-Riss) the core-tools of north-western Europe were exclusively of 'Early' and 'Middle' Acheulian types whose origin most probably must be sought in Africa or Asia. The Acheulian hand-axes are thinner, finer and more skilfully fashioned than the Abbevillian, and the Acheulian implement can be reproduced by striking the flint core (held in one hand) with a wooden baton.

LEVALLOISIAN TECHNIQUE

Before the onset of the Riss glaciation the Clactonian flake-tool is still found. In the Clactonian technique a core of flint has a flake knapped off to furnish a striking-platform on which the knapper struck a blow obliquely (as the core rested on an anvil of rock), so as to detach a sharp-edged and fairly flat flake. Later Clactonian artefacts were produced by 'pressure flaking' with wood, and in this manner finer and more regular trimming was effected. All Clactonian tools have the striking-platform at an angle of about 120 degrees to the long axis of the flake.

So in Mindel-Riss interglacial times we have both Acheulian core-industries and Clactonian flake-industries side by side. However, before the onset of the Riss glaciation, the evolved Clactonian seems to have given rise to a new flake-culture, the 'Levalloisian' in which the flakes were detached in the following way: first of all blows were directed to produce a faceted striking-platform, then a blow aimed inwards stripped

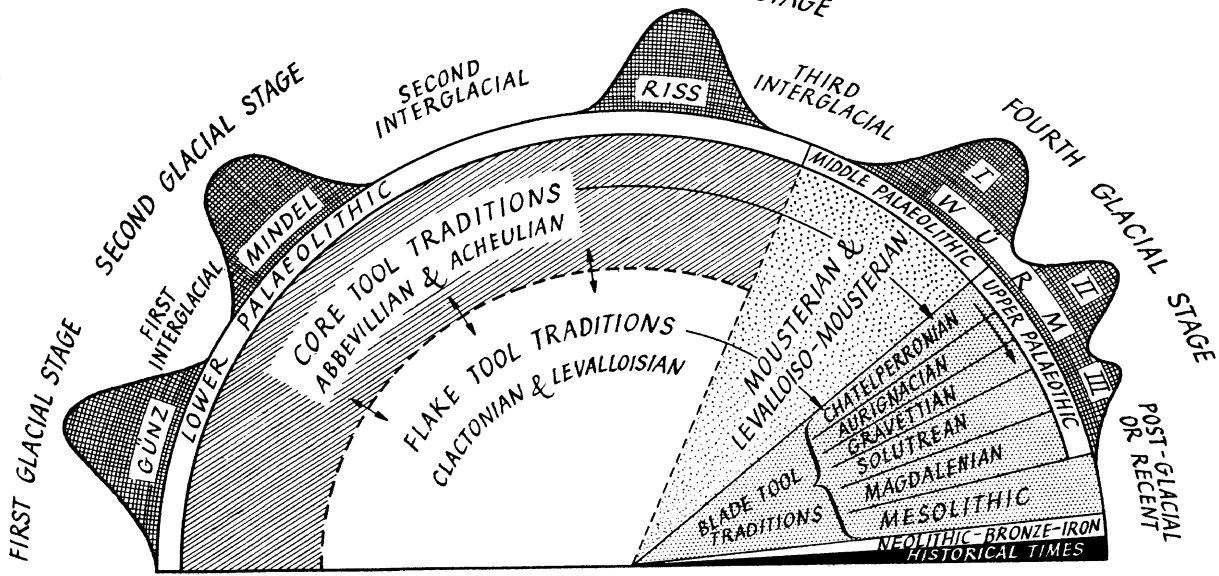


FIG. 4. Prehistoric Ages. An attempted chronology and correlation of glacial stages and industries. (*Musée de l'Homme*, Paris)

off a flake with a base at right-angles to the long axis. The Levalloisian artefact can be reproduced (and perhaps only produced) by vertical blows delivered by a hammer-stone on to a nucleus. This technique was a great improvement on the old Clactonian, which consisted essentially in bashing a flint against a stone anvil. Levalloisian seems to have preceded Mousterian, anyway in western Europe.

MOUSTERIAN CULTURE

Mousterian artefacts are mostly chipped on one side only so that their reverse shows a bulbar or 'conchoid' surface revealing where the flake has been stripped off the core. The typical Mousterian flake has a thick base and is roughly triangular. The other 'general' Mousterian tool (though there are further types) is the so-called 'side-scraper' flaked on one side and then retouched. There are also a few 'end-scrapers' and occasional 'choppers' or heavy blades with thick backs and edges sharpened on both faces so as to produce a cleaver-like tool. We may, however, bear in mind that the (often fanciful) names given to artefacts by prehistorians have been awarded without any clear knowledge as to what was the precise function (if any) of a given implement. In Europe, anyway, the 'disk-industry' known as 'Languedocian' precedes 'real' Mousterian towards the end of the Riss-Würm Interglacial, whereas 'Tayacian' (found with Fontéchevade Man, see page 204) —derived, apparently from Clactonian, but influenced by Levalloisian technique, seems, in a measure, to be preparatory to 'real' Mousterian. Up to now when artefacts have been found in association with the remains of European Neanderthaloids, they have been of general 'Mousterian' type, at least, this holds good for Neanderthaloids of the 'extreme' or 'classic' sort. But we should not conclude from this that any sort of industry was the exclusive property of any sort of hominid (see page 123). Many of the artefact specialists are inclined to think that there is no 'real' separate Mousterian industry at all. Furthermore, Mousterian implements are not found before the Würm glaciation (in Europe) and therefore at a period long after the appearance of the Neanderthaloids in the Riss-Würm Interglacial.

LARTET'S WORK

On 26 May 1859—a date which should be as memorable as that of 1st July 1858, when the Darwin and Wallace paper was read before the

Linnaean Society—Prestwich made a communication to the Royal Society and in it accepted the claims of Boucher de Perthes and of Rigollet. In the same year Lyell (who had first suggested the names of 'Oligocene', 'Miocene', etc., which are still used to designate subdivisions of the Tertiary) published his 'Antiquity of Man' and in 1859 also Albert Gaudry[1] conducted excavations at Saint-Acheul and at Amiens.

Edouard Lartet (1801–1871) must, however, be considered as the pioneer of prehistoric research in what has proved to be the richest of all areas in Europe—that of the Dordogne. In 1861 he conducted the first systematic examination of a prehistoric cave, that of Aurignac (hence the name 'Aurignacian') in the Haute-Garonne department. His report revealed the earliest notes we have of something of the life of Late Palaeolithic Man. Lartet's books ('On the Antiquity of Man in Western Europe') were perspicacious and clearer and better arranged than those of either Lyell or Geikie in Britain.

Lartet one day received a box of bones and worked flints sent him by a collector of fossils who stated that he had removed them from a cave at (the now renowned site of) Les Eyzies in the Vézère Valley of the Dordogne. The sender added that 'all the Périgord' was rich in similar objects. Lartet passed on the news to an English friend, Henry Christy, who, in 1863, financed a season's dig in the Vézère Valley.

The results of the excavation were startling. The Vézère region was revealed as one exceptionally rich in traces of early men, so rich, indeed, that it is from typical sites in the area that most of the names have been taken which designate the industries and culture-phases of men of the Upper Palaeolithic. It is in this same Vézère Valley, moreover, that have been discovered many of the most striking prehistoric painted and engraved caverns (e.g. Font-de-Gaume, Lascaux, Les Combarelles, etc.). Exploration is still going on to this day and Professor Movius's dig at the Abri Pataud (not far from the Cro-Magnon site, see page 233) has revealed illuminating data regarding the succession and the dating of late palaeolithic cultures.

Lartet was able, as a result of his discoveries, to sketch out a provisional classification of prehistoric eras under zoological appellations: e.g. the 'Hippopotamus Age', the 'Great Bear and Mammoth Age' and

[1] Albert Gaudry (1827–1908) was the discoverer of the Pikermi fossils in Greece (see page 53). He was an evolutionist and the first holder of the chair of Palaeontology in the Paris *Muséum d'Histoire Naturelle*.

the 'Reindeer Age'. Lartet's classification, with some modifications, held the field until about 1880, when Gabriel de Mortillet, of the French Museum of National Antiquities at Saint-Germain-en-Laye near Paris, began his substitution of archaeological designations for zoological ones. The 'Hippopotamus Age' became the 'Chellean' (from

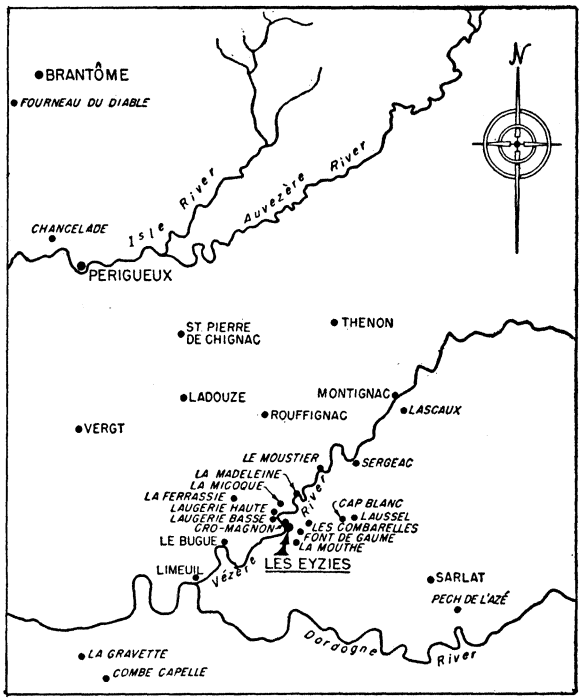


FIG. 5. Map of the Vézère Valley Region in South-Central France, showing the principal prehistoric sites.

the site of Chelles to the west of Paris where very primitive sorts of hand-axes were found), some of the 'Mammoth and Great Bear Age' became the 'Mousterian' (from the cave of Le Moustier in the Dordogne, see page 101), and so on.

In 1865, at a special meeting of the Italian Society of the Natural Sciences (held at Spezzia), it was decided to set up an International

Congress of Anthropology and Prehistoric Archaeology and this Congress still flourishes.[1]

FINDING THE EVIDENCE

Since the idea of very ancient Man seemed absurd to most people only a hundred years ago, we need not be surprised to note how recently discovered has been the evidence of our ancestry.

In 1832 Tournel and Christol found human teeth and bones with pottery in a breccia formation containing fauna, 'some extinct', at the Bize cavern in the Aude department of southern France. In 1848 the first Gibraltar (neanderthaloid) skull was discovered and remained neglected until Busk described it in 1868. The famous Neanderthal remains themselves were unearthed in 1856. Thus in 1858, at the time of the Darwin and Wallace paper, very few remains of ancient man were known. The science of human palaeontology developed with the study of the first neanderthaloid remains (see page 148).

As late as 1910 the veteran anthropologist E. B. Tylor wrote:

'The existence of man in remote geological time cannot now be questioned, but . . . no bones with the exception of the much discussed *Pithecanthropus*' (see page 111) 'have been found which can be regarded as definitely bridging the gulf between man and the lower creation. It seems as if anthropology has, in this direction, reached the limit of its discoveries.'

Commenting on this opinion—which seemed fair enough when it was offered, although the language in which it is stated may appear to us rather old-fashioned—in 1921 Elliot Smith was able to declare:

'This prediction has fortunately been stultified almost every year since it was made.'

If, however, we take the year 1912—less than half a century ago—when Duckworth's excellent and sane little book 'Prehistoric Man' was published—the only really significant remains of very ancient men were a few neanderthaloid specimens, the *Pithecanthropus* skull-fragment and the Mauer jaw.

In these circumstances, it is not so surprising that the Piltdown fraud was successful. So little was known of the course of hominid

[1] Now, however, divided into two (1) The International Congress of Anthropological and Ethnological Sciences, held every four years, and (2) The International Congress of Prehistoric and Protohistoric Sciences.

evolution that the monstrous 'Dawn Man' of Sussex did not strike many people as an impossibility. At times the oddest identifications were made. In 1840 Richard Owen, the famed palaeontologist, recognized as hominid a mandible fragment and a portion of a skull (from the *Tertiary* London clay) which, in effect, were parts of a *Hyracotherium* one of the early European horses.

THE 'MISSING LINK'

The fossil remains of early man are, indeed, distressingly few, although those of some other mammals are most abundant. Maybe man, until comparatively recently, was rather a rare animal. In any case, if he was eaten by his own kind (see page 193), his bones would hardly be preserved. If he drowned the chances of any of his bones surviving to become fossilized were remote. If he was killed by wild beasts his bones would be crunched to bits. He did not congregate, as did so many other mammals, around ponds, lakes and pools where his bones might be washed into bone-beds.

Still, all the same, even if our ancient ancestors were not very numerous, the relics we have of them are just those of a few individuals out of hundreds of thousands. And these hundreds of thousands, we may be sure, showed a very considerable degree of individual, sexual and geographical variation. It is easy to multiply 'races' and 'species' because the material we have is so scanty. Nearly every specimen seems to be 'unique' because we have not enough others similar, but not quite identical, to show us the gradations and 'normal' variations. It is rather as though we had a few dozens of Australoid, Mongoloid, Negroid, Alpine or Mediterranean skulls of *Homo sapiens* and concluded from this evidence that the world was peopled with absolutely distinct 'races' all of which showed little or no variety within themselves, instead of by forms merging into one another. In such circumstances what chance have we of hitting upon the ancestors of any given variation? Precious little.

C. Arambourg, the French palaeontologist, has said that we may take it there was 'discontinuity in macro-evolution, no orthogenesis (in the "finalist" sense of the word), and above all no orthogenesis applying to an assemblage, but rather an increasing specialization to a determined function favoured by natural selection utilizing the most suitable mutations'.

In the early part of this century the phantom of the 'Missing Link'

(as imagined by Ernst Haeckel, see page 111) long bedevilled anthropology. To such preoccupations we owed in large measure the classical description of the Neanderthaloids (see page 155) as shuffling, 'simian' creatures, shaggy and with heads lolling forwards.

The Link is Missing because it never existed. Our genealogical tree is not a straight palm shooting up to the heights and bearing a proud crown (US) but rather, as we have seen, a very tangled, thorny and bristling bush (see page 60).

THE 'CRADLE OF MANKIND'

It would not be fair to say of the words 'Cradle of Mankind' that they are as meaningless as 'Missing Link', but the chance of our ever being able to say 'Here it is' . . . 'within this area, the first hominids appeared' —is remote indeed. Succinctly we might however say this:

Men and apes are creatures which must have originated in a warm climate. We do not know, of course, when our ancestors lost most of their body-hair but it must have been a long time ago. There is no evidence to show that the Neanderthaloids—or the Pithecanthropoids —were as hairy as gorillas.

It is possible that the crucial epoch for hominid evolution was the late Villafranchian (see page 39), that is what is now counted as Lower Pleistocene, since climate was, on the whole, all over the world a good deal warmer than it is now. We shall probably not be far wrong if we assume the transition from the 'pre-hominid' (say a form just ancestral to the Australopithecines) to the hominid, though this may have been a complicated process both in time and space, occurred where warmth-loving animals could live and prosper.

The 'Cradle of Mankind' or, as we should say, the differentiation area, must be set probably somewhere in southern Asia or in Africa.

COMPARATIVE DATING OF FOSSIL BONES

In addition to the methods for the absolute dating of fossil bones (see page 197), there are methods for comparative dating and although these may seem to give less spectacular results than the former, they are of the highest importance.

Since buried bones lose their protein at a slow, and, under comparable soil conditions, a fairly uniform rate, the relative ages of fossil

bones, at some sites, may be determined by comparing their organic contents (carbon, nitrogen and chemically bound water) which decrease with age, or, again, by comparing the quantity of mineral left after burning, for this quantity increases with age. The organic matter in bones (fats, protein, collagen, etc.) is gradually lost but the fatty matter is lost quite rapidly after burial. The proteins disappear much more slowly and in some conditions (where air and bacteria are excluded) may persist almost indefinitely.

The changes which take place during the fossilization of bones are, indeed, of two sorts: there is a decrease in the amount of organic components (notably protein), but there is also an increase in the matter absorbed by percolating moisture—especially fluorine and uranium. Since fossils in similar conditions in the same deposit will present the same amount of uranium or fluorine—if the fossils are of the same age —we can determine, by estimating the amount of these elements, whether one bone is older or younger than another bone found in the same level of the same deposit.

The mineral matter in buried bones is indeed subject to change depending on the composition of the percolating ground-waters. Such change is of two sorts: (1) alteration of the phosphatic mineral of which the bones are mainly composed (hydroxyapatite); and (2) the addition of new matter (e.g. lime or iron oxide) into the pores of the bone —which open with the decay of organic matter. However, these changes are so rapid and can be so easily reversed (e.g. by additional mineral matter being dissolved out owing to some change in local conditions) that they are unreliable as a means of establishing relative dating.

The change in the mineral composition, valuable as a criterion of age, is that of the slow alteration that occurs through the irreversible substitution of one element for another in the hydroxyapatite. The two elements which thus accumulate irreversibly are uranium and fluorine.

THE RADIOMETRIC ASSAY METHOD

This method presents the advantage of causing no destruction to material such as is inevitable with the fluorine method (see below), and it can be applied to fossils from limestone formations, and much of the fossil Primate material is from such formations.

The natural process which allows of this method being applied is as

follows: Mineral phosphates (including fossil bones) contain uranium and uranium circulating in the blood-stream is fixed in the phosphatic matter of the bones by what is, apparently, a replacement of the calcium atoms in the hydroxyapatite (see below). There is also a process of replacement in bones buried in deposits through which there is a percolation of ground-water containing traces of uranium. And much, if not most, of such water does contain traces of uranium. Thus the longer a bone has lain in such a deposit, the more uranium it will have absorbed. Since uranium is radioactive it is possible to estimate the uranium-content of a fossil by counting, in suitable conditions, the rate of its *beta* radiations. In fact, you can use a Geiger counter on fossil bones.

It must be stressed that the above method, and also the fluorine method, mentioned below, do not afford any *absolute* dating for fossils, but the methods do permit us to say whether or not different fossil bones discovered in one and the same deposit are, or are not, of the same age.

Thus, the Swanscombe skull parts are of the same age as the associated fauna (see page 203) and in any site, generally speaking, it can be determined whether hominid bones are 'intrusive' (i.e. were buried down into existing strata or layers) or whether they are contemporary with the other mammalian bones, and as we know a good deal about the succession of many mammalian lines (for which the palaeontological evidence is incomparably more rich than for the hominids), we have valuable data even for absolute dating—in some cases, and indirectly.

THE FLUORINE METHOD

This, as we have noted, necessitates the destruction of the specimen submitted to examination. This method, which proved so capital in exposing the Piltdown fraud and in determining the relative dating of a number of other questionable fossils, e.g. the Galley Hill skeleton (see page 202), owes much to the work of Dr Kenneth P. Oakley.

Fluorine is a poisonous element which does not occur free (as a gas) in nature, but is widely distributed as soluble fluorides of which traces may be found in almost all ground-waters. When fluorine ions come into contact with bones (and teeth) they are absorbed and become locked in, since they replace the hydroxylions in the ultramicroscopic crystals of the hydroxyapatite of which the bones are composed.

Fluorapatite is less soluble than hydroxyapatite, so when the fluorine atoms have become fixed in bone they are not dissolved out except in conditions which would destroy the whole fossil bone. Thus bones which have lain for the same time in a particular deposit will all have, approximately, the same fluorine content.[1]

[1] See K. P. Oakley 'Dating Fossil Man'. It may be mentioned, as a curiosity, that some progress has been made in determining the blood groups of individuals whose fossil bones have been recovered. Only A and C have up to now (1960) been recognized.

5

The Pithecanthropoids

EUGEN DUBOIS

THE story of Eugen Dubois (a Dutchman despite the French name) is rather a curious one. He was born in 1858, studied medicine, and by 1886 was a lecturer in anatomy at Amsterdam. In those days he would often declare that Man arose either in Africa 'where the gorilla and chimpanzee exist' or in the Indo-Malayan region 'where there are orang-utans', though his suggestion that the presence of anthropoids in any given area today, indicates that, in the past, 'Man arose' there, is not very illuminating, at least in the light of the knowledge we have now.

It was, no doubt, with the idea of probing into the evidence in the 'Indo-Malayan region' that, in 1887, he applied for, and obtained, a job in the Netherlands East Indies. In that year he arrived in Sumatra and made his headquarters at Padaung (Padang) on the western coast of the island.

Sumatra and Java—though a narrow strait of not more than fifteen miles broad separates them—are lands different in their geology and geological history. Sumatra is, in effect, a peninsula now detached from the mainland of south-eastern Asia while Java is an island of recent date that was represented, until about a million years ago, by a cluster of volcanic islets. Though Sumatra is more than three times as large as Java (178,338 square miles as against 48,504 square miles) it is sparsely populated whereas Java is one of the most densely populated regions of the globe and has a more fertile soil than Sumatra. Still, Sumatra must hold in its immense area relics of early hominids. If there were Pithecanthropoids in Java and in southern China it looks most probable that they also inhabited Sumatra at some epochs.

WADJAK AND KEDUNG BREBUS

Dubois did a good deal of prospecting in caves but found nothing of any great significance. In 1889, however, the first Wadjak skull (see page 214) was discovered in Java and when, in 1890, Dubois was transferred to that island, he went to Wadjak and there unearthed a second skull of the same type as the first. He did not, however, reveal what he had found until 1918, and did not publish any description until 1922, over thirty years after making the discoveries.

On 24th November 1890 at a site called Kedung Brebus some twenty-five miles to the south-east of Trinil (see below) he recovered a small, badly preserved fragment of a hominid mandible and also a tooth. The lower jaw seems to be of a type very like that of a (female) *Pithecanthropus* and should, probably, be classed as *Pithecanthropus erectus I*—then the famous *calotte* would rank as *P. erectus II.* In 1890 also Dubois unearthed a left thigh-bone and two upper molars which are possibly those of an orang-utan.

In September 1891 in a cave on the banks of the Solo River near Trinil, he recovered a right upper last molar that looked hominid but still was of unusual form. Dubois himself attributed this tooth to a 'chimpanzee'.

PITHECANTHROPUS I SKULL FRAGMENT

This consists only of the upper part of the calvaria—the occipital bones are lacking and, in front, only the ridge or torus over the eyes exists. The bone is very dark brown in colour and much corroded by acid ground-waters. The *calotte* was found, by Dubois's Javanese diggers, three months after the 'chimpanzee' tooth and only ten feet away from it. Dubois, at first anyway, attributed the skull fragment also to a 'chimpanzee' though, of course, there is no evidence to indicate that chimpanzees (or gorillas) ever existed in Asia.

It was not until 1894 that Dubois sent a report on his 'chimpanzee' to Haeckel of Jena, at that time regarded as the foremost authority on hominid palaeontology. Haeckel (1834–1919) had indeed, in his book *Natürliche Schöpfungsgeschichte* (1868), presented a 'family tree' of mammals, the twentieth stage of which was that of the anthropoids, the twenty-first stage that of the *Homines.* The clumsy (and tendentious) name of *Pithecanthropus* was not, however, of Haeckel's invention. He had borrowed the term from the works of a philological

philosopher or a philosophical philologist named August Schleicher.[1] Dubois, no doubt, adopted the name *Pithecanthropus* as a tribute to Haeckel.

In 1895 Dubois returned to Europe for good and made a communication on his finds to the Third International Congress of Anthropology held at Leyden. Virchow, Mack, Flower and Milne-Edwards, among others, commented on and described the relic which was also shown in Liége, Paris, London, Dublin, Edinburgh, Berlin and Jena.

Controversy raged about this relic of 'Trinil Man'. T. H. Huxley, who was still alive when the discovery was made, guessed that the bones were those of a very early type of man. Virchow, however, was as stoutly opposed to the hominid status of the Java fossil as he had been to that of the Neanderthal skeleton (see page 148). Many years passed before the *Pithecanthropus* was generally recognized as hominid. Weinert called the skull-fragment 'more nearly resembling a chimpanzee than a gibbon', and as late as 1921 the late Marcellin Boule was still maintaining that *Pithecanthropus* was an ape—probably a gibbon.

Before, however, we get too wise after the event, we may reflect that the evidence, which would have settled the question, once and for all, in the 'nineties of the last century, was withheld by Dubois whose whole attitude with regard to his finds in Java was a strange one.

THE TRINIL SITE

The original *Pithecanthropus* skull-fragment was unearthed from a layer of volcanic *lapillae* overlying a conglomerate stratum of marine origin. Nearby, in the same deposit, were recovered bones of hippopotamus, rhinoceros, deer, stegodont elephant and some tailed monkeys. No artefacts were present. The famous *calotte* was, however, not found in quite satisfactory stratigraphical conditions. It may have been subject to fluvial action, i.e. been washed about in a river.

During the dry season of 1892 Dubois discovered, about fifteen yards upstream and in the same level as the skull, a fossil femur not readily distinguishable from that of *Homo sapiens* and obviously belonging to a creature which walked upright. Dubois, who rejected the idea that femur and *calotte* might belong to the same type, named the owner of the femur *Anthropithecus erectus*. Indeed, for years afterwards, the general opinion was that femur and skull must have come from two

[1] August Schleicher (1821–1868) held the chair of Philology at Jena from 1857 until his death.

different creatures, for how could so ape-like a being have a limb-bone so resembling our own?

At one time Dubois seemed ready to admit that his *Pithecanthropus* was an early type of hominid. At other times he maintained that what he had discovered was the relic of a 'gigantic gibbon'. Moreover, until his death he persisted in dating *Pithecanthropus* back to Pliocene times.[1]

Not unnaturally, attempts were made, from time to time, to find further traces of the Java 'ape-man'. In 1906 Emil Selenka, professor of zoology at Munich University, was to have led an expedition but died before he could set out. His wife, in 1907, together with the German geologist Elbert and the Dutch mining engineer, Oppenoorth (see page 180), visited Java, dug at the Trinil site, unearthed an abundant fossil fauna but found no traces at all of any *Pithecanthropus*. The sole hominid mandibular tooth recovered (and attributed, for a time, to *Pithecanthropus*) is of *Homo sapiens*.

However, the expedition produced one happy result, it induced Dubois to do some publication, thus, in 1907 and 1908 he issued two small monographs on the Trinil fauna but they were very summary.

From time to time, thenceforth, there would be rumours that pithecanthropoid remains had been found but all these reports were erroneous. For instance, on 27th December 1926, it was reported in the Batavia Press that Dr C. E. J. Heberlein of Surabaya had found another *Pithecanthropus* skull at Trinil, but the 'skull' was an isolated spheroid joint from the upper foreleg of a huge elephant.

However, after he had published (and at Weinert's insistence) his memoir on the two Wadjak skulls (see page 214), Dubois finally decided in 1922 (that was over thirty years after his Java discoveries) to open up his cases and boxes. He produced from them no less than four femora similar to the first. Indeed, when the material was re-examined in 1935 a fifth femur was recognized. It had become fairly obvious that the long bones really did belong to *Pithecanthropus erectus*, and that he was a hominid who walked upright, though maybe his face was rather ape-like.

[1] Or, maybe, we should say to what counted as Pliocene in those days (see page 39). In his last published paper ('Early Man in Java and *Pithecanthropus*') Dubois insisted that his *Pithecanthropus* was 'a gigantic gibbon as the calvaria indicates'. In this publication he admitted, curiously enough, that Modjokerto Man (see page 118) was hominid and of 'proto-Australian type' but he asserted that neither Modjokerto Man nor Solo (see page 179) had 'anything to do with *Pithecanthropus*'. Rhodesian Man (see page 173) Dubois, acutely enough, stated resembled Solo Man. See 'Early Man in Java and *Pithecanthropus erectus*' by Eugen Dubois, Curator of Palaeontology and Mineralogy in the Teyler Museum, Haarlem, Holland (1937).

The fluorine content (see page 106) of the *Pithecanthropus I calotte* and that of the long bones recovered by Dubois is the same, that is to say both sets of fossils lay in ground-waters for the same length of time. Moreover, both calvaria and long bones came from the same level of the Trinil site. Dubois also produced three lower premolars of *Pithecanthropus* and two large molars belonging to extinct orang-utan (see page 111).

Nevertheless, Dubois was unshaken, apparently, in his opinions even by the additional *Pithecanthropus* material discovered by C. R. von Königswald (see page 115) and persisted in calling his find a 'giant gibbon' and also in describing the 'Sinanthropus' (see page 128) as a 'degenerate Neanderthaloid'.

Thus although Dubois could have, at the time of his return to Europe in 1895, produced evidence to show that his *Pithecanthropus* stood on its two legs like modern man, he preferred to obstruct research for many years. It must be admitted, of course, that sixty years ago, and more, there was no fluorine test available and also that the idea of early Man with a 'primitive' sort of head and face but with perfectly 'human' posture, was hardly entertained. It is only comparatively recently that we have come to see that man walked like a man before he looked like one (see page 79).

There is, however, a curious detail of Dubois's private life that throws a good deal of light on his doubtfully ethical conduct, at any rate from a scientific point of view. He lived with two old sisters who exercised a good deal of influence over him. Their pious 'fundamentalism' no doubt prevented him from publishing evidence which might seem to run counter to accepted religious beliefs.

JAVA'S PAST

Java is a region which plays such an important part in our story that it is worth while glancing at the geological history of the island.

The overall picture of south-eastern Asiatic geography during the Pleistocene is something like this: Java, at least, was not dry land (or at the most was represented by a chain of fairly large volcanic islands) until post-Villafranchian times, that is to say, until the Mid Pleistocene.

Sumatra and Borneo were not only, it would seem, dry land throughout the Pliocene but also had some land connection with the continent of Asia. It is, indeed, fairly certain—judging only by the distribution of the fauna—that both Borneo and Sumatra were linked

with southern China. Whether the land-bridge was between southern China and Borneo or whether Borneo's link with the mainland was through Sumatra is not clear. Possibly, probably even, sometimes Borneo was directly linked and sometimes joined through Sumatra. Anyway, the straits between Sumatra and Borneo are studded with islands and islets (e.g. Banka and Billiton and their satellites). Moreover, both Sumatra and Borneo are on platforms and a fall in the sea-level of, say, 130 to 150 feet would link up all the island-world of western Indonesia. We may also bear in mind, when we are considering eustatic sea-levels, that rise in the level (due to the melting of ice-caps) is complicated by the upthrust of the continental masses themselves.

There are in Java two main series of Pleistocene strata (1) the 'Solo' and (2) the 'Karst. It is the 'Solo' layers which have yielded human remains. The 'Karst' has revealed specimens of man's implements and also animal bones but no hominid fossils.

The 'Solo' layers are divided into:

(*a*) The 'Djetis' due to lake sedimentation and volcanic action.
(*b*) The 'Trinil' formed by river and volcanic action.
(*c*) The 'Ngandoeng' due to river action.

The deposits in which the Pithecanthropoids and the *Meganthropus* have been found (their remains were all recovered from gravels, i.e. river sediments into which the bones had been washed) belong to 'Djetis' and 'Trinil'. According to D. A. Hooijer (1954) both the Trinil and Djetis beds contain faunal elements that are characteristic of the '*Stegodon-Ailuropus*' fauna of southern China (see page 17), and this is generally assigned to Mid Pleistocene date. So both Djetis and Trinil beds cannot be earlier than this, and may be as late as the Riss-Würm Interglacial.

If we want a date in years we must be content with a pretty wide margin of possible error. Let us say that the Javan Pithecanthropoids (who flourished no doubt over long ages) lived from 300,000 to 500,000 years ago.

The remains of *Pithecanthropus pekinensis* (from fissure and grotto filling, see page 127) are also dated by their associated fauna to the Mid Pleistocene.

SANGIRAN

From Trinil to Sangiran is about forty miles as the crow flies. On the ground the way leads past the dormant volcano of Merapi, trailing a

plume of smoke, and Mount Lawu topped with a Mexican-looking shrine. Here and there are marine deposits. The land rises and there is the limestone of ancient coastal deposits and those of lakes.

At Sangiran on the Solo River (where long ago the first elephant teeth were found in Java) had been recovered fossils of a 'Siwālik' (see page 50) fauna as well as of elephants. This 'Sangiran' fauna, indeed, included *Chalicotherium* as well as rhinoceros and sabre-toothed felines. The *Chalicotherium* died out in Europe in early Pliocene times, but in southern Asia (and in Java) it flourished until the mid-Pleistocene and survived in central and eastern Africa until still later (see page 142).

The Carnegie Institute supplied money for excavation at Sangiran where, in 1936, there was recovered one side of a pithecanthropoid lower jaw with four teeth in place and in good condition. The mandible was much mineralized (as were the other fossils from the site) and embedded in concretion. This jaw is very large and has no chin eminence. From the shape and size of its socket the canine tooth had evidently been small. The teeth (three molars and last premolar) increase in volume from front to back, i.e. the first molar is the smallest. Such a condition is normal in apes but in other fossil hominid jaws (e.g. Pekin, Heidelberg or the Neanderthaloids) as well as in *Homo sapiens*, the second molar is generally so reduced in size that the first is the largest. Thus, from some points of view, this Sangiran right half of a mandible is the most 'primitive' hominid mandible discovered.

In September 1937 one of Königswald's native 'collectors' sent him (from a site on the banks of the Kali Tjemore) a fragment of a fossilized hominid skull. As the fractures were quite fresh, he at once proceeded to the spot and offered ten cents for every additional fragment produced. This was a lot of money since the price of a tooth was only one cent or even half a cent. The Javanese, of course, had broken up the specimen so as to get more money. In all, forty fragments were recovered. A small piece of the front edge was missing, the temporal regions were intact together with those of the ear and the deep 'glenoid' cavity for the lower jaw, but there was nothing of the face or the upper jaw. The cranium had, it would seem, been washed out from the lowest part of the Trinil beds, i.e. from a lower level than that of the *Pithecanthropus*.[1]

This 1937 skull is smaller and somewhat less robust than Dubois' original find and the 1937 specimen may well be that of a female and

[1] The region round the ear is generally taken as indicative of 'status', in apes the ear is more or less on a line with the zygomatic arch. In man the ear is lower down. In apes (or most of them) the depression or fossa of the tempero-maxillary joint is a good deal more shallow than in man.

has a cranial capacity of about 775 c.c. as compared with an estimated 900–950 c.c. for the original *Pithecanthropus*. The cranial capacity of the 1937 Sangiran skull would, then, be only about one half of that of an 'average' European of today (though 'average' is a rather misleading word and the cranial capacity of our kind varies very much from man to man, and only about 150 c.c. greater than that of the largest recorded (male) gorilla skull. In fact the Sangiran (1937) skull is not only the smallest of any of those of the Java Pithecanthropoids but it is the smallest of all fossil hominid skulls, save, of course, those of the Australopithecines (see page 76).

The supraorbital ridge is strongly marked and the skull is strikingly narrow and restricted in the post-orbital portion, that is in the region of the temples—a 'primitive' trait. The roof of the cranium is flat and there are marked edges for the attachment of the temporal muscles. There is no mastoid process behind the ear. This bump is almost always present in *Homo sapiens*. However, the position of the ear-opening is quite different from that assumed in all 'restorations' of the original *Pithecanthropus* skull fragment—which should make us a little suspicious of even such 'reconstructions' as that of the Mauer Man's face (see page 136)—while the articulation of the lower jaw is entirely hominid and, in deed, the same as in *Homo sapiens*. The 1937 Sangiran skull was remarkably similar to the first *calotte*, even to the slight indication of a median crest (see page 111) on the head. The skull-bones are more than one centimetre thick. (Plate IIIa.)

Under X-rays the cranial sutures (which had closed up and were no longer visible to the naked eye except in the temporal region) stood out clearly and without any interruption. What seem to be imprints of the convolutions of the brain appear more distinctly marked on the inside of the cranium than in the skulls of *Homo sapiens*. The two *Pithecanthropus* skulls (i.e. Trinil I and Sangiran II) give almost identical inside casts.

In 1938 a small fragment of a young *Pithecanthropus erectus* skull was found in the tufa of the Trinil levels south of a hill-top about half a mile away from the 1937 site. It is now known as *Pithecanthropus III*. It consists merely of a fragment of the occiput and of the two parietals, one of which is complete. In *Homo sapiens* the parietal is longer than it is high. In *Pithecanthropus* the bone is, roughly speaking, square. The bones were 0.5 cm. thick though the sutures were not occluded.

Near a highway at Krikilan were found isolated teeth from skulls which had weathered away. It took more than a year to find four

maxillary teeth which belonged apparently to the same jaw. These were no larger than the similar teeth in *sapiens*. At another site were recovered a first lower premolar (a duplicate of the *Pithecanthropus* tooth found by Dubois at Trinil). The Java Pithecanthropoids had rather small teeth, no larger than those in the Mauer jaw, as against the large-toothed Chinese Pithecanthropoids.

THE DJETIS DEPOSITS

In February 1936 a *mantri* or 'collector' of the Geological Survey excavated the skull of an infant at Modjokerto, a village in the hills to the west of the town of Surabaya (and some considerable distance away from the Trinil site). The cranium was lying undisturbed in what is probably a lower Mid Pleistocene stratum.

The deposits in which the skull was found are known as 'Djetis' (from the name of a *kampong* or village near Modjokerto) and they are apparently more ancient than the 'Trinil' deposits in which was discovered *Pithecanthropus erectus*. The Trinil fauna is certainly Mid Pleistocene while the Djetis fauna looks, on the whole, Villafranchian (that is Lower Pleistocene); still the archaic look of the Djetis fauna may be due to Java's isolation (and this remark may apply also to the hominid remains), however, despite this isolation (which may well have been broken during periods of glaciation and consequent lowering of the sea-level) the Djetis beds in Java contain a number of animals which first appear (together) in the Chinese Mid Pleistocene (i.e. orang-utan, tapir, etc.).

The 'original' Java fauna (i.e. that dating back to the formation of the island) seems to have been of 'Indian' type. The 'Chinese' component of the ancient Java fauna was certainly a later arrival. A typical animal of the Djetis fauna is the *Leptobos*, an early type of ox with horns over its eyes.

THE MODJOKERTO CHILD

The thin-boned skull is no thicker than an ostrich eggshell, moreover it is incomplete, lacking part of the base and almost all the facial bones.

This 'brachycephalic' cranium is only fourteen centimetres long (five and a half inches), the fontanelle is still recognizable and had only just closed up. Thus, if the skull were that of *Homo sapiens* we could set its age as about two years. However, the cranium is smaller than that

of a *sapiens* infant of twelve months. The cranial capacty may have been about 700 cubic centimetres—and that would give isome 900 c.c. for an adult of the same type. The forehead is more retreating than any recorded for a child of two years of age. There is a slight occipital torus and the superciliary ridges had hardly developed. The post-orbital region (i.e. that of the temples) is constricted to a degree never met with in *sapiens* children. The glenoid fossa is deep and the mastoid process strongly developed. The part played by the parietal bones in shaping the cranial vault is greater than that played by the frontal bones and the occipital region is rather rounded, so that there are several features recalling the skulls of *Homo sapiens.* However (as seemed probable even at the time of the discovery) the Modjokerto child is doubtless of a form allied to that of the Pithecanthropoids. A skull of so young a subject would certainly have appeared less 'pre-hominid' than the cranium of an adult of the same type. (The cranium was (at first) placed in the special class of *Homo modjokertensis,* a designation which had at least the merit of vagueness.)

MODJOKERTO ADULT

At the end of 1939 a local 'collector' gave Königswald a thickly encrusted upper jaw together with some other fragments of a cranium. The whole was sent to Peking for treatment under Weidenreich's supervision. Finally, there emerged from the matrix the major portion of a thick, coarse skull. Only the frontal section and the upper part of the face were missing. The hind part had been crushed by a heavy blow and, in places, the bones were not just broken but telescoped one over the other. This is a condition which is produced with fresh bone since after death the bone rapidly loses its plasticity and just fractures.

The upper jaw was also broken and bore huge teeth similar to those in a lower jaw Königswald had attributed to a *Pithecanthropus erectus.* The second upper molar (as in the apes) was larger than the first. The canine was not very large but stood out above the level of the other teeth and was worn down both at the front and the back so that it had a pointed, chisel-shaped crown. The structure of the nasal aperture and of the ear region was hominid, for instance the intermaxillary bones (clearly visible in practically all other mammals) had fused together with the rest of the jaw—as in Man.

But what was the most astonishing feature in the whole skull, and a feature not found in any other hominid, was a gap or *diastema* of four

millimetres in breadth separating the upper canines from the outer incisors. Such a *diastema* is a characteristic of the apes and the gap serves to accommodate the tip of the lower canines (see page 24).

Weidenreich named the specimen *Pithecanthropus robustus*, but it is now generally recognized as the adult form of *Pithecanthropus modjokertensis*. In 1939 Königswald reported another mandibular fragment apparently of the same type but in such bad condition as to admit of no detailed account.

MEGANTHROPUS PALAEOJAVANICUS

Not far from the level in which was discovered the *H. modjokertensis II* was found in 1941 a fragment of a mandible with three teeth in position; the first molar and the two premolars are not unlike the corresponding teeth in *Pithecanthropus pekinensis*. The second premolar has only one root which is usual in hominids, whereas modern apes, at least, have two roots to this tooth. Both the jaw-fragment and the teeth are of considerable size and exceed, for instance, the teeth of the Heidelberg jaw, which, although very robust, has comparatively small teeth (see plate IVa).

There is in this *Meganthropus palaeojavanicus* a little protuberance inside the jaw behind the chin region, it is a rudimentary *spina mentalis* (or *tuberculum geniale*) characteristic of the hominids and serving to attach tongue-muscles which are employed in articulate speech (see page 25). This *Meganthropus* must have had a head at least as big as that of a full-grown gorilla.

In 1952 Dr Pieter Marks of the University of Indonesia at Bandoeng found, at Sangiran, about fourteen hundredweight of fossils which had been dug up and put aside during the preceding ten years. Among the bones was a *Meganthropus* mandible with an almost complete dental arch, a little crushed and with only one tooth, but just as massive as the 1941 specimen. It presents, to a greater degree than the first, a likeness to certain australopithecine forms, especially to *Telanthropus*, so it has been held. However, the closest form to the Java *Meganthropus* seems to be the *Meganthropus africanus* (Weinert) of Kenya.

MEGANTHROPUS AFRICANUS

In 1939 Kohl-Larsen discovered, on the north-eastern shores of Lake Eyasi at Garusi, the fragment of a maxilla embedded in the scree of

hill-slopes correlated with Layer I at Olduvai (that is early Kamasian or Second African Pluvial which may be, more or less, the equivalent of the European Mindel glaciation). In 1943 Kohl-Larsen claimed his *Meganthropus* as an australopithecine form, but, after a study of the fossil by H. Weinert and A. Remane (1950–1) this upper jaw would appear rather to be that of an African counterpart of the *Meganthropus* of Java. The teeth of the African specimen are very large, and from some points of view, ape-like, though there are hominid features. In 1953 J. T. Robinson stated that he considered *Meganthropus africanus* to be 'closely related' to *Plesianthropus transvaalensis* (see page 69).

G. R. von Königswald would refer the Java 'giant' forms to a period more remote than that of *P. pekinensis* or of Heidelberg Man (see page 135), but the dating in Java is not so satisfactory as in Europe where Heidelberg Man may be with some confidence referred to the Mindel glaciation or some phase of interstadial within it. Königswald claimed for his *Meganthropus* an antiquity of about half a million years.

PITHECANTHROPUS DUBIUS

In 1939 there was recovered from the black clay at Sangiran a mandible, or rather a fragment of a lower jaw which itself must have been larger than that of *Homo modjokertensis*. The section through the symphysis in the two specimens is different, the crowns of the teeth are more folded in the 1939 Sangiran specimen. At first Königswald thought the jaw might be that of a female *Meganthropus*, but it is now referred to as *Pithecanthropus dubius*.

THE JAVAN PITHECANTHROPOIDS

Although it would be rash to generalize from the scanty evidence it does look as though the *Pithecanthropus erectus* of Java formed a remarkably homogenous assemblage or group. But we may remember that we are dealing with remains from an isolated and comparatively small island (no larger than England), where the surviving Pithecanthropoids might well tend to display the homogeneity common among communities living in isolation. As E. A. Hooton said, Pithecanthropus I is as like Pithecanthropus II as 'one egg to another'.

Peking Man (for whom admittedly our material is a good deal more abundant) shows much more individual variation. Our Peking Man

may possibly be rather later in date than the Pithecanthropoids of Java and in any case, one would be inclined to say, on the evidence as it is, that the Java Pithecanthropoids look like the lingering survivors of an ancient stock, while the Northern Chinese Pithecanthropoids suggest a population showing some evolutionary activity.

Seen from the outside, the *Pithecanthropus erectus* skulls appear quite bulky but the bones are very thick (compared with those of *H. sapiens*) and the cranial capacity may be more or less about 940 c.c., but this figure is not really much lower than that for the smallest *sapiens* brains known, i.e. those of the Veddahs and Australian aborigines. There is a greater gap between the brain-volume of the Java Pithecanthropoids and that (655 c.c.) recorded as a maximum for a gorilla.

THE TOOLS OF PITHECANTHROPUS

The Java Pithecanthropoids—or some of them—seem to have fashioned tools, though no artefacts have been found in association with pithecanthropoid remains in Java and this is not remarkable if we reflect that most, if not all, of the pithecanthropoid material has come from gravels and fluviatile deposits.

The prevalent rocks in Java are limestone and volcanic formations and such stone is almost useless for making implements. However, there is some silicified limestone which splinters easily and gives a sharp cutting edge.

A number of hand-axes was recovered in 1933 from the Punung district, which is now barren but in Pleistocene times fairly well watered. But most, if not all, of these hand-axes had been rolled and displaced by water-action. No site in central or eastern Java has yielded any hand-axes in association with fossil fauna, so it is at present impossible to set a dating for the Javan artefacts, but maybe 'Abbevillian' industries lasted longer in Java than in Europe where the latest hand-axes occur in a Riss-Würm setting.

However, at Patjitan 'chopping instruments' of a primitive sort have been found in great quantities and these are very like the chopper of Choukoutien (see below).

SOAN INDUSTRY

Members of the Yale North India Expedition—before the 1939–45 war —distinguished in northern India a pebble and flake flint artefact

industry that has been termed 'Soan'. The main tool of this industry is essentially the same chopping instrument that has been found at Patjitan in Java and also in association with the remains of *Pithecanthropus pekinensis* (see page 133). The Soan industry seems to have lasted long, indeed right up to the Würm glaciation.

During this same expedition true Abbevillian-Acheulian hand-axes were found especially in the banks of the Soan River, but the later Soan tools seem to show the influence of flint-knapping techniques which may well be of a general Abbevillian-Acheulian character.

BURMA

In Burma in 1937 Hallam Movius recognized a lower Palaeolithic (which would now be classified as Mid Palaeolithic) industry made up, for the most part, of choppers and coarse scrapers, nearly identical with those from Choukoutien (*Pithecanthropus pekinensis*) and from Patijan. Movius dubbed this industry the 'Anyathian'. In fact, from various parts of Burma and from Malaya choppers have been recovered which are comparable with those of Java and northern China.

It is a rash conclusion to draw that physical hominid types can be, so to speak, equated with types of artefacts (see page 101), but in view of what we now know about the diffusion of pithecanthropoid men in Asia, Europe and Africa it is interesting to note that these chopping tools *may* be evidence for the presence of Pithecanthropoids in the Indo-Chinese peninsula and in India itself.

DRAGON BONE HILL

Even today, when they have been pierced for new streets and have been outstripped by factories, tall buildings, housing blocks and the sprawling tentacles of 'new urbanism' the formidable walls of Peking still stand out impressively. Sometimes, when approaching the capital from the south-west, from the Western Hills, if the Yellow Wind is blowing from the vast loess formations of northern China, then the ancient imperial city looms up like some magic fortress that must contain incomparable treasure.

However, thirty years ago, Peking was, externally at least, little changed from what it had been during the glorious reigns of the K'ang-hsi and Ch'ien-lung emperors.

It was near these ancient city walls that on 19th October 1927 a

young Swedish archaeologist, named Birger Bohlin, was stopped, searched, and stripped of his belongings by the soldiers of some war-lord. Bohlin had been excavating at a site in the Western Hills near the village of Choukoutien, some thirty-five miles from Peking. From the spring of 1927 until the October of the same year, Bohlin had found little of interest, but late in the afternoon of 16th October, when he was thinking about closing down his dig for the winter, he unearthed a massive lower molar tooth, very wide, very wrinkled, a good deal larger than the equivalent tooth in *Homo sapiens*—and in almost perfect condition. It was, in fact, so little worn that it was obviously the tooth of a young subject. Bohlin was, not unnaturally, rather excited. He made off for Peking—and the war-lord's mercenaries did not find the precious tooth. Bohlin was able to make his way to the Peking Union Medical College and show his find to Davidson Black, the professor of anatomy there.

Black examined the tooth and soon made up his mind it belonged to a hitherto unknown type of man which he named *Sinanthropus pekinensis* (Black and Zdansky). He described the tooth at a meeting of the Geological Survey of China on 2nd December 1927. There were plenty of people to call him reckless for assuming the existence of a 'new' sort of man—on the evidence of one tooth. Black had a Chinese goldsmith fashion a small receptacle which just fitted the tooth and with this trinket on his watch-chain, Black went off to Europe (he was himself a Canadian) and travelled about asking opinions. His remarkable intuition was fully verified by a succession of discoveries which must rank as among the most significant ever made concerning man's pedigree and ancestry.

CHU KU SAN

The story of the search for Peking Man goes back, however, to a good deal before 1927. It had been known for long that workmen quarrying among the limestone of the Western Hills often discovered fossils. During the Boxer Rebellion of 1900 a German physician, one K. A. Haberer, who collected fossils, purchased in a Peking druggist's store a worn left upper third molar (i.e. a 'wisdom tooth') which was of surprising dimensions and difficult to classify, though it looked like the tooth of a hominid. In 1903 Haberer returned to Germany taking with him a case full of 'dragons' bones' he had collected for Zittel (1834–1904) of Munich. The mysterious molar was studied by Max Schlosser

at Munich, and he came to the conclusion it was that of an anthropoid and not of a hominid.

Nevertheless it was this tooth which excited the quest for hominid remains at Choukoutien. The irony of the story lies in the fact that the tooth, after all, turned out not only to be hominid but actually of *Homo sapiens* and not of any strange, ancient sort of man. Several other teeth, resembling the 'Schlosser' tooth, were later acquired in Chinese druggists' shops. To add to the strangeness of the tale, the 'Schlosser' tooth later on disappeared and has never been recovered. Still, the story tends to show how easy it is to make mistakes in classifying Primates' teeth, especially when they are rather worn.

In 1916 the Swedish geologist, Gunnar Andersson, was summoned to Peking by Yuan Shikai[1] to work in the newly founded Geological Survey. In the course of his prospections Andersson collected a good number of fossils and sent some of them to Upsala. In the spring of 1918 Andersson, in Peking, heard that at Chi Ku San, or 'Chicken Bone Hill', numbers of fossil bones were being unearthed. He visited the site, poked about a little in crevices and caves, and found a number of animal bones some of which seemed to have been split by an instrument of sorts. He reported back to Sweden on the possibilities of the site.

In 1921 Ivar Kreuger, the international financier and swindler—who blew out his brains in Paris in 1932—supplied funds which enabled the Austrian-born scientist, O. Zdansky, to begin digging at Chicken Bone Hill. Zdansky unearthed two teeth, some fragments of Mid Pleistocene fauna and a number of pieces of what looked like worked quartz. The teeth Zdansky found were, apparently, similar to the 'Schlosser' tooth, but Zdansky does not seem to have been a very enterprising sort of excavator, though Andersson told him that there were plenty of fossils at Choukoutien and that he had only got to find them. Zdansky returned with his fossils to Upsala—after a comparatively short stay in China.

During, and after, 1921 Andersson and Walter Granger (a member of the Roy Chapman Andrews and New York Natural History Museum expedition to Mongolia when the famed dinosaur eggs were found) visited Chicken Bone Hill, and there learned that there was a much more promising site on the far side of the village, a site where the workmen were turning up large teeth and the fossil bones of horses. This was the area that was afterwards to become world famous as 'Choukoutien'.

[1] Then head of the Chinese government; he died just as he was about to proclaim himself Emperor.

Andersson and Granger visited the workings and found bones and teeth of deer as well as splinters of quartz rather out of place in a limestone quarry.

THE HOME OF PEKING MAN

The Western Hills at Choukoutien are not high, though they are rugged and have the forlorn and dusty appearance of much of the northern Chinese mountain land. In some parts of the range there are bold peaks and jutting cliffs that afford views sometimes resembling the strange landscapes of the south-west, landscapes that are familiar to us through Chinese paintings but which we are always inclined to think of as the products of the artist's imagination.

In the time of Peking Man, the Choukoutien climate was warmer than that of the Peking region today. The climate was moister too. The fossil bones of horses, cattle and deer suggest pastures while the remains of leopard, tiger and bear point to forests. Indeed, beneath the hills toward the east the dry course of what must have been a large stream can still be discerned. Since quartz formations do not exist within two miles of the Choukoutien site, Andersson suspected that the splinters of this stone pointed to Choukoutien having been a home of ancient Man.[1]

In 1926 Andersson wrote to Zdansky at Upsala and learned from him that among the fossils he had taken back from Chicken Bone Hill were those of twenty different sorts of mammals—e.g. horse, bear, hyena, sabre-toothed 'tiger', rhinoceros, buffalo, pig . . . and Man (represented by the two teeth).

In 1927 the Chinese 'Cainozoic Research Laboratory' (i.e. for the study of Pliocene and Pleistocene) was founded with subventions from the Rockefeller Foundation, and digging began at the Choukoutien site. Although the excavations were under the direction of the Geological Survey of China, the Chinese themselves, at first, played a subsidiary part. Birger Bohlin was in charge.

Between 16th April and 18th October 1927 3,000 cubic feet of earth were sifted and yielded an abundant fauna but no remains of fossil Man. Bohlin was working on a layer thirty metres thick and there, together with the charred bones of animals, he discovered charcoal and

[1] In accounts of the 'Sinanthropus' discoveries the prime role played by Gunnar Andersson is often largely ignored, but without his foresight, intuition and encouragement the 'Peking Man' would probably never have been found.

artefacts—all indicating the dwelling-place, or at least the kitchen, of some sort of hominid—the charred bones were of *Elephas antiquus*, rhinoceros, *Trogonotherium* (this latter a giant rodent of the beaver type). It was near these latter Birger Bohlin found the famous tooth which induced Davidson Black to postulate the existence of 'Sinanthropus'.

When Bohlin left China in 1929 Pei Wênchung took charge of the excavation and it was he who, on 2nd December 1929 at four o'clock in the afternoon, found the first 'Sinanthropus' skull fragment embedded in hard travertine limestone and so imprisoned that Davidson Black took no less than four months to free the bones from the rock.

From 1927 to 1929 in sixty-four weeks of excavation 1,485 boxes of fossils were sent to Peking, and these included isolated human teeth and fragments of 'Sinanthropus' mandibles.

The skull was that of a young male and was complete with the mandible. The cranium was low in the vault, there was hardly any forehead behind the heavy torus, and the cranial content of the skull was about 1,000 cubic centimetres—that is small for any sort of Man (see page 79). There could, however, be no doubt about the hominid character of the cranium. Even the fossa of the temporo-maxillary joint was deep as in *Homo sapiens* and not shallow as in the apes. The sutures were not fused and therefore the subject must have been a youth. This skull—and indeed all the Choukoutien fossil hominid remains, was of a bright yellow colour and very different from the *Pithecanthropus* material from Java, which is very dark.

Associated with all the Peking Man remains were chipped pebbles and thick layers of ash from ancient hearths. The hearths suggest that Peking Man cooked his food, though his fires may have been lighted mainly to ward off predatory beasts and to keep him warm. The cooking of food must have made for a marked increase in the length of the lives of early men, for cooked meats wear down the teeth less quickly than does a raw diet, and men in Pleistocene times who had no teeth must have been in dire straits and apt to be clubbed on the head and used as food.

The '*Sinanthropus* Locality I', that is to say the site where Pei found the first skull (and, indeed, where most of the hominid remains were recovered), looked, at first, like an ancient cave, but was afterwards revealed as a cleft which had slowly filled up with debris from above, forming stratum after stratum (some sterile) with a vast accumulation of animal bones. The refuse obviously attracted hyenas for many of

their remains have been found. The strata, in many places, had hardened to a rock-like consistency and the whole site was evidently no dwelling-place but a dump and the *Pithecanthropus pekinensis* bones are doubtless the relics of individuals who were eaten.

In July 1930 fragments of a second skull were recovered (from material collected in 1928). There was a large portion of the brain-case and a part of the nasal bones. The skull (presumably of a female) was larger and higher in the vault than the first (see plate III). By the end of 1936 there had been recovered the skulls (or portions of the skulls) of more than twenty-four individuals. These fossils included five more or less complete crania, twelve mandibles and a great number of teeth. Between 1936 and 1939 seven femora and one humerus were unearthed. These long bones indicate that *P. pekinensis* had a fully upright station.

Of the total number of skulls known in 1939 (fifteen of immature subjects) seven were sufficiently well preserved to be compared with other types. Three of these Choukoutien crania are of men who (in *Homo sapiens* anyway) would be less than thirty years of age, three other skulls are of subjects ranging in age from thirty to forty and only one calvaria (probably of a female) is of an individual over fifty, maybe even over sixty. In all, up to the time of the Japanese invasion, the remains of about forty-five individuals were recovered. Some of these, however, were represented only by a few teeth. There were about a dozen fairly complete skulls and jaws.

All parts of the *P. pekinensis* skull are known except for the area immediately around the *foramen magnum* which had, in all cases, been broken away. In addition to these mutilations (for the extraction of the brain) all the crania bear marks of injuries inflicted (most probably) before death and of sufficient violence to cause death, although it is sometimes difficult to distinguish between immediate post-mortem fractures and those caused just before death. In any case, it does not look at all as though the men of Choukoutien were just eaten because they had died. They were knocked off and then eaten.

THE CHARACTERISTICS OF PITHECANTHROPUS PEKINENSIS

Skull I (Locus E) and Skull II (Locus D) were rather well preserved. The former comprised the whole brain-case except the middle parts of the base, and the latter had part of the nasal bones and the temporal groove, but the occipital region and the whole base were missing. Skull I would be that of an immature male and Skull II that of an adolescent

female. Davidson Black estimated that the cranial content of Skull I was 964 c.c. However, the cranial capacity of the skulls recovered seems to vary within a wide range, from about 925 (?) c.c. to 1,250 c.c. with an average of about 1,050 c.c. 1,250 c.c. is within the range of *Homo sapiens sapiens* in Europe today.

The frontal bones are more rounded than in *Pithecanthropus* from Java and the unbroken supraorbital ridge stands out more sharply.[1] The lower first premolar in *P. pekinensis* is larger than in *H. sapiens sapiens*. The crowns of the molars are so strongly wrinkled as to have a peculiar character of their own. The incisors are all protuberant and display the 'shovel-shape' sometimes found in all hominid types but characteristic of the Mongoloids (see page 131).

Judging by the thighbones, *P. pekinensis* stood about 5 ft. 2 in. for the males and about 4 ft. 7 in. for the females. The upper arm and the thigh were about the same length as in the modern chimpanzees, whereas modern man's thigh is on an average 25 per cent longer than his upper arm. In Peking Man the difference was about 20 per cent only.

Maybe the most striking thing about the *P. pekinensis* material is the marked degree of individual variation that exists as between skull and skull. For instance, the smallest of the crania has a cranial capacity of not much more than 915 c.c., whereas the capacity of the largest skull (presumably male) is about 1,225 c.c. The five skulls whose capacity can be estimated with some degree of accuracy would give these figures: (1) 915 c.c. for adolescents; (2) 1,030 to 1,225 c.c. for three males; (3) 1,015 c.c. for a female; and (4) 1,030 c.c. for a specimen difficult to sex. These figures are higher than those at first estimated, and they are a good deal higher than those for any of the *Pithecanthropus* skulls from Java.

Again, while some *P. pekinensis* skulls are very similar to those of the Javanese pithecanthropoid forms, other of the Chinese skulls look almost what might be called 'proto-neanderthaloid', though no *P. pekinensis* skull has as high a vault as the lowest vaulted neanderthaloid cranium. (Plate IIIb.)

There is, then, in this group not only a sexual dimorphism, i.e. a marked difference between the sexes, typical of most Primates, but also what looks like an individual degree of variation difficult to match except among the Neanderthaloids.

[1] The *Pithecanthropus pekinensis* skulls were a bright yellow in colour and not so highly fossilized as the Javanese specimens. The former were better protected in their caves than the Javanese Pithecanthropoids embedded in sandstone and tufa.

A COMPARISON BETWEEN P. PEKINENSIS AND P. ERECTUS[1]

The *Pithecanthropus pekinensis* forehead is very retreating but the cranium is, however, a little 'domed'. The brow-ridges project and are separated from the forehead by a marked and broad furrow. The ridges are united by a torus over the nose, in fact the 'shelf' is unbroken. As in *P. erectus*, the skull is constricted behind the orbital region (this is a 'primitive' feature which persists in some of the Neanderthaloids and traces of which may be seen in some types of *Homo sapiens*). The greatest width of the cranium is above the ear-opening. The summit of the skull shows a blunt crest which, behind the vertex, merges into a flat depression. The occiput bears a thick transverse ridge. The neck muscles were evidently powerful.

The jaws are robust and there is no sign of a mental eminence, and they are deeper in the (supposed) males than in the (supposed) females. The dental arcade is long and, relatively speaking, narrow. Not only in the jaws and teeth but in size of the brain-case, there is a marked difference between the male and female specimens, so, one might conclude, that in *P. pekinensis* there was a greater variation in bodily build between the sexes than in any group of *Homo sapiens*.

The *P. pekinensis* dentition is a rather strange mixture of 'primitive' and fairly 'advanced' features. For instance, there are to be seen, in one and the same jaw, premolars with more pongid (anthropoid) characters than those recorded for any other hominid, and together with incisors differing little, if at all, from those of *Homo sapiens*. Again, some features of the teeth are almost neanderthaloid, and if one were to judge from the teeth alone, it would look as though *P. pekinensis* was a hominid in a general state of evolution in a neanderthaloid direction. The small fragments of *Pithecanthropus erectus* jaw, found many years ago by Dubois at Kedung Brebus (see page 111), look as though they formed part of a mandible very like that of a female *P. pekinensis* while the Sangiran lower jaw (see page 116) compares well enough with the mandible of the *P. pekinensis* male. The molars of *P. erectus* are, on the whole, larger than those of *P. pekinensis*, but the incisors and canines seem to be smaller in the former than in the latter.

The *P. pekinensis* long bones, like those of *P. erectus*, indicate that both types of hominid had a fully erect station.

[1] The evidence, such as it is, suggests that the Java Pithecanthropoids are considerably older than those of North China. Perhaps the most ancient of the Java specimens may be 500,000 years old, whereas the Choukoutien material may be 100,000 years or more later, say a dating of about 200,000 years.

In cranial capacity the Java forms are inferior to the average of *P. pekinensis*, but we may note that the Steinheim skull which is such a very 'generalized' sort of Neanderthaloid that it looks like an early type of *H. sapiens*, has a cranial capacity of under 1,100 c.c. which is less than the estimated capacity of the largest of the *P. pekinensis* crania. But, as we have seen (page 79), cranial capacity alone is no safe criterion of intellect. It is just in the prefrontal areas (associated with the development of intelligence) that the Pithecanthropoids' skull is the least well filled out.

Weidenreich (to whose remarkable studies we owe most of what we know about *P. pekinensis*) not only thought that he could detect features in *P. pekinensis* which would indicate he was the remote ancestor of the Mongoloid type of *Homo sapiens*, but also that the Java Pithecanthropoids were the forerunners of the Australoid type of *Homo sapiens*. He cited, to support his first hypothesis: (1) the *torus mandibularis* or ridge on the inner or lingual surface of the lower jaw, and this is undoubtedly a common feature in Mongoloid skulls; (2) the so-called 'shovel-shaped' upper incisors; (3) the 'Inca bone', a special portion of the occipital bone, separated by sutures, and a feature noted in many Mongoloid crania and especially in those of Amerindians (hence the name 'Inca').

These views have not met with much acceptance and, indeed, the evidence for them is slender enough. What, however, is clear is this: during the Quaternary there existed a number of different hominid types so that it must be difficult (as yet) to determine which *forms* led up to any type of *Homo sapiens*, for our knowledge of the history of the main sorts of *Homo sapiens* today (i.e. Negroid, Mongoloid, etc.) is almost non-existent.

We may also bear in mind, as we have already said, that though we have today more specimens of ancient Man than we had a generation ago, each one of these specimens represents hundreds and thousands of individuals scattered about all over the Old World, individuals who showed, no doubt, a wide range of variation—sexual, geographical and even specific.

THE FATE OF THE BONES

The story is a confused one. In 1937, at the time of the Japanese invasion of China, the *Pithecanthropus pekinensis* fossils were removed to the Peking Union Medical College. In 1941 the collection was at the

American Embassy, and the Chinese authorities requested that the bones should be despatched, as soon as possible, to the United States. An American major is said to have added the cases of fossils to his own luggage, for conveyance to America. The 7th December 1941 was Pearl Harbor, but on 5th a train had left Peking, apparently with the fossils, headed for Chin-wang-tao (a popular summer resort with the best ice-free port in northern China), where the remains of Peking Man were to be put on board a vessel for the U.S.A. The Japanese are reported to have seized the train on its arrival at Chin-Wang-Tao and to have arrested the American guards.

However, there is another and perhaps more circumstantial account. The *P. pekinensis* material is said to have been packed into three chests and put aboard the American ship *President Harrison* which also evacuated a number of U.S. Marines from China. On 8th December 1941 the liner grounded on a sandbank in the Yangtse near Shanghai. The Marines were captured and the chests vanished, it would seem for ever. Anyway, after that a veil of mystery descends upon the famous cases. The Chinese, with their current prejudice against all things American, are inclined to hint that perhaps the Americans did remove the fossils to the U.S.A. and are there keeping them hidden. It has even been stated in the Chinese Press that a 'British scientist' has reported that in 1951 he saw a *P. pekinensis* skull in the New York Museum of Natural History. It was of course a cast. Extensive inquiries in Japan after the war failed to produce any information about the remains, though the Americans did recover one of the Solo skulls which had been stolen in Java and presented to the Emperor (see page 178).

During the 1939-45 war the Japanese occupied Dragon Bone Hill, cut down what trees there were, razed the excavators' hutments and fortified the position. However, in 1949 excavations (under the direction of the Academia Sinica Laboratory of Vertebrate Palaeontology) began anew at Choukoutien. Four new sites were opened up. A number of *P. pekinensis* teeth have been recovered and there also remained in China parts of a humerus and tibia unearthed before the collapse of Chiang-kaishek's regime. On 31st August 1959 there was announced from Peking the discovery at Choukoutien of a complete *P. pekinensis* mandible, probably of an aged female. And we may expect that other hominid fossils will be found at Dragon Bone Hill, but nothing can make up for the loss of the original material, though, of course, there are plenty of casts and copies in various museums throughout the world.

PITHECANTHROPUS PEKINENSIS AND FIRE

There is no proof that any of the Java pithecanthropoid types made fire, but Peking Man did use fire as the remains of hearths and bits of charcoal indicate, though these are, of course, much too ancient to yield any dating by the radiocarbon test. In Europe there are hardly any indications of man-made fire before the Mousterian culture-phase, but maybe the evidence from earlier sites has been lost, though three hearths at Teting in the Moselle have been reported as of 'Chellean age'.

There are quantities of meat-bones with the remains of *Pithecanthropus pekinensis*, and in fact Peking Man himself seems to have served as meat—probably for his own kind. He also ate fruit, as the kernels of the *Celtis* or nettle-tree 'cherry' indicate.

THE ARTEFACTS OF PEKING MAN

The remains of the Java Pithecanthropoids were found in river or lake deposits and were not associated with any artefacts (see page 122). However Peking Man did fashion implements. Maybe the earliest artefact yet found in China is the stone implement recovered from the Nihowan lake-deposits in association with utilized bones, but the object is difficult to date.

There is a chert core-artefact or 'chopping-tool' found at Choukoutien (Locus 13) which, in technique, is 'Abbevillian', that is to say both faces were flaked alternately. The associated fauna suggests a dating within the Mindel glaciation.

The undoubted *Pithecanthropus pekinensis* industry (associated with hominid bones) occurs only in Locus 1. It is a flake industry, for the most part in quartz, and consists of thousands of pieces without any secondary retouching. There are, however, some retouched artefacts, but they are scarce. There are all sorts of shapes, 'scrapers', 'points', 'chisels', 'choppers', a few 'burins' and even one or two pieces which have been characterized (rather gratuitously) as 'pseudo-Solutrean' (see page 231). Clactonian, Tayacian Mousterian and even Late Palaeolithic types may be seen, which suggests that we should not always attach too much importance to tool-types as affording evidence of dating. There are also some bones which have obviously been fashioned and utilized. This collection seems later in date than the chopper from Locus 13 and may date from the early part of the Mindel-Riss Interglacial, though some would set a date within the Mindel

glaciation or even in the Günz-Mindel Interglacial, but the associated fauna points to Mindel-Riss.

In Locus 15 (where however no fossils of *P. pekinensis* were discovered) there were found in 1934–5 many hundreds of chert and quartz tools, but these may well be later in date than the artefacts from Locus 13. The former are better retouched. They are fashioned from finer materials than quartz (i.e. flint, chert, hard sandstone) and comprise 'side-scrapers', 'chisels' and points. The associated fauna is apparently typical of the Chinese loess (i.e. *Rhinoceros tichorhinus, Syphnea fontanieri*, etc.).

Many of the Choukoutien quartz fragments would hardly have been recognized as artefacts had they been found on the surface of the ground and far away from traces of Man. However, quartz does not occur locally at Choukoutien and must have been brought thither by hominids. We may also note that very 'primitive' flaked stones are more readily accepted as artefacts if they occur isolated in what are, otherwise, stoneless layers of lake-mud or sand.

Palaeolithic implements have been recovered from 1953 in the Ordos and in Shansi. The most important site is Tingtsun in Hsiangfen county of the latter province. Here were found an abundant fossil fauna, three hominid teeth and over two thousand artefacts of a type more advanced than those of *Pithecanthropus pekinensis.*

PITHECANTHROPUS PEKINENSIS WIDESPREAD IN CHINA

In 1939, among bones bought in druggists' shops in Hong Kong and Canton, there was found a first lower premolar, larger than the equivalent tooth in *Pithecanthropus pekinensis* and coarser and devoid of the characteristic wrinkles of the northern fossils' teeth from Choukoutien. This premolar has been assigned to a 'Sinanthropus officinalis'. Doubtless the tooth came from some southern Chinese site, quite possibly one in Kwangsi.

In the years just before 1939 Fromaget recovered a number of hominid teeth (apparently those of a Chinese *Pithecanthropus*) in cave fissures of Upper Tongking. In gravels underlying the loess of northern Annam the same researcher discovered a fragment of a hominid temporal bone and also a second lower molar very like those of *P. pekinensis.*

P. pithecanthropus cranial fragments have also been found at Yungning in Kwangsi and several other finds of apparently hominid

fossils have been reported from south-western China in recent years, although no detailed description of these finds is as yet available in Europe.

A portion of the facial bones and a molar of *P. pekinensis* type were found in 1957 (together with fossil mammalian fauna) in a cave in Hupeh province, that is to say in central China, west of Hankow and north of the Yangtse River.

It is quite evident then, that at one period, which we may set as being in the Mindel-Riss Interglacial (and no doubt before and after), men of the *P. pekinensis* type, that is to say Pithecanthropoids, existed in north China, in central China, in south-west China and into Indo-China. And they existed at the same time as the Pithecanthropoids in Java, in North Africa and in Europe.

Pithecanthropoid Man was, therefore, at one time widely spread about regions of the Old World. We need not think that he was the only sort of Man then existing, although he may have been towards the end of his time an archaic sort of Man. Until comparatively recently in Man's story several sorts were flourishing at the same time, possibly even in the same areas, and no doubt hunting and chasing each other and eating each other.

EUROPEAN PITHECANTHROPOIDS

THE MAUER JAW

In the now far-off days not long after the Second World War when living conditions in Germany were so miserable that it looked as though the country and its people would never recover from the devastation of bombs and bombardments, the village elders of a small place near Heidelberg made a public presentation to an old man—over ninety years of age. This venerable fellow received a particularly large sausage, a bottle of wine, a box of cigars and a diploma. He was the workman who, in 1907, had discovered the now celebrated 'Mauer jaw' in a gravel-pit about six miles from Heidelberg. (Plate IVa.)

Otto Schoetensack (then a lecturer in geology at Heidelberg University) was the first to describe the mandible which he assigned to a *Homo heidelbergensis* while Bonarelli created for this fossil a special genus, that of the *Palaeanthropi.* Since, at the time of the discovery, no mandibles were known of any hominid type more ancient than the Neanderthaloids, the Heidelberg jaw seemed very puzzling, for even

those who were prepared to attribute it to a hominid, could hardly imagine that a subject with such massive and ape-like jaw could have such relatively small and 'human' teeth. However, some of the more perspicacious[1] suggested that the jaw would not be unsuited to the *Pithecanthropus erectus* skull fragment (for in 1907 only Dubois' original *P. erectus calotte* was known). Indeed, the Mauer jaw would fit rather well into one of the (presumably male) *Pithecanthropus pekinensis* skulls. No artefacts were found at the site.

Since the discoveries at Choukoutien, the further finds in Java and those of the Algerian pithecanthropoid material, it is clear that the Mauer jaw is that of a European *Pithecanthropus.*

The jaw (which is complete with all its teeth, though the crowns of four on the left side were accidentally removed during the cleaning of the specimen) is very massive—though if compared with the Java *Meganthropus* jaw-fragment the Mauer specimen appears almost delicate—the ascending ramus is stout and the sigmoid notch remarkably shallow. In fact, were the jaw to exist without the teeth, it might well be taken to be that of some giant Australopithecine.

There is a shallow pit behind the symphysis (where the genial tubercle, [see page 25] appears in most hominids) and the jaw has no trace of a chin eminence at all. Nevertheless, not only are the teeth completely hominid but they are, as to size, within the range even of *Homo sapiens.*

The Pithecanthropoids were a large family with members showing, in the course of the ages and in different parts of the world, a number of special features peculiar to one species and not to another, and then we may remember that the Chinese Pithecanthropoids, at least, display very considerable variation within one group. Maybe we all have a tendency to imagine that one specimen which has survived from the past must be a pattern for all others of its group, whereas none of us expects to find all human beings looking alike.

From the Mauer lower jaw it is possible, with some degree of reliability, to reconstruct the upper dental arch, the maxilla and the zygomatic or cheek-bone regions. It would seem (to judge from such a reconstruction) that the cheek-bones of the Mauer Pithecanthropoid could not have sloped obliquely backwards (as do those of many, if not most, of the Neanderthaloids) but must have stood out square like those

[1] Notably W. L. H. Duckworth, who wrote in his 'Prehistoric Man' (1912)—an admirable little book for its time): 'Would the Mauer Jaw be appropriate to the cranium of *Pithecanthropus*? I believe an affirmative answer is justifiable.'

of the Asiatic Pithecanthropoids. The Man of Mauer then would have had a rather broader and flatter face than the Neanderthaloids. In any case this jaw would be out of place in any neanderthaloid skull we know.

THE DATING OF THE MAUER JAW

The dating of this highly interesting and significant fossil (the most ancient hominid as yet found in Europe) is not easy. The mandible was found seventy-nine feet below the surface of the ground in a sand-pit cut through by strata deposited by an Ice Age river. These strata extend downward to a depth of no less than eighty-five feet, that is to the bottom of the Elsenz valley.

The so-called 'Older Loess' of Mauer would appear to have been deposited before, and the 'Younger Loess' after, the Würm glaciation. There are eighteen feet of 'Younger Loess', then seventeen feet of 'Older Loess' before fifty-one feet of 'Mauer Sands'. The jaw, as we have said, was embedded not in the loess but in the sands and only seven feet from their base. The position in which the fossil was found indicates, then, great antiquity.

Indeed the deposits in which the jaw lay may have been laid down during the Günz-Mindel Interglacial. If we take into account the great erosional unconformity and the completely weathered loess deposit near the base of the site (which represents a whole cold-warm-cold cycle) it would appear that the Mauer sands must date from a pre-Mindel II warm phase and not from the (later) Mindel-Riss Interglacial.

The Mauer jaw may then be of the First Interglacial (or Günz-Mindel) or more probably (as Zeuner thinks) from Phase I of the interstadial (i.e. warm interlude) in the Mindel glaciation. As the peak-period of the Mindel glaciation was recently fixed by the potassium-argon method of dating (see page 40) at about 450,000 years ago, there is some reason for thinking that the Heidelberg Pithecanthropoid flourished as much as 400,000 years ago. The Mauer jaw may be the most ancient pithecanthropoid relic we have as yet.

AFRICAN PITHECANTHROPOIDS

TERNIFINE-PALIKAO

The Algerian walled town in whose Great Mosque Abd-el-Kader, after his recognition as Emir, preached the *jihad* or Holy War against the French in 1832, backs against hills called *Sherab-el-Rih*, that is,

'Lip of the Wind', since they serve to protect the place and its plain from the mists and blasts of the north. The town is Mascara. The name has nothing to do with cosmetics or with the Spanish word for 'mask'. Mascara is just a European way of writing the Arabic *Umm-el-'Askarin*, that is 'Mother of Soldiers'. The town, some 1,800 feet up, lies to the north of the 'Plateau of the Chotts', the high ground, to the south of which are the saline marshes that string out from western Algeria to south-eastern Tunisia, though by no means in a connected chain.

Some eleven miles east-south-east of Mascara and in a countryside that is not infertile, though the scenery is typical of Algeria back from the coasts, is the village of Palikao founded in 1872. It is an arid landscape, dusty, treeless, grey and brown, burning hot in the sun and cold, wind-swept at night and bounded by bare, sage-grey splotched heights. For the building of Palikao settlement a gravel-pit, near a Moslem cemetery, was opened at a hamlet called Ternifine. From this gravel-pit an abundant fauna was recovered. The whole site is permeated with ground-waters, and in 1951 C. Arambourg made a boring which showed that the deepest parts of the pit were drowned in a sheet of water and demonstrated moreover that these areas had not been touched and were rich in mammalian fossils and in man-made implements.

The site of the gravel-pit was, indeed, an ancient lake-basin which had been choked up with sand in Mid Pleistocene times, when the level of the surrounding area was some fifty feet higher than it is today. By the time that Arambourg prospected the site the pit was no longer worked since it was too near the Moslem cemetery.

In 1954 Arambourg and R. Hofstetter opened up their dig at Ternifine, and during the whole of the excavation water had to be pumped up from the bottom of the pit. The fossil fauna recovered showed, mostly, affinities with that of tropical Africa today, though there were also extinct forms such as a *Machairodus* (sabre-toothed 'tiger'), a giant form of warthog, a large cynocephalous monkey, etc. The stone artefacts were coarse bifaces and quartite choppers, but the materials most commonly employed were limestone or sandstone.

On 6th June 1954 a hominid mandible was unearthed—a complete arcade with molars, premolars and two incisors. On the 14th of the same month there was excavated a half mandible with all the teeth. The two fossils were lying under a sheet of water and thus had been protected from disturbance. Indeed, the second fragment was actually

buried in the calcareous nodular clay which forms the bed of the basin.[1]

The associated fauna was composed of hippopotamus, *Elephas antiquus*, *Elephas africanus*, *Equus mauritanicus*, rhinoceros (rather like *Rhinoceros simus*), zebra, giraffe, camel (*Camellus thomasi*), antelope, *Hyaena crocuta*, *Hyaena striata*, *Felis leo*, giant warthog (very like *Notochoerus* from the Mid Pleistocene of East Africa) and a giant baboon.

In fact, in many respects, a fauna of archaic character more or less resembling that of the Kamasian or Second Pluvial in East Africa. In any case, this Ternifine fauna is post-Villafranchian as the presence of *Equus* indicates. Although a *Machairodus* (sabre-toothed feline) suggests a considerable antiquity, it is not any longer held that such beasts died out everywhere in what used to be classed as the late Pliocene. We may remember that animals shifted about, they may have become differentiated in one area, then have moved far away from it and then have returned to it later. A horse originated in North America where elephants were common in Pleistocene times. The camels also seem to have originated in North America. But horses had been for long extinct in the New World when it was discovered by Europeans. So, also there were camels in Africa untold ages before they were reintroduced from Asia into that continent a few centuries before our era.

Most of the animal remains from Ternifine have broken bones and may be, then, the debris of meals.

The four remains of this north African pithecanthropoid type are, then:

1. A very well preserved mandible (No. III to be discovered) with only the left first premolar, the left canine and three of the incisors missing. It is no doubt of a male (see plate IVb).

2. Another mandible, not so well preserved, and minus the right ascending ramus and the incisors—also of a male. (No. I.)

3. Half a mandible (the left side) probably of a female, broken after the alveolus of the right incisors and containing all the teeth except the incisors, that is to say the two premolars and the three molars are present. (No. II.)

4. A complete right parietal of a fairly young subject.

[1] Professor Arambourg is to be congratulated on the promptness with which he described his finds and the rapidity with which casts of his discoveries were made available—within a matter of months. Unfortunately, his example is not always followed. It was not until 1959 that the British Museum obtained a cast of the Fontéchevade skull (discovered 1947).

The 'Atlanthropus' parietal suggests that the general appearance of this Pithecanthropoid must have been very like that of *P. pekinensis.*

Mandible No. 1 has a well developed *torus marginalis.* Indeed, except for the size, the jaw reminds one of the Java *Meganthropus* (see page 120). The ascending ramus is broad and relatively low and, says Arambourg 'of the same order as . . . *Paranthropus crassidens*'. The dental arch is parabolic and its anterior portion is relatively well developed compared with the total length. The teeth are massive and large. The crown of the molars low and convex. The premolars are (as in all the Pithecanthropoids) particularly large compared with the molars. The canines (of which only the sockets remain) must have been powerful and at least as large as in *P. pekinensis*—even in the female 'Atlanthropus'. The mandibular angle is more open than in Mauer and *P. pekinensis.* The angular region is not very projecting and the profile is 'truncated' as in some anthropoids.

In May and June 1955 numerous isolated teeth (of both upper and lower jaws) were recovered and on 26th June a third mandible and a right parietal bone. The jaw was probably that of a male. It is extraordinarily massive, is in a better state of preservation than the first two mandibles. The symphysis region is robust and markedly receding. The jaw, indeed, has been compared with that of *Paranthropus crassidens* (see page 70). The Ternifine third mandible lay in the thickness of the clay that was formerly the bed of the pond.

There is a slight variability as between mandible I, II and III (as may be observed in *P. pekinensis*) and is no doubt due, in part at least, to age and sex. Mandible II (possibly female) is very like *P. pekinensis* (G_1), the symphysis is retreating, the ascending ramus high and stout. The horizontal ramus is low and broad (as in Peking Man), but rather more slender than in the Mauer jaw. In some respects this specimen recalls *Telanthropus* (see page 71), whose dentition is, however, more 'primitive'.

The right parietal is that of a young subject with a low-pitched cranium, but the skull was broad in the parieto-temporal region. The inside face of the bone is etched deep with grooves corresponding to the meningeal circulatory system which, says Arambourg, 'in its relative simplicity recalls that of the Asiatic Pithecanthropoids'. The parietal was found close to the half-mandible No. II. The sutures are not ossified at all, the thickness is about that of an adult *Homo sapiens* (probably because of the young age of the subject). The general shape of this parietal is entirely hominid and its curves indicate a low cranial vault like that of the Asiatic Pithecanthropoids.

The low, broad molars are 'taurodont' (see page 159), the premolars as large as in the Java Pithecanthropoids and have a cingulum on their buccal surfaces. The molars are six-cusped and the grooves separating the cusps are of the *Dryopithecus* type (see page 54) though somewhat attenuated as in *P. pekinensis.*

TERNIFINE INDUSTRY

The 'Atlanthropus' jaws are the first remains of Man to be found associated with a Chellean industry. This consists of about a hundred pieces in quartzite, silcrete or sandstone with a few in flint and limestone. They were all found in levels corresponding to the hominid remains.

There are coarse rostroid bifaces, hand-axes, choppers and large flakes of Clactonian type, with a few chipped pebbles. The whole might be called a primitive 'Chelleo-Acheulian' and in type it resembles the Kamasian industry II or the Oldowan III (see page 146). There are many discoidal 'racloirs' and, in the main, the pieces were fashioned by a rough stone-on-stone technique.

CASABLANCA MAN

In 1955 P. Biberon found in the Sidi Abderrahman quarry near Casablanca in Morocco an abundant stone industry of bifaces or hand-axes of Middle Acheulian type though rather archaic. This despite the fact that they were, apparently, later in date than the Ternifine artefacts and were to be assigned, without doubt, to the last but one of the great marine 'regressions', that is to say corresponding to the third African Pluvial (see page 65), and maybe to the Riss glaciation in Europe. He also recovered, together with other mammalian fossils, some hominid remains from a grotto in the consolidated dune and datable to the beginning of the third African Pluvial.

The fossil fragments consist of a portion of a right side of a hominid lower jaw (without the ascending ramus) and with the posterior molars in place; a post-symphysial portion (left) with the first premolar and with the sockets of the canine and the second incisor. The mandibular branch is in height and in thickness comparable with the lower jaw of Ternifine II, of *Pithecanthropus pekinensis* (0_1) and of the Mauer jaw. 'Casablanca Man' seems to be pithecanthropoid though in some ways, perhaps, showing (as far as can be judged by the fragmentary evidence)

some resemblance to Rabat Man (see page 176), which is a type of Neanderthaloid, though a very 'primitive' one. Casablanca Man may well represent a type descended from that of the Ternifine Pithecanthropoids. The latter, indeed, appear to date back only to the Mindel glaciation (that is the Second African Pluvial).

OLDUVAI PITHECANTHROPOID

The great Serengeti Plains, covered with yellowish grass and herds of zebra and bounded by blue mountains, are cut through to the east by the Olduvai Gorge (see page 72), where in 1958 Leakey found two living-sites, the first to be discovered anywhere of men using Chellean-type artefacts. The Serengeti Plains region has, for some years past, yielded many fossils of giant mammals: a large sheep (*Pelarovis*), an ox (*Bularchus*), a hippopotamus (*H. gorgops*), a huge antlered giraffe (*Sivatherium*), a three-toed horse, *Chalicotherium*, *Dinotherium* and several sorts of giant pig. These creatures were hunted by men with a hand-axe culture. In 1958 were recovered fossil bones of a new species of huge baboon—a mandible (presumably of a female) and a fragment of an even larger lower jaw (presumably of a male). As we have noted already, there is among the Primates a marked tendency toward 'sexual dimorphism', that is to say, a considerable difference (in size) as between males and females.

The two Olduvai living-sites (numbered BK 11 and SHK 11) yielded not only an abundant stone industry but also an ivory tool, a 'hand-axe' made from a hippopotamus tooth as well as lumps of red ochre (see page 143). From site BK 11 was recovered in association with artefacts of 'Chellean I' culture, a child's tooth. The site is near water and there is no evidence from these living-sites that the Olduvai men of this culture knew the use of fire.

The tooth is large, undoubtedly hominid, and came from the milk dentition of a child maybe from two and a half to three years of age. There was also found a fossil milk canine. The roots suggest that the molar came from an upper jaw (we may remember that 'milk' molars occupy the place afterwards taken by the permanent premolars). However, the cusp-pattern looks more like that of a lower 'milk' molar, so that it is possible the tooth does come from a mandible—despite the roots.[1]

[1] In *Homo sapiens* the upper 'milk' molars have three roots whereas the lower have but two generally though there are exceptions.

It is, of course, not absolutely certain that these teeth are those of a Chellean-culture people, but it looks very much as though they were, and if they were then this early East African population was probably of pithecanthropoid type comparable with the *Meganthropus* of Java.[1]

RED OCHRE

Clots of red ochre were found at the living-site BK 11 at Olduvai (where the large milk molar was discovered) dated by Leakey to 'Chellean I stage'. The lumps must have been brought from at least fifty miles away, and may possibly have served for a painting of the body (such ornamentation may have preceded tattooing—for tattooing is attested in Upper Palaeolithic statuettes). The use of red pigment in burials is (see page 235) one of the most ancient of human customs, and it is tempting to let one's fancy roam and to wonder whether this association of red with death and interment may not have survived in man's tradition up to this day. The Chinese emperors were buried in red and in red coffins until the last (and the Emperors of Annam also), while the Popes are also robed in red and laid in red-lined coffins. But, of course, all this is merely suggestive and forms no basis for any hypothesis, even a working one.

THE PITHECANTHROPOIDS AS A GROUP

Up to now at least eight types of Pithecanthropoids have been recognized and their remains come from Morocco, Algeria, Germany, Java, South and North China—and possibly from other regions. The remains date from before and during (and even possibly after) the Riss-Würm Interglacial.

There is abundant evidence (from North China and Algeria) that pithecanthropoids made artefacts and that some of them used fire. It is probable that Pithecanthropoids, the *Meganthropus*, the *Gigantopithecus* and the Australopithecines were all living on this earth at the same time. Moreover, if Swanscombe Man is Riss-Würm Interglacial dating, then a type very like *Homo sapiens* was also living when some of the Pithecanthropoids still survived.

[1] It may be (e.g. from the Java *Meganthropus* evidence) that there were, in past ages, giant types of men, or anyway types of men with very big jaws. Indeed the late Franz Weidenreich suggested that the hominid as a whole passed through a giant stage. But a regression from such giant forms to smaller ones would go against what we know of general evolutionary trends.

The outstanding feature of the Pithecanthropoids is an 'archaic' form of skull (including teeth) with limb-bones practically the same as those of *Homo sapiens.*

The main features of the Pithecanthropoids are:

1. Upright posture and bipedal walk as perfect as in *Homo sapiens.*

2. Cranial capacity varying between 888 c.c. (for *Pithecanthropus erectus*) to 1,046 c.c. (for *Pithecanthropus pekinensis*), and the latter figure is well within the range of *Homo sapiens* cranial capacities.

3. Face fairly prognathous, malar bones of *sapiens* type, canine fossa well marked in *P. pekinensis.* Mandible less powerful than in the Australopithecines, though in some specimens (e.g. *P. dubius,* Ternifine and *Meganthropus*—if the latter is to be regarded as a pithecanthropoid type) there are features reminiscent of the Australopithecines' mandibles. The symphysis is always retreating and thick, though there is no simian shelf.

4. Dentition continuous (though there is a diastema in *P. modjokertensis*) and of definitely hominid type. The dentition of the Java Pithecanthropoids is, in a sense, more 'primitive' than that of *P. pekinensis* and somewhat resembles that of the South African *Telanthropus.*

5. Variability, thus *P. pekinensis* has a longer cranium than *P. erectus* and a supraorbital torus more projecting and separated by a depression, sulcus or furrow, from the rest of the forehead which, however, is a little less flat than in *P. erectus.*

6. In *P. pekinensis, P. mauritanicus* ('Atlanthropus') and in *Meganthropus* there is a cingulum on the premolars, but the last molar is in process of reduction and the pattern of the folds on the oral faces less 'dryopithecoid'.

A NOTE ON NOMENCLATURE

There is a tendency in some quarters to substitute the name of a culture or industry for that of the type of hominid who is held to have fashioned and used such artefacts. In the same way political tags are often attached to types of men, as though it told us anything about physical type to be informed that such and such a man was a 'Celt' or an 'Arab' or a 'Semite'. Linguistic labels, too, are out of date. So to speak of 'Mousterian Man' when we mean Neanderthaloids and still more of 'Chellean,

or 'Acheulian' Man is to be deplored. Such appellations merely darken counsel.

A 'Pebble Industry' has been found with Australopithecine remains in South Africa. A 'Pebble Industry' has also been discovered with a very different type of hominid in northern China. Acheulian artefacts have been recovered in association with the pithecanthropoid 'Atlanthropus' (which should rather be *Pithecanthropus mauritanicus*) in North Africa. An Acheulian industry also was in association with the Swanscombe skull which is apparently that of *Homo sapiens fossilis* —or of a hominid type, anyway, quite different from that of the Algerian Pithecanthropoids.

The equating of one hominid physical type with one sort of artefact is running counter to the evidence. One might as well say that the neolithic population of Australia in A.D. 1800 must have been like that of the neolithic population of Britain in 2000 B.C.

THE CRADLE OF MANKIND . . . AGAIN

The search for the 'cradle of mankind' (and it still goes on) seems to be actuated, at least in part, by some hang-over from creation-legends. Might we not stumble on some fossil Garden of Eden where the First Man with his non-hominid immediate ancestors are preserved for us as in a family vault? Stated thus the question looks silly enough.

But there is, alas, no chance of our ever finding such a sanctuary for obviously it never existed. The more we learn of our own past the clearer we see that not so long ago (in terms of Primates' history) there were several sorts of hominids living at the same time on our globe. There is after all nothing surprising in this. We take it as a matter of course that there should be three or four sorts of camels today.

From the time that the first *Pithecanthropus* was discovered (in 1892), the tendency was to look to south-eastern Asia for the 'cradle' of our kind, though, if we come to reflect, that cradle could hardly have been an island which was under the sea when Australopithecines were maybe wandering about on the high veldt of South Africa. The discovery in 1925 and the following years of the 'Sinanthropus' kept attention well turned towards the Far East.

Now we have Pithecanthropoids in Africa and we also have there a more 'primitive' sort of hominid that made tools and walked upright: the Australopithecines. The 'cradle' has swung round.

THE SEQUENCE OF MAIN SOUTHERN AFRICAN INDUSTRIES		
Post-Gamblian	Late Stone Age	Wilton Smithfield
Gamblian	Middle Stone Age	Stillbay
Kanjeran		Fauresmith Stellenbosch II — III — IV — V
Kamasian	Early Stone Age	Stellenbosch I Oldowan
Kageran		Kafuan

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6

The Neanderthaloids

NEWMAN'S VALE

IN THE year 1676 a young theologian from Bremen, called Joachim Neander, who had been a few years before appointed rector of the Latin school at the little town of Düsseldorf on the Rhine, got into trouble with the ecclesiastical authorities for abstaining from Holy Communion, and what was even worse, inducing others to abstain also. He was suspended from his teaching and so had plenty of time to wander about and take long walks. It was during these excursions, it seems, that he composed some of the poems for which he remains famous in the history of hymnology. He published in all some seventy spiritual songs under the titles *Bundeslieder* and *Dankpsalmen*. His favourite walk appears to have been up the valley of the Düssel stream to a point about ten miles from the town and where the narrow vale widened out to a very pretty piece of scenery. On either side high limestone cliffs, a broad canyon full of shade and verdure. Here Neander would sit and meditate and compose his hymns. Later, he got back his job but did not stay on at Düsseldorf. He returned to his native Bremen where he died in 1680. But the men of Düsseldorf kept his memory green and named his favourite stretch of the Düssel-dale—Neanderthal, after him. The countryside is now much changed from what it was three hundred years ago or even from what it was in 1856, but Neander's name is still attached to this piece of the valley and the hymnologist (whose hymns are still sung in Germany) has acquired another fame which would much astonish him if he could learn of it. Whenever we write or speak or hear the words 'Neanderthal', 'Neanderthaloid', we are, in a way, commemorating pious Joachim Neander who died when he was but thirty years of age.

It is worth while telling this rather pathetic story, since it is often

thought that the Neanderthal is the vale of some Neander stream that falls into the Düssel.

In 1856, thus three years before the publication of Darwin's 'Origin of Species', workmen clearing out a limestone cave on the precipitous sides of a winding ravine and about sixty feet above the Düssel stream, unearthed a skeleton. When it was found it was, apparently, complete, but the men threw away a good deal of the material so that all that survived was the frontal bone, both parietals, part of the squamous and the upper third of the occipital of the skull together with the thigh-bones, parts of the arm-bones, a few ribs and a large fragment of the pelvis.

When, then, we come to note the very varied reception accorded to these remains by the scientists of the day, we may remember that what they had to go upon was a very imperfect skull and bits and pieces of the rest of the skeleton.[1]

These fossil bones came into the possession of one Fuhlrott, a schoolmaster at Elberfeld. He submitted the remains to Schaafhausen of Bonn who surmised that they belonged to a 'barbarous and savage race'. In 1858 Schaafhausen published his description which does not seem to have attracted much attention—anyway outside Germany—until, in 1861, Busk translated the paper into English and accompanied his version with an illustration of the skull with one of a chimpanzee for comparison.

Neither Darwin nor Huxley appears to have taken any notice of Busk's translation. It was Lyell (who wanted to put a description of the Neanderthal remains in his book 'The Antiquity of Man') who visited Germany, procured a cast of the skull and gave it to Huxley, who made a report (in 1863) in which he judged the Neanderthal specimen to be that of a primitive variety of Man '. . . different from *sapiens* but not wholly distinct anatomically'. In his 'Man's Place in Nature' he wrote that the place of the specimen was not clear, but that it was the 'most pithecoid human cranium yet discovered', though 'in no sense can the Neanderthal bones be regarded as the remains of a human being intermediate between men and apes'.[2]

[1] The Neanderthal cave (which no longer exists) was several hundred feet below the top of the cliff and gave on to a ledge overlooking the stream. A hundred years ago there were no photographs to show things as they really were and in the 'classical' drawing of the Neanderthal cave in section, there is shown a 'rent' or 'funnel' connecting the cavern with the surface of the ground at the top of the cliff. But the funnel never existed.

[2] The reference to not being 'intermediate' between men and apes is significant if we remember that in those days (and for long afterwards) there was much ado about the 'Missing Link'.

Other comment was less reasonable. A Dr Gibb opined that the Neanderthal subject had been afflicted with 'hypertrophic deformation' (which may sound edifying but which means nothing); another opinion was that the ancient Man had been affected with 'idiocy and rickets'. Pruner Bey, an anthropologist who left us some racy descriptions of sexual habits, declared that Neanderthal man had been 'a powerfully organized Celt somewhat resembling the modern Irish with low mental organization'.[1] Professor Mayer of Bonn was, however, the most perspicacious, and stated that the bones were those of one of the Cossacks from Russia who invaded Germany in 1814.

The merit of having named the specimen *Homo neanderthalensis* goes to William King, a professor at Queen's College, Galway, who, in 1864, recognized that the fossil was that of a 'new species of *Homo*', that it was of 'glacial epoch' and of great antiquity.

TWO MAIN GROUPS OF NEANDERTHALOIDS

Neanderthaloids' remains have now (1960) been recovered from western and south-eastern Europe, from northern, eastern and southern Africa, from western, central and south-eastern Asia. However, the group exhibits such wide variations that we are clearly confronted with a kind of Man that flourished for long ages, and some of whose forms are hardly distinguishable from *Homo sapiens*, while others suggest a type which looks like an enlarged and 'improved' pithecanthropoid form.

The variations among the Neanderthaloids are great. To take, for instance, the mandibular symphysis. This is retreating with no trace of a chin in La Chapelle-aux-Saints; it is vertical in the Spy, Ehringsdorf, Rabat and La Ferrassie subjects as well as in some subjects from Jebel Kafzah (Palestine) which show a slight mental eminence.

The cranial capacity varies from about 1,300 to 1,600 c.c. The La Chapelle-aux-Saints, La Quina, Monte Circeo and Rhodesian Neanderthaloids have a 'snout', a flattened vault, and flattening of the nuchal area, an occipital torus, and a bar or supraorbital torus that is very marked. But the Spy, La Madeleine, Gibraltar and Palestine (Mount Carmel) types have a much attenuated torus, while in Jebel Kafzah

[1] Such nonsense terms as we should consider them now (e.g. 'Celt' as an anthropological designation) were usual enough a hundred years ago. Even Huxley wrote of his paternal ancestors as 'mainly Iberian mongrels, with a good dash of Norman and a little Saxon'.

individuals the torus is divided (as in *Homo sapiens*). The platychephaly (or flattening of the vault) is but little marked in Steinheim and in some Palestinian forms, the projection of the occipital region is less (also in Saccopastore); Steinheim, indeed, has a *sapiens* type rounded occiput, and so forth.

However, we can group the Neanderthaloids into two main classes: (1) a 'generalized' type some members of which appear to be almost *sapiens*; and (2) a 'classic' or 'rugged' type to which the original Neanderthal specimen belongs. This may serve as a working classification for the time being but if, or when, more apparently *Homo sapiens* material (cf. that of Swanscombe and Fontéchevade) is forthcoming from the Riss-Würm Interglacial, and earlier, we may have to revise our ideas about the Neanderthaloids and reserve the name for the more 'rugged' specimens. It is noteworthy that the 'classic' type (in Europe) seems to be the more recent and the 'generalized' type the older and to date from the Riss-Würm Interglacial. Outside of Europe the situation is rather different.

The fact is, as we see the problem today, the history of some, at least, of the Neanderthaloids cannot be dissociated from that of *Homo sapiens*, though it is more convenient still to consider the whole neanderthaloid group apart from *Homo sapiens* while, at the same time, noting that types such as *Ehringsdorf* and *Steinheim* do not seem much more 'neanderthaloid' than specimens classed as *sapiens* (i.e. Wadjak and some early Australoid crania, see page 214).

NEANDERTHALOIDS FOUND BEFORE NEANDERTHAL

Although the Neanderthaloids are now so named (and we must keep the name, although it is so clumsy) other remains of neanderthaloid type had been found before 1856. As long ago as 1832 P. C. Schmerling had found two crania in a cave at Engis in Belgium. He described his specimens in 1833 but their significance was not realized at first, though Huxley in his 'Man's Place in Nature' compared the Engis specimens with that of Neanderthal.[1]

In 1848 a Royal Artillery officer discovered a fossil skull-fragment at Gibraltar. No notice was taken of this until, years later, the prison governor on the Rock became interested in palaeontology. In 1864, however, Busk studied the specimen. It is undoubtedly neanderthaloid,

[1] In 1936 C. Fraipont published a monograph on the Engis child's skull (the other is of an adult) and reported it was that of a Neanderthaloid apparently of the 'classic' type and about six or seven years of age.

though it probably belongs to the more 'generalized' type. The cranial capacity is about 1,280 c.c. and the skull is very like those of Saccopastore (see page 191).

For long, all the neanderthaloid evidence came from Europe, and it was held that this 'primitive' and 'ape-like' man faded away 'almost suddenly' before the invasion of Europe by *Homo sapiens*. This picture has now changed.

Neanderthaloids were in Europe before the Würm glaciation—and so was *Homo sapiens*. The two sorts of men must have lived side by side for long ages. Furthermore, as the Neanderthaloids flourished for so many thousands of years, the group must have become differentiated into a number of types ranging from what may be called 'varieties' to distinct 'species', and from some points of view it may be justifiable to say that one of these 'species' *represented* the ancestors, of *Homo sapiens* (see page 214).

We may also note that it is because we have now such a rather large amount of neanderthaloid material that we find it varied, whereas our pithecanthropoid material is much less abundant so that we are still inclined to think of the Pithecanthropoids as a homogeneous group although (see page 130), as the evidence piles up, it is clear that there was as much difference between the Men of Peking and those of Java as between some sorts of Neanderthaloids, or if this seems too strong a statement we may say that the African, Java and Chinese Pithecanthropoids make up a far from homogeneous group.

To sum up: the Neanderthaloids were spread all over the earth (that is in regions of the Old World suitable for man's settlement[1] in those remote times), and they were a mixed lot, some so like *Homo sapiens* (e.g. Steinheim, see page 189) that it is difficult to place them, others very definitely neanderthaloid in the sense the word was understood when Boule published his famous paper (see page 154), others again (Rabat Man page 176), Solo and Rhodesian Man look like transitional types from Pithecanthropoids to Neanderthaloids.[2]

In a former book I gave a rather full list and description of the principal neanderthaloid remains found in Europe. It is perhaps not now necessary to furnish such a catalogue, for there is available the

[1] From the Riss-Würm glaciation (in Europe) to the middle of the Würm glaciation and that is a period of certainly 150,000 years.

[2] A plausible *morphological* line of descent of various sorts of men is that postulated by Weidenreich, i.e. Pithecanthropoids, Solo Man (Neanderthaloid) and Wadjak Man (*sapiens* and 'proto-Australoid') see page 214.

excellent list of *Hommes fossiles*[1] and also because, with very few exceptions, the remains of the 'classic' Neanderthaloids do not throw much light upon our main theme except insofar as some of them offer evidence for funeral rites. A list of the main sites is given below and we may mention the La Ferrassie specimens which were evidently intentionally buried. Between 1909 and 1921 the remains of six individuals were recovered from this site. The bones were associated with Mousterian flints and fossils of reindeer, bison and horses (some of which may have been interred): this is a typical fauna of the Würm I phase of glaciation. All the bones are those of 'classic' Neanderthaloids.

The Le Moustier and the La Chapelle-aux-Saints neanderthaloid skeletons were found lying at full length. At La Ferrassie the bodies had been flexed and placed into the 'foetal' position (a position found in European Iron Age burials and common in many countries, e.g. predynastic Egypt). Maybe the dead were trussed up 'squatting' (as they are to this day in parts of Africa), so that they might not come back and worry the living, or perhaps 'squatting' just represented the usual attitude of repose. Just how much can be assumed from such intentional burials of the Neanderthaloids' ideas about the dead is largely a matter of opinion. In any case, it is not safe to assume any definite 'belief' in a life after death.

THE PRINCIPAL NEANDERTHALOID FOSSILS

There are now well over sixty Neanderthaloid individuals whose bones have been recovered and ten of them have been found since 1950. As this book was in the press a report was received (in March 1960) from the Institute of Vertebrate Palaeontology in Peking that a 'fairly complete' hominid skull with orbital ridge and nasal bones had been found by peasants in a cave in north-western Kwangtung (and thus in the same general region as the *Gigantopithecus* discoveries). The cranium (estimated to be 'about 200,000 years old') had an associated fossil fauna of hyena, panda, tiger, rhinoceros, porcupine, stegodont elephant and deer. But although the relic is described as 'the earliest form of the palaeoanthropic stage found in China', it is not yet clear exactly how it should be classified. In the following list both 'classic' and 'generalized' forms are given. In some cases the specimens are so small or so fragmentary that it is not possible to decide, with certainty, into which main category they should be placed.

[1] Vallois, H. V., and Movius, H. L. 1953 *Catalogue des Hommes Fossiles.*

EUROPE

Arcy-sur-Cure (France)
Bañolas (Spain)
La Chaise (Charente, France)
La Chapelle-aux-Saints (France)
Ehringsdorf (Germany)
Engis (Belgium)
La Ferrassie (France)
Gibraltar (2)
Malarnaud (France)
Monte Circeo (Italy)
Le Moustier (France)
Neanderthal (Germany)
La Quina (France)
Saccopastore (2) (Italy)
Spy (Belgium)
Steinheim (Germany)

In 1941 there was discovered embedded in a cliff at Montmaurin, near Lespugue (France) a maxilla which appears to be more or less contemporary with Fontéchevade (see page 204), that is to say of Riss-Würm Interglacial dating. All the teeth are missing except the six molars. The specimen has been rather vaguely characterized as 'pre-neanderthaloid'. In 1956 a neanderthaloid skull was reported as having been discovered at Melsungen in Germany, but no detailed description is, as yet, available (1960), though it is described as that of a female about forty years of age, of neanderthaloid type and 'about 120,000 years old', and therefore of Riss-Würm dating.

ASIA

Galilee
Kiik Koba and the Crimea
Mount Carmel
Solo
Shanidar
Teshik-Tash

AFRICA

Diré-Dawa
Haua Fteah
Rabat
Broken Hill (Rhodesia)
Saldanha
Tangier

LA CHAPELLE-AUX-SAINTS

The neanderthaloid skeleton of La Chapelle-aux-Saints was discovered in 1908 by the Abbé Bouyssonie (the French clergy have played and still play a notable part in prehistorical and anthropological research) in a cave of the Department of the Dordogne. The specimen had, apparently, been intentionally buried; at least, it lay in a depression cut down into the marl at the base of the deposit which contained also the bones of rhinoceros, marmots and cave-hyena. Although, therefore, the dating cannot be very precise, it is clear that the skeleton is of general Würm glaciation date.

The bones were much crushed (especially those of the head and face), and the remains were certainly those of an aged man who was deformed by osteo-arthritis and who bore many stigmata of advanced senility. The reconstruction of the skull, and especially of its base, was unsatisfactory (see plate VII).

From this material M. Boule, of the Institute of Human Palaeontology in Paris and an admittedly eminent anthropologist, prepared his description of the Neanderthaloids, a description which has done much to accredit misleading ideas about the whole neanderthaloid question. It may be remembered that in 1908 no other neanderthaloid skeleton was known.

Boule concluded that the Neanderthaloids (since fifty years ago they were thought to constitute a very homogeneous group) did not have a completely upright station, that their heads hung forwards at the end of a spinal column whose curves were more anthropoid than hominid. There can be no doubt that such a description is false—for any sort of Neanderthaloid. Boule, for instance, thought that the *foramen magnum* of the La Chapelle-aux-Saints specimen was so placed that the head must have hung forward in an almost 'ape-like' fashion. But in all the other neanderthaloid skulls, in which the *foramen magnum* is still visible: e.g., La Ferrassie, Saccopastore I, Solo, Rhodesia and Skhūl V (and some of these are 'classic' and some are 'generalized' types), the position of the *foramen magnum* is exactly as in *Homo sapiens*.

Boule's description has led to a hundred ridiculous 'reconstructions' of Neanderthaloids (including the statue which still disfigures the museum terrace at Les Eyzies) all of which, of course, are covered with a thick coat of hair.

Radiograms taken of living men show that the so-called 'simian'

structure of some Neanderthaloids' cervical region is to be found also in *Homo sapiens* and is in no way associated with an 'ill-balanced' head, though how an individual can go through life with an 'ill-balanced' head—unless he wears a neck-brace—is not clear. The curvature of the femur and the retroversion of the tibial plateau (which were taken to indicate that the Neanderthaloids walked with bent knees) are subject, both in *Homo sapiens* and in the Neanderthaloids, to such a wide range of variation that it cannot be held that the Neanderthaloid shuffled along with knees flexed like those of a lean and slippered Pantaloon. We cannot imagine a stock of hardy hunters, men who braved the great cold, men who maintained themselves for tens of thousands of years, that was not swift of foot, agile and nimble.

It is worth while insisting upon these points because still, and very frequently, a representation of the Boule La Chapelle-aux-Saints reconstruction (or a slight modification of it) figures in books on anthropology and palaeontology and especially in works designed for the general public. Such fanciful 'reconstructions' are much to be deplored: (1) because they are quite unfounded and (2) because they lead people to believe that the Neanderthaloids not only formed a very homogeneous group, but also that they were quite unlike *Homo sapiens.*

THE HOTTENTOT VENUS

The 'Hottentot Venus' (see plate v) was brought to France in Napoleon's reign and was 'publicly exhibited in London and Paris'. She was made the subject of a report by Cuvier (in the *Mem. du Muséum*, Paris, volume III), and after her death (in 1816) a plaster-cast was made of her body and this cast, together with her skeleton, is now preserved in the Museum of Man in Paris.

The remarkable steatopygy, or bulging buttocks, characteristic of Hottentot women, reminds us not a little of the Aurignacian Upper Palaeolithic statuettes such as the 'Venus of Willendorf'. Cuvier opined that the steatopygy bore 'a striking resemblance to those which appear in the female mandrills, baboons, etc., and which assume a truly monstrous development'.

'The vibration of these substances,' says Dr Lawrence in his 'Lectures on Physiology' (1819), 'at every movement, was very striking in the Hottentot Venus. They were quite soft to the feel.' In fact, the

poor 'Venus' was poked about, and examined and 'felt' even by the great Cuvier. He found that the *labia minora* had a length of four inches.[1] This characteristic 'Hottentot apron' wrote Mr Barrow in his 'Travels into the Interior of South Africa' has 'at least the advantage of serving as a protection against violence from the other sex, it being near to impossible for a man to cohabit with one of them, without her consent, or even assistance'.

There is little on the skeleton of the 'Venus' to suggest the 'fat buttocks' and of course nothing to indicate the presence of a 'Hottentot apron'. The Late Palaeolithic statuettes and sculptures (e.g. the Laussel woman with the horn) may, or may not, have represented women as they were or just women as they, or their men, wanted them to be. The ladies of Cro-Magnon, Chancelade, Grimaldi, etc. may have been as slim and slender as the beauties figuring in fashion advertisements today.

The wild camels of the Gobi desert's fringes (there are still a few left) have much smaller humps than the domestic camels (just little bumps, in many cases, not more than six inches high), but these camels of the Altai foothills, though their heads may be rather flatter, and their general build rather more slender, than those of the domestic varieties, and their coat shorter than in the familiar 'Bactrian' camel, are hardly distinguishable from it in their skeletons. The huge hump makes an African camel look as different from a llama as, let us say, a lion from a tiger, and, indeed, renders it difficult for us to think of the South American 'camels' as 'camels' at all. But if we look at the skeleton of a 'dromedary' and that of an alpaca, for instance, they seem (except for size) very similar indeed.

So let us beware of 'reconstructions' which, indeed, are always with us. We can open scarcely any book devoted to early types of Man without being confronted with fanciful presentments of *Pithecanthropi*, Australopithecines or Neanderthaloids.

BONES AND BODY

In 1936 I spent some time with the late Professor Weninger in his anthropological laboratory in the Van Swietengasse at Vienna. The Institute was housed in an ancient monastery with walls three feet thick and resounding corridors and huge vaulted chambers in one of which was a glass case.

[1] The 'apron' is an elongation of the *labia minora* and of the *praeputium clitoridis*; the 'apron' of course varies in length according to the individual; some women have it but slightly developed.

It contained the cast of a man's head and also a human skull. The head, very life-like, was that of a fleshy individual in late middle age. A man with a thick neck and the protuberant nape which we like to think of as typically German and which gives so many people in Germany what is known as a *Steilkopf*. The general effect was of a subject with a flat back to his head, a fairly short skull, heavy features and a rather coarse aquiline nose.

The skull, on the other hand, was mesocephalic, and even verging on the dolichocephalic, and had a generally delicate appearance. Obviously cast and skull could not be in any way connected. But they were. An anthropologically minded Viennese citizen had willed his skeleton to the laboratory. The cast gave his appearance in life. The skull was his own, 'real' head.

Maybe this little anecdote will serve to underline the fanciful nature of 'reconstructions' which, for the most part, are not more reliable than the woodcuts that illustrated the bestiaries of the Middle Ages—and later.

It is, however, true that some bones in some specimens show a surface which indicates they were the support for powerful muscles; again, some features can be assumed. If there is no 'mental eminence' there will not be any chin in the living subject.[1] If the nasal aperture of a skull is narrow it is improbable that it was preceded by a flat, thick, fleshy nose—but even so we must proceed with care.

Since our classifications of fossil hominids is based exclusively on their bones, many features which appear specific in the skeleton would not so seem in the living subject. The converse also is true. I have sat next to a Negro in the New York subway who, with no make-up at all, might have sat for the portrait of a Neanderthaloid (as we may imagine him) yet the Negro was, of course, fully *sapiens*.

THE 'CLASSIC' NEANDERTHALOIDS

What may be termed the 'classic' Neanderthaloids (i.e. those belonging more or less to the type of the original Neanderthal remains) differ from *Homo sapiens* in a number of particulars. Our material for the

[1] The 'chin' has been formed not by the sprouting of a bit of bone from the lower jaw but by the receding of the teeth so that the anterior part of the lower jaw has remained projecting in front of the line of the incisors. We may also remember that a 'chin' is just this prominence; in popular speech 'chin' often seems to indicate a heavy and massive lower jaw which may have a comparatively small mental eminence, whereas a lighter and less massive jaw may have an eminence that is absolutely, as well as relatively, larger.

'generalized' Neanderthaloids is not so abundant and does not (except in Skhūl V, see page 185) show any long bones.

The long bones of the arm and leg, the shoulder-blades and some of the ankle-bones are of a shape different from that of specimens recognized as *Homo sapiens*, either fossil or living. The long bones are heavy and thick with large joints, and such marks of muscle attachments as to indicate very considerable physical strength. The ribs are thicker and less flattened than in many, perhaps most, 'modern' men, though the neanderthaloid 'barrel-shaped' thorax is by no means unknown in *Homo sapiens*.[1]

The 'classic' neanderthaloid skull is recognizable, principally from its brow-ridge or supra-orbital torus, forming a heavy bar across the face. The eye-sockets are generally larger than in our skulls. Compared with that of *Homo sapiens* the face is long (and appears even longer than it is because of the low vault of the skull), and the nasal aperture is wide with the lower borders generally sharp and the spine of the nose very prominent. The distance between the nose and the upper teeth is greater than that common in *Homo sapiens*, though in this respect (as in a number of others) the Neanderthaloids appear rather as creatures well within the range of what we might consider as 'normal' variations of *Homo sapiens*, let us say another type of our stock. The neanderthaloid cheek-bones slope backwards (this is no 'ape-like' feature), and the profile of the face is 'snouty', i.e. sloping forehead and sloping lower jaw leading up to a prominent nose and middle face. The 'canine fossa' about which much ado is sometimes made (it is a depression in the upper jaw beneath the eye-orbits) is wanting in the 'classic' Neanderthaloids though it is generally, though by no means always, present in *Homo sapiens*.

The mastoid process (the little bump behind the ear) is smaller than with us. There is a ridge at the back of the head ('the occipital torus'), and the head is always long for its breadth, while the attachments for the neck muscles usually extend farther up than they do in *Homo sapiens*.

[1] Among 'modern' men an excess of pituitary activity or a pathological enlargement of the pituitary gland will produce either (or both) an augmentation of certain parts of the skeleton ('acromegaly') or an augmentation of all parts of it ('gigantism') —though the Neanderthaloids were certainly not giants, but these conditions are sometimes accompanied by a pseudo-neanderthaloid appearance of the skull. In 1927 F. G. C. Hansen of Copenhagen received from Greenland a skull unearthed at a place called Gadar in the south-west of the country. This Gadar (or Ikaliko) relic was found in a Norse grave (in the eleventh century there was a cathedral at Gadar) but had it been discovered in a 'Mousterian' context it would probably have been accepted as neanderthaloid.

The palate is long, broad and rather less parabolic than in *Homo sapiens*, and there is only a slight (and often no) indication of the chin protuberance at the tip of the lower jaw.

The molars often show a condition known as 'taurodontism' with a larger pulp-cavity than common in *Homo sapiens*, though this taurodontism does not occur in all even of the 'classic' Neanderthaloids. By the way, all neanderthaloid teeth, as yet examined, are free from decay, though they are often much worn down by abrasion.

The skulls are long for their breadth[1] and this dolichocephalic type of head is that of all early hominids. 'Brachycephaly' seems to be a relatively recent form of cranium which appears only in Late Palaeolithic times and after. The Neanderthaloids' skulls, in general, are rather restricted about the temporal region and this is also a 'primitive' condition which may be seen, in its extreme form, in the Australopithecines and the Pithecanthropoids, though plenty of *Homines sapientes* present a 'pinched' look about the temples (especially in 'Mediterranean' types, see page 213).

It has been computed that the average volume of the brain in the ('classic') Neanderthaloids was well up to the average of *Homo sapiens*. In fact the Neanderthaloids (of all types) were rather big-brained fellows, though this does not mean that they were what we should call exceptionally intelligent, then again it does not mean that they were not pretty intelligent. Comparisons based upon comparatively few skulls on the one hand, and, practically, as many as we like (for *Homo sapiens*) on the other hand, are not really illuminating. We may agree that, generally speaking, the skulls of many *Homo sapiens* types have a frontal region that is better 'filled out' than those of most Neanderthaloids whose crania are also more flattened. As far as can be judged, however, the 'association areas' of the brain seem to be as well developed as in most *Homo sapiens* specimens. The *foramen magnum* of the Neanderthaloids does not present (as formerly held) an oval contour (as against a round one in *Homo sapiens*) neither is the *foramen* placed farther back than with us. The cranial capacity of the Monte Circeo skull is about 1,550 c.c.—greater than the *average* for any group of *Homines sapientes*—and Boule estimated the cranial capacity of the La Chapelle-aux-Saints skull at 1,620 c.c.

[1] The cephalic indices are obtained by dividing width into length and are expressed as a percentage.

Dolichocephalic:	c.i.	less than 75 per cent.
Mesocephalic:	c.i.	between 75 and 80 per cent.
Brachycephalic:	c.i.	greater than 80 per cent.

In fact, though neanderthaloid characters of the more rugged sort are specialized, they are not enough to put the Neanderthaloids of any type in a different evolutionary category from *Homo sapiens*. We might say that the Neanderthaloids are a kind of *Homo sapiens* or that *Homo sapiens* is a kind of Neanderthaloid, maybe an aberrant sort—but certainly cunning.

The 'primitive' features such as platycephaly (flattened top of the head), strongly developed supra-orbital ridges, large jaws and teeth seem to be secondary, that is to say the result of regressive evolution from earlier types which, it would seem, we cannot regard as being specifically different from *Homo sapiens*.

FURTHER FINDS

After Bouyssonie's discovery in 1908 the neanderthaloid material in Europe accumulated rather fast, but it was not until a good deal later that any remains of Neanderthaloids were recognized out of Europe.

We may remember that, at the beginning of this century, evidence for the story of *Homo sapiens* and his relations was almost entirely confined to our continent. There was the pithecanthropoid skull (regarded by many as that of an ape) from Java, and that was all. It looked as though Europe was the prime area of hominid evolution.

In 1909 the Swiss antiquarian dealer Hauser (whose devastating digs led to the promulgation of laws regulating excavation at prehistoric sites) found at Le Moustier, in the Dordogne, the skeleton of a Neanderthaloid, that of a young lad aged about sixteen years at the time of his death. The specimen is of 'classic' type, but as there was never any proper scientific report made on the site, or on the conditions of discovery, the value of the fossil was lessened. The skeleton was much damaged but Hauser sold it for 125,000 gold francs or 100,000 gold marks (about five thousand sovereigns) to the Berlin *Museum für Völkerkunde*. During the bombardment of the German capital in the 1939–45 war the Le Moustier specimen was destroyed.

Between 1909 and 1911 Capitan and Peyrony discovered two neanderthaloid skeletons of adults and three of children in the La Ferrassie shelter (three miles west of Les Eyzies), and in 1912 and 1921 the remains of four other individuals (very much damaged) were recovered from the same site. With the hominid bones were those of bison, reindeer and horse and also Mousterian artefacts. The shelter

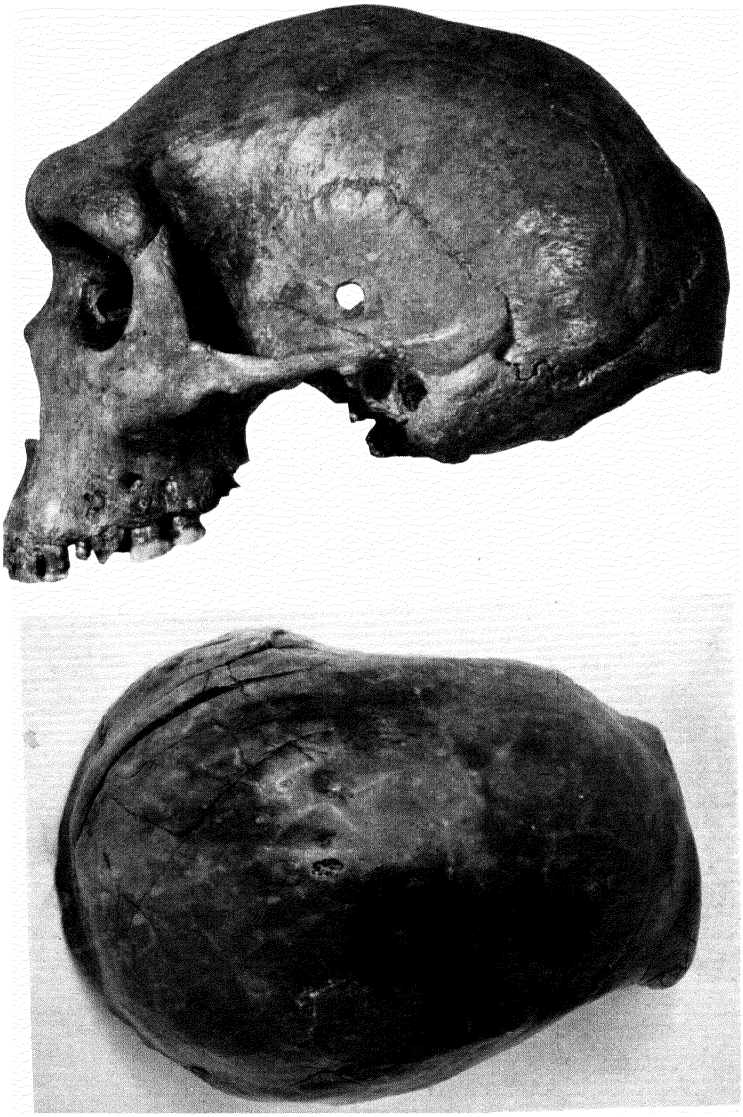


PLATE IX

Above: *Homo rhodesiensis* skull

Below: Solo skull No. 1

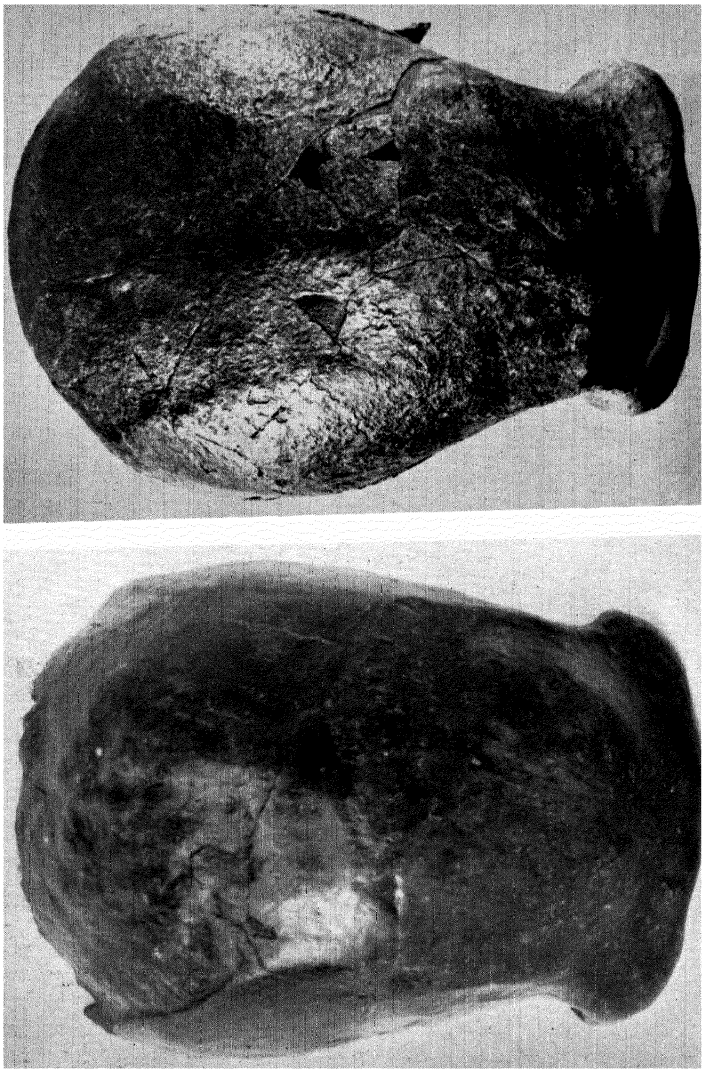


PLATE X

Above: *Pithecanthropus erectus II* skull as reconstituted

Below: Solo IV skull

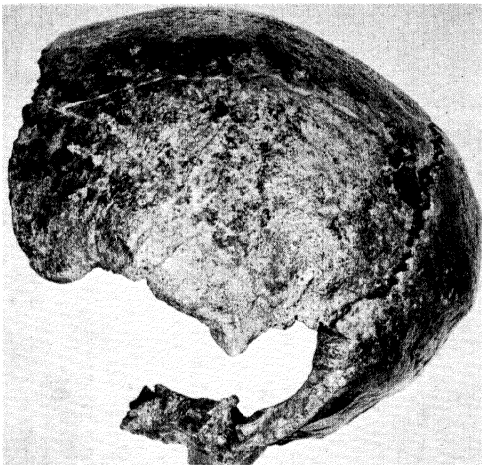


PLATE XI (a)
Swanscombe
skull fragments

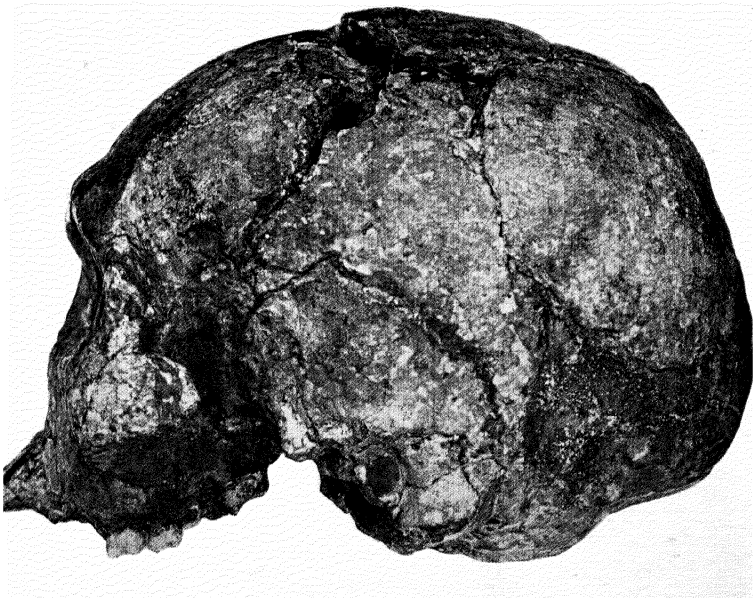


PLATE XI (b)
Wadjak skull No. 1

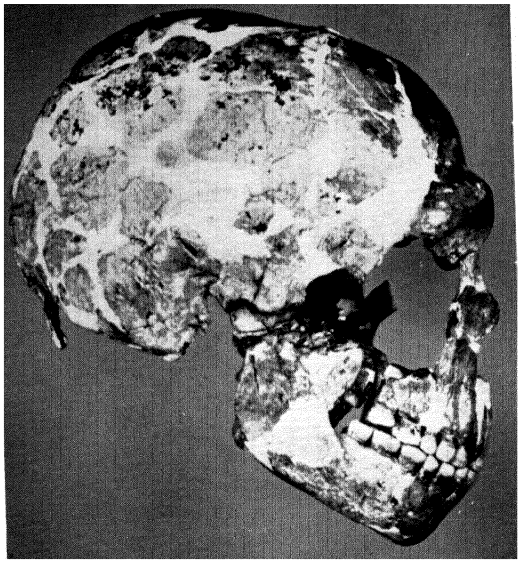


PLATE XII (a)
Tabūn skull

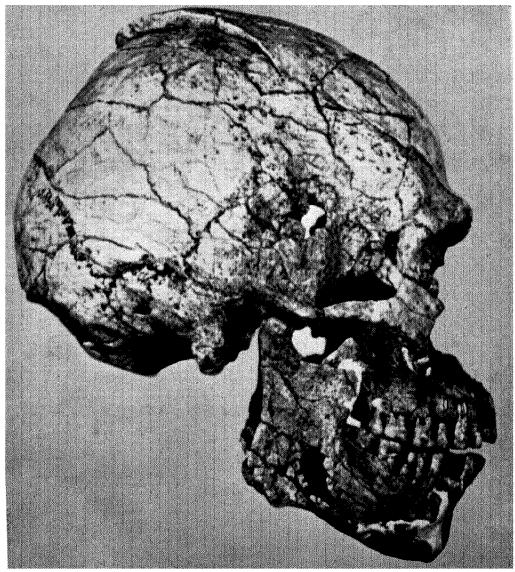


PLATE XII (b)
Skhūl skull No. 5

was, no doubt, a grave and the specimens are of early Würmian Glaciation dating and of 'classic' type (see page 157).

In 1911 and up to 1920, Henri Martin made a whole series of neanderthaloid finds at La Quina. He thought, indeed, he had found the remains of twenty individuals. It now seems that there were not quite so many. A publication dealing with the finds, in general, was issued in 1923. Here again, there was intentional burial, for which there is no evidence before the time of the early Würmian Neanderthaloids. Any collection of hominid bones found in anatomical connection indicates burial, as a rule.

Almost all the European neanderthaloid finds came from caves, and in Europe only five discoveries of ancient hominid material have been made in old sand, or gravel, deposits:

1. The Heidelberg mandible
2. The Steinheim skull
3. The Saccopastore skull I
4. The Saccopastore skull II
5. The Swanscombe skull fragments.

TANA DELLA BÁSURA

Saint Lucy, it is said, was a Syracusan virgin and martyr, and her images often depict her holding her eyes upon a platter before her. One of her shrines is high up on a hillside overlooking the village of Toirano a few miles inland from Borghetto Santo Spirito on the Italian *Riviera di Ponente*. The shrine is a small chapel in a cave which has been furnished with a pale brown frontage and flanked on either side of the entrance by a singularly symmetrical and tall cypress. Here, as in far distant China (see page 11), the ancient dwellings of prehistoric Man have been consecrated to a cult of our own days.

At almost any place along the Ligurian shore, if you walk inland a few miles from the crowded bathing-beaches, you will find yourself in an almost deserted world of hills and mountains, the barrier of the Ligurian Alps whose northern face slopes gently down into the Lombard plain. The continental shelf hereabouts—under a fringe of relatively shallow water—is fairly wide and, at various times in the past, when the ice-caps piled up on the heights of western Europe, the level of the sea sank so that there stretched southwards a wide plain from what is now but a narrow strip of littoral. This, then, was a favoured region,

protected from the northern blasts and enjoying, indeed, what is called a 'microclimate'—as it does to this day.

The first discoveries of fossil man on these coasts were made in the famed Grimaldi Caves or *Balzi Rossi* (now almost entirely destroyed) at the foot of the cliffs just to the east of the Pont Saint-Louis which, since 1860, has marked the frontier between France and Italy (see page 232). But the skeletons of Grimaldi are those of *Homo sapiens* and no remains of other sorts of men were found in Italy until the recovery of the first (1929) and the second (1935) Saccopastore skulls near the Porta Nomentana at the gates of Rome. These crania are of Neanderthaloids (see page 191). On the eve of the Second World War (in 1939), A. C. Blanc penetrated into a cave at Monte Circeo on the southern limit of the former Pomptine marshes and there discovered a singularly interesting neanderthaloid skull in an excellent state of preservation, together with a lower jaw belonging to another individual of the same type (see page 168).

However, northern Italy yielded no traces of Neanderthaloid Man's presence (save for some artefacts) until the opening up, in 1950, of the *Tana della Básura* or *Grotta della Strega*, that is the 'Cavern of the Witch' in the hills behind Toirano.[1]

A newly constructed road (for visitors now come fairly numerous to the *Tana della Básura*) cuts into the flank of what we might call St Lucy's hill—for her shrine is the most outstanding object on the cliffs —and drives upwards until it ends in a footpath which soon swerves to the right and leads you along the rock-face overlooking a gorge turning out of the main valley. Here you are out of sight of sea or strand. The country around is wild and cannot have changed much in aspect since the Neanderthaloids lived here, maybe 40,000 years ago and more. Still, here and there are improbable patches of cultivation, half-neglected terraces, where you may see an odd man or two or even a woman grubbing about in a tangle of weeds.

To your left and in the main valley that here soon narrows into what seems to be a cleft worming its way into the heights of these Maritime Alps is a huge quarry, and the only sound to break the silence will be booming, reverberating explosions from the blasting that scores the hillside.

[1] *Tana della Básura* (and not, apparently, *Básua* as often spelt) is Ligurian dialect for the classical Italian *Grotta della Strega*, though *tana* is also good Italian for a cavern or cave. Caves are numerous in these limestone formations of the Ligurian coast and some, such as the Arena Candida near Finale Marina, have yielded remains of Late Palaeolithic (i.e. *sapiens*) Man.

You are about 700 feet above sea-level and the secondary limestone formations are pitted with caves, most of them called by names which indicate long familiarity, such as the *Grotta del Colombo*, while in one, at least, of the caverns have been found Mousterian artefacts (see page 101). These caves, it seems, were not only used as places of refuge during the invasions which so often swept the coasts of medieval times, but the population of the neighbouring villages of the plain took to the hills and hid in the grottoes during the Allied bombardments of August 1944.

LIMESTONE CAVES

For all practical purposes we may say that natural caves occur mostly in limestone rocks and the caverns have all been hollowed out in the same way. Limestone formations are invariably cracked and fissured. Rainwater is charged with carbonic acid and this eats away the rock in an astonishing fashion. In a comparatively short time water percolating through natural fissures will enlarge them until they become channels for streams carrying pebbles, gravel and sand, which churn and carve and hollow until subterranean galleries, passages, chambers and halls have been formed.

There is a continual cycle of interchange of carbonate of lime from land to ocean and from sea to earth, and this cycle has been in progress, apparently, since the first deposits of marine-animals' remains were laid down as limestone. The caves, the caverns and the grottoes lived in by early Man, and used by our remote forefathers as shrines, sanctuaries, tombs, schools of painting and halls of initiation, are, for the most part, formed of the same substance as our bones—carbonate of lime.

Underground caves fashioned in this way by water-action may have, for long ages, but very small entrances and it is not until, by collapse, subsidence or landslide, a sizable entrance is cut that such caverns can become beasts' lairs or shelters for men. It may be borne in mind that many if not most of the caves for which we have evidence of Man's occupancy also served as dens for animals, especially hyena and cave-bear.

BEYOND THE BARRIER

The *Tana della Bàsura* has borne that name, say the local inhabitants of Toirano, 'from time immemorial'—but that does not mean much,

maybe, often, only a couple of hundred years. Men's memories are short, especially in an illiterate community.

However, the history of the *Tana* goes back certainly to 1880 when the cave (or as much of it as was then visible) was explored by N. Morelli, an archaeologist. He cut some trenches in the central chamber and recovered human bones (of *sapiens* type), neolithic pottery and fragments of Roman amphorae. So, evidently, the cave had served for several thousand years as a refuge or dwelling for men. As the cavern was in Morelli's time (and until 1950) it measured about forty metres (or some 150 feet) in length and displayed no specially interesting features except some stalactite and stalagmite formations, which were noted in the old guide-books as worthy of a visit.

About ten years ago, two of the young men from the village, who used to guide the few visitors or archaeologists who wanted to see the *Tana della Básura* (and other caverns nearby), noticed that the wall of calcite that blocked the back part of the cave showed a very small opening through which air passed. They decided to dynamite the wall (it was easy to get a charge from the neighbouring quarry) and see what lay beyond. They carried out their plan on 29th May 1950. They had not guessed what a job they had undertaken, for the wall was over nine feet thick.

At first sight, nine feet of thickness of stalagmitic formation suggests an accumulation drop by drop and drip by drip during an immensely long period of time, but although this calcite wall must have been of considerable antiquity it is not possible to reconstruct past climate conditions well enough to set even an approximate time for the building of the wall. At one period percolation through the limestone may be comparatively abundant, at other times it may slow up or stop altogether.

When, at last, the barricade had been removed there was revealed the rest of the cavern, over 328 yards in length from the wall to where the cave narrows and loses itself in the interstices of the rock, though there are some small passages which prolong the grotto still farther into the heart of the mountain. The new part of the cave is much damper than the fore-chamber, there are little pools and puddles and stalactite formation is going on at a fairly rapid rate. On all sides are drips and conical mounds rising to meet conical pendants from the roof, although the grotto is a good deal less slimy than some it is also not as dry and comfortable as others.

Clearly the *Tana della Básura* had been at one time a cave-bears'

den. Here and there scattered about are the fossilized bones of this beast. There is indeed what may be called a stream of such bones stretching along for yards in a hollow of the cave-floor. There were also recovered the bones of panther (*Felix pardus*) and mountain goat (*Capra ibex*), and one of the bones shows traces of cuts made by the edge of a sharp instrument, undoubtedly a flint artefact.

Although the cave-bear was a formidable-looking beast, standing some ten feet high, maybe, when rearing up on its hind legs, it was, probably, an almost entirely vegetarian sort of bear which was no doubt esteemed for its flesh by early Man. But of such early Man, in the *Tana della Básura*, there are few traces—except the footprints in some parts of the clayey cave-floor. And on the ground, too, can be made out the prints of the fore- and hind-paws of *Ursus spelaeus*, the cave-bear itself.

The absence of artefacts (and of any hominid bones) suggests that the cave was never used as a habitation in remote times (see page 169). Maybe men ventured into the cavern to slaughter the cave-bears while they were hibernating. Such an exploit, though it must have taken courage enough, is not quite so foolhardy as it sounds. Man knew the use of fire, he had torches, and weapons, and he was sure the bears were sluggish and sleepy.

There are bears' claw-marks here and there. There is the imprint, on one of the walls, of a sooty hand. There are other charcoal smudges, maybe where torches were brushed to revive the flame. A number of little heaps of charcoal on some parts of the floor may be the remains of torches stuck in the ground and left to burn out. No radiocarbon test on the charcoal would be of use, since the material was lying on the surface and therefore would have been almost certainly subject to contamination. There are also clay balls sticking to parts of the walls, balls certainly made and projected by Man.[1]

In all there are twenty-five human footprints to be discerned, though some are so blurred and faint as to be clearly visible only in photographs taken by infra-red light.

The charcoal collected from the floor of some parts of the cave was produced from the wood of conifers. These trees are not now common (at least when not planted by Man) in the region, and they suggest a climate colder than that now prevailing on the Italian Riviera, that is to say, presumably, a climate of part of the last or Würmian Glaciation

[1] 'A New Palaeolithic Cultural Element . . . the Clay Pellet in the Cave of the Básura (Savona)' by A. C. Blanc, in *Quaternaria*, Vol. IV, 1957.

which comprised three peak periods with relatively warm 'interstadial' periods between them.

The Italian scientists who first visited the cave suggested that the footprints were not those of *Homo sapiens* but of Neanderthaloid Man. Some of the footprints which are most clear and striking are in a peculiar situation. They are in clayey soil (with a certain amount of surface wetness) under an overhanging ledge of rock, that is to say, they are in a kind of miniature rock-shelter churned out in distant times by water-action. Not only, however, are these footprints in this situation but the overhanging ledge of rock is not more than three feet above the level where the marks are visible. These are quite obviously footprints of Man, but the men who made them must either have been crouching or bent double, since they certainly were not less than three feet tall!

The footprints display a type of foot that is, indeed, most unusual among *Homo sapiens*. In trace the prints show a foot that was splayed out in the region of the toes, with the big toe powerful and separated from the others, and the whole outline short and broad.

FOOTPRINTS ON THE SANDS

In addition to the (presumably) neanderthaloid footprints of the *Tana della Básura* (see page 165), there are some *sapiens* footprints to be seen in the Tuc d'Audoubert, Cabrerets, Montespan and Niaux caverns in south-western France. The finest collection is, however, in the Aldène or Fanzan grotto in the Hérault Department of southern France. Aldène was discovered by the Abbé Cathalà and it lies on the southern slopes of the Black Mountain at a site which has been worked for phosphates since the beginning of this century.

There are many hyena tracks on the clay, a number of coproliths and some bones of cave-bear. The human footprints are of five different sizes and vary in length from $7\frac{1}{8}$ to $9\frac{7}{8}$ inches. They are all comparable with the imprints of modern feet; the big toe shows a certain flattening of the ball, as is common in those men who walk bare-foot, the other four toes are curled round and the little toe—as with us—so small as to be atrophied. The men who left these footprints were neither bow-legged nor bandy-kneed, and their feet were well arched. Their stride was about half a yard showing rather small stature (say, 5 ft. 4 in. or 5 ft. 5 in. for a fully grown adult), though, of course, it may be unfair to judge of stature from the steps made on a slippery floor in a dark cave with, at best, a torch for lighting.

Where the ceiling in the Aldène 'gallery of footprints' becomes low, there are signs of creeping, i.e. prints of hands and of elbows and knees can be seen. Here and there on the walls are black smudges made by charcoal (where torches were tapped?).

The clearest of the Aldène footprints (shown on plate VIIIb and contrasted with a print from the *Tana della Básura*) indicates that the man who made it was about 5 ft. 3 in. tall.

NEANDERTHALOID FEET

Long ago F. Sarasin, the Swiss anthropologist, noted that the skeleton of the Neanderthaloids' feet suggested those of the living New Caledonians (Kanakas) whose shape is distinctive.

Dr Léon Pales, formerly assistant director of the Museum of Man in Paris, and one of the foremost authorities on the human foot, made a long study of the *Tana della Básura* footprints. He spent a good deal of time jumping about on clay so as to see whether the Básura footprints might show a different stance from that of men like ourselves. His conclusion was that whatever sort of men made the imprints, their carriage was as upright as our own. Moreover, he recognized that the *Básura* footprints were very like those made by New Caledonians today. Kanakas are, of course, fully *sapiens* though, in some respects, their anatomy has been held to show 'archaic' features.

Pales's main object was, of course, to discover whether the ancient Ligurian footprints were made by men with upright carriage and also what were the affinities of the feet represented by those footprints. Since the *Tana della Básura* footprints are widely advertised as those of Neanderthaloid Man and as, therefore, something quite unique in the world, we may add that the case is not entirely proved, though all the probabilities are that we have near Toirano the first indications of what any 'soft part' of a Neanderthaloid looked like.

We do not know what sort of Neanderthaloids they were who may have danced about in the Witch's Cavern, but certainly in the Italy of early in the last Glaciation and maybe late in the Riss-Würm Interglacial, there lived both sorts of Neanderthaloids. When we say 'both sorts' we may understand that specimens of both 'generalized' and 'classic' Neanderthaloids have been found in Italian soil. That there may have been any number of intermediate varieties is very possible indeed, and we should not forget that the few fossils we have can hardly be supposed to be a representative sampling.

CIRCE'S MOUNT

Monte Circeo, though a peninsula today, has been in the past—and often, it would seem—an island, and an island it may still appear today if you come upon it as you loll, maybe, idly in a fishing-smack on the waters of the Tyrrhenian Sea. Low-lying sand-dunes bind Circe's Mount to the Pomptine marshes, or as they are now more fitly called the Pomptine Fields on whose shores the Allies landed in 1943.

In later Roman times the mount was a seaside resort and its slopes are still strewn with Roman ruins. Up from the little village of San Felice you pass a rock-cut inscription naming this crag *promunterium veneris* or Venus's Cape. The way to the summit is steep but sweet for the flanks of the mount are softened with low bush of scented shrubs—rosemary, myrtle, lentiscus and the perfumed plants of the Mediterranean south. It will take you two hours' scramble to reach the top where the view is evocatory. Here are some tumbled traces of building where, old authors tell us, stood Circe's fane, a flashing white beacon lighting the Latin shore. To the north-west you can see the dome of St Peter's maybe, while to the south-east lie Ischia, Capri, Vesuvius and the waters set with Ponza's islets.

This Monte Circeo was, at least in later legend, held to be the isle Apollo gave his daughter Circe whom he had by Perse, the ocean nymph. Here it was that Circe—whose name we may remember means a female hawk and in all that tribe the female is larger and more powerful than the male—bewitched her admirers into beasts. Here it was that Ulysses dallied with her and here she revealed to him how he might sail to the Land of the Shades lying upon the edge of the Ocean Stream and there learn his fate from ghosts.

THE SECRET OF MONTE CIRCEO

Just where the mount's cliff drops down to the beach you may find the local inn and restaurant owned, in 1939 anyway, by a Signor Guattari who the year before had decided to enlarge the terrace of his restaurant and cut away some of the limestone rock abutting on his property.

While hacking away at the hillside the workmen extracted a number of animal bones which strangely enough, we may think, were put carefully on one side. However, Professor A. C. Blanc of Rome University had been, from 1936, investigating changes of Pleistocene sea-level and coast-line nearby. Blanc from time to time would lunch or dine

and chat with Guattari who in February 1939 showed him some of the excavated fossil bones—mostly of deer, horse and ox. By mid-February Blanc was shown two cases full of bones, mostly of larger sorts of deer. Blanc, when congratulating his host on his diligence, added jokingly: 'Keep a sharp look-out, one never knows, you might come across so rare and precious a thing as a neanderthaloid skull.'

On 24th February 1939 Guattari's men found the conglomerate yielding to their pick-axes, soon the entrance to a narrow corridor was revealed. Into this tunnel, whose entrance is some fifteen feet above sea-level and about 150 yards from the shore, the men began to creep, followed by Guattari himself and one or two of his household's ladies. There is an excellent tradition in Latin lands that ladies should be present at all important events. And this was a most important occasion. These Italian peasants, after worming their way into the bowels of the rock, beheld something hidden from sight for tens of thousands of years.

THE CAVES OF MONTE CIRCEO

The Monte Circeo, like most limestone hills, is pitted and burrowed with caves. The grottoes on the Mediterranean face are, for the most part, not deep, though nearly all of them bear traces of having served at one time as dwellings of men—when the sea-level was lower than at present. All these caves have by now been carefully examined, and the essence of what they reveal is that during a period when hippopotamuses were floundering about in Italy, the men who took shelter in the caves were using Mousterian implements (see page 101), while some of the artefacts found with a 'cold' fauna were of 'Aurignacian' type. That is to say there may be evidence on the one hand for Neanderthaloids and on the other for *Homo sapiens*.

THE NEANDERTHALOID SANCTUARY

Guattari at once advised Blanc of the find, and on 25th February the two men grovelled through the passage until they were in a first cave hung with stalactites and on an irregular floor jumbled with fossil animal-bones of deer, ox, horse, hyena and many coproliths.

The history of the cave is fairly easy to reconstruct. It was at one time invaded by the waters of the Tyrrhenian, which left behind a marine strand (with *Strombus* a typical warm-water shell). Then, when the waters had receded, the cavern was inhabited by Man, and by

(though obviously not at the same time) hippopotamus, hyena, rhinoceros, lion, panther, great horse, and fallow-deer. The latter is characteristic of the warm fauna which lingered on in southern Europe during the beginning of the Würm Glaciation. A landslide, however, had sealed up the Guattari grotto before the last of the 'warm' animals had disappeared from the Pomptine region.

When the two men reached the last of the three caves they were in an innermost sanctum, a chamber nearly circular—about eighteen feet by fourteen—and with a roof lofty enough for a man of medium height to stand upright with ease, and some Neanderthaloids seem to have been, by our reckoning, rather short, say from 5 ft. 2 in. to 5 ft. 4 in. The walls of the cavern are dark, down to within a few inches of the floor, but there the walls are whitish and the presumption is that the demarcation line indicates an old water-level.

Bones of deer, oxen and horse were scattered about the floor and together with them were a few of elephant, leopard and lion as well as many hyena bones. Some of these remains were neatly heaped up in little mounds round the walls.

Just about on the median line drawn from the entrance, not however in the middle of the floor but rather near the face of the farther wall, there was scooped in the earth a shallow hole, surrounded with a ring of small stones (showing traces of fire) arranged in a fairly true oval. When Guattari had entered the cave on the first day there had lain within this circle of stones a round smooth object. It was a skull.

Under the cranium Guattari found two fore-foot bones (metacarpi) one of an ox and the other of a fallow-deer. Both showed signs of apparently intentional fractures. On this first day also one of the girls picked up a fragment of a hominid lower jaw which she seems to have further broken while handling it, since one of the edges shows a clean, fresh fracture. In any case this mandible (although of a Neanderthaloid) does not belong to the skull (see plate VII).

When Blanc and Guattari together saw the skull it was lying upside down, but Guattari had displaced it on his first visit and the parts covered with calcareous concretions and an area of discoloration show clearly enough that the cranium had lain for long ages on the left side.

PICKING SOMEONE ELSE'S BRAIN

As the late A. E. Hooton wrote: 'Picking someone else's brain is an old family custom . . . and perhaps the first symbolic act. . . . Cutting away

or bashing in the base of human skulls—presumably to secure the tidbit brain—is nearly the most ancient human trick we know.'

This Monte Circeo skull is remarkably well preserved, especially if we reflect it may well have lain within its miniature and protecting Stonehenge for 70,000 years or more. The left side which had been buried in the earth was almost intact. The right side which had suffered exposure to damp and water was mutilated. In the region of the right temple the skull had been dealt a violent blow or succession of blows sufficient to cause death.

The upper jaw is toothless and, since the tooth-sockets have closed in, the teeth must have been lost during the individual's lifetime. Such loss of teeth does not, of course, indicate any great age, by our reckoning, but a Neanderthaloid without teeth must have been brought very near starvation.

The Monte Circeo Man was killed.

It is tempting enough to weave a good deal of rather unsupported romance about this evidence. Maybe the man was killed just because he was a nuisance, could not earn his keep and could not eat the family meals. Maybe the man was killed because he was caught in war. Maybe he was sacrificed for some obscure reason. But it is as well not to attempt to read into the evidence what it does not present. Comparisons with relatively modern human habits may seem to be illuminating, but we do not know to what extent they are valid. But in many lands and at different times the skull has been considered a powerfully magic object. In Nigeria, in Oceania, men keep their ancestors' skulls about the house. Of course, the reason given for the custom, e.g. that the things may 'attract good fortune' and the like, is not only possibly not the one really held but also is certainly not the original reason for the practice. What is really 'believed' is never definable, moreover ritual, rites, traditions survive and are reinterpreted as time goes by.

However, not only had Monte Circeo Man been killed, he had also, apparently, been eaten, or part of him had been eaten, since the *foramen magnum* had been hacked around into a gaping hole, measuring some $3\frac{1}{2}$ by $2\frac{1}{2}$ inches (see plate VI). There is, too, much evidence from other sites (e.g. Solo, see page 179, Ofnet, etc.) for this opening not to have been made for the purpose of extracting the brain. Cannibalism as we have already seen (page 71) is about the most ancient human custom of which we have knowledge, but whether in these very remote times cannibalism had any 'ritual' significance or was just a tidy, useful and economical way of disposing of the dead we do not know. Anyway,

certainly in later phases of Man's history, cannibal feasts did assume a ritual significance.

A 'RITUAL' POSITION

Here then is evidence for cannibalism at Monte Circeo tens of thousands of years ago and also evidence for some death-ritual, for the position of the skull inside a circle of stones must have had a significance. There is a number of neanderthaloid burials with objects which may have had some vague 'magic' import. There is the 'protecting' circle of mountain-goats' horns round the skeleton of the Teshik-Tash boy (page 180), and animal bones, forming 'fences', are common in very ancient interments.[1]

However, the Monte Circeo arrangement is unique. The skull was never buried, it was laid out in a ceremonial way in what one is almost tempted to call a sanctuary complete with a relic. No doubt the hazard of a landslide preserved this lay-out. No men were trapped in the caves. Perhaps all the inhabitants were out hunting, but more probably the caves were not used as dwellings at all or at least not regularly. Possibly the grottoes served only for ceremonial or magical uses, as, later on, were the painted caverns (page 242) of our western European ancestors. Maybe at Monte Circeo we have evidence for the first recorded 'religious' ceremonialism of mankind, or at least of such not immediately connected with funerary and burial rites.

AFRICAN NEANDERTHALOIDS

HOMO RHODESIENSIS

It was as far back as 1921 that a workman engaged in digging for very rich mineral ores at Broken Hill in Northern Rhodesia discovered a skull of general neanderthaloid appearance. During the years following on the find, A. S. Armstrong (in 1921) and A. Hrdlička (in 1925) made further finds at the site, so that we have now the remains of two individuals.

The first skull is that which was attributed to *Homo rhodesiensis* (Woodward), There are also portions of a second skull, a humerus, pieces of pelves, femora and tibiae. The first skull (for the second is so

[1] The custom of interment within a circle (of stones) was a long-lasting one. In 1959, a child's skeleton was recovered from the *Grotta dei Piccioni* near Bolognana in Italy. The bones were surrounded by a circle of stones, but this interment does not date back more than 6,000 years and the skeleton is, of course, of *Homo sapiens.*

incomplete that not very much can be learned from it save that it is of the same general type as the first) is remarkably like that of the Neanderthaloids. In fact had it been found in Europe it would have been, offhand, unhesitatingly classified as neanderthaloid. That it was not was merely because it was found in southern Africa, and because in 1921 the presence of Neanderthaloids was not proved anywhere in Africa (save by Mousterian artefacts but that in itself is no clear proof). There was, therefore, much discussion as to the right classification of the specimen and its dating.

The Rhodesian skull is dolichocephalic and has a cranial capacity of about 1,400 cubic centimetres. The supra-orbital torus is huge, there is, indeed, a shelf projecting over the eye-region, a shelf more marked than in some gorillas. The forehead is very retreating, and the face has a 'snout' as marked as that of the La Chapelle-aux-Saints Man. The palate is very broad. The teeth, however, are quite 'evolved' and have nothing especially primitive about them. The *foramen magnum* is as far forward as in 'modern' Man (or in all the Neanderthaloids for the matter of that, see page 154). Evidently the Broken Hill Man had a completely upright position. The cranium, by the way, bears a small round hole on the left parietal. This may have been perforated by the canine tooth of some beast, though the mutilation is puzzling (plate IX).

Taking it all in all, then, our Rhodesian Man was a fine, powerful, upstanding fellow, a little antique-looking maybe about the face, with let us say rather heavy features—a 'rugged' type in fact who, if we met him, would probably not seem more strange than many an Australian aborigine. He seems to have been about forty years of age at the time of his death and he suffered both from dental decay and from arthritis.

Also the Broken Hill skull resembles that of Saldanha (page 175), though the latter has thicker bones and less pronounced *torus occipitalis*, or 'bun-like' projection at the back of the skull.

The limb-bones found at Broken Hill are quite comparable with those of *Homo sapiens*. The isolated maxilla or upper jaw is broad and might, judging only by its dimensions, have belonged to a skull of the same type as the original *Homo rhodesiensis*, but the maxilla has some more 'modern' features (e.g. a canine fossa, see page 158), though there is no real reason to suppose that it did not belong to another 'Rhodesian Man' of neanderthaloid type. It is, however, interesting to note that the isolated maxilla rather recalls that of more modern types of Man, notably that of Florisbad (page 208).

THE DATING OF RHODESIAN MAN

It was in 1947 that a monograph on the age of Rhodesian Man was issued by D. Clark, L. Wells, K. Oakley and J. McClelland.

Broken Hill is a typical southern African dolomitic rock-formation and, before it was quarried for zinc and lead ore, comprised a cave opening at the base of the hill and almost filled with animal bones both fossilized and impregnated with metallic ores. Later quarrying disclosed an unexplored part of the cave which was originally a slightly inclined passage about fifty-five yards long, leading down to a pit forty-five feet deep. All traces of the cave have now been destroyed.

The first hominid bones were found on the bottom of the cave and some hundred and fifty-five feet below the surface of the hill. With the human bones were recovered also fauna and artefacts. The fauna is (with one exception) made up of extant forms. The artefacts are of what in Africa is known as 'Proto-Stillbay'.

The deposits in the site are impregnated with lead salts which become more and more marked from top to bottom, that is to say, the lowest level is the richest in lead. On the other hand the impregnation with zinc salts is most noticeable at the top level and decreases towards the bottom. Spectrum analysis tests have shown that the isolated maxilla, parietal and two femora all contain the same proportions of lead and zinc, with much more of the former than the latter. The tibia contains zinc and lead, in equal quantities, while the first 'original' skull has 79 per cent of zinc to 21 per cent of lead. The mammalian bones contain either more lead than zinc, or, in a few cases, about the same amount of both metals.

The conclusion to be drawn from all this is that the 'original' cranium is of comparatively recent date, and may be taken to be of African Middle Stone Age and probably of early upper Gamblian (page 65), say from 20,000 to 50,000 years old.

DIRÉ-DAWA

In 1923 the Abbé Breuil and P. Wernert found a hominid lower jaw near the base of a cave-filling of phosphated breccia in the *Porc-Epic* grotto, some one and a half miles from the town of Diré-Dawa, in the province of Harrar, Ethiopia.

The jaw is, apparently, of the same age as the stratum (which contained an evolved Mousterian industry). The specimen has been studied by H. V. Vallois; it has an archaic appearance, is robust, has no mental

prominence and the teeth are very large. It is undoubtedly neanderthaloid, it would seem of the 'rugged' or 'classic' type and would date from the lower Gamblian Pluvial of East Africa.

EYASI 'AFRICANTHROPUS'

L. Kohl-Larsen, in 1935, discovered near Lake Eyasi (Tanganyika) a large number of fragments belonging to two, if not three, separate crania. The site is about forty-seven miles south of Olduvai. H. Weinert reconstituted one skull which looks somewhat pithecanthropoid. There is a heavy supra-orbital ridge, retreating forehead and a markedly flattened vault. The maximum width of the skull is, however, higher up than in the Pithecanthropoids. The estimated cranial capacity is about 1,100 c.c., and the specimen must be considered neanderthaloid of a type resembling Rhodesian Man. Recent research has shown that the non-rolled elements associated with the skull fragments were those of a Gamblian fauna (with *Elephas africanus* and Levalloisian-type industry), but the same deposit contains rolled hand-axes and remains of 'Kamasian' fauna, and these induced the first observers to attribute the 'Africanthropus' a greater age than now seems justified. 'Africanthropus' then is, roughly speaking, contemporary with Rhodesian Man, and both forms are those of an extreme sort of Neanderthaloid living in Africa during the last great Pluvial.

HAUA FTEAH

A neanderthaloid lower jaw was recovered in the Haua Fteah grotto in Cyrenaica. The level where the fossil was found contains a Levalloiso-Mousterian industry, and lay at from six to seven metres below the surface. The mandible would appear (from radiocarbon tests on associated material) to date back as far as 32,050 $\pm$ 2,800 years before our era. It would be then of general Würmian dating. A report on the fossil was published in 1953.

SALDANHA

In January 1951 K. Jolly, working with Dr Singer at a site near Hopefield in Cape Province, discovered a skull in a considerable number of fragments, but which has been quite satisfactorily reconstituted. The site of the discovery was some nine miles from the sea at Saldanha Bay and the cranium is generally referred to as 'Saldanha'. It lay in lime-

impregnated sands containing nodules of secondary limestone or *kunkar*, enclosing an archaic fauna (e.g. giant buffalo, palaeoloxodont elephant, *Griquatherium*, etc.), together with an industry of hand-axes, cleavers and some flake tools of 'Fauresmith' and final 'Stillbay' type. Both fluorine and uranium tests show the Saldanha skull to be of the same age as the fauna which would appear to be what in Europe would rank as Riss-Würm Interglacial. So we might set a dating for the specimen at round about 100,000 years ago.

The skull (whose bones are thicker than those common in *Homo sapiens*) rather resembles those of Solo Man (page 179): there is, for instance, a similar flattening of the lower surface of the occiput, a flattening which would allow the attachment of very powerful neck muscles. Again, Saldanha resembles the *Homo rhodesiensis* skull (page 173), the large and massive eyebrow ridges in both specimens being very similar. The cranial capacity of the Saldanha skull has been estimated at 1,200 c.c.

Saldanha, then, is neanderthaloid, and neanderthaloid of more or less the 'classic' type which, as far as we can see, was more ancient in Africa than in Europe where all the 'classic' Neanderthaloids seem later than the Riss-Würm Interglacial.

MAKAPANSGAT NEANDERTHALOID

In 1947 B. Kitching found in the Cave of Hearths at Makapansgat (pages 71–2) a lower jaw of a youthful subject 'about twelve years of age' embedded in a red breccia with an Acheulean industry, known in southern Africa as 'Stellenbosch III'. Among the associated fossil fauna was *Equus capensis*, an extinct South African horse.

This jaw is robust and the symphysis is thick. The teeth are bulky and show a degree of what is known as taurodontism, that is, having pulp-cavities of large size. This condition is characteristic of the Neanderthaloids but is rare in other hominid types. The third molar of this mandible is larger than the second (page 22). The specimen has been classed (rather doubtfully) as *Homo* cf. *neanderthalensis*. R. A. Dart thinks that the specimen shows some relationship with the Boskop type of *sapiens* (page 209).

RABAT MAN

The Rabat mandible was discovered in 1933 embedded in a Pleistocene sandstone quarry near Rabat (Morocco). The jaw was found at about five metres from the surface of an ancient consolidated dune that



PLATE XIII
Skull of Asselar Man

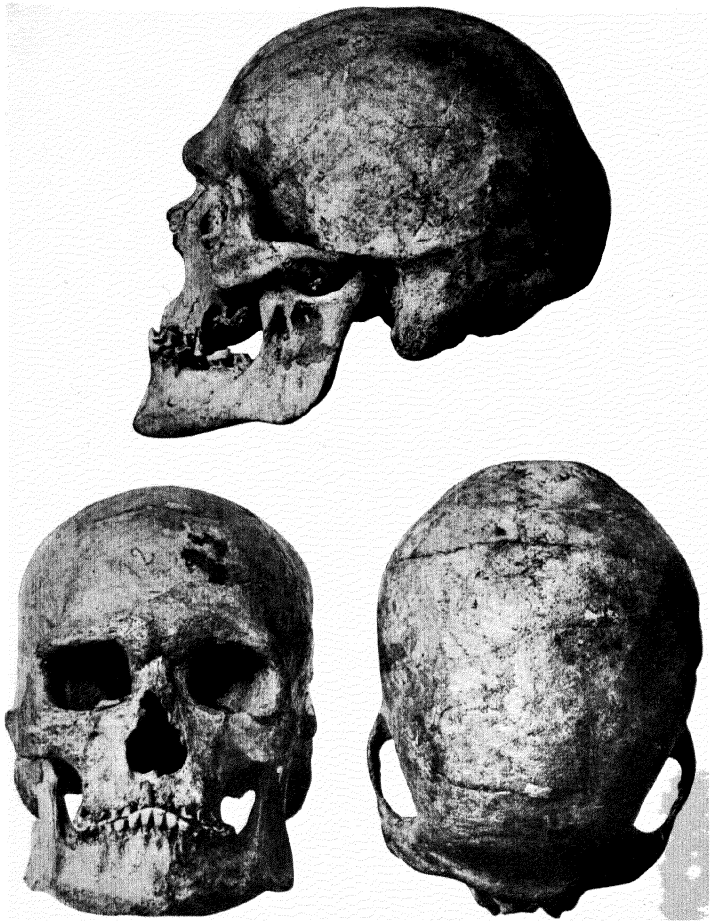


PLATE XIV

Mechta-el-Arbi type of skull (from Beni Ségoual caves)

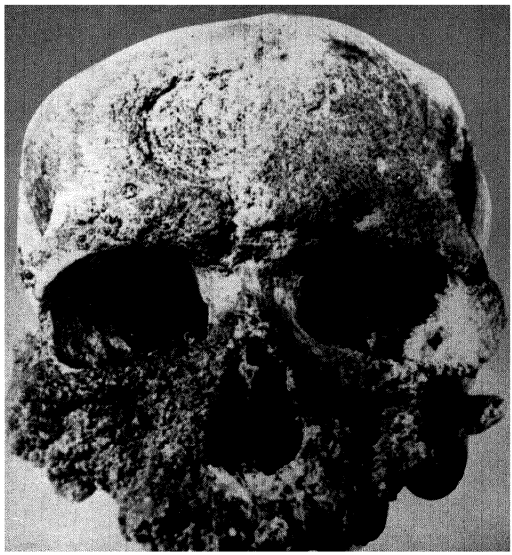


PLATE XV (a)
The 'Old Man'
of Cro-Magnon

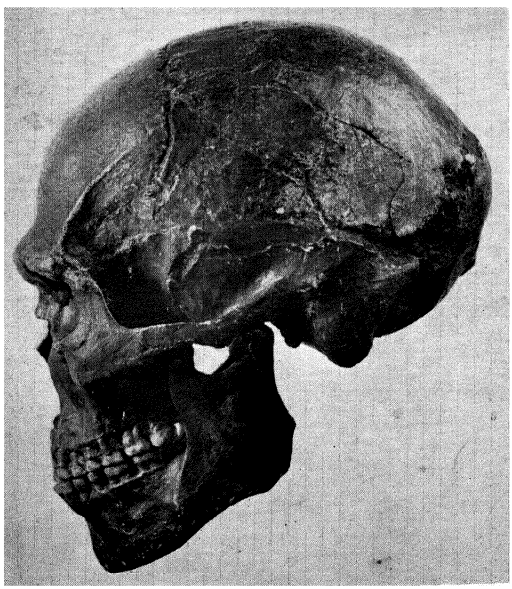


PLATE XV (b)
Prèdmost skull

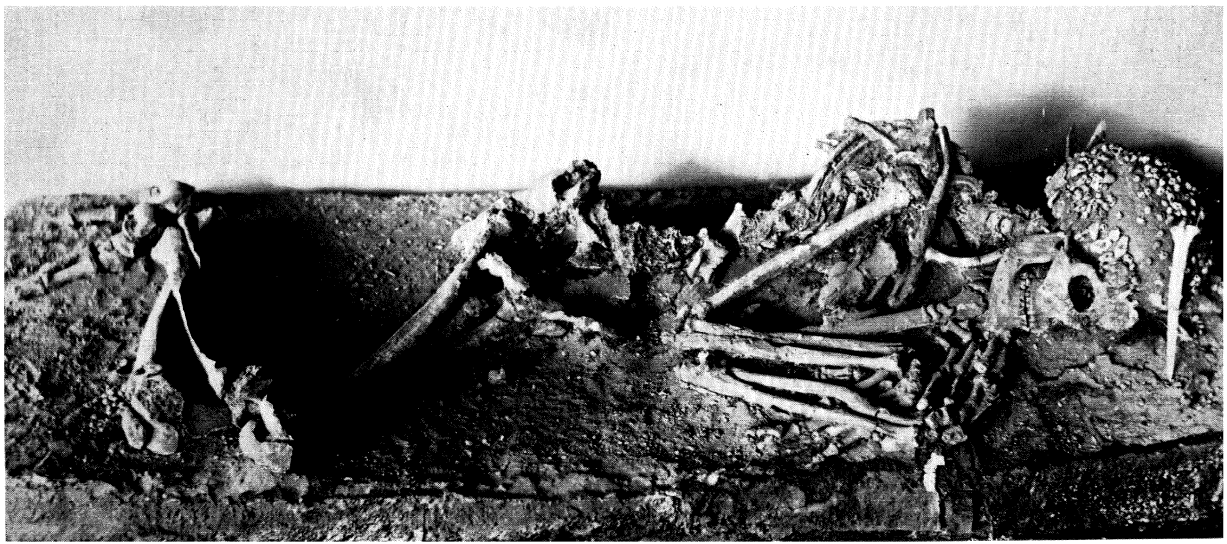


PLATE XVI

Homo sapiens of Cro-Magnon type from the Balzi rossi, Grimaldi, Italian Riviera

Neuville and Ruhlmann date to the dry phase between the two last African Pluvials whereas Bourcart thinks that the mandible was contemporary with the great Tyrrhenian transgression. In any case this fossil may be considered as earlier than the Würm Glaciation in Europe.

The remains consist of the right half of the palatine vault with the anterior edge of the maxilla and the greater part of the mandible, the teeth are in place and the bones belonged to a male not more, says Vallois, than sixteen years of age. The face was doubtless 'snouty' and probably had no canine fossa, the palatal vault is very large and quite neanderthaloid in character and the lower jaw displays a number of 'primitive' features. It is thicker and stouter than almost any known neanderthaloid mandible, and is indeed comparable with those of the *Pithecanthropus pekinensis*. There is no chin. The teeth are much larger than those of living Europeans and are especially broad and most of the lower teeth (as well as some of the upper) have a cingulum or projecting ledge, not found in Neanderthaloids, though present in *Pithecanthropus pekinensis*. The upper canines especially resemble those of the Chinese form. The second lower premolar has two roots. Such a condition is not reported in *Homo sapiens* or in the Neanderthaloids, although it is normal in the anthropoid apes and occurs in *P. pekinensis*. The molars are 'taurodont'—a condition common in Neanderthaloids and constant in *P. pekinensis*.[1]

Obviously Rabat Man was not a *Homo sapiens* and was most probably a type of Neanderthaloid, though more archaic (i.e. more like a Pithecanthropoid) than any of the European Neanderthaloids, even those of the most 'classic' sort.

We have, then, in Rabat Man, a type which may well represent a form of 'pre-Neanderthaloid' with pithecanthropoid affinities. Up to now (1960) Rabat Man remains the sole representative of its type to have been found in Africa in a deposit well dated from the geological point of view.

What we know, then, is that all Africa from Morocco to the Cape was, at one time, a home for Neanderthaloids and that they survived until, at least, the early part of the Gamblian Pluvial (page 65).

TANGIER

Where the Moroccan shore sweeps southwards from the headland of Cape Spartel the land slopes very gently to the sea in a broad strand, with here and there consolidated dunes that make a littoral chain or

[1] See H. V. Vallois, *L'Homme fossile de Rabat* in *Comptes-rendus des séances de l'Académie des Sciences*, 26th November 1945, Paris.

cordon. Where a small wadi cuts through the grass-ground flatlands these consolidated dunes are pitted with caves known locally as the 'Caves of Hercules' (the name is not ancient of course).

Here in May 1939 in the 'High Cave' or Mugharet el 'Aliyah, C. S. Coon (then of Harvard University), Hooker Doolittle (then U.S. Consul at Tangier) and Ralph Nahon (a local physician) found in a layer of red gritty sand the fragmentary upper jaw (left side) of a child about nine years of age as well as a very much worn-down upper second molar belonging to a much older individual.

In the maxilla the permanent canine, the premolars and the permanent second molar (which is missing) had not yet erupted. The jaw-fragment is large and thick and has no canine fossa while the zygomatic process slopes outwards and backwards. The 'simian' nasal groove is present. The permanent teeth extracted from the jaw (as well as the isolated upper molar) show distinct neanderthaloid features. In fact the relics are undoubtedly those of North African Neanderthaloids, though whether of the 'generalized' or the 'classic' form cannot be decided from such scanty material. Since Tangier is very near Gibraltar, and since the two Gibraltar skulls are of the 'generalized' sort, it is tempting to think that this child's jaw may be of similar type. However, the Rabat neanderthaloid specimen (page 176) is of a Neanderthaloid more 'classic' than any, in fact almost pithecanthropoid from some points of view. Rabat is on the same land-mass as the Pillarsof Hercules, some 150 miles farther south, so we cannot make any pronouncement except that Neanderthaloids did once live near Tangier.

There were no artefacts in the level with the hominid bones (Level 9), but in Level 6 there is an industry comparable with that of the Upper Mousterian (Layer 1 and 2 Garrod 1928) in the Devil's Tower at Gibraltar. We may guess then that Tangier Man lived some time in the Late Pleistocene, and that he used artefacts of Mousterian type.

ASIATIC NEANDERTHALOIDS

SOLO MAN

In mid 1931 Ter Haar had his headquarters at a *kampong* (village) on the Solo, the most important watercourse of Java, about six miles north of Trinil. The *kampong* is called Ngandoeng,[1] and there is a bone-bed

[1] During the time of the Dutch domination in the East Indies, Dutch transliteration of proper names was, of course, usual. Now more often an 'English' form is used, e.g. Surabaya, for Soerabaja, etc. 'Ngandoeng' is the old form which it is perhaps better to retain when we are dealing with matters which relate to former times of Dutch sovereignty.

in a gravel deposit with sand that is sixty feet above the present level of the river. It was on 15th September 1931 that Ter Haar found the first human skull of neanderthaloid type. Up to that time no neanderthaloid remains had been found in eastern Asia—if we except the single tooth from the Ordos loess of northern China.

In this Ngandoeng bone-bed there was an abundance of antique buffalo with very wide-spreading horns and, as V. Königswald has pointed out, the presence of such beasts indicates a different climate from that of today, since these oxen could hardly have made their way through the Java jungles.

Because of the well-marked succession of Glaciations and Interglacials, it is much easier to date Pleistocene deposits in Europe than in the tropics. Moreover in much of the tropics we must not expect to find fossil bones as, for example, in the tropical rain-forest or where laterite clays have been formed, whose sludge destroys all organic matter quite rapidly. In a site contemporary with Ngandoeng was found a heron not now living south of the Yangtse River, so it is possible that these Solo levels are to be equated with the last or Würmian Glaciation, and they would then be contemporary with the later neanderthaloid sites in Europe.

Between 15th September 1931 and the November of the following year eight 'Solo' skulls were recovered. Of these, the first consisted of the major part of the cranium. Skull II was only a fragment, as was Skull III. Skull IV was found on 25th January 1932, and Skull V measured 22.1 centimetres in length and may be the longest fossil hominid skull ever discovered. Skull VI was embedded in gravel. The base was intact and the *foramen magnum* had not been enlarged. No facial bones or jaws were recovered.

In all, the remains of eleven individuals were found. There are only two shin-bones (exactly similar to those of *Homo sapiens*) and no other bones of the body, although some 25,000 bones and teeth of various other mammals were found at the site.

The general appearance of the Solo skulls (although they must be classed as neanderthaloid) is like that of an 'enlarged' *Pithecanthropus* form (plates IX and X).

All the Solo skulls but two have the *foramen magnum* hacked away (presumably to extract the brain) as is the case with the Pithecanthropoids of Choukoutien and the Monte Circeo Neanderthaloids (page 171). Undoubtedly Solo Man was eaten. Skull No. I had been smashed with a heavy blow delivered with a blunt instrument, maybe a

wooden club. The back of the skull was severely fractured and a triangular bit of the bone had been pressed into the cranium. The areas around the fractures are blackened, possibly by manganese, while all the other parts are dark brown in colour. The triangular fragment is no longer visible as it was pushed in when the skull was reconstituted. Although the base of Skull V was intact the cranium had been bashed in farther forward. The Solo Man material was studied and published by W. F. F. Oppenoorth, director of the Java Geological Survey.

Ngandoeng was, it seems, a dwelling-place and, maybe, the skulls were preserved as protective trophies much as they are today in New Guinea, where they are placed in trees and on dwellings.

The Ngandoeng fauna is more recent than that of the Trinil *Pithecanthropus* levels and comprises water-buffalo, banting (still extant), Rusa deer, a large hippopotamus, rhinoceros, two sorts of elephant (one close to the Indian form and the other stegodont), tiger and pig, although this list contains forms (e.g. tiger and hippotamus) which have long been extinct in Java.

Associated with Solo Man's remains were stag's horns and a few splinters of siliceous stone, as well as small spheres of volcanic rock (comparable with those recovered from the La Quina, Rhodesia and Aïn Hanech sites in Europe and Africa), together with ray-spines utilized as spear-heads or daggers.

At Watualang, a site to the west of Ngandoeng, was found a hippopotamus skull with a bone spear-head (almost eight inches long) which had been carved into the likeness of a ray-spine: evidence maybe for the ancient custom of reproducing in one material the shapes of an instrument of another (and maybe more anciently used) material. Thus the 'polished' stone implements of neolithic Europe may have been imitations of metal implements imported from afar. After all, the first automobiles were made to look as much like 'horseless carriages' as possible.

TESHIK-TASH

The Soviet Republic of Uzbekstan is made up of what were formerly parts of Turkestan, of Khorezm and of the western plains of Bukhara. In the south-west of Uzbekstan rises the Hissar Range or *Koh-i-Tau* that is the southern arm of the Tien Shan's westward prolongation. The length of the Hissar Range is some 200 miles, and it is traversed by passes only from one to three thousand feet lower than the surrounding summits of 12,000 or even 14,000 feet. Along the foot of the range runs

the sun-scorched, half-desert valley of the Sharabad or Turgan Darya. The stream bites its way through gloomy, narrow gorges whose walls are pitted with caves.

Teshik-Tash or the 'Pitted Rock' is nearly five thousand feet above the bed of the Sharabad Darya and on the left bank facing north-east. The cave is approximately sixty-four feet deep and sixty feet wide. No shepherds visit this lonely spot, so that on the cavern's floor there is no layer of ash or humus formed from decaying sheep-dung. The floor covering is light-coloured yellow clay mingled with stones fallen from the vault, while in some places pot-holes have been sunk by drips from the roof.

In 1938 and 1939 this site was explored by A. P. Okladnikov of the Marr Institute in Leningrad. During his first visit, Okladnikov recovered fragments of animal bones and pieces of limestone—all showing traces of having been utilized by Man. The artefacts were found in two separate layers divided from each other by a sterile stratum. The grotto must, then, at times have been covered with a coating of slime and stagnant water and then at other times have been fairly dry. The artefacts are all of a type of 'advanced' Mousterian comparable with that of western Europe and generally found with neanderthaloid remains. The closest parallel to the Teshik-Tash industry is, said Okladnikov, the industry found in the Caucasus (Akhtyr cave), the Crimea (Shaitan-Koba), Kurdistan (Hazard-Merd grotto) and the Tabūn cave in Palestine —all sites where the presence of Neanderthaloid Man is proved or strongly suspected.

The fauna of Teshik-Tash does not look archaic and consists mostly of 'modern' forms, for example, wild boar, Siberian mountain-goat, wild horse (now extinct in Uzbekstan), leopard, marmot, etc. But mountain-goat remains (*Capra sibirica*) account for not less than 97.2 per cent of the total. The *kiik* (mountain-goat) still survives in the heights though he has been, in the Hissar region, largely superseded by the immigrant screwhorn-goat from the south.

THE HOMINID REMAINS

In the Teshik-Tash cave was found a skeleton, skull, with the lower jaw, the cervical vertebrae, fragments of the ribs, shoulder-blades, humeri and tibiae. The burial had been disturbed soon after interment by a beast of prey, probably a cave-hyena, so the site must have been abandoned, even if it had once been a home. Burial in dwelling-places is

attested for periods well into historical times and in advanced civilizations (e.g. Jericho and Ras Shamra), but Late Palaeolithic Man seems to have, generally speaking, deserted the home that had become a tomb.

Five or six pairs of Siberian mountain-goat horns were found round the skeleton. The horns had originally been arranged in a circle with the tips downwards and slightly inclined inwards towards the skull. This suggests a 'ritual' arrangement? (cf. Monte Circeo, page 170).

The hominid remains are those of a child aged about seven or eight years. And the type is neanderthaloid, though whether a 'generalized' or a 'classic' neandertheloid specimen it is difficult to determine (in view of the immature nature of the subject). Hrdlička (after visiting the specimen at Leningrad) agreed that the Teshik-Tash boy was a Neanderthaloid, but our material for young Neanderthaloids is scanty—the Le Moustier youth was about sixteen at the time of death, practically an adult—so the Gibraltar child (page 192) and the La Quina (and also Pech de l'Aze specimen) child are about all we have to go upon. The Gibraltar cranium looks like that of the 'generalized', while the La Quina specimen seems to be that of a 'classic' Neanderthaloid.

The Teshik-Tash skull has no canine fossa and little trace of a chin. Weidenreich pointed out that the tooth-eruption sequence is of 'modern' type, that is, the second molar was, apparently, going to erupt after the premolars, whereas in the Neanderthaloids, as far as we know, the second molars erupted before the premolars.

However, the main interest of the specimen is its dating. If, as seems possible, it is of comparatively late Würmian date, that would tend to show that Neanderthaloids, of some sort, lingered on in out-of-the-way places long after they seem to have become extinct, as a distinct type, in western Europe.

THE CRIMEA

The southern face of the Yaila Dagh is pitted with hundreds of caverns and many have yielded Mousterian and Tardenoisian artefacts, maybe proof that the region was at times inhabited both by the Neanderthaloids and by *Homo sapiens*. The remains of a man and an infant were found in the Kiik Koba cavern near Simferopol. Only the right leg-bone and parts of the hand bones of the adult, and some of the child's bones from the waist downwards, were recovered together with a worn lower incisor which would not be out of place in the Mauer jaw (page 136). Bonch-Osmolovski placed the Kiik Koba Man as far back as the

end of the Mindel-Riss Interglacial, but there are no real grounds for this dating. We may take it that the hominid type in this Crimean cave was neanderthaloid and more or less like that of the female at Tabūn (page 184).

There are indications of neanderthaloid presence from many places in Turkey, Persia and northern Iraq. Neanderthaloid remains were reported some time ago from Shahidan in the latter region.

GALILEE MAN

The 'Sea of Galilee' is set deep in hills rising eastwards to about two thousand feet, while on the west they fall to the desolate oleander-fringed shores in precipices of black rocks. Nowadays, the lake is a sort of no-man's-land between Syria and Israel. The waters, however, are comparatively shallow and nowhere reached the depths supposed in Byron's time when he wrote of the sea, 'Where the blue wave rolls nightly on deep Galilee'. The cliffs are pitted with caves and in one of them known as the *mugharet-ez-zuttiyah* was unearthed in 1925 the 'Galilee Skull' in association with an Acheulo-Mousterian industry.

The cranium is in a poor state of preservation since only the fore portion has been found. There is some evidence that the individual had been exposed to considerable suffering before death, since not only is the skull crushed from a blow but there are also traces of the cicatrization of the bones.

The skull is apparently neanderthaloid, though certainly not (to judge from the fragmentary state of the relic) of the 'classic' type. The Galilee cranium, indeed, would fall into the class of 'generalized' (and apparently more ancient) Neanderthaloids, such as the Saccopastore and Gibraltar skulls, and it may be compared with the Ehringsdorf and Steinheim specimens (pages 190 and 189). The Galilee cranium has, for a Neanderthaloid, a high vault. Keith held that the specimen was that of a female, but Hrdlička considered that it was of a male aged about thirty to thirty-five.

MOUNT CARMEL

Although the Mousterian industry of Palestine is somewhat different from that of Europe, there is reason to think that the two cultures were, roughly speaking, contemporary. When, however, there was much ice in western Europe, Palestine was apparently wet and fertile with

abundant game. As Europe became warmer and drier, Palestine parched to the arid land it has since remained.

The Mount Carmel of Elijah is a limestone ridge scored with ravines and pitted with caves. Innumerable legends haunt the mount and some may be legacies from the push northwards of the first waves of Semitic-speaking peoples. The ridge of Carmel runs for about twenty miles in a south-easterly direction and then dips and rises again as the mountains of Samaria. Only a generation ago most of the mount was clothed with coppice of oaks, myrtles and pines, but now it is almost denuded as you see it when flying westwards from Damascus, avoiding Hermon. Carmel stands up from its plain until you are far out over the Mediterranean, when the lone bluff seems to rise right up from a girdle of white surf curling round the curving shore.

Into the western flanks of Carmel cuts a valley called the *wadi-el-mugharet* or just 'valley of the caves' in unimaginative Arabic nomenclature. The three most important caves, from our point of view, are named *es-Sukhūl* or *Skhūl*, *el-Wad* and *et-Tabūn*. Their bottom strata yielded artefacts of an ancient palaeolithic type known as 'Tayacian' (that is a phase of Acheulian); above this layer sixteen feet of another stratum were filled with thousands of 'late' Acheulian ('Micoquian') hand-axes. The total depth of the deposits in the Tabūn cave was eighty feet.

In the Acheulian stratum were found also the much-worn molar of a man and the greater part of a femur whose length would indicate a subject about 5 ft. 5 in. tall. It is not possible to identify these bones as neanderthaloid. Above the Acheulian layer was a group of skeletons in association with a flint industry partly of Mousterian type.

TABŪN

The Tabūn type is represented by one skeleton only—together with (possibly) two lower jaws also found in the Tabūn cave, one of which has little or no chin-eminence, whereas the other has a well-developed one. This latter mandible is almost as heavy and robust as the Mauer jaw (page 136) and so might fit into a pithecanthropoid skull.

The Tabūn skeleton is that of a young, but apparently adult, female (plate XIIa). It was found lying on its side with the legs slightly flexed. The subject, when alive, measured possibly about 1,656 mm. (or some 5 ft. 5 in.) in height. The skull, when recovered, was smashed, but has been reconstructed. It is not very low-vaulted but has a heavy frontal ridge over the eyes. The cranial capacity would be about 1,271 c.c. The

rounded occiput is not that of a typical 'classic' Neanderthaloid. The lower jaw is chinless and the face projects into a sort of 'snout'. The pelvis, especially in the flat and elongated pubic bone, shows anthropoid features not noted in any hominid type (apart from the Australopithecines), but of course our fossil material for this part of the skeleton is very scanty. The Tabūn woman's foot resembles *Homo sapiens* type.

SKHŪL

The Skhūl material is much more abundant. In 1931 McCown recovered the skeleton of a child aged about three years. The remains seem to be of a neanderthaloid type. In 1932 eight other skeletons were found. Altogether the remains of some twelve individuals were unearthed. The most immediately striking thing about this series is its variability. Had the specimens not been found all together, in a same level, they could hardly have been referred to a single group.

The Carmel skeletons can, in fact, be arranged in three groups:

(1) The Tabūn female.

(2) A slightly larger type which is intermediate between the neanderthaloid and that of *Homo sapiens* and is comparable with the Krapina material (page 192).

(3) Specimens displaying features like those of the *Homo sapiens fossilis* of the European Late Old Stone Age.

Four adult males can be classed together. They were tall men varying in height from 1,723 mm. to 1,780 mm. (the latter figure comes to but little less than six feet) and their lower limb-bones approximate, in measurements, to those of the Cro-Magnons (page 233). The skulls are large and well domed, but display prominent supra-orbital ridges of varying degrees of development. The palates are large, but the lower jaws have definite chin-eminences and are of *sapiens* conformation. There are no 'taurodont' teeth (page 159), and the men were not typical Neanderthaloids, although their bones exhibit archaic traits that are not present in 'modern' men.

The ten Skhūl individuals are mostly males. They are: (1) a male aged 4–4½ years; (2) a female aged 30–40; (3) a male, adult—only parts of the leg-bones were recovered; (4) a male, aged 40–50; (5) a male aged 30–40; (6) a male, aged 30–35; (7) a female aged 35–40; (8) a male, aged 8–10; (9) a male, over 50; (10) a male aged 5–5½.

All the skulls were crushed and in no case is the skeleton complete. Only Skhūls (4) and (5) are in a fairly good state. Skhūl (5) is of a

peculiar type with a high-vaulted skull, rather recalling that of the Galilee specimen, nearly vertical forehead and well-developed chin, but also with heavy supra-orbital ridges (plate XIIb).

Both the Tabūn and the Skhūl material were found associated with what is approximately the same Levalloiso-Mousterian industry and with the same fauna (plenty of wild ox), so it may be taken that the Tabūn woman and the Skhūl people were more or less contemporary. At Tabūn there is a lower layer ('B'), not that of the hominid remains, showing a quite different fauna with an abundance of gazelle bones.

JEBEL KAFZEH

MM. Neuville and Sketélis found in the grottoes of Jebel Kafzeh, near Nazareth, the remains of five individuals whose date seems to be about the same as that of the Skhūl people. One of the Jebel Kafzeh skulls displays more noticeable neanderthaloid features than the others, though all the skulls had marked supra-orbital ridges. Their moderately dolichocephalic crania (of an average cranial capacity of some 1,560 c.c.) have fairly high vaults, no occipital torus and little of the 'snouty' appearance characteristic of some neanderthaloid remains. The eye orbits are set as low as in the Cro-Magnon men (page 233) but, generally speaking, the Jebel Kafzeh type may be considered like those of Skhūl.

DATING OF THE MOUNT CARMEL SPECIMENS

All the Mount Carmel evidence seems to date to some time before the disappearance of damp-loving animals and the appearance of the dry, modern-type climate. Therefore it is quite possible that the Mount Carmel people (and those of Jebel Kafzeh) flourished during the Riss-Würm Interglacial and would, therefore, be roughly contemporary, not only with Fontéchevade (page 204) but also with Steinheim and Ehringsdorf, that is to say with types either close to *Homo sapiens* or falling into the class of the 'mitigated' and 'generalized' Neanderthaloids. The Palestine border-line cases may have lived tens of thousands of years before the men of La Ferrassie, Spy, Neanderthal, Monte Circeo and so forth.

THE PALESTINE EVIDENCE

There have been two main ways of regarding this evidence from Palestine. First of all that it affords proof of the evolution of Neander-

thaloids into *Homines sapientes*, but, as the late E. A. Hooton put it: 'That Neanderthal Man should have changed thus rapidly into modern Man within the space of two caves and a city block would seem to me a more incredible miracle than the changing of water into wine at Cana in Galilee a few miles away, which happened, perhaps, fifty thousand years later.'

From Mount Carmel we have a range of material which shows, at one end of the scale, the Tabūn woman, not falling far short of such 'classic' neanderthaloid types as Le Moustier or La Quina, while, at the other end of the scale, we have some of the male Skhūl skeletons, which approximate to the general Cro-Magnon type of *Homo sapiens* while, nevertheless, displaying some neanderthaloid features such as great eyebrow-ridges and projecting jaws. It has therefore been proposed that we have, at Mount Carmel, evidence for hybridism between Neanderthaloids and *Homines sapientes*.

As Keith and McCown state in their work on the Mount Carmel sites: 'The great physical variation of these ancient Palestinians is striking. The differences between the sexes is marked not only between the Tabūn woman and the Skhūl men, but also between the Skūhl females and the males. More striking even than this is the unexpected variability in the Skhūl population. It is no exaggeration to say that if these individuals had been found in different sites at different times, and each one described by a different anthropologist or anatomist, we should have a corresponding number of fossil races.'

The fact is that our fossil material of ancient hominids is, generally speaking, confined to a few specimens discovered isolated and not comprising more than one or two individuals' remains at any one site. When, however, a number of skeletons is found together (e.g. at Choukoutien, at Mount Carmel, at the Upper Cave in Choukoutien), we are often struck by the considerable degree of individual variation displayed. It is the paucity of evidence that leads to the idea of the members of any given group, being 'all alike'. There were, no doubt, areas and epochs in which hominid groups tended to become homogeneous, and these were generally 'dead end' groups—such as that of the 'classic' Neanderthaloids. The main current of hominid evolution looks as though it has always comprised a variety of types, some more conservative than others and surviving long after the mass of mankind had swept on. In any case, what the evidence definitely does not bear out is a scheme whereby one type gave rise to another and then faded away.

All this does not, of course, mean that there was not hybridism between different, rather markedly different, types, and such hybridism no doubt still further complicated the tangled story of our origin. The history of our pedigree, alas, is not very different from that of other mammals.

SHANIDAR

In 1953 the Smithsonian Institution expedition to northern Iraq recovered from a cave near Shanidar on the upper reaches of the Greater Zab river the skeletal remains of a neanderthaloid infant. As is generally the case with the bones of very young children it is difficult to say whether those of the Shanidar infant belong to a Neanderthaloid of 'classic' or generalized type.

The Shanidar grotto is in the Zagros Mountains some 2,500 ft. above sea-level, and about 25 miles from the nearest place on the Turkish frontier, and pointers to the presence in remote times of Neanderthaloids in eastern Turkey have been forthcoming. The Shanidar cave is fairly dry, has a wide entrance and looks south.

In 1957 three adult Neanderthaloids' remains were unearthed from the cavern. Shanidar I had the skull much crushed and the upper and lower incisors very worn. The remains seem to be those of a male aged about forty at the time of death. The right arm and shoulder had never developed normally and it would seem that the arm was amputated at the elbow, possibly by some primitive surgical operation. The skull is asymetrical and the left side shows extensive scar-tissue. The subject had suffered from arthritis. A low heap of stones had been raised over the remains which, however, had been disturbed by predatory animals. Associated carbon gives a dating of about –46,000 years.

Shanidar II skeleton also has the skull crushed, and Solecki of Columbia thinks its dating must be about –60,000 years.

Shanidar III has the lower limbs fairly intact, but the rest of the skeleton is smashed and of the skull only a few teeth were recovered. It is evident that all the subjects were killed by rock-falls from the roof of the cavern.

The excavation trench was cut in the centre of the cave and down to 45 ft. over an area from 20 to 30 ft. wide and 60 ft. long, so that there may well be other hominid remains waiting to be discovered. Indeed, Shanidar I was missed in 1953 by less than 1½ ft.

There is an abundant associated fauna (doubtless the remains of

meals) and fossil pollen grains have been recovered. The stratification of the cave is:

(a) Recent to Neolithic.
(b) Mesolithic or late Upper Palaeolithic (in Iraq 'Zarzi').
(c) Upper Palaeolithic (in Iraq 'Baradostian').
(d) Mid Palaeolithic (Mousterian).

The oldest radio-carbon dating is –50,000 years and sixteen in all have been determined. It is clear that the hominid remains date from the first cold phase of the Würmian and probably also from the beginning of the first Würmian interstadial. There are no traces of Neanderthaloids after about –45,000 years and evidence of *Homo sapiens* does not appear until much later (maybe 12,000 years later).

The three Shanidar Neanderthaloids all appear to belong to the 'classic' type (though the absence of the skull from Shanidar III makes it difficult to be sure, in this case, of classification). It is not clear whether the Shanidar material is or is not later in date than that of Mount Carmel (see p. 186). There is a distance of 600 miles between the two sites, but it is evident that two at least of the Shanidar Neanderthaloids are rather of the Tabūn sort than of any of the Skhūl types. In any case, it is obvious that at one time Neanderthaloids were widely scattered throughout the Near East.

THE 'GENERALIZED' NEANDERTHALOIDS

STEINHEIM

On 24th July 1933, the Steinheim-am-Murr, just where the Murr stream falls into the Neckar River, there was discovered a fossil skull which is a capital piece of evidence for the Neanderthaloid-*Homo sapiens* problem. No piece of the lower jaw nor any other bones but those of the cranium were found. The associated fauna would indicate a general 'late Mid Pleistocene' dating. The skull is now preserved in the Stuttgart Natural History Museum. The surface of the skull is corroded and the greater part of the left orbital and temporal region is missing together with the anterior maxillary area (i.e. the front part of the upper jaw).

The vault of the skull is low, as low as in most Neanderthaloids of the 'classic' sort, and the ridge over the eyes is prominent. The eye-orbits are spacious and the mastoid tubercle (page 158) but slightly developed. The frontal profile angle is 66 degrees (as against 65 degrees

in the La Chapelle Neanderthaloid) and the index of the cranial cap is 47.2. The cephalic index may be calculated at 70. The length of the skull is only about 182 mm. but the profile angle is identical with that of some skulls of modern Europeans. There is no neanderthaloid 'snout' and also no occipital fold or 'bun' which are characteristic of the Neanderthaloids as a whole, whether 'generalized' or 'classic'. In a word, the Steinheim skull is more like a *Homo sapiens* skull than are most of the skulls called neanderthaloid. In fact, if we compare those parts which have been preserved of the Swanscombe skull (page 203) with the corresponding parts of the Steinheim cranium, it will be seen that they are very much alike. We appear to be here right on the borderline between *Homo sapiens* and the Neanderthaloids.

The Steinheim specimen was the subject of a study by Berckhemer (*Ein Menschenschädel aus den diluvialen Schottern von Steinheim*, in the *Anatomisches Anzeiger* of 1933). Although the Steinheim skull is smaller than that of Ehringsdorf it can be classed with it, in a general way. H. Weinert holds that Steinheim dates from the Riss-Würm Interglacial (in which case it would be more or less of the same age as Fontéchevade and much less ancient than Swanscombe).

The Steinheim skull looks like that of a female—and therefore may be less 'rugged' than would have been a cranium of a male of the same group. Anyway a canine fossa is present.

EHRINGSDORF

At Ehringsdorf, near Weimar in Germany, there were discovered in 1914 and 1916, respectively, two lower jaws of neanderthaloid type. The remains were studied by Hans Virchow (the son of Rudolf Virchow who was so obtuse about the significance of the original Neanderthal skeleton) and in 1920 he published a monograph on them. He found that the first of the two mandibles was that of a 'not senile' subject, and the second that of a child 'ten years of age'.[1]

In 1925 a more significant discovery was announced from Ehringsdorf; it was that of a cranium described by Weidenreich in 1928 as of 'a female aged from eighteen to thirty years'.[2]

The skull was found quite near where the two mandibles were unearthed. These jaws, however, look as though they belonged to Neander-

[1] At Taubach (also near Weimar) were recovered, in 1871, an incomplete skull and, in 1892, at the same site, some molars which all appear to be of the same type as the Ehringsdorf and Steinheim specimens.

[2] See F. Weidenreich, 1928, *Der Schädelfund von Weimar-Ehringsdorf*, Jena.

thaloids of the 'classic' type, whereas the 1925 skull is the most 'generalized', and one might say *sapiens*-looking, of all the crania classed as neanderthaloid. Weidenreich was of the opinion that with the Ehringsdorf specimen 'we are getting back to the common parent of Neanthropic [i.e. *sapiens*] and Neanderthaloid Man'.

This Ehringsdorf skull is apparently of late Riss-Würm Interglacial dating and therefore may be 150,000 years old. The cranium must be classed with that of Steinheim (page 189) and is not unlike that of Galilee (page 183). Into this same category as Steinheim and Ehringsdorf must be placed the Krapina material, the two Saccopastore skulls and the Gibraltar crania—and possibly a good many others which are in so fragmentary a condition as to make identification difficult (e.g. Bañolas, Tangier, etc.).

Steinheim, Ehringsdorf, Krapina and Palestinian forms (Mount Carmel and Jebel Kafzeh) do have heavy ridges over the eyes (but maybe in the living subject no more marked than in some Australian aborigines at the present day), but as against the more 'rugged' Neanderthaloids these forms have relatively well-developed foreheads, high cranial vaults, rounded occiputs with rather weak muscular markings, a low position of the inion, a mental eminence, moderately developed jaws and facial bones, rather small sphenoid angle, and a mastoid process, tympanic plate and mandibular fossa that are *sapiens*.

To put it graphically, it is possible that some of the Neanderthaloids, if carefully shaved and capped with a natty bowler hat, would not seem out of place in a City office, while other Neanderthaloids were, well, more formidable-looking individuals. Maybe they would not appear out of place on a football field or in the ring.

SACCOPASTORE

There are two Saccopastore cranial portions. The first (not complete) was found in 1929 by workmen digging in a gravel-pit near the bridge on the old *Via Nomentana* some two miles from Rome's Porta Pia. The cranium was found in a level with fossils of *Elephas antiquus, Rhinoceros mercki* and *Hippopotamus major*. Saccopastore is in the low terrace of the Aniene Vale (the ancient Anio), and this terrace is just above the Flandrian 'inundation plain' formed when the Mediterranean's waters stretched much farther inland than at present. The skull, then, would belong to the Riss-Würm Interglacial.

The supra-orbital torus was chipped off by the workmen's picks and

the zygomatic arches were lost in very ancient times, but most of the facial bones are intact and the whole of the base has been preserved (as in no other 'generalized' neanderthaloid skull).

In July 1935 A. C. Blanc and the Abbé Breuil found at the Saccopastore gravel-pit several fragments of another hominid skull embedded in a block of conglomerate. The reconstitution of the skull took four years of patient effort. Saccopastore II is very like Saccopastore I and both are 'generalized' Neanderthaloids. They date from the last Interglacial and are therefore contemporary (more or less) with other skulls of the same type (i.e. Gibraltar, etc).

GIBRALTAR

The first Gibraltar skull (page 150) is also of 'generalized' type and may be that of a woman, the facial bones and those of the right side of the occiput are the only ones to have been preserved. The cranial capacity would be about 1,280 c.c. The specimen is in the museum of the Royal College of Surgeons in London.

In 1926 parts of another neanderthaloid skull were found at Gibraltar. The specimen is, apparently, that of a child aged about five years. The frontal and left occipital bones together with the lower jaw are all that remain. It is difficult to place this Gibraltar II cranium because the specimen is in such a fragmentary state and because of the age of the subject. However, the mandible is comparable with that of Tangier (page 178), and there is little doubt that Gibraltar II, like Gibraltar I, must be classed with the 'generalized' Neanderthaloids.

KRAPINA

In 1906 Gorganovič-Kramberger made a study of the neanderthaloid remains found in 1899 at Krapina near Agram (Zagreb), Croatia. The bones are, on the whole, in poor condition. The skulls, for the most part fragmentary, bear traces of charring. The long bones have been split lengthwise and the remains are probably those of cannibal feasts.

At least twenty individuals of both sexes were represented in the Krapina site and Gorganovič-Kramberger sorted the bones out into three groups: (*a*) children, aged from six to thirteen; (*b*) Adults of ages varying from twenty to thirty; (*c*) 'Very old' adults.

As classified, later on, by Hrdlička the relics can be arranged thus:

(1) Three crania—two of children and one of a young adult
(2) Six upper jaws
(3) Ten lower jaws.

The Krapina men may be compared with those of Steinheim and Ehringsdorf (pages 189 and 190) and are of 'generalized' and therefore probably of rather ancient dating. With this Croatian material may be compared the (very incomplete) mandible of a child (aged, it would seem, between eight and ten) found at Šipka in Moravia (Czechoslovakia) and described by Maška as long ago as 1886. With the Krapina remains were found artefacts of a rather crude Mousterian type and the site almost certainly dates back to the Riss-Würm Interglacial.

MAN EATS MAN

In May 1959 some of the New Guinea hillmen, when raiding a village in the Upper Purari area of Papua, had an effective way of dealing with the troublesome local cop. They not only killed him but ate him.

In the Batak country of Sumatra there are places where cannibalism flourished until the turn of the century—and maybe later. The slain enemy was eaten and the taste of human flesh, say the survivors of the good old times, was not only pleasing but by eating his flesh one ingested the virtue and valour of a dead warrior. The joint of the thumb was a titbit reserved for chiefs, but the brain was the most esteemed meat of all.

There is evidence for violent death in hominid skulls from most remote times. There can be little doubt that the australopithecine remains we have are those of meals. The skull of *Pithecanthropus modjokertensis II* had its hind part smashed by a terrific blow (page 119). All the skulls of *Pithecanthropus pekinensis* had their basal region hacked away and a hominid femur was split lengthwise, presumably to extract the marrow. Solo Man was a head-hunter and cannibal; in all the skulls, except two, the region of the *foramen magnum* is completely smashed. Modern head-hunters also hack away at the *foramen magnum* so as to winkle out the tasty brain. The Monte Circeo skull was treated so as to get at the brain. At Krapina were the charred bones of certainly forty neanderthaloid men, women and little children who had been eaten (page 192). The Ofnet men (of *sapiens* type) were eaten (page 237).

The evidence is overwhelming: Man has eaten Man throughout his history. In fact, we might add to our list of the distinguishing features, whereby hominids differ from anthropoids, this—cannibalism.

We may, of course, suppose, if we wish, that ancient hominids were not eaten by their own kind but by another sort of hominid, that the Australopithecines were devoured by, say, *Telanthropus*, that Peking Man was eaten by another sort of Man (of whom there are no traces at all), that the Solo and Monte Circeo Neanderthaloids were served up for dinners of *Homo sapiens*, though there is nothing at all to prove this. But the Ofnet men could only have been eaten by other *Homines sapientes*, and we know that cannibalism has flourished throughout the times when only men like ourselves (or more or less like ourselves) inhabited the earth.

It is tempting to see in the most ancient evidence for cannibalism evidence also for some sort of 'ritual', some sort of belief in the transference of 'virtue' from victim to eater. In fact, this comparatively easy way of securing protein and salt must have suggested itself to our remote forefathers long before they began to bother their heads about such transcendental matters as are reflected in ritual and 'belief' in spiritual values. As R. M. Berndt of Sydney has pointed out, 'cannibalism is a most nourishing and hygienic means of disposing of the dead'. And not only of those who have died naturally. The old and helpless must be knocked off, and why waste good meat?

Because, in comparatively recent times, head-hunters and cannibals appear to have practised skull-cults and imagined that the eating of human flesh was a sort of communion with the dead man, we have no right to suppose that these explanations can be held valid for most remote ages—or, indeed, that they are entirely valid for today. The head-hunters of northern Luzon go out and secure a head when they want to get married and be recognized as 'men'. The head sticks on a pole in the village and the head-hunter is recognized as really grown up.

It is quite probable that in, say, the times of the Neanderthaloids in Europe (and Man had then a long history behind him) there was some ritual skull-cult as at Monte Circeo (page 170). Maybe, in a long-developed series of customs, we can see cannibalism (originally entirely utilitarian and always so to a great extent) merge into communion-rites —and maybe we cannot.

It is as well to be on our guard against fallacious comparisons between what is stated to be believed today and what might have been believed 100,000 years ago. And this also because we cannot define 'belief' even in a modern community. Because a man conforms, because a whole people conform, that does not mean that each and every one has decided that what the professionals formulate is true in every

particular. A rite may be performed because it is the 'proper' thing to do, because it may bring good luck, or ward off evil luck, or cannot do any harm anyway. *Quot homines tot sententiae* whether now or then. The 'explanation' of so much that seems puzzling in Man's conduct is that there is no explanation that can be formulated in words.

Some of the European Neanderthaloids seem to have practised some sort of bear-'cult'. The Ainu in northern Japan practise a bear-cult, but it would be as imprudent to conclude that the Neanderthaloids and the Ainu shared the same 'beliefs' as it would be to imagine that the neanderthaloid bear-cult was handed on through thousands of years to our days.

BEAR-CULTS

Although we are concerned principally in this book with the physical evolution of Man, it may not be out of place to add a note here on bear-cults.

As the evidence accumulates (though it is still all too scanty), it does look as though the Neanderthaloids (or some of them) practised some sort of rites. They seem to have been the first men to have buried their dead with objects of some non-material significance. Furthermore, at Petershöhle (near Velden and about thirty miles to the east of Nuremberg) in a cavern opening on to the left bank of the Pegnitz stream were found bear skulls in niches in the walls as well as in a sort of primitive stone box. On a stone platform were ten isolated bear crania and with them other (mostly long) bears' bones. The artefacts discovered in the cave are of general Mousterian type and bear relics may well have been put in place by neanderthaloid men. In Switzerland also has been found a stone chest covered with slabs and containing skulls of bears—all pointing in one direction. At Drachenhöhle near Mixnitz in Styria (Austria), also a Mousterian-culture site, fifty-four bears' thigh-bones were found laid out in one direction. And forty-two skulls with several thigh-bones lay in another cave.

At the Montespan cavern in the Pyrenees there is a headless model of an animal, probably a bear, but on the ground between the fore-paws was a bear's skull; maybe the model was draped in a bear's fell and a real bear's head fitted over the stump of the model's neck. Of course, the Montespan cave was occupied (or at least used) by *Homo sapiens* and not by Neanderthaloids, but the persistence of a bear-cult seems proved right into late Würmian times.

Bears, particularly the cave-bears who could tower up ten feet on

their hind legs, seem to have been one of the beasts that most impressed early men, though the cave-bear may have been very largely a vegetarian and it would seem (e.g. at the *Tana della Básura*) that Neanderthaloids, at least, sought out the hibernating beasts and killed them for food.

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7

Homo sapiens

RADIOCARBON DATINGS

WHEN we come to deal with *Homo sapiens*, at any rate from the time that he stood alone in Europe, we have a new method of dating on which to rely. It is one of the greatest use but it is also one upon which *too* much reliance must not be placed. This is to say that if a radiocarbon dating gives us a reading which seems (from other evidence) wildly improbable, then we should not accept it unhesitatingly.

Radiocarbon, indeed, does not yield single dates in which complete confidence can be placed in the absence of confirmatory evidence (page 223). Moreover, there is always a risk of 'contamination' which may completely falsify the results.[1]

Furthermore, it is now thought that variations occur in the earth's magnetic field and, since that field acts, more or less, as a screen for cosmic rays, if, in the past, the intensity of the field was greater than it is now, then a smaller quantity of cosmic rays would have reached living organisms on our globe. The American geophysicist Elsasser thinks that for datings of more than 4,000 years the radiocarbon readings may be too great by as much as 1,000 years, while, for objects dated by Carbon-14 methods at 2,000 years ago, the error may be in the region of 250 years.

[1] Carbon-14 or radiocarbon is an isotype of ordinary carbon formed in the upper atmosphere by the action of cosmic rays on nitrogen. This carbon-14 penetrates into all living things on this earth and remains in them although, after the death of the organism, the radiocarbon is lost at a regular rate, irrespective of conditions and surroundings. The half-life of radiocarbon is 5,600 years and it goes on being lost until all disappears. The sample containing the radiocarbon is dissolved in a hydrocarbon fluid in a tube where radiation from its unstable atoms causes the liquid to emit light-flashes. The photo-multiplier tubes pick these up and the counter is adjusted so as to ignore all light-flashes too weak (or too strong) to come from radiocarbon.

It may be mentioned also that human bones (or those of any other animals) are not very suitable material for the radiocarbon tests, though now only half a gramme of organic carbon is sufficient for a test. Radiocarbon dating has been derived from uncharred bone, that which has been charred by fire is the most suitable, and although any matter or substance of organic origin can be used, the best material is charcoal. Thus it comes about that the datings given by radiocarbon tests are generally not those of animal bones themselves but of associated vegetable matter.

The radiocarbon method has now been so refined that it can be used for dating material up to 70,000 years old and such an age is very near to the absolute limit, that is to say to the point where there is no more radiocarbon in the specimen.

Despite the refinement of the methods used, it is, of course, true that the margin of error for the lower figures is less than it is for the higher ones (page 223). The radiocarbon datings for objects of as recent date as Egyptian dynastic agree very well with the computations arrived at on other grounds. However, here are some datings taken at random for objects belonging to many millenia ago, and these results do enable us to plot out our chronology much more satisfactorily than would have been thought possible ten years ago—for the radiocarbon-dating methods have been in use only since about 1950—thus:

A level in an Iraq cave (with Mousterian implements and, therefore, probably occupied by Neanderthaloid Man) appears to be more than 25,000 years old.

Man was in the Americas 20,000 years ago and possibly earlier (page 222).

The famous painted prehistoric cave of Lascaux (in the Dordogne Department of France) had human inhabitants about 15,000 years ago, although this does not mean that all, or any, of the pictures have just that dating.

The Mesolithic (page 237) in England began some 9,000 to 10,000 years ago and thus when Britain was still linked to northern France and to Denmark.

THE ORIGINS OF HOMO SAPIENS

It must be admitted that until comparatively recently we knew almost nothing about the ancestry of the men who seemed to appear 'almost suddenly' in Western Europe, say 40,000 years ago, although it was

evident that they must have had a long history behind them, a history which, as likely as not, had been lived in part, at least, in other regions than Europe.

For a time it was thought that very ancient types of *Homo sapiens* had been discovered in East Africa—the famed Kanam and Kanjera specimens (page 206), but it now seems evident that these are relatively modern, and that the most ancient fossils of *Homo sapiens* are to be found in Europe on our own doorsteps, in England and in France.

BODY AND BONES

Here, we may remember one or two points about fossil Man. First of all, the fossil *Homo sapiens* types to which a considerable antiquity can be assigned are not entirely similar to existing sorts of men. Generally speaking, the skull-bones are thicker and there is a number of other features which are enough for us to class such specimens in the category of *Homo sapiens fossilis* as distinguished from *Homo sapiens* (*sapiens*).

Furthermore—and this remark applies to all the relics of early Man —most of the material was (and even still is) composed of skulls or parts of skulls. Much time was spent in measuring and comparing these skulls with those of other types, and it was evident that the heads of say, Pithecanthropoids, Neanderthaloids and *Homines sapientes* did appear easy to recognize and impossible to confuse with each other. However, as the material piled up we were confronted with a number of 'marginal cases' which we have noted earlier on in this book.

What, however, has been realized only for a comparatively short time is that all the various sorts of men (together with the Australopithecines) stood and walked upright alike. It had been thought that creatures so 'ape-like' as the Pithecanthropoids in their heads and faces, must have moved about more or less as apes do. But if we remember (1) that all the hominids we know of had long bones of practically the same pattern and also (as far as we know) pelvic bones of similar form, and therefore held themselves and walked as we do, and (2) that we know nothing about the hair colour, the skin colour, the shape of the external lips, of the external genitalia, of the degree of pilosity of fossil Man, we shall be inclined to agree that some Pithecanthropoids, Neanderthaloids and early *Homines sapientes* may have looked more alike than we are *a priori* ready to admit.

It is true that we can guess from the skeleton whether the subject

was a 'typical Negroid' or a 'typical Mongoloid', but we do not know whether, in life, such men had very dark skins or epicanthic folds to their eyes.

The view which held the field until twenty years ago was that *Homo sapiens* appeared 'suddenly' in western Europe during the middle of the Würm Glaciation and that just as 'suddenly' the Neanderthaloids disappeared—some went so far as to say 'annihilated', others 'superseded by' *Homo sapiens.*

Now this view seems unjustified if we remember the amount of relevant evidence which has piled up since 1938. First of all, *Homo sapiens* must have had some ancestry behind him when he 'appeared' in Europe. He must have come from somewhere—if he was not differentiated in Europe. But all attempts (e.g. 'Kanam Man', etc.) to find an ancestor out of Europe failed. Maybe some observers rather liked the idea of *Homo sapiens* being in the same class as Melchizedek, King of Salem.

Then, about twenty years ago (though it had been put forward before), the idea was mooted by Weidenreich at Copenhagen Congress of that year that *Homo sapiens* was much more ancient *in Europe* than had been supposed. There was the evidence of the Swanscombe skull fragment and of the Steinheim and Ehringsdorf skulls. Also the evidence from Mount Carmel, which seemed to antedate *sapiens* remains known in Europe before 1935 and showed a population with mixed *sapiens* and neanderthaloid characteristics.

So the pendulum swung in the other direction and we were asked to believe in *Homo sapiens* in Europe as long ago as the Mindel-Riss Interglacial, if not earlier.

We have seen that the Neanderthaloids make up a varied group with some of their forms much resembling those of *Homo sapiens.* Although it seems likely that there was *sapiens*-neanderthaloid hybridism in Late Palaeolithic times, the story of the two sorts of men must have been, from the first, in many ways a common one.[1]

Where, indeed, do we draw the line between what is and what is not *Homo sapiens*?

There is a number of skulls, or parts thereof, and of early Würm or of pre-Würm date, which, although presenting some features of the Neanderthaloids, are so similar in anatomical characters to *Homo*

[1] And there are skulls of comparatively late date which show neanderthaloid features such as, e.g. the Santián cranium (found in 1953 in the Santián cave about ten miles from Santander in northern Spain) associated with Aurignacian artefacts. (See: *El Craneo prehistorico de Santián* by V. Andérez.)

sapiens that these specimens can hardly be put in a class that is different from that of 'modern' Man. Of such are the fossils from Steinheim, Ehringsdorf, Krapina, Fontéchevade, Swanscombe and Mount Carmel. Some have marked supra-orbital ridges (though not comparable with those of the 'classic' Neanderthaloids) but hardly more developed than in the australoid types of *Homo sapiens*, and they have a relatively well-developed forehead, a high cranial vault, a rounded occiput with rather slight traces of muscular attachments, a low position of the inion, a chin-eminence, moderately developed jaws and facial skeleton, relatively small sphenoidal angle, a forward position of the *foramen magnum* and a general *sapiens* appearance of the mastoid process, the tympanic plate and the mandibular fossa.

A DEFINITION OF HOMO SAPIENS[1]

Here is an admittedly rather technical definition of *Homo sapiens*, but it may be as well to give it in order to indicate the features (some of them certainly somewhat arbitrary) on which the systematists and physical anthropologists rely to recognize one of our kind from any other sort of hominid.

Homo sapiens, a species of the Genus *Homo*: mean cranial capacity about 1,350 c.c (though this figure is often smaller or greater in specimens recognized as *H. sapiens*); muscular ridges of cranium not strongly marked (but 'strongly' is a controversial word), rounded forehead, supra-orbital ridges not forming a continuous torus; rounded occipital region with a nuchal area of relatively small extent; *foramen magnum* facing directly downwards (though this is a feature in the Neanderthaloids and maybe in other sorts of men); presence of prominent mastoid process of pyramidal shape (in young individuals as well as in adults)—but this is not peculiar to *Homo sapiens*—associated with a well-marked digastric fossa and occipital groove; maximum width of calvaria *usually* in parietal region and axis of glabellomaximal length well above level of the external occipital protuberance. Marked flexion of the sphenoidal angle with a mean value of about 110 degrees. Jaws and teeth *relatively* small (we may ask 'compared with what?') retrogressive features in the last molars. Maxilla with concave facial surface including a canine fossa (this latter, however, is not confined to *H. sapiens*), a distinct mental eminence, the eruption of the permanent canine *commonly* precedes that of the second molar. The spines of the

[1] This classical definition is that of Sir W. E. Le Gros Clark.

cervical vertebrae (except the seventh) rudimentary. The skeleton adapted for fully upright posture and gait (as is, moreover, as far as we can see that of all the hominids) and limb-bones *relatively* slender and straight.

Not many of these features show in a living subject, and, in fact, the definition, though good enough as far as it goes (which is about as far as it can go), must be taken as rather arbitrary as must be all definitions which seek to fit a mass of evidence from living beings into man-made classifications.

SPURIOUS SPECIMENS OF ANCIENT HOMO SAPIENS

The number of specimens held to be of *Homo sapiens* of very ancient date has been considerable. Now that new methods of detection and examination have been devised, most of these specimens have been proved to be either much more recent than was supposed, or (in the case of the famous 'Piltdown Man') bogus.

In my book 'Early Man' I gave an account of the Galley Hill, Lloyds and other relics, and also, of course, of the *Eoanthropus Dawsoni* or 'Piltdown Man' regarding which I stated that the jaw could not belong to the skull since, by any reconstruction, 'the bicondyloid width of the mandible is noticeably less than the biglenoid width . . . of the cranium. In other words, the jaw and the skull just do not fit'. As everyone now knows, the fake has been exposed in masterly fashion in the study 'The Solution of the Piltdown Problem', by J. S. Weiner, K. P. Oakley and W. E. Le Gros Clark (1953). The cranium is 'recent', the mandible belonged to a young orang [probably], the teeth were filed down with a metal file, the bones stained and all the artefacts 'planted' in the site. The imposture was executed by Dawson, the 'discoverer', who, apparently, was desirous of making himself into an important scientific figure, rather different from the respectable country solicitor that he was. The Piltdown monster was celebrated for so long, very largely because it was advertised as the 'most ancient Englishman' and acknowledged by a species of local patriotism which, however regrettable, is common enough (page 217).

The Galley Hill skeleton (discovered not so far from the site of the Swanscombe skull remains) is proven to be 'modern'. The fluorine content of the bones (0.3 per cent) indicates that the skeleton was 'intrusive' in the layer where it was found and Galley Hill Man was, probably, intentionally buried. In any case the bones (although

some thought they saw in them 'a prototype' of the 'generalized Mediterraneans') are those of a *Homo sapiens* of our days.[1]

Not only 'Galley Hill', but 'Bury St. Edmunds' and 'Ipswich' men and the 'Dartford' skull are all modern, while the 'Baker's Hole' and 'Lloyds' crania are, to put it at its best, extremely doubtful.

These are comparatively recent finds but in the early days, during the last century, when the great antiquity of Man had been proved (by his artefacts), but when there were still few bones of ancient men, a number of patently false attributions was made, since the scientists of the day had little or no comparative evidence and also since no clear idea existed as to what type of Man flourished in very remote epochs. Then the pendulum swung in the opposite direction and it was held that the different types of men followed one another in succession, that one type 'died out' in giving birth, so to speak, to another, and that *Homo sapiens* was a very recent form dating back only to the middle of the last or Würmian Glaciation. This view, which seems to us rather unreasonable today, fitted in with a number of prejudices and seemed to leave a loop-hole for a special 'dispensation', favouring men like ourselves and leaving all other types out in the darkness.[2]

However, with the Swanscombe and Fontéchevade specimens we are on firmer ground, both these are undoubtedly ancient and both appear to be of general *sapiens* type.

SWANSCOMBE

The Swanscombe cranium consists of the two parietal and the occipital bones. The left parietal and the occipital were found by Mr. Alvar Marston in 1935 at the Barnfield gravel-pit (which is part of the Thames 100-foot river terrace), 800 yards north of Swanscombe church, between Gravesend and Dartford in Kent. In 1955 a right parietal was unearthed at the same site and proved to fit exactly with the original pieces found in 1935 (there is slight damage to the bone so that when all the portions

[1] See K. P. Oakley and M. E. Ashley Montagu, 1949, 'A Reconsideration of the Galley Hill Skeleton', London.

[2] The older anthropological textbooks (e.g. the Mortillet book *La Préhistoire, Origine et Antiquité de l'Homme*—latest edition 1910) gave an imposing list of these supposedly very ancient men: the Denise, Marcilly, Bréchamps etc. specimens. In recent years Carleton Coon's excavations at the Hotu Cave in northern Persia revealed not only evidence for early neolithic cultures but also a hominid skeleton to which the age of 75,000 years was attributed. The evidence was misread. The Hotu remains are not only *Homo sapiens* but also of mesolithic dating (say about 6000–7000 B.C.) as demonstrated by K. P. Oakley.

are assembled there is a wedge-shaped gap between part of the left parietal and the right), see plate XIa. The cranial capacity is some 1,325 c.c.

With the Swanscombe specimen were found many (over 600) Acheulian-type artefacts. The hominid remains are contemporary (as shown by fluorine, nitrogen and uranium tests) with the mammalian fauna associated with them (i.e. *Elephas antiquus*, *Rhinoceros mercki*, *Bos primigenius*, *Cervus elephas*, *Cervus alcea* and *Equus caballus*, though this is not a very ancient-looking fauna). The deposit in which the cranial portions were found may be Mindel-Riss Interglacial and that is the view now generally entertained. The bones have been submitted to the organic-nitrogen test and have proved to contain no organic nitrogen at all, thus a very considerable age is indicated.

The cranial bones seem to be those of a female aged from twenty to twenty-five years. There is nothing in these bones to distinguish them from those of *Homo sapiens*, except, perhaps, their thickness. It is possible, of course (page 190), that the frontal bones and those of the face might look rather less *sapiens* than do the parietals and the occipital.[1] Still, there is no neanderthaloid type of the most 'generalized' sort (e.g. Steinheim or Ehringsdorf, page 189), whose parietal and occipital bones look quite so *sapiens* as those of Swanscombe.

If the Swanscombe cranium can be dated back to the Mindel-Riss or 'Great' Interglacial, then the bones may be 200,000 years old or more, and they indicate possibly, even probably, that at this remote period *Homo sapiens* existed in Europe. From no other part of the world (though see page 206) is there forthcoming comparable evidence about the antiquity of *Homo sapiens*.

FONTÉCHEVADE

Here the position is rather different. In 1947 Mlle G. Henri Martin (the daughter of the discoverer of the La Quina material, see page 161) found, in an assemblage of 'warm' fauna and Tayacian artefacts, a cranial *calotte* and in the same level a small fragment of another cranium. The site is some eight miles from La Rochefoucauld in the Charente Department of western France, and not far from La Quina. The calotte was exhibited at the Museum of Man in Paris and in 1959 H. V. Vallois published a full account of the specimen.

[1] The nasal sinuses seem to have extended very far back so the face and jaws may have been of massive build, though we cannot say whether the brows were as flat as in Fontéchevade or as projecting as in Steinheim.

The substance of this study is as follows: the calotte includes the greater part of the parietals with about two-thirds of the upper portion of the frontal bones. In shape and size the specimen is comparable with a skull of present-day *Homo sapiens*, though the thickness of the Fontéchevade bones is greater than that in many neanderthaloid skulls and may be compared with that of Swanscombe. The parietal 'bosses' are hardly marked and correspond to the middle part of the bone instead of being lower and farther back as in most Neanderthaloids. There is no trace of a supra-orbital torus. This 'Tayacian' man had, then, a forehead like ours, and this observation is confirmed by the small fragment of a frontal bone also found at Fontéchevade not far from the calotte.

Vallois concludes that 'the Fontéchevade specimen affords quite unimpeachable proof, from the stratigraphic point of view, that there existed in France, before the Würmian Glaciation, a human *phylum* different from that which is represented in its extreme form, by the Man of Neanderthal'.

The artefacts found associated with these Fontéchevade specimens are of a general Mousterian, or 'proto-Mousterian' sort, known as 'Tayacian' and not known later than the Riss-Würm Interglacial. Moreover, the associated fauna is of a 'warm' type unknown in Europe during the Würmian Glaciation. We can, therefore, set the date of the Fontéchevade specimens, for the present, at rather over than under 100,000 years. This is considerably later than the Swanscombe skull which *in the portions we have* looks even more *sapiens* than does Fontéchevade.

The evidence, such as it is, suggests, then, that men very like ourselves inhabited this continent both during the Mindel-Riss and the Riss-Würm Interglacials, as well as during the later phases of the Würmian Glaciation, and that means *Homo sapiens fossilis* appeared in Europe at least 250,000 years ago.

During the glacial periods Europe was not a very pleasant place to live in, even south of the mountain barrier, and it is quite possible that there was a recession of population southwards (e.g. to Africa), and that during the glaciations most of Europe was more or less empty of Man (anyway, a rather rare sort of animal), until when, during the Würmian, he learned to brave the cold. That is what the evidence looks like today though, of course, we may have to change our opinion in the light of further material.

TZEYANG

Since 1949 a number of finds of fossil Man's remains has been reported from China;[1] the most interesting of these specimens of ancient *Homo sapiens* seems to be the skull found at Tzeyang south of the Chengtu plain in Szechuan in 1951, while foundations were being dug for the construction of a bridge over the Huangshanchi River.

The cranium was described by Pei in a publication of the *Academia sinica* (1952). The skull, which is nearly complete save for the lower jaw and some of the facial bones, is that of a young woman. The type is completely *sapiens* and the cranium was discovered twenty-three feet deep in gravel. Pei is inclined to attribute it to the Riss-Würm Interglacial and in this case Tzeyang would be more or less contemporary with Fontéchevade and would furnish additional evidence for the existence of *Homo sapiens* before his formerly supposed 'sudden appearance' (page 198) in Europe during the Würmian Glaciation.

AFRICA

There do not seem to be any very early *Homo sapiens* remains in Africa, which seems strange not only because this continent appears to have been a differentiation area for the hominids, but also because of its milder climate during the European Ice Ages. We may remember, however, that much of the continent has climatic conditions which are unfavourable for the preservation of bones, and that Africa has been prospected for a much shorter time and on a much smaller scale than Europe.

KANAM AND KANJERA

After the 1914–18 war L. S. B. Leakey recovered at Kanam (in 1936), on the southern shores of the Kavirondo Gulf in Kenya, a portion of a hominid mandible which he claimed was of Lower Pleistocene date. The jaw fragment was associated with teeth of *Dinotherium* and other extinct elephants and pebble industry tools. The jaw fragment has a fairly well-marked chin, there is no prognathism (even alveolar) and the teeth seem to have been filed. In fact, the general appearance is *sapiens*.

[1] Other finds of early *sapiens* type have been reported from Anhwei, Ting (Shansi) and Holung, while bones of 'Upper Palaeolithic Man' were reported from the province of Szechuan in 1955. Unfortunately we have as yet (1960), in the West, no detailed account of these discoveries or of their dating.

The bone is heavily mineralized but fossils in many parts of Africa become mineralized more rapidly than in Europe.

At Kanjera, a few miles from Kanam, Leakey discovered also several fragments of hominid skulls and bits of one femur. Some of the bones were lying on the surface of the ground and others were in stratified sands where, in the same level, were also 'Chelleo-Acheulian' hand-axes. The associated fossil fauna looks to be of general Mid Pleistocene date.

There are, in all, fragments of four skulls, and the portions comprising one of them were found *in situ*. There are seven fragments (only two of which were discovered *in situ*), and they are sufficient to give a good general idea of the appearance of the whole cranium (large part of frontal, part of the left parietal, a large piece of the occipital, a small piece of the temporal and a portion of left malar and maxilla). The bones are thick (for a *Homo sapiens*), the supra-orbital ridge is slightly developed, the skull was very markedly dolichocephalic. In fact, from the remains as they exist, it is fairly clear that Kanjera Man was *Homo sapiens*. A fragment of femur indicates that Kanjera Man walked as we do and was probably a pretty muscular fellow.

The fauna and the artefacts at the Kanjera hominid level are such as to suggest a later dating than that of the Kanam deposit.

It is solely because of the doubtful conditions in which the Kanam and Kanjera material was found that there is hesitation in admitting it as proof of the existence of *Homo sapiens fossilis* in Africa at times when we have reason to think that comparable human types flourished in Europe and, in fact, we should expect to find traces of very early *Homines sapientes* in Africa. We may hope to discover other evidence supporting the theory that *Homo sapiens* existed in Africa long, long ago, when on that continent (as well as elsewhere) other types of hominid (e.g. neanderthaloid and even pithecanthropoid) were still surviving.

'OLDUVAI MAN'

There is another specimen of *Homo sapiens* found in Africa and to which a very early dating has been accorded. It is the famous Olduvai (or Oldoway in German spelling) skeleton found by Hans Reck in what was then (1913) German East Africa and is now Tanganyika. Reck unearthed the specimen from strata he thought were 'early Pleistocene'. But the bones are not in any way 'primitive' and were, apparently,

intentionally buried. The skeleton seems, indeed, to be of a type represented now by the extant Masai people. It is now admitted that Reck was mistaken in his dating. The teeth of 'Olduvai Man' exhibit, moreover, filed incisors which do not suggest a remote dating. The skeleton was found in a flexed position and the bones were in anatomical connection.[1]

SOUTH AFRICA

The remains of *Homo sapiens fossilis* recovered from the soil of southern Africa fall into three main classes: (1) that of Florisbad; (2) that of Boskop and Fish Hoek often referred to as 'proto-Bushman' and (3) that of Bayville, Mistkraal, Barkley West, Cape Flats, etc. which have a general 'australoid' appearance.

The South African Bantu-speaking peoples are quite recent immigrants (they do not seem to have reached the western part of what is now Cape Province by the time that the first Dutch settlers touched the shores of southern Africa).

FLORISBAD

What seems to be the most ancient of the southern African skulls is that of Florisbad found thirty miles north-east of Bloemfontein in 1933. The hominid molar and the greater part of the cranium were unearthed from a mineral-spring deposit some thirty feet high above the ground with water rising through a series of eyes or vents. The fossils lay in a pocket of sand in a peat level. The associated mammalian fauna was early 'post-Olduvan' and crude chopping-tools with blades and flakes were also present. The analysis of the fossil pollen at the site shows a climate like that of the Karroo today, that is to say a good deal drier than is the present climate of the Orange Free State.

Of the cranium there have been preserved the major portion of the frontal, the anterior part of the parietals. There is also an isolated piece of the palate together with the right maxillary region and a molar tooth. The relic is, then, far from being complete, and deductions made from it about type and affinities must be regarded with caution. However,

[1] See Hans Reck, 1914, *Erste vorläufige Mitteilung über den Fund eines fossilen Menschenskeletts aus Zentralafrika*, Berlin. From the first there were sceptics. Weinert was against the fossil character of the Olduvai material, but he was also sceptical about the undoubtedly ancient Boskop skull (page 209) and was inclined to attribute too great an age to the Springbok remains.

the head was large and rather long, with a low vault, and the frontal region broad and much flattened. The brow ridges are fairly well developed. On the whole, the Florisbad specimen does seem to show both a general 'australoid' tendency, and also some likeness to the Boskop skull (see below). The receding forehead, the brow-ridges and the prominent jaws have led some authors to see in Florisbad a 'reduced form of Rhodesian Man' (page 172), and it is just possible that the cranium may not be that of *Homo sapiens* but of a 'generalized' sort of African Neanderthaloid with close affinity to *sapiens*.

In any case, the early *sapiens* inhabitants of southern Africa seem to have been of australoid or of bushmanoid type (or both) and certainly not Negro.

A. C. Hoffman, director of the National Museum, Bloemfontein, holds that Florisbad is 'over 100,000 years old'. Certainly it is the most ancient *sapiens* or maybe 'pre-*sapiens*' cranium to be found in southern Africa. Radiocarbon tests on the associated peat organized at Chicago by Movius have shown that the specimen is 'over 41,000 years old' (this was the maximum dating obtainable by radiocarbon in 1953), and it is reported that there is no radiocarbon left in the bone.

BOSKOP

The Boskop was the first hominid cranium to be reported from South Africa and was found as long ago as 1913. The portions consist of the greater part of the skull-cap, a fragmentary lower jaw, and portions of the arm and leg-bones. An associated artefact is of 'Middle Old Stone Age'. The cranium does show some rather 'primitive' features, but none which would make us discard it from the *sapiens* category. It is flat on the top, the bone is thick (or would be considered thick in a man of today), and the jaw is massive. The cranial capacity is great—some 1,650 c.c.—which is more than that of many present-day Europeans. The skull is dolichocephalic, the forehead vertical and the face orthognathous. From some points of view (perhaps chiefly because of its size) the Boskop cranium suggests those of the Cro-Magnons. Maybe Boskop Man was a sort of ancestral Bushman—and the Bushmen must have inhabited southern Africa for many thousands of years. The Boskop leg-bones indicate a fairly low stature, in fact, to our ideas, disproportionately low for the size of the head.

FISH HOEK

At Fish Hoek, near Cape Town, was discovered another 'proto-Bushman' skull, smaller than Boskop, though larger than the crania of living Bushmen. The head is particularly long behind the ears. The face is small and the total height of the body did not exceed 5 ft. 2 in., a fair average height for a Bushman of today.

Another (but incomplete) skull, with other bones, was found in 1921 at Tzitzikama on the South African coast. Dreyer also discovered at Knysna other individuals of general Fish Hoek type, though some of the skulls suggest neanderthaloid features.

CAPE FLATS AND COMPARABLE TYPES

The Cape Flats (Cape Town) skull fragments and thigh-bone were found in 1928. The skull seems to be of general 'australoid' type. The Tuinplaats (Transvaal) hominid remains appear to indicate an individual rather comparable with the eastern African 'Hamites' of today, while the 'Border Cave' fossil (Ingwavuma) has been thought to represent a 'later form of Florisbad'.

What, however, seems clear is that early *Homo sapiens* forms from southern Africa indicate the existence there in late Pleistocene times of two main groups (1) an australoid and (2) a bushmanoid.

The australoid seems to have disappeared, but the bushmanoid lingered long (and survives to this day). The little Bushmen, indeed (so sorely persecuted by invading Bantu-speaking peoples and by 'white' men), are the real natives of South Africa.

INDICATIONS OF DIFFERENT TYPES OF HOMO SAPIENS

We have singularly little data which throw light on the early history of the different types of Man now existing on this earth. Weidenreich thought that he could recognize in the skulls of *Pithecanthropus pekinensis* features which recalled the Mongoloids, but his view has found no acceptance.

The fact is that although when we examine the skeleton of a Negroid, a Mongoloid or a Mediterranean, today, we can point out such and such a feature which enables us to classify the specimen with some certainty, there are any number of border cases.

In living men so much of our data is afforded by the soft parts and

by skin and hair colour. We do not know, and we shall doubtless never know, the colour of the skin of any of the Pithecanthropoids for instance. If we watch a gorilla carefully we may, first of all, be inclined to say 'He looks rather like a Negro', mainly because gorillas have a black skin, but there the resemblance ceases. Negroes, for instance, have the most averted and largest external lips of any type of Man, whereas no ape has any external lips at all. If gorillas were pink we should not find much likeness to Negroes in them.

Again, we are inclined to think that skin colour must have some 'adaptive' significance, to use an old-fashioned phrase, i.e. that dark-skinned men are found in hot climates and light-skinned men in cold climates and indeed this observation is roughly, but only roughly, true. But the Eskimo, who live in arctic conditions, have dark skins, dark eyes and black hair, whereas the Touareg of the great heat of the Sahara are 'white' men and sometimes even have grey eyes and brown hair.

And, of course, we do not know when Man lost most of his body hair, although some types of men living today are very hairy, as, for instance, the Australian aborigines, some of whom, it has been calculated, have as many hairs on their body as some chimpanzees (which are the least pilous of the apes). All the fanciful 'reconstructions' of ancient Man (generally shown in a row from Australopithecine to *Homo sapiens*) represent him as covered with a shaggy coat of hair like a cocker spaniel. But, as the earlier types of hominids certainly lived in very warm climates, there is no reason to suppose they must have been very hairy. In fact, outside the damp forests where the apes have their dwelling, a thick coat of body hair would be a disadvantage which might well be eliminated by natural selection.

So, then, when we speak of any type of fossil Man as being 'negroid' (e.g. the so-called Grimaldi Negroids, see page 232), we do not imply that they were very dark-skinned, had kinky hair and averted lips; what we do mean is that such fossil bones look rather like those of existing negroid types.

Such evidence as there is, and it is slight enough, seems to suggest that the existing 'races' of *Homo sapiens* were not fully established until the latter part of the last Ice Age. But, despite all the other criteria which may be advanced (e.g. percentage of blood groups—for some of the blood's biochemical properties depend upon a single gene)—the most obvious difference between Mongoloids, Negroids and 'Caucasoids' is one of skin-colour and we do not know, nor shall we ever

know, what was the skin-colour of the Grimaldi 'Negroids', of Chancelade or of Combe-Capelle Man. 'Races' are not fixed but are continually changing through mutations, cross-breeding and selection both natural and sexual.

ASSELAR MAN

In 1927 MM. Besnard and Monod discovered in the heart of the Sahara' near the Asselar Post, some two hundred and forty or fifty miles to the north-east of Timbuktu, a fossil hominid skeleton. The site is close to the dry valley of the ancient Tilemsi stream. The remains lay in fluviatile sands strongly marked by aeolian erosion, so that the projecting parts of the skeleton (i.e. the knee regions) had been sawn off by wind-blown sand. The presence in the site of water molluscs and, nearby, of fish bones, fossil bones of gazelles, warthog, antelope and crocodile, may indicate that the hominid remains date to as late a period as the first wet phase of the last African Pluvial.

The bones are those of a man of late middle age, tall (1.70 metres or about 5 ft. 7 in.), distinctly *Homo sapiens* but not of 'Mediterranean' type. From the shape of the nasal and long bones it is clear that Asselar Man was some sort of negroid. The skull is dolichocephalic and has a high vault, whereas the rather short face is broad. There is marked alveolar-dental prognathism, and the mental eminence is well marked (plate XIII). The teeth are large and the third molar well developed. There was avulsion (i.e. 'knocking out') of the upper incisors, an ancient African practice. The nearest living type to Asselar Man would seem to be that of the southern African Bantu-speaking peoples.

Asselar Man appears to have been drowned.[1]

Other Saharan hominid remains appear all to be of later dating than the Asselar skeleton (i.e. hominid fossils from the Oued Tilemsi and also from Yaoua).

Homo sapiens seems to appear 'suddenly' in eastern and northern Africa during the Upper Gamblian (page 65), and with a 'Capsian', i.e. Late Palaeolithic industry. But these *Homines sapientes* were certainly not negroid. Moreover, the most ancient types of *Homo sapiens* from southern Africa (i.e. Florisbad, more or less 'australoid', and Boskop) are also not negroid. Either, then, the negroid type is a comparatively recent one (but see Asselar and the Grimaldi 'negroids')

[1] A monograph on Asselar Man was published by M. Boule and H. V. Vallois in 1932.

or, what is more probable, the early forms of this sort of Man belonged to the equatorial forest belt where bones are not easily fossilized or preserved.

The Upper Palaeolithic men from East Africa (i.e. 'Nakuran', 'Hyrax Hill', 'Navaisha', etc.) are not negroids—although of course we cannot say what was the colour of their skins or the shape of their soft parts. They would be more comparable with the 'Hamites' (a sort of 'Mediterranean') of today.

The Singa calvaria from the Sudan seems rather bushmanoid and suggests (as does other evidence) that the Bushman type was once widely spread in Africa.

The late predynastic population of Egypt shows a mixture of types about a third of which is negroid and another third 'Mediterranean'.

MECHTA-EL-ARBI

There is, however, one type of hominid remains found with Upper Palaeolithic artefacts in eastern Algeria, that is worth some attention. The two main sites are Afalou-bou-Rummel and Mechta-el-Arbi, the former with 'Oranian' artefacts and the latter with 'Capsian'.

At Afalou one skeleton (No. 28) is of a variety that can be described as 'basic' or 'generalized' Mediterranean, but the other Afalou remains and those of Mechta-el-Arbi are of more robust physique (plate XIV).

So robust, indeed, that for a time the Mechta men were regarded as 'generalized' Neanderthaloids, so heavy are the skulls. The vault of the cranium is fairly high, but the supra-orbital ridges are thick and projecting. The skulls vary from dolichocephalic to mesocephalic, but the faces (like those of Cro-Magnon men) are short and broad. Though, by almost any criterion, the Mechta men are *sapiens*, they have an archaic appearance and may well represent an ancient form of *sapiens* or might be individuals of a mixed *sapiens*-neanderthaloid origin.

A significant point is that the Afalou No. 28 which is almost indistinguishable from a 'Mediterranean' from the Inland Sea today is older than the more archaic-looking Mechta men. There is overlapping of hominid types everywhere, it would seem.

'MEDITERRANEAN' MAN

The 'Mediterranean' is one of the few *apparently* 'pure' hominid types in Europe today—and the 'blond Nordics' are more or less a kind of

bleached and elongated Mediterranean. The first to arrive in Europe were, it would seem, small Mediterraneans, who appear to have traversed North Africa and to have entered Europe through Spain. A later, taller type of Mediterranean (long-headed, long-faced and with delicate bones) may have reached the western Mediterranean both by sea and land. The two types may still be seen and recognized in the Iberian Peninsula and in the western islands of the Inland Sea.

EARLY HOMO SAPIENS IN JAVA AND AUSTRALASIA

WADJAK MAN

The Wadjak skulls, as we may remember (page 111), were found in 1889, and later in the rock fissure of the Wadjak marbles near Tulungagung on the southern coast of Java. There were two crania, one of them with a few neck vertebrae (which may indicate a burial), and there were no accompanying artefacts.

The Wadjak specimens are not of interest as suggesting the existence of *Homo sapiens* in Java, in, say, the Riss-Würm Interglacial, for the skulls are, probably, 'recent'. They have no supra-orbital torus, the curve of the jaw is very marked, but the dentition does not differ from that of *Homo sapiens*. The cranial capacity would seem to be about 1,550 c.c. (plate XIb).

Wadjak Man is rather of interest because he seems to lie on a line of possible (morphological) descent between the pithecanthropoid-Solo series, and the australoid types such as are represented by the Australian aborigines and a number of fossil forms. At the beginning of this century Hermann Klaatsch suggested that the Australian aborigines were, in some way, related to, or descended from, ancient forms of hominids whose remains had been found in Java. It was not until 1918 that Dubois, page 111) revealed he had discovered Wadjak remains. In 1921 he published descriptions of two Wadjak skulls (one found by him) which are markedly dolichocephalic, have rather heavy eyebrow-ridges, low orbits, large palates and but slight development of the chin-eminence.

Weidenreich considered that a case had been made out for the descent of the Australoids from pithecanthropoid forms through Solo and Wadjak Man. But Weidenreich was much preoccupied with the question (and it is a puzzling and exciting one) of the origin of the present-day different varieties of Man. He postulated, indeed, as we

have noted, a descent of the Mongoloids from *Pithecanthropus pekinensis.*

Australian skulls of the Cohuna type (page 216) Weidenreich held so much to resemble those of Solo Man (in certain essential features) that 'such skulls can be interpreted as a further evolutionary stage of *Homo soloensis*'. But the gap between Solo and Wadjak is considerable, though we may, perhaps, take it as a working hypothesis (while awaiting further evidence) that there is a plausible line of descent from pithecanthropoid *types* through Solo and Wadjak *types* to the Australoids. This, of course, does not mean that our Mid Pleistocene Java Pithecanthropoids were the ancestors of today's 'Black Fellows'. Java must have been for ages a dead end, a little lost world in which antique types of men lingered on more or less undisturbed.

THE AUSTRALIANS

The Australian aborigines represent, undoubtedly, an archaic type of mankind, and although there is a certain degree of variation they are, generally speaking, men of dark chocolate-brown skin, they are rather tall, they are hairy, and the hair of their head may be curly, wavy or even straight but it is never kinky as that of a Negro. The Australians are long-headed, the bones of their skulls are thick and their brains relatively small (though plenty of them are intelligent and when they want to, or have the opportunity to, can absorb most of the so-called white man's lore). Their brow-ridges are projecting, their foreheads retreating and the vault of their skulls rather depressed. They are prognathous and the chin (i.e. the bony protuberance from the lower jaw and not the mandible itself) is poorly developed. Their noses are broad and flattened at the base and the nasal bones recall those of ancient types of men. The palate and teeth are remarkably large (compared with those of other types of existing *Homo sapiens*) and the facial skeleton has the upper part set back.

However, the Australoids (that is roughly the Australian aborigines with the Veddoid groups) have little really recalling the Neanderthaloids *of the rugged variety,* and the Australian aborigine's skeleton is delicate.

TALGAI SKULL

There have been some skulls recovered from Australian soil which have been held to be those of very early immigrants into the island

continent, but, as a matter of fact, there is no conclusive evidence as to when the ancestors of the Australians (and of the extinct Tasmanians) managed to make their way, no doubt through New Guinea, to Australia.

In 1914, on the eve of the First World War, the British Association for the Advancement of Science held its meeting in Sydney, and there was exhibited the fossil skull of a boy aged apparently about fifteen years. This cranium, known as the 'Talgai skull', had been picked up on the Darling Downs in Queensland as long ago as 1884. The specimen was heavily mineralized but there was no evidence as to the geological stratum in which it had lain. Moreover, the Talgai specimen conforms essentially with the skulls of modern Australian aborigines, although its canine teeth are exceptionally large and projecting.

COHUNA

In 1925, in the State of Victoria, and a short distance south of the Murray River, there was discovered the skull of an adult male. Later, portions of several skeletons were unearthed from nearby. In size of palate and canines and in prognathism the Cohuna specimen surpasses the skull of almost any known type of *Homo sapiens*. But the Cohuna cranium looks like the adult form of Talgai, that is to say it belongs to a type in which the so-called 'primitive' features of the existing Australian aborigines are rather exaggerated. The Cohuna skull has been compared with the Solo skulls from Java (page 178), but Cohuna must on the whole be classed as *sapiens*, whereas Solo Man was certainly neanderthaloid. Maybe the Cohuna type is not very unlike that of some early sorts of *Homo sapiens*.

KEILOR

In 1942 a very interesting find was reported from Keilor, a township on the outskirts of northern Melbourne. Keilor lies at the junction of Dry Creek and the Maribyrnong River and the site of the find was a sand-pit that was still worked. The pit is less than an acre in extent, and the contractor who found the skull seems to have had in his possession (and discovered at the same spot) another hominid skull and some further bones, together with five fragments of a third cranium unearthed about six feet from the first and in the same level; but these latter have all been lost. The cranium is said to have been recovered from

'undisturbed strata' beneath the surface of the 'Keilor Terrace' of the Maribyrnong River.

The Keilor skull is very like one of the Wadjak crania (page 214) which themselves may be described as australoid. The comparable Wadjak cranium is rather more prognathous than Keilor and possesses a supra-glabellar torus (lacking in Keilor), has a rather more sloping forehead and is altogether heavier and thicker.

The Keilor skull is mineralized and is in quite a good state of preservation (though it lacks the lower jaw). Extravagant claims were made for the Keilor cranium. It was dated back to the Riss-Würm Interglacial. The skull was found at a depth of more than nine feet in river silts of the Keilor terrace. The terrace surface is 45 feet above the present river and was correlated with the high sea-level of the last (Riss-Würm) Interglacial—hence an inference based on the Milanko vitch (page 40) chronology, that the Keilor cranium was as much as 150,000 years old, if not older.

A fluorine test proved that the skull was a true fossil belonging to the terrace and not an intrusive burial. However, a careful re-examination of the site by geologists showed that the terrace sloped too steeply downwards to be related to a prolonged stand of sea-level. Furthermore, the terrace's fossils indicate that they date from a cool, damp period, probably the last Pluvial phase (corresponding to Würm III phase) of the Australian Pleistocene. Charcoal from hearths within the Keilor silts were dated by Dr Karl Suess at 6546 $\pm$ 250 B.C. So the Australians may have been in Australia for at least 9,000 years. It must have been during the later part of the Würmian Glaciation that *Homo sapiens* made his way both to Australia and to America; though those continents had been linked up with Asia at many periods during the Pleistocene no sort of hominid seems to have pushed as far afield as Australasia and the New World.

HOMO SAPIENS IN THE FAR EAST

THE UPPER CAVE AT CHOUKOUTIEN

At Choukoutien we pass at a bound from the most ancient *Pithecanthropus pekinensis* to the *Homines sapientes* of the 'Upper Cave or Base' discovered in 1930, but whose hominid remains were described only in 1939.

This Upper Cave revealed a wealth of animal bones—Sika deer,

roe-deer, leopard, tiger, bear, hyena and ostrich. Many of these are of species long extinct in northern China and, indeed, incapable of enduring the present-day climate of the Peking area.

The associated artefacts were mostly in flint and quartz, some of them hardly superior in workmanship to the tools attributed to *P. pekinensis*. However, in the Upper Cave, there were bone artefacts (notably a needle very like those used by the Eskimo today), and ornamental objects—beads of calcareous stone (painted red with haematite and placed near one of the women's skulls), pendants carved from the bones of large birds of the ostrich family, perforated *marine* shells and fish bones.[1] The bone needle and the perforated teeth are of a technique inferior to that of the western European Aurignacians, whereas the ground and polished beads are as good as those of the European Magdalenians.

The hominid remains comprise those belonging probably to seven individuals. Three of the crania are fairly well preserved and are those of a man (probably over sixty) and of two fairly young women. All the bones are of *Homo sapiens* and present an odd mingling of types found in no other 'family grave' of early men, except at Mount Carmel (page 184). The old man's skull has been compared with that of the Ainu, but it is still more like those of some of the Upper Palaeolithic types from western Europe (especially the 'Old Man' of Cro-Magnon,see page 233). One of the women's skulls is rather like those of present-day Melanesians from Oceania, while the other female skull (which was described by Weidenreich as 'Eskimoid') is, in its general lines, uncommonly like the Chancelade skull (page 233) from south-western France, except that the Upper Cave specimen has a more marked alveolar prognathism than has been recorded even for any Eskimo cranium.

The existing Eskimo, it may be noted, form a highly specialized group whose physical characters seem to differ rather markedly from those of their relatively recent ancestors.

In Upper Palaeolithic times there were, no doubt, vast migratory movements spreading all over the Eurasiatic continent. Anyway, we have from the Upper Cave evidence for the existence of mixed 'racial' types among an Upper Palaeolithic population. And maybe, if we could come across more of these 'family vaults', we should find there also a mingling of hominid types.

[1] Today the sea is more than a hundred miles from Choukoutien, but the central plain in this part of North China is of comparatively recent formation.

The skulls of the two Upper Cave women show shallow depressions running round from the forehead, perhaps marks left from head straps to which were suspended bags or baskets for carrying objects including babies. The Ainu of Hokkaido use such headstraps to this day.

THE MIRAGE OF THE SOUTHERN ISLES

Of course, when we say that one of the Upper Cave skulls is 'Melanesoid', it is not suggested that peoples, whose present-day representatives inhabit some of the Oceanian islands, migrated to the mainland and northwards. The inhabitants of Oceania, whether in islands rather near the continent or far out in the Pacific's waste of waters, reached their present homes fairly recently. There is no sort of evidence at all that any of these islands (save of course those in the past united with the mainland) were inhabited anything like so long ago as 20,000 or 15,000 years. To get to islands men need sea-going craft, and, as has been well pointed out by Andrew Sharp in his 'Ancient Voyagers in the Pacific', most of the 'voyages of discovery' must have been undertaken by men who were carried out of their course by winds and weather. Even in our western Europe, Britain has been inhabited for countless millenia (for it was until yesterday—geologically speaking—a part of the European continent), whereas no man crossed the narrow sea between south-western Scotland and north-western Ireland until mesolithic times, or, say, eight to ten thousand years ago; for Ireland has been an island for very much longer than has Britain.

There is a radiocarbon dating of 1530 B.C.$\pm$200 years for a site on the island of Saipan in Micronesia. But we must look in southern China and in Indo-China for traces of the peoples which spread over the Pacific islands.

In Tongking, that is northern Indo-China (southern China is still less known archaeologically), there can be distinguished three main hominid types, an Australoid, a Melanesoid and an Indonesian. The latter forms the sub-stratum (more or less 'Mongolized') of the population of Vietnam and much of southern China itself.

In any case, our Upper Cave men were a mixed lot, showing little of the 'Mongoloid' type that is general in eastern Asia today. That type, indeed, seems to have moved progressively southwards in late prehistoric and in protohistoric times. However, the earliest 'Chinese' Neolithics (of the Han and Wei valleys) were as Mongoloid as the northern Chinese of today.

EARLY PILGRIM FATHERS

Some writers have suggested that we should see in the Choukoutien Upper Cave people representative of the earliest men to make their way into the Americas. The radiocarbon datings (page 197) we now have do suggest that the Upper Cave people may have been, roughly, contemporary with the first migrants across the Bering Strait area.

Still, there is a grave objection to the theory. The Amerindians are, more or less, Mongoloid, some more so than others. The Eskimo, in the north, are, indeed, physically speaking, almost indistinguishable from some eastern Siberian populations. From the Eskimo in the north right down to the Fuegians in the Land of Fire the indigenous peoples of the Americas are of types rather markedly different from those of the Upper Cave peoples. There are in America no 'Ainu' types, though the 'Eskimoid' Choukoutien skull might well be of a type resembling that of some of the early Pilgrim Fathers.[1] No doubt the key to a good many mysteries of America's peopling lies buried farther north in Asia than the Peking area—in eastern Siberia.

AMERICA

A hundred years ago and more the Russian frontier in America extended down into the north of what is now California, and there are some place-names to recall that Russia might have become an American Power. However, strange as it may seem, the U.S.A. and the U.S.S.R. share a common frontier even today. In the Bering Strait, Big Diomede Island, which is Russian, peaks up to 1,759 feet. Only two and a half miles away is Little Diomede, which is American. Thus the territorial waters of Russia and America are, hereabouts, only a mile and a quarter wide. The frontier is on the sea but it is there.

The depth of much of the Bering Strait is not more than thirty fathoms, and from the Asiatic to the American shore a course can be laid under which the water nowhere exceeds twenty fathoms, or one hundred and twenty feet, in depth. The widest stretch of open water from East Cape to Cape Prince of Wales (on the Diomedes line) is only twenty-five miles or so, not much more than the width of the Channel from Dover to Calais. Although the Bering Sea area is notoriously one of fogs and mists, Fairway Rock and the Diomedes can often be seen from Cape Prince of Wales, while in fine weather, from the heights of

[1] Though see page 227 under 'Punín'.

the American coast, the Asiatic shore from East Cape southwards can be made out by the naked eye. At no time since the Tertiary has the Bering gap been much wider than it is today. The fifty-six miles of sea separating Asia from America are, moreover, as we have seen, broken approximately half-way by the Diomedes.

It is demonstrable that Pliocene and Pleistocene mammals migrated back and forth by the Bering Strait route between America and Asia and, furthermore, it is clear that at various epochs there was a land-bridge between the two continents. During the last (Würm) Glaciation the general sea-level was often much lower than at present, maybe by as much as 300 feet.

It looks, at first sight, as though it must be fairly easy to determine what were the changes in sea-level during the past, for when ice-caps and glaciers melted the level must everywhere have risen, and, when great quantities of ice were piled up on the land, then the general level of the sea must have fallen. However, sea-level is not due only to the rise or fall of the surface of the oceans; there are other factors. When, for instance, the mighty masses of ice melt they release pressure and the land they lie on rises, freed of its burden. Then, there are earth-movements, uplifts and subsidences. There is volcanic activity . . . and also, on the whole, the continents have tended to rise for long ages past.

Although the waters of the Bering Sea show almost no tidal variations—the mean rise and fall does not exceed one foot—there is, off-shore, a strong current bearing somewhat northwards from Asia, so that a crossing upon drift-ice, were such possible, would land the traveller on the Alaskan shore rather to the north of the strait.

So much for the Bering route. A migration way through the Aleutians and the Komandorski Islands would be a much more difficult one. The nearest of the Komandorskis is distant 115 miles from the Asiatic continent, and it is 175 miles away from Attu, the last of the Aleutian chain.

WAY THROUGH THE ICE

For long ages during the Glaciations the routes through Canada from Alaska were apparently blocked with great ice-barriers. It has been held, however, that at an early stage of the retreat of the Wisconsin Glaciation the two main ice-sheets became disconnected so that Man may have been able to make his way through the open country to the east of the Rockies. The Wisconsin (in America) and the Würm (in

Europe) were probably coincident in a general way but the ice-sheet in North America extended some 10 degrees farther south than in Europe.

It is now generally held that during the greater part of the last Glaciation a large area of Alaska was free of ice. The valley of the Mackenzie River may possibly have been an immigration route and radiocarbon analyses have given datings for the presence of Man in the Yukon Valley over 20,000 years ago, though such dating (page 224) could not be held to be absolute without some sort of cross-checking.

DATE OF MAN'S ARRIVAL IN AMERICA

However, the geological indications do also lead us to fix a date of about 20,000 years ago for the arrival of the first men in America. As long ago as 1935 Antevs estimated the time as being from 15,000 to 20,000 years ago. On the other hand there were plenty of much shorter estimates, e.g. that of Spinden, who was of the opinion that there were no men in America much before 2000 B.C. Such a view is now impossible to hold.

However, there are two points which are quite clear:

1. There has been found nowhere in the Americas hominid remains of any other but *sapiens* type.
2. There is no evidence whatsoever of America having been the 'Cradle of Mankind'.

The radiocarbon evidence supports quite well the longer estimates made as to the date of Man's arrival in the New World. It looks as though, for a considerable time, Man kept to the western part of the continent. There is a dating of 9,000 years ago for leather sandals discovered in a cave in Oregon. The Gypsum Cave near Las Vegas gives 10,000 years. Material from Tlatilco, near Mexico City, about 6,700 years. Organic material from a cave in southern Chile (with traces of Man's habitation) about 9,000 years, while the earliest datings for the eastern United States are several thousand years later.

SOME AMERICAN DATINGS

Some of the American radiocarbon datings indicate such great antiquity as to induce one American prehistorian to declare that they would point to 'quite a new interpretation of American prehistory' and before they can be accepted we 'need more evidence'.[1]

[1] Robert Heiser of Berkeley.

Here, however, are some of them:

A camp-fire and 'apparent artefacts' found by George Carter in the centre of the town of San Diego, California, is referred to 'about 40,000 B.C.' The hearths of a camel-eating people near Dallas (Texas) are dated to 'more than 38,000 B.C.' Bones of a dwarf (6 ft. high) mammoth and 'evidence of Man's occupancy' on Santa Rosa Island, forty-five miles south-west of Santa Barbara, California, have been dated to about 27,000 B.C. (charred bone and charcoal).[1] The Tule Springs site is dated to about 26,000 B.C. and the Sandía Cave site to a little earlier (page 225).

These datings certainly need corroboration. As Zeuner has pointed out, carbon samples, if washed in a strongly alkaline solution, lose radiocarbon particles, and thus the apparent age is increased. On the other hand, the radiocarbon dating of about 7,000 B.C. for charcoal from an occupation site near Lubbock, Texas, seems reasonable enough and doubtless Man had been in the Americas for a considerable time earlier.[2]

A length of time measured in two hundred centuries is immense on the human scale and quite long enough for Man to have made himself isolated from other regions of the globe into something both like and also different from men elsewhere.

The history of Man in America is of supreme importance for the understanding of his story, for in the Americas we can see men going through those stages of culture, making most of the inventions—agriculture, architecture, religion, writing, astronomy, arithmetic and so forth—which he made in the Old World.

After all, Man had to invent these things somewhere at some time. In western Europe during the later phases of the Old Stone Age men developed and practised a refined and exciting pictorial art. This art died out with changing climate and modes of life. Pictorial art was 're-invented' in the Near East, for few, even of the most hardened 'diffusionists' (who would derive all culture from Egypt, though Sumeria is undoubtedly a more ancient area of high culture), would suggest that the men of the Nile Valley, for instance, derived their art tradition from the painters of Lascaux and Altamira.

[1] A report on the Santa Rosa site was made by Philip Orr of the Santa Barbara Nat. Hist. Museum, Wallace Broecker of Columbia, and George Carter of Johns Hopkins.

[2] The new Mojave Desert camp-fire sites are reported by Ruth Simpson (of the Museum of the South-West, Los Angeles) to contain flint artefacts 'typologically related to those of the Lower Palaeolithic in Europe'.

The Yukon miners in the gold rush of 1898 had to cut through layers of frozen silt to get (or not to get) to their gold and this earth contained thousands of remains of mammoth and mastodon, of bison, camels and large cats, most of which could not live in the Yukon today. During the milder periods of the Würm Glaciation (and of course long before) herds of animals must have migrated back and forth from Asia to America and from America to Asia. At a site near Fairbanks, Alaska, wood found from 80 to 100 feet below the frozen silt gave a radiocarbon dating of more than 20,000 years ago. It might not be too hazardous to say that Man has been in the Americas for anything up to 25,000 years.

EXTINCTION OF THE FAUNA

One of the most curious features about the story of Man in North America is the rapid extinction of the native North American fauna. Of course, there is the sad tale of the practical extinction of the plains 'buffalo' almost in our times, but these bison were hunted on horseback, shot and driven. Nothing of the kind could have happened to the American camels, horses and elephants. One might think that they would have been driven say, maybe, by the advancing glacial conditions at times, but apparently they just died out. The American mammoth, mastodon, the American horse, extinct forms of peccaries and other mammalian types were in the continent when Man appeared. The American camel was certainly hunted by Man. Yet there was no such rapid and sweeping extinction of animals in Eurasia or in Africa. Furthermore, the American continent seems to have been at no time thickly populated even according to late Pleistocene standards. In fact, when it was discovered less than 500 years ago, North America was singularly poor in types of large mammals. If the disappearance of these beasts was due entirely to Man then he must have been a mighty hunter and his Folsom, Yuma and Sandía points must have been very effective weapons indeed.[1]

[1] Some interesting indications of ancient climates for the north-eastern United States have been given (based on pollen classification and palaeobotany) by Edward S. Leevey, Jr., of Yale University:

By 5400 B.C. a salubrious climate re-established with plenty of warmth and rain and this continued until

3000 B.C. when there was a slight decline but the general weather pattern continued until about

500 B.C. when a cold and stormy period set in and lasted for about a thousand years until

500 A.D. when there was a warmer period lasting for about another ten centuries until

1500 A.D. since when a colder climate has prevailed.

FOLSOM

The Folsom site is in Pleistocene gravels of a stream some fifteen miles west of Folsom township between Portales and Clovis in the Guadalupe Mountains of New Mexico. The original discovery of artefacts was made in 1926. A stone spear-head of peculiar form was found embedded between the two ribs of a huge *Bison taylori* (a form larger than any living bison). The points were fashioned by pressure-flaking and not by percussion. They have a longitudinal groove or fluting on either side and a secondary chipping or retouching is visible along the edges. The objects bespeak an advanced technique and the Folsom points are, indeed, finer than the artefacts made by any 'recent' Amerindians.

In the 'thirties and 'forties Folsom points were found in many different parts of North America, in Texas, Nebraska, Kansas, the Dakotas, the Canadian plains and right up to the Bering Strait, where a Folsom-like point has been recovered. The radiocarbon dating of a Folsom site at Clovis (New Mexico) is about 10,000 years ago.

No hominid fossils have been found anywhere in association with the Folsom points.

SANDÍA

At the Sandía Cave near Albuquerque (New Mexico) there are upper levels with charcoal, splintered bones and Folsom artefacts, and in the lower levels charcoal and leaf-shaped stone points with side shoulders at the base—for hafting. But there have been found no remains of 'Sandía men'.[1]

Although there is no reason for our not finding the fossils of ancient men in the Americas (but we should expect all those fossils to be of *Homo sapiens* type) there has been, up to now, no hominid relic which can be dated back, with any degree of plausibility, to the times relatively soon after Man made his way into the New World.

'Minnesota Man', 'Brown Valley Man', 'Trenton Man', 'Calaveras Man' and the rest (there are a round dozen of them) not only appear to be comparable with types of Amerindians still existing, but have not been found in stratigraphical conditions which indicate an age of anything like, say, 20,000 years.[2]

[1] There is also another point, the 'Yuma', rather like some artefacts from Manchuria.

[2] See the article by Hrdlička in the work edited by MacCurdy, 'Early Man in America' sv. 'What Have the Bones to Say?'

TEPEXPAN MAN

It is evident that Man has lived in Mexico for a long time, that is to say a long time for America. Maybe Man was settled in the Valley of Mexico 11,000 or 12,000 years ago. As early as 1884 the French anthropologist Hamy found stone artefacts in association with bones of *Elephas colombi* (a form long extinct) and in 1945 Arellano discovered obsidian blades and a mammoth skull near to the village of Tepexpan. In 1952 Luis A. Aveleyra recovered six stone implements associated with the articulated bones of a mammoth which apparently dated to the last Pluvial, which in Mexico would be the equivalent of Mankato phase of the American 'Wisconsin' Glaciation (comparable with the European Würm) near the village of Santa Maria Ixtapán. But the most canvassed discovery of ancient Man in Mexico was made in 1947 by Helmut de Terra. At a depth of only 48 cm. (about 19 in.) below the surface of the dry bed of the old Lake of Texcoco there was found the skeleton (face downwards) of a man, though many of the bones were wanting. There were neither artefacts nor other mammalian bones in the immediate vicinity, but the dating given by the radiocarbon analysis of the adjacent turf was 11,003 + 500 years.

The physical type of Tepexpan Man is more or less that of the modern Indian inhabitants of the Valley of Mexico. In the same deposit as the hominid remains were found also, though at some distance away, the bones of a *Mammutus imperator*, a giant form of mammoth. There is no absolutely reliable proof that man and mammoth are contemporaneous, but Aveleyra's find of artefacts together with mammoth bones only a mile to the south of Tepexpan does suggest that Tepexpan Man was a mammoth hunter, and that he lived approximately 11,000 years ago.

Up to now, although there may be differences due to local or individual variations, all the fossil men discovered in the Americas can be matched by types of men still living. Much of the skill and ingenuity expended in making new classifications has been, from some points of view, wasted.

SOUTH AMERICA

South America is a region of archaic fauna and even flora; it was isolated from North America for long ages until the land-bridge of central America was reconstituted in late Tertiary times. The South American monkeys, as has been mentioned, possibly developed *sur place* from

earlier Primate forms and they are, compared with the Old World monkeys, archaic in type.

However, patriotic ardour led the Argentinian anthropologist Ameghino to construct a fabulous pedigree of Man, supported by 'evidence' of fossils from the South American pampa. Needless to say this material was not hominid at all and his classification remains only as a scientific curiosity.

LAGÔA SANTA

In the Lagôa Santa region of Brazil and in a cave called 'Confins' or, more grimly, 'Mortuario' were recovered in 1935 the cranium and almost the complete skeleton of a hominid. The bones had been gnawed by rodents. The type of the bones is that of *Homo sapiens* but the skull presents peculiarities which have led to its being put into a special class, that of 'Lagôa Santa'. The skull is remarkably long, narrow and high vaulted, but is comparable with that of many living Brazilian Indians. The 'Lagôa Santa' type has been recognized in Lower California (Diquet) and (between 1917 and 1919) by Valin near Point Barrow in Alaska. As McCown wrote in 1950, the original presentation of this type was based on evidence a modern anthropologist would regard as inadequate. No doubt Lagôa Santa is (if it exists as a separate and recognizable type) a local variation, and in no way implies (as some enthusiasts have endeavoured to make it) a type come into the Americas by some other route than that by the north-west.

PUNÍN

At Punín, near Riobamba, Ecuador (at about 9,000 feet up) there was discovered in 1923, in a stratum of volcanic origin, a hominid cranium with no immediate associated objects, although at distances of from 50 to 100 feet were recovered bones of horses, camels and mastodons. An antique fauna of course, but we may remember that native American horses and camels (page 224) died out comparatively recently and after Man made his appearance on the continent.

The skull is markedly dolichocephalic, with a prognathous profile and of general australoid appearance. L. R. Sullivan and Milo Hellman would see in the Punín specimen one of the 'Lagôa Santa' type, but it looks rather more like the 'australo-melanesoid' skull from the Upper Cave in Choukoutien (page 218), which might represent one of the types

of ancient immigrants into the Americas, although most, if not all, of the present-day Amerindians show mongoloid affinities more or less marked. There is no way of dating the Punín skull satisfactorily, but the specimen is of significance as showing, maybe, a type of one of the waves of immigration into the New World.

PALLI AIKE

As is said in effect by H. M. Wormington in 'Origins' (1953) of all the South American discoveries of fossil Man, those whose evidences of antiquity are the most obvious are the charred remains Bird found in Patagonia and the infant's skull discovered in the lowest level at the *Gruta de Candonga.* The cave of Palli Aike, to the north of the Strait of Magellan, displays five prehistoric levels, but much confusion has been caused by erroneous interpretations of evidence from this region. The famous 'Mylodon' cave (about 125 miles from Palli Aike) has given (for specimens of Mylodon dung) a radiocarbon dating of 10,832 $\pm$ 400 years. But it is evident that Mylodon (giant sloth) and Man were not contemporaneous at this site. However, it is possible that the hominid remains at Palli Aike are as old as 9,000 years. Other indications from radiocarbon datings suggest, indeed, that Man had reached the extreme southern tip of South America as long ago as that. The line of progression seems, as we have mentioned, to have kept well to the west, or at least let us say the radiocarbon datings from the eastern part (of North America) are later than some from the western part of the continent.

The Palli Aike remains have also been claimed for 'Lagôa Santa' type. The crania are markedly dolichocephalic and are thus distinct from the mongoloid types—which predominate among the existing Amerindians—and which are brachycephalic.

AGRICULTURE

The evidence as to the antiquity of cultivated plants in the Americas is highly interesting since men can hardly have brought any agriculture with them when they arrived from Asia. For cultivation as well as for culture the ancient Americans must have depended upon their own invention.

R. MacNeish in 1953 found in a dry cave near Ocampo in north-eastern Mexico, pieces of gourd, a small Lima bean and a fragment of

squash dated by radiocarbon tests to about 6500 B.C. By 3000 B.C. these ancient Mexicans were growing maize and cultivating cotton. By 2500 B.C. *Gossypium* type cotton was being grown in Peru. Junius Bird, at Huaca Prieta, at the mouth of the Chicama River on the Peruvian coast, found evidence of continuous occupation from 2500 to 1200 B.C. together with squashes, gourds, peppers and cotton, and a mass of cotton cloth made by finger-weaving.

If, therefore, ancient Americans had a comparatively advanced agriculture by 6500 B.C. there is nothing surprising in the idea that the first immigrants from Asia may have crossed into the New World by 20,000 B.C.

MAN IN THE AMERICAS

To sum up, the evidence is something like this: the presence of Man in the Americas is proved for a period a good deal more remote than most authors would have admitted even a decade ago. The very high dating figures however (e.g. 40,000 years and so forth) are still subject to checking from other evidence, especially when we reflect that the carbon-14 method (page 197) can easily present errors in certain cases.

It seems clear that the current of immigration ran down the western portion of the continent and that the east, at least of North America, was not colonized until a comparatively recent date—say 7,000 years ago or so. The evidence goes to show that Man entered the Americas by way of what is now the Bering Strait, and also that the waves of immigration were successive, the latest being the backward and forward movement of the Eskimo.

Man, when he entered the Americas, was perhaps in possession of a Mesolithic industry—at least no true Palaeolithic artefacts have as yet been found.

The physical type of the immigrants was predominantly mongoloid, as is that of the majority of Amerindians today, but other types may well be represented that were also in existence in eastern Asia up to 10,000 years ago and before.

Though there does not seem to be much evidence for contacts with Asia across the Pacific, it is possible that there were waves of culture borne by the northern route, which may have carried some Asiatic-culture traits to pre-Columbian America.

Nothing at all can be learned regarding origins from a study of Amerindian languages. They are of extraordinary variety. It is only with

difficulty that they can be resolved into sixteen or seventeen main families, each distinct from the other. None of these tongues resembles any in other parts of the world, for the languages the immigrants brought with them from Asia soon would have been twisted and changed out of all recognition. A thousand years (and much less) is enough to modify the speech of an illiterate and isolated community. In our Europe there is not a single living language that is a thousand years old. All the tongues we speak were the creations of simple peasants and herdsmen. No wonder our languages sometimes seem a little inadequate to the demands we make on them when we strive to express (and to create) new ideas.

The artefacts of the Amerindians are of special types and forms, but the art and mystery of knapping was no doubt brought with them by the immigrants. But, so often in cultural borrowing, it is the idea that is taken, not the object. The 'idea' of writing passed from community to community in the Near East, not the shapes of signs. But the Americans seem, in isolation, for many centuries to have found a solution for most of their problems.

EUROPE

'RECENT' WEATHER IN EUROPE

It helps in our understanding of Man's history in Late Old Stone Age times and afterwards if we take a note of the weather, and this has been fairly satisfactorily determined for the last 20,000 years or so—for north-western Europe anyway.[1]

In 16,000 B.C. the weather was arctic, by 12,000 B.C. sub-arctic, from 10,000 B.C. to 8000 B.C. mild, from 8000 B.C. to 6000 B.C. cold. A period of 'optimum' climate set in by 6000 B.C. when it was warm and dry. From 4000 to 2000 B.C. it was warm and damp, from 2000 B.C. it was warm and dry to the beginning of our era, or perhaps until about 500 B.C. Since then it has been on the whole cool and damp.[2]

We may remember that these indications hold true only for north-western Europe. The climate, say, in France (and particularly in those parts of France where the Late Palaeolithic cultures flourished, with

[1] See Flint and Morris in Flint 'Glacial Geology'. The data are based on the study of peat pollens.

[2] Comparatively small cumulative annual temperature-changes can produce great climatic variations. Two-tenths of a degree of temperature-rise would, it has been calculated (if continued for a century), make it possible to grow palm-trees in New York. There is a seemingly odd theory that as carbon-dioxide clouds tend to keep the earth warm our apparent rise in temperatures today is due to the great amount of CO_2 released into the air by industrial processes.

the cave art) was no doubt rather warmer on the whole, but recent radiocarbon datings seem to show that Magdalenian men were still flourishing and living in rock-shelters until about 8000 B.C.—a good deal later than was thought probable until recently.[1]

CULTURE SEQUENCES IN WESTERN EUROPE

The culture sequences (as evidenced by stone industries and art) for the Late Palaeolithic, the time when, as far as we can see, *Homo sapiens* was the only hominid type in Europe, are as follows (for France, where the evidence is most abundant):

The transition from Mousterian to Aurignacian (which probably indicates an invasion of *Homo sapiens sapiens*) may have taken place over 25,000 years ago. The sequence recently revealed at the Abri Pataud (Les Eyzies in the Dordogne department of France) is this:

Solutrean
Upper Perigordian (of several types of artefact)
Aurignacian
Mousterian.

At this site no Magdalenian is present, but the Magdalenian (which is the culture of the finest prehistoric art) comprises about six (in some places) different phases.

The Mesolithic (characterized by small artefacts) may date back to 8000 B.C., while some Neolithic (without pottery, e.g. at Jericho) may be as early as 7000 B.C. if not earlier. Neolithic, that is a culture marked by 'polished' (really ground) stone implements with pottery is not found in Europe before 4000 B.C. Lately it has been suggested that 'true Neolithic' dating back to 7000 B.C. (or even 10,000) has been found in China, but this evidence is not convincing.

MEN OF THE LATER STONE AGE IN EUROPE

There are well over a hundred skulls from Europe of *Homo sapiens fossilis*, and most of them are indistinguishable from those of some types existing today. Indeed, the present complexity of the European population may reflect a state of things which is very ancient. The only European type which seems to be of comparatively recent immigration is the Mediterranean.

[1] Reindeer antlers utilized by Magdalenian Man gave by radiocarbon tests a dating of 8000 B.C.

THE GRIMALDI 'NEGROIDS'

The earliest specimens of human remains associated with 'Aurignacian' (that is the first of the Later Old Stone Age implements) industry are the two 'Negroids' from Grimaldi and the Combe-Capelle skeleton. And of these the Grimaldi 'Negroids' are perhaps the older. Both Grimaldi and Combe-Capelle remains were accompanied by artefacts of the sort known as 'Chatelperronian', which is to be distinguished from typical Aurignacian.

The Grimaldi 'Negroids' (there are other 'non-negroid' remains from the same site) were recovered from the *Grotte des Enfants*, one of the now almost entirely destroyed caves, or *Balzi Rossi*, 'Red Cliffs', down near the water's edge, below the railway line where it passes under the hamlet of Grimaldi just over the frontier from France into Italy. The 'Negroids' were a youth, aged about sixteen years at the time of his death, and a woman. When the Grimaldi people occupied the cave the sea-level was lower than now and a (probably marshy) plain extended some way out from what is now the shore-line. The *Grotte des Enfants* was a hyenas' den before it was occupied by men with a Mousterian industry (probably therefore Neanderthaloids), who may well have been the contemporaries of the men who left their footprints in the *Tana della Bàsura* (page 161). The 'negroid' remains were, indeed, unearthed from a level containing Mousterian artefacts, but it is clear that a grave had been dug down into this lower layer by a people using Chatelperronian artefacts.

The skulls of these 'negroids' are long (dolichocephalic), but higher and larger than those of many existing negroids. There is some degree of prognathism, the chin-protuberance is only slightly developed, the teeth are large and the incisors protruding. The nasal bones are rather flat. The lower limbs are long compared with the upper. The woman's height was about 5 ft. 2 in. and that of the boy slightly less—about 5 feet. The legs and arms of both skeletons were flexed and stained with red ochre (page 143), the bones were adorned with pierced shells and surrounded by 'protecting' stones.

The Grimaldi people apparently antedated the Cro-Magnons (see *infra*)—possibly by a long period of time. These 'Negroids' have been compared both with Bushmen and with Australoids by some imaginative anthropologists. But the Grimaldi people, although they do show some features which exist in Negroes, may have been related both to the Combe-Capelle and Předmost peoples and may well

represent an ancient European population of *Homo sapiens*, long established in our continent and dating back to the Riss-Würm Interglacial, and thus contemporary with the men of Fontéchevade (page 204).

We know so little about the origins of the existing types of men (e.g. negroid or mongoloid) that any remains, even if so doubtfully negroid as those of Grimaldi, which seem to point to the existence in Würmian times (or earlier) of types of men which can be equated with those existing today, are of great interest.

CHANCELADE

The Chancelade skeleton (unearthed near Périgeux in 1888) was for long supposed to exhibit 'eskimoid' features and to have been that of a 'typical Magdalenian'. The Chancelade skeleton may be, roughly speaking, contemporaneous with the Cro-Magnon remains and be considerably later in date than the Grimaldi relics.

However, the identification of the Grimaldi type with 'negroid' and that of Chancelade with 'Eskimo' has been due, at least in part, to wishful thinking inspired by a desire to push back as far as possible the differentiations which exist today among types of living men.

COMBE-CAPELLE

The Combe-Capelle skeleton (found with Chatelperronian artefacts) seems to be earlier than Chancelade and to be, more or less, of the same date as that of the Grimaldi 'Negroids'. The Combe-Capelle cranium bears some resemblance to that of Afalou No. 28 (from Algeria, see page 213) whereas the general 'Mechta' type (page 213) is not unlike that of the 'classical' Cro-Magnons of south-western Europe.[1]

CRO-MAGNON

This, the most publicized of Upper Palaeolithic types in Europe, is often thought of, in popular opinion, as being one of a sort of supermen, more noble-looking—of course, that is possible—better developed and better built than any people now living.

The Cro-Magnon rock shelter, where in 1868 Louis Lartet (page 101)

[1] See Mendes-Corrêa's monograph on the 'Aurignacian Skeleton of Combe-Capelle'. The Combe-Capelle type (with which may be equated or classed those of Brünn and Brüx from Czechoslovakia) were men generally shorter than the Cro-Magnons and with deep-set eyes, prominent cheek-bones and brows, rather broad noses, some prognathism of the upper jaw and with narrower faces than the Cro-Magnons.

found five skeletons, has long since been masked by an hotel facing the railway line a short distance from Les Eyzies station in the Dordogne Department of France. In fact, visitors to the hotel may enjoy the unusual experience of seeing the original rock-face forming the back wall of the hostelry.

Hamy and Quatrefages, the French anthropologists, called the type 'Cro-Magnon' and other specimens of the same sort of men have been recovered at various localities in western Europe.

The famous 'Old Man' of Cro-Magnon (who was probably not very old) may, when alive, have measured over six feet in height (plate XVa). A man's skeleton in the *Grotte des Enfants* (from a higher level than that of the 'Negroids') also of Cro-Magnon type, would indicate a height in the living specimen of about 6 ft. 3 in. But the Cro-Magnon women (with the 'sexual dimorphism' common in all Primates, see page 129) seem to have measured a good deal less than their men, and then by no means all the male skeletons give evidence of great stature. Men of over six feet may therefore have been no more common among the Cro-Magnons than with us.

The 'original' Cro-Magnon remains included, besides the 'Old Man', a woman and a prematurely born infant. On the woman's forehead is the mark of a deep wound and the bones were surrounded with marine shells, though Les Eyzies is well over a hundred miles from the nearest point on the sea-coast today. Perforated beasts' teeth and ivory pendants were also present. No doubt, in 'Cro-Magnon' times, trade and commerce were already developed.

If we must discount the stories about the Cro-Magnon supermen, these people were strongly built and displayed a combination of a long head and a rather short, square face. Legend has it that the Cro-Magnon type is still to be found among the inhabitants of the Dordogne. But I lived for several years in that part of France and very rarely saw anything that I thought looked like a 'Cro-Magnon'.

The Cro-Magnon burials at the Grimaldi site (for all the Cro-Magnons there seem to have been intentionally buried) offer some interesting evidence concerning Upper Palaeolithic burial rites. The tall man in the *Grotte des Enfants* had his head resting upon a stone reddened with ochre and over both head and thorax had been placed a sort of covering of pierced shells (reminding one rather of the bead network on some Egyptian mummies), while the body was partially protected with large stones and a deer-horn implement with perforated deer's teeth was lying near the head. The remains of a woman, also from

the same cave, were surrounded by a multitude of shells and a red-painted pebble was placed under the skull.

In the nearby *Grotte du Cavillon* was the skeleton of a man (about six feet long) interred in a crouching position with over two hundred pierced shells and twenty-two perforated teeth about the head, two flint knives at the back of the neck and an implement of stag-horn across the forehead (plate XVI). The remains were stained from an application of a red ochreous powder. Bones could hardly become so coloured from any pigment scattered over the body, so we may suppose in this case (as in so many others) that the remains were disinterred when the flesh had rotted away a good deal, and the bones were then dusted with the red pigment, or maybe the body was allowed to decay before burial. In this case, if enough pigment were used, it might well colour the bones.

In the fifth or *Barma Grande* cave at Grimaldi lay a skeleton (recovered in 1884) in a stone-lined grave. The head was stained with ochre. In the same cave were also found remains of other Cro-Magnons from a pit lined with red ochre. The bones were surrounded with perforated shells, teeth, the vertebrae of fish; an ivory object (which Breuil takes to be a cloak fastener, a sort of primitive 'morse') lay on the breastbones of two of the skeletons.

CENTRAL AND EASTERN EUROPEANS OF THE UPPER PALAEOLITHIC

All the specimens of western European men of the Late Old Stone Age, whether Cro-Magnon, Chancelade, Grimaldi, Combe-Capelle, or even such 'aberrant' types as Obercassel (man and woman found in 1914 and characterized by short stature, heavy build and large skulls), are quite 'modern' and do not differ from each other more than do the skeletons of different sorts of Europeans today, i.e. 'Alpines', 'Nordics', 'Dinarics', to use some of the names which suggest a more definite differentiation of type than really exists.

However, when we come to central and eastern Europe, the position is not quite the same. During his excavations in Moravia from 1890 to 1894 J. K. Maška recovered men's skeletons accompanied by numerous mammoth tusks—indicating, probably, 'protective' burials. Absolon, continuing Maška's work, recovered a series of remains now generally referred to as the 'Předmost' type.

Předmost is about two miles from the town of Prerov (Perau), while

Vistoniče (Wisternitz), from which come the curious and interesting prehistoric statuettes, lies on the eastern flank of the Palava Hills to the south of Brno (Brünn). The Předmost bones and the Vistoniče objects were destroyed by the Germans a short time before they evacuated Czechoslovakia in 1945.

The worked flints from the Předmost site resemble those of the comparable culture-phase from Combe-Capelle in the Dordogne. Cultural objects of great variety have been unearthed at the Moravian site—horn 'buckles', horn needles, daggers, mammoth bones shaped rather like spades and forks, human figurines in clay and models of mammoths in mammoth-ivory. The Předmost hominid remains were recovered from what appear to have been intentional burials. One grave, lined with stones, was set, on one side, with mammoth's shoulder-blades and on the other with mammoth's jaws, while in the middle of the tomb was the skull of a fox.

Předmost skull No. III (plate xvb) is perhaps the most important of the collection since both in shape and in measurements it much resembles Skhūl skull No. V from Mount Carmel (plate xiib), and while neither deviates very much from the European Upper Palaeolithic *metrical* mean, still these two skulls look as though they are of an intermediate form between, say, the Combe-Capelle type and that of some of the European 'generalized' Neanderthaloids. Moreover, the Předmost skull No. III is almost certainly more ancient than the rest of the Předmost material—and than the west European Cro-Magnons.

NEW WEAPONS

As Upper Palaeolithic Man was a hunter he was also a nomad. Probably his nomadism was confined to what we should now regard as rather circumscribed areas. But he was accustomed to travel and shifting his habitation about. When lack of game or unfavourable climatic conditions forced him, then, also, he could tramp and trek great distances.

We must imagine such men as rather few in number. The immense proliferation of one sort of mammal, Man, is a modern phenomenon, only beginning after the invention of agriculture and only shooting up to its present uncontrolled proportions within the last few centuries. Man used to be a rather rare mammal.

New weapons gave Upper Palaeolithic Man a great advantage. He ceased to rely mainly upon traps and pits and the killing of his game by rolling down boulders and stones. He had arrows, and that complicated

and ingenious instrument the bow was invented. He had propulsors and javelins. Maybe he knew the use of poison for the chase (some grooves at the base of bone-points suggest this). In fact the men of the Upper Paleolithic possessed already most of the basic crafts of our species.

MEN OF THE EUROPEAN MESOLITHIC

In the Mesolithic culture phase (which spans the time between the disappearance of the later palaeolithic cultures and the appearance of the Neolithic) the European populations, which in their general features suggest clear affinities with the peoples of the Aurignacian and Magdalenian cultures (of south-western France), comprise new elements including a broad-faced, short-headed type of Man which some have thought (on little evidence) to be the result of *sapiens* and Neanderthaloid hybridization.

It is possible that in eastern Europe 'Palaeolithic' types were reinforced in early post-glacial times (i.e. from about 8,000 B.C.) by elements from the Near East.

The fossil remains of men of the Mesolithic are not numerous and by no means all of those attributed to this phase are undoubtedly well dated. The Mugem men from the lower course of the Tagus in Portugal are of basically Mediterranean type (page 213) and are, for the most part, distinctly dolichocephalic.

OFNET MEN

The Ofnet skulls are, however, worth a mention, especially as they seem to be the most ancient European examples of what may be, speaking generally, classed as 'Alpines' (who now form such an important ingredient in European populations), although the associated industry does not look very Mesolithic, and it is possible that the site has been mis-dated. Some of the skulls had cervical vertebrae with them and the state of these bones suggest that the heads were severed from the bodies after the death of the individuals. There is evidence of separate head-burial from various parts of the world—Neolithic China and pre-Columbian America among them—but the Ofnet collection (in which there is a marked predominance of women's crania and those of children from five to eight years of age) looks very much like remains of cannibal feastings, for the bases of the skulls have been hacked away

in the good old style that dates back to the Australopithecines maybe. The Ofnet skulls are dyed with red ochre.

. . . . .

The Mesolithic in western Europe may have ended about 4000 B.C., but although a Neolithic culture begins, it is in the Near East that we find agriculture with a Neolithic economy, and we find it earlier than was thought only a few years ago, possibly by the eighth millenium, and we have, after a pre- and proto-dynastic period in Egypt and in Sumeria, the first civilizations of the world by about 3500 B.C. Civilization did not reach Europe until much later. Thus our continent which saw the first dawn of art became a backward area and so remained until civilized from the East, where the change of climate had driven men to exercise their ingenuity in new conditions.

CONCLUSIONS

In 1857 Darwin wrote to Wallace:

'I think I shall avoid the whole subject as so surrounded with prejudice; though I fully admit that it is the highest and most interesting problem for a naturalist.'

The 'subject' was that of Man's evolution and there is still no topic concerning which we entertain more prejudice. Since we can do nothing to change our ancestry we are all the more touchy about it and strive to make it look, in the record, more impressive than it is.

But as everything in this world exists for us because of us, everything leads back, eventually, to our bodies. To get a sane view of the world we must get a sane view of ourselves. Maybe the much-deplored gap (more marked perhaps with us than in some other countries) between humanists and scientists would not be so wide if the former had knowledge of our origins and the latter would make more allowance for our limitations.

However, in considering the story of our evolution, we should avoid both exaggerating the differences between ourselves and extinct types of hominids and relegating the appearance of *Homo sapiens* to an, as yet, unjustifiably remote past. Both excesses serve to feed prejudices which stem from myth and legend and arrogance.

WHAT THE BONES TELL

The line of Primate development which led, on the one hand, to the anthropoid apes and, on the other hand, to ourselves must have bifurcated a very long time ago, in the Oligocene or, at the latest, in the early Miocene (say 30,000,000 years ago). It is, therefore, not remarkable that apes and men, though 'blood relations', are distant cousins. It is, however, remarkable that we and the apes are so much alike, not that we are so different.

The common ancestors of apes and hominids would have been rather 'undifferentiated' Primates (if compared with the existing apes), that is to say possessing shorter fore-limbs and also less pronounced eyebrow-ridges and smaller canine teeth than present-day anthropoids.

The decisive step to hominid status was taken when one line of Primates adopted an upright carriage. The upright posture long preceded the modifications of the skull and the face which we are inclined to call a 'human appearance'.

As far as we can see, now, the Australopithecines were confined to southern and eastern Africa, though it is reasonable to assume that they represent forms once more widely spread in early Pleistocene and Mid Pleistocene times. The southern African Australopithecines probably survived into times when the Pithecanthropoids were flourishing in Africa, Europe and Asia. At least there was, in southern Africa, and as a contemporary of the Australopithecines, another hominid, *Telanthropus* which looks like a 'pre-pithecanthropoid' type. The Pithecanthropoids, in fact, have rather the appearance of 'enlarged' Australopithecines and one of the australopithecine skulls (i.e. *Plesianthropus*), had it been found minus the facial bones, might well (save possibly for the size) have been taken for that of a Pithecanthropoid. Of course, the Australopithecines from southern Africa could hardly be the direct ancestors of any pithecanthropoid forms we know. The datings would rule that out.

The evolution of the hominids, in fact, resembled that of most other mammalian lines for which we have enough evidence to judge. Some forms developed in one direction, some in another. Some forms did not evolve so fast as others. Thus, the family bush of our kind is a tangled and tufted one that sprouts and shoots out in all directions.

It is because *Homo sapiens* has survived his near relations that we are able sometimes to regard ourselves as altogether different from other mammals. No doubt our ancestors passed through what we may

call a pithecanthropoid phase, though possibly it was not one exactly like that of any Pithecanthropoids of which we have the remains. Certainly these latter cannot represent direct ancestors of *Homo sapiens.*

It appears, indeed, that men resembling *Homo sapiens* existed during the Mindel-Riss or Great Interglacial—say 250,000 years ago. It also seems clear that during the Riss-Würm Interglacial there were, in Europe, hominids of various types, some of which can be hardly distinguished from the *Homines sapientes* of the later phases of the Würm Glaciation (that is to say the men some of whom made the arts of the Old Stone Age), while others of the Riss-Würm Europeans approximate to the 'generalized' neanderthaloid type.

We cannot, in fact, separate the *sapiens* story from that of the various sorts of Neanderthaloids. There is evidence for the coexistence of the two types (e.g. at Mount Carmel) and there are alas indications of interbreeding. We may, if we like, consider *Homo sapiens* as a rather infantile sort of Neanderthaloid, and the 'classic' Neanderthaloids as especially 'masculine' and rugged *Homines sapientes.* But we may repeat that the differences were largely those of head and face.

Among the different sorts of *Homo sapiens* on this earth the principal variations are those of colour and conformation of the soft parts (and these of course do not show on the skeleton) and then, in shape of face and head. It is quite possible that if some Neanderthaloids were still surviving we should not think of them as being much more unlike ourselves than negroes or the aborigines of Australia.

Since the rest of the skeleton in almost all types of *Homo sapiens* is much the same, the physical anthropologists devoted a great deal of their time and energy to measuring, comparing and defining various sorts of skulls, with a result that innumerable 'sub-species' and 'varieties' were recognized. The list of them is endless: 'Armenoid', 'East Baltic', 'Dinaric' and what you will, just for European populations alone. But so-called 'pure' types do not exist and, in any case, attempts to sort out men by head-shape do not seem to be very useful or, let us say, illuminating, unless one considers that there were once a lot of 'pure' types which have since become mixed up owing to human perversity. But such a view smacks not a little of traditional, literary and theological views which have no basis in the evidence.

Since most of the material relating to fossil Man also consists of skulls, nothing was easier than to conclude that the ancient sorts of hominids were very different from ourselves, maybe—who knows?—the product of an entirely different, let us call it, dispensation, to use

one of those agreed terms which help, so we are told, to bridge the gap between deductive and inductive thought.[1]

THEY'D ALL LOOK THE SAME WITH THEIR HEADS CHOPPED OFF

The chances are that if we could line up in a row living Pithecanthropoids, Neanderthaloids, *Homines sapientes* (of various sorts, e.g. pygmies, Negroes, Chinese, Australoids and our famous 'Nordics'), and even Australopithecines, maybe, and put sacks over their heads we should say: 'Here's a lot quite different from any other mammal, they stand upright.' When the sacks were ripped off we might, however, well think that some of these hominids were wearing masks.

Of course, it might be advanced, for mere argument's sake, that the archaic sorts of Man were easily distinguishable from each other because their skins were of different hues, that the Pithecanthropoids were green or the Australopithecines blue or any other nonsense—that is not much more crazy than some of the suggestions made in all seriousness about the appearance, cultural level and 'intelligence' of early men.

Let us say, then, that if instead of living subjects (which we cannot produce anyway) of such early hominids, we were to exhibit their complete skeletons (which we may hope to be able to do one day), we should then have to agree that, except for their skulls, they all looked pretty much alike.

We have no proof that *Homo sapiens* is potentially more intelligent than were the Neanderthaloids, though the former has had the invaluable prop of writing, so that any fool with a good memory can pass for a wise man. 'Race' or 'type' in *Homo sapiens*, again, does not seem to bear much relation to intelligence. Mere brain-bulk is no indication of intelligence and plenty of men with rather 'primitive'-looking faces may be brighter and more apprehending than others with a more 'foetalized' face.

The fact is that we are for ever inclined to confuse anatomical, mental and cultural factors. Some of the first explorers of and settlers in 'Black Africa' would be much astonished were they able to see (as we can today) negro doctors of law or medicine who speak French or

[1] There is a good deal of difference between a Clydesdale, an Arab and a Shetland pony, but they are all horses, and none of them is like the (now extinct) tarpan or the (still surviving) Przewalski's horses; when we think of cattle, we think of horns, yet a polled Herefordshire bull is a bull all right. None of us would mistake him for a horse. It may be objected that domestic animals are bred by Man (though he could not 'breed' them were there no mutations to work on) but Man has been breeding himself, by natural selection, throughout his history.

English as their 'mother tongues'. In 1819 an eminent member of the Royal Society could write that 'the superiority of the whites is universally felt and readily acknowledged by other races', and in saying this he was but echoing a well-nigh universally held prejudice among the 'whites'.

The fact is that there are unteachable types among 100 per cent European specimens of *Homo sapiens* and teachable types among 100 per cent Australoids. That Man invented more in one place than in another is due to a whole complex of circumstances. Why did the ancient Greeks not make machines? Because they had slaves? Because their metal-working methods were inadequate? Maybe, still no one will suggest that Plato and Aristotle were less 'intelligent' than, well, some of our fellow-citizens.

MAN IS INTELLIGENT BECAUSE HE HAS HANDS

We have tried in the foregoing pages to define the term 'Man'. He is a Primate who can and does walk upright and has free fore-limbs and hands. But there might have been such a Primate to which we should have to deny the name of 'Man'. The definition cannot be based wholly upon bodily characters. A Man must be able to make things, to fashion implements (maybe we should rather say 'utilize implements for a predetermined purpose'). So we move from a physical to a cultural plane.

When discussing matters connected with our family pride we must leave ourselves a loop-hole through which to slip and call out: 'Yes, of course, but no animal can be a Man if it cannot speak—not just imitate like a parrot, but utter sounds that are meaningful; a Man must be able to talk and by talking create the world of ideas, legends and myths in which we live.' We think because we can speak, and we are intelligent because we have hands.

Our loop-hole is also very convenient because it cannot be proved whether any fossil hominid could or could not speak. Evidence must be indirect, but such indirect evidence is persuasive. It does not look as though Man could manufacture stone implements (and even some of the earliest evidence a complicated technique) without being able to describe how the artefacts were to be made and how they were to be used. It is a good working hypothesis that *Homo faber* was also *Homo loquax*.

But there is a sop to our pride. We have no evidence that any kind of Man other than *Homo sapiens* could draw, paint, engrave and make pictures. And pictures are the beginning of writing by which we can perpetuate our world made with words.

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