LITTLE BLUE BOOK NO. 481
Edited by E. Haldeman-Julius

The Stone Age

CLEMENT WOOD

HALDEMAN-JULIUS COMPANY
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CHAPTER I

THE RECORD OF THE ROCKS

A few days ago, I was walking down the long field back of my house in Hastings-on Hudson with J. Otis Swift, the naturalist. He stooped and picked up an odd-shaped fragment of quartz. "You could write a volume," he observed, "about that stone. Long ago, in all probability, it appeared either in granite, a primal stone out of the warm crust of the earth, or as one of the vast mineral group of silicates. The slow seasons weathered it, water took it in solution, and it was deposited afresh as quartz in the cavities of some old basic igneous rock. The action of sea or river rounded it to this large pebble; these scratches may have been made by the glacier that once scratched the top of the Palisades yonder. But these chipped places—here, and here—these were made by the hand of man. The Indians, anywhere from five hundred to fifty thousand years ago, chipped off the flakes and made of it a hammer stone, to shape their stone weapons and implements. You could write a volume about that stone."

And this monument of the slow fashioning of fire and weather, water, ice, and man, is now a simple field stone, trodden under foot by the careless passerby! I have handled

more than five hundred of these worked Indian stones, in the fields within four miles of my house.

We often think of stones as worthless things, unless perhaps as material for building. Yet they are the skeleton that holds the earth together. In the old Greek myth of the flood, Deucalion was told to throw the bones of his mother behind him; and he rightly interpreted this as meaning stones, the bones of Mother Earth. Much of man's achievement is graven on the stones: from the ancient wordless ruins of Stonehenge to the great pyramids, from the masterpieces of architecture and sculpture to the stone writings of Egypt, Babylon, and the nearest cemetery. The hearthstone commemorates the earliest home, the millstone an early industry. From a rock smitten by Moses' hand water gushed for the thirsty wanderers; from a stone flung by the sling of David death came to the giant foe of Israel. Commercial products of the stone range from the salt that seasons each meal to the precious metals and the more precious stones called gems. Lastly, the observant men called scientists show us how to read stones like a printed book, in order to understand the early history of the lifeless earth, the beginnings of life upon it, and the forgotten days of the awkward ape-like ancestors of man, and of the earliest man himself.

We do not know how old the earth is, or even how old the earliest rocks are. Estimates by geologists and astronomers, based upon painstaking study, vary between 3,000,000,000 and 25,000,000 years. Carroll Lane Fenton, in "The

Building of the Earth" (No. 275) in this series of books, has chosen the conservative figure of 800,000,000 years. In any case, the time occupied by man and his immediate ancestors, the apemen, hardly exceeded one sixteen-hundredth of this, or 500,000 years. A table may make this clearer:

GEOLOGIC TIME TABLE

Years Ago	*Era*	*Period*	*Life*
25,000		Recent	Man
475,000		Pleistocene (Ice Age)	Rise of man
	Cenozoic (Recent Life)	Pliocene	Rise of ape-man
40,000,000		Miocene Oligocene Eocene	Development of mammals, grass, land forests, etc.
140,000,000	Mesozoic (Middle Life)		Great reptiles
360,000,000	Paleozoic (Ancient Life)		Early marine life, fishes, amphibia, swamp forests
600,000,000	Proterozoic (Primordial Life)		No visible trace of life. Primitive forms, jelly fish, etc.
800,000,000	Azoic (Lifeless) or Archeozoic (First Life)		No life, or one-celled life

Man's immediate ancestors emerge from the vast geologic history of the earth at the end of the Pliocene and the beginning of the Pleistocene, the Ice or Glacial Age, immediately following. In this, as in all of the tables, the order is stratigraphic, or following the strata of the rocks. Thus the most recent age is at the top, the oldest at the bottom. The Glacial Age, which reached from 475,000 to perhaps 50,000 years ago, was supposed until recently to consist of one great advance and retreat of the ice-fields from various centers. The last forty years has established that there were at least four chief glacial periods, with three interglacial periods, each with its corresponding cold and warm climates. The terraces on either bank of such European rivers as the River Inn, in Austria; the Rhine above Basle, Switzerland, and the Thames, near London, establish a different type of deposit for each glacial period, with different and advancing forms of animal life and human remains. The successive coverings of loam and earth, which washed down from the original sand and gravel terraces left by the glaciers, indicate the same series of glacial and interglacial periods. This loam was retransported in the form of dust by the winds and laid down afresh in layers of varying thickness known as "loess," a process that still continues in certain districts; this points to the same succession of glacial and interglacial epochs. Finally, the different types of human relics and remains found in the limestone shelters and caverns of Europe point to the same succession of divisions of the Ice Age. The time since the Pliocene may thus be divided as follows:

RECENT GEOLOGIC TIME TABLE

Years Ago	*Period*	*Culture*	*Division*	*Life*
9,000-12,000		Neolithic (Polished Stone)		Recent races of men
25,000	Recent	Upper Paleolithic (Chipped Stone)	Post Glacial	Man, or *Homo sapiens* Grenelle race Cro-Magnon race Grimaldi race
		Lower Paleolithic	4th Glacial	*Pre-Homo sapiens* Neanderthal race
75,000			3rd Interglacial	Piltdown race ("dawn" men)
125,000			3rd Glacial	
250,000	Pleistocene (Ice or Glacial Age)	Eolithic	2nd Interglacial 2nd Glacial 1st Interglacial 1st Glacial	Heidelberg race
475,000	Pliocene	Eolithic		Ape-man (*Pithecanthropos erectus*)

There is a common belief that primitive man had to contend with the dinosaurs and pterodactyls of the Great Reptile Age, the Mesozoic. As the first table indicates, this is entirely in error. These reptiles disappeared suddenly from the earth millions of years before the first ape-man appeared. The earliest mammal, a direct transition from the reptile, may have hastened the disappearance of the great saurians by his habit of feeding upon the eggs of the reptiles. Much later came the earliest ape-man; he was contemporaneous with the hairy mammoth, the sabre-tooth tiger, and the rhinoceros —unpleasant enough neighbors. When it came to these monsters, he was less a hunter than the hunted; when he took to the chase, it was after much smaller game.

Science has discovered many facts about the immediate ancestors of man, and the earliest men. Yet all that has been discovered is but a fraction of what is contained in the Record of the Rocks. A few isolated spots on the earth's surface have been examined; how much of the surface has not even been scratched! Localities in France, England, Germany, parts of Spain, the United States, Java, and elsewhere, have been examined with some care; but there are thousands of miles in these countries where secrets are unrevealed. Whole continents have been hardly touched; South America, Africa, even Asia, perhaps the land in which the races of men originated, are still to be searched. And if all the remains hidden today were uncovered, we would have only a small fraction of the story of the ancient life. Of one race we have

found only two teeth, a thigh bone, and the top of a skull; of another, we have only one jaw. Why are there not more fragments? Certain of man's ancestors were perhaps tree-dwellers; these leave few remains. Their bones are light, brittle, easily destructible; they were crushed in a fall, consumed by beasts, or decayed and disappeared with the dead leaves and wood of the early forests. The apemen and the first men were ground dwellers, hiding among trees and, especially, rocks. It is not such creatures that the Geological Record preserves, as a rule; that record holds chiefly traces of water or marsh creatures, or creatures easily and frequently drowned. When early man, during the harsh Ice Age, took to the caves, he left more traces of his stay. More than this, it has been only seventy years that such prehistoric human fossils have been found; the Gibraltar skull of the Neanderthal race, found in 1848, was practically the first of the long series. Seventy years is not a long period, in which to read the mysteries of five hundred thousand years. We will learn much more in the future.

If the remains of bones are scanty, there is another record of the rocks that yields more: the stone implements of man. Some scientists hold that wooden implements came first, and shell implements second; whether these preceded the use of stones as tools, or came with them, wood and shell have decayed and disappeared. But tools of flint, agate and quartz may not decay in a million years; and men have found every stage of implement widely scattered over the earth. The important thing

always is to trace the stages in the development of man—not the exact date when he reached these stages. With different localities, the rate of progress differs enormously. Today, the white races are in the age of the radio and the airplane; backward races still use stone implements; South Sea Islanders and certain African Negroes and bushmen still make use of wood and the sharp-edged shells of land and water molluscs as tools. When Europe was in the age of Shakespeare and Elizabeth, the twin continents of America were largely in the Stone Age. But the order of development, as revealed by the tools, is always similar. There was first a period whose tool remains cannot be identified: because the stones and wooden clubs were used without any shaping changes. Then came the Eolithic Age, or dawn stone age; scientists are still disputing its remains. The tools of this age, called eoliths, have only the rudest working. After this came the Paleolithic, or Old Stone Age—the age of chipped stone. This varies from the crudest flaking to the exquisite laurel-leaf pattern of the Solutrean stage of tool-making (named from the implement station of Solutre, near the Saone River, in France). This Old Stone Age is the period, stretching over more than a hundred thousand years, that we will study here. Next came the Neolithic, or New Stone Age—the age of polished stone. After this came the Bronze Age, and then the Iron Age, blending into the Steel Age. We are still in the last-named period. It is convenient to remember these thus:

THE AGES OF TOOL CULTURE

Iron, and later Steel, Age.
Bronze Age.
Neolithic (New Stone) Age, of polished stones.
Paleolithic (Old Stone) Age, of chipped stones.
Eolithic (Dawn Stone) Age, of stones slightly chipped.

It is now time to answer the questions, who were the immediate ancestors of men, and what can we find out about them.

CHAPTER II

THE APE-MEN

It is not correct to say that man is descended from any form of monkey or ape now alive upon the globe. Both the anthropoid or man-like apes, and men, are descended from a common ancestry, now extinct. There are four of these man-like apes upon the earth today: the gibbon and the orang-outang, in Asia, and the chimpanzee and the gorilla, in Africa. But near the beginning of the Cenozoic or Recent Life Period, in that stage known as the Oligocene, we find skeletal remains of a forerunner of the great apes, resembling the gibbons, in the deserts of northern Egypt. In the Miocene Stage which followed, true tree-living gibbons found their way into Europe and continued throughout the Pliocene, the stage preceding the Ice Age; these ranged as far north as Germany. Another ape, quite man-like, called the *Dryopithecus*, inhabited France in the Miocene; it was closely related to the ancestral stock of

the chimpanzee, gorilla, and orang, with a jaw remotely like the dawn man, or Piltdown Man, found in Sussex, England. The Pliocene saw a third great ape dwelling in Germany, and the Old Ape, or *Paleopithecus*, inhabiting the Siwalik hills of Asia. This creature was a generalized form apparently related to chimpanzee, gibbon and baboon, with upper teeth resembling man's.

The four existing man-like apes are all tree-dwellers, with long arms especially adapted to arboreal life. In all these apes there is a grasping power in the big toe, which is a kind of thumb; in man this is a function of the hand alone. The opposable thumb, which may be brought against each of the fingers, is the one characteristic lacking in every one of the man-like apes, and which was early developed among the ancestors of man. They had projecting faces, retreating foreheads, and small brain-cases, compared to men; in his slow development man's face has become vertical, his nose prominent, his forehead high, his brain-case large. In brain evolution, the tree life of man's early ancestors or cousins stimulated the development of the hind and side portions of the brain, which control the muscular movements needed for arboreal existence. All the man-apes have some power of walking more or less erect on the hind limbs, thus releasing the arms. There were four chief lines of development:

(1) the erect attitude;
(2) the opposable thumb;
(3) the growth of the front of the brain; and
(4) the acquisition of the power of speech.

In late Pliocene times the ancestor of man, in all probability a ground ape, a running creature rather than a climbing creature, had achieved the first three of these, and had a rudimentary power of speech. Then came the first Glacial approach, and after thousands of years the first Interglacial period. Scientists disagree as to whether the first recognizable stone implements, the eoliths, came before or after the first Glacial approach; but about this time came these first evidences of man's immediate ancestors upon the earth.

Among the early popularizers of the eoliths was a man named Benjamin Harrison, a grocer, of Ightham, in Kent, England. In a great gravel bed five to seven feet deep he found, among unmistakable paleoliths, or chipped stones, hundreds of stones only slightly worked, with a similarity of appearance which could hardly be accidental. In Belgium and elsewere many other eoliths have been found; I have picked up in the field below my house in Hastings-on-Hudson stones of exactly the same type. Whether these Kent or Belgium examples are the work of man or of nature is not the most important thing; the thing to remember is that the paleoliths or chipped stones were not originated all at once; there must have been thousands of years of experiment before these forms could be reached. These may not be recognizable to the satisfaction of science; but they undoubtedly existed. Eoliths have been found near the Sussex home of the early Piltdown man, and in France. These are of the borer form, the hollow-scraper form, and the

crescent-shaped-scraper form. They are usually rolled and water-worn. Nature has dulled their once keen edge, as she has dulled human recollection of their ancient users.

Who were the man-like forms that fashioned and used these earliest recognizable tools? Remember what was said about the infrequency of relics of these early men. We must travel far away to find the pre-human type which must have used similar tools.

The island of Java is separated from Asia by Sumatra and Borneo, and by water. Geology has established that it was once a part of the Asiatic mainland. In 1891, on the Bengawan River in central Java, a Dutch army surgeon, Eugen Dubois, while excavating for pre-human remains, discovered near Trinil a deposit of numerous mammal bones, a single upper molar tooth, and, a short distance away, the top of a skull. Further digging revealed a second molar tooth and a left thigh bone, all imbedded and fossilized in similar fashion. In 1894 Dubois described these scattered parts as the remains of the type of *Pithecanthropos erectus*, the erect ape-man. The *erectus* was determined by the thigh-bone, which demonstrated that the creature had the same upright posture as man, and walked on two legs. The creature was clearly not simian, or monkey; it was closer to man than to the highest man-like ape. And yet it was not man. It was the transitional form between man and the man-like apes, which the laws of evolution had taught us must have once existed. It was the ancestor of man. It was one of the missing links.

The geologists at once became busy. At first they were inclined to place the creature in the late Mesozoic (Middle Life), also called Tertiary (Third Stage), in the period Pliocene; but later researches indicate that the true age is more probably Pleistocene, or the beginning of the Ice Age, in the Cenozoic (Recent Life), also called Quarternary (Fourth Stage). The mammal bones included a primate or monkey called macaque; two species of the rhinoceros; and three late Pliocene elephants,—the same elephants found in the Siwalik hills of India, in earlier Pliocene deposits. The discovery of a race similar to *Pithecanthropos*, the Ape-man, in India, may be anticipated. The Trinil race may therefore be set down as late Pliocene or early Pleistocene, as just before or during the opening of the Ice Age.

Judging from the length of the thigh bone, the Trinils were a tall race, reaching a height of 5 feet 7 inches, a few inches higher than the later Neanderthal race. The forehead is undeveloped, the frontal area of the brain is small; thus the Trinil Ape-men had only a limited faculty of profiting by experience and accumulated tradition. The industry of the Trinil race was very elementary. The tools required were simple, and natural flakes and fragments of flint were plentiful. Hammer and knife were the original tools; both were picked up ready-made, or were rudely chipped. When the edge of the flake become dulled by use, the piece was thrown away, or the edge was retouched for further use. If hammer or flake could not be held comfortably in the hand, the

troublesome points or edges were removed or reduced by chipping. The stock of tools increased slowly, with the growing needs. Artificial flakes were produced at last, to supplement the diminishing stock of natural ones. Definite types of implements were at length evolved, which led readily into the simplest forms of the paleoliths, or chipped stones. It is fairly definite that the Trinil race were in the Eolithic culture, using several weapons of wood and stone.

Periods of glaciation are periods of subsidence of the land; the second glacial period, which came next, was by far the greatest of all four. The glacier withdrew after many thousands of years, the land was elevated again, and a new race appeared upon the scene. In 1907, Schoetensack discovered in the Mauer sands near Heidelberg, Germany, a single jaw, which has been named as belonging to the Heidelberg man. Along with this pre-human jaw were discovered remains of the ancient elephant, a rhinoceros, a wild horse, a primitive ox or aurochs, and many other mammalian forms. The presence of the elephant indicates a comparatively moist and well-forested country. The solitary jaw indicates the human occupancy.

This Heidelberg jaw is one of the most important finds in the whole history of anthropology. It contains features never before found in fossil or recent man. There is no evidence of chin at all. The teeth establish that it was not the jaw of an ape, but of a human form. The teeth are not large, in proportion to the jaw; but the jaw is the most powerful jaw ever

known, even greater than the largest Eskimo jaw. It indicates a skull of very massive and primitive character. The space left for the tongue is not large; this may have interfered seriously with the free use of the tongue for articulate speech.

The Heidelberg man is apparently a low form of the Neanderthal race, that is, a Neanderthal in the making. The Heidelberg teeth are arranged in a perfect arch, or horseshoe arrangement; in all the apes, the grinding teeth are almost parallel with each other. This establishes it as another of the missing links. We know little of the habits of this ape-man. Future excavations may tell more of his story. All that we are sure of is that, during the second interglacial period, this race of subhumans roamed Europe.

Then came the third glaciation. After thousands of years, the ice retreated, and a new race appeared upon the human stage.

CHAPTER III

THE DAWN MEN

The best scientific estimates agree that the third warm interglacial stage opened about 100,000 years ago, and lasted between 50,000 and 60,000 years. It must be remembered, however, that the eolithic industry may have commenced more than a hundred thousand years before this. The borders of one river, the River Somme at St. Acheul, France, give us a vista of the whole story of the succession

of geologic events, from the eolithic culture through the whole Old Stone Age to the neoliths, or polished stones. The animal life during this period, as indicated by the remains, included the mammoth, the rhinoceros, the hippopotamus, a primitive horse, the sabre-tooth tiger, elephants, and many lesser species. This animal life is associated with eoliths, with the next stage of stone industry, called pre-Chellean, and with some later Chellean chipped implements.

The pre-Chellean differs from the pure eoliths in that it included stones for weapons, as well as stones for tools or implements. It is to be noted that there are three methods of concurrent chronology, depending upon the kind of evidence. The purely geologic evidence gives us the age by the geologic changes, such as the glaciers, and the accompanying animal remains; the human skeletal remains give us the successive pre-human and human races; while the implements give us the successive stages of industry or culture, such as the eolithic, pre-Chellean, etc. In the pre-Chellean, there is no longer any question of human handiwork; these stones were shaped by men or submen. It is possible that these primitive flint-workers entered Europe by way of the northern coast of Africa, which was united to Europe by two land bridges, one at Gibraltar and the other by way of Sicily to Italy. The stone remains are restricted to Spain, France, Belgium, and Great Britain. None are found in Germany or central Europe. Thus it is clear that this race did not enter directly from the

east. The best stations are discovered along the rivers Somme and Seine. The eoliths found in connection with the Piltdown flint workers, or Dawn Men, were typical eoliths, and not as advanced as the real pre-Chellean. At this time the flint workers, from the specimens discovered, were not designing the shapes of their implements and weapons; they were utilizing the natural shapes of the flakes and stones. In the industry, a second stage had been reached. There was first the use of the stone hammer, to make the sharpened edge; now came, in addition, the retouch, with a second stone, which further sharpened the implement by knocking off small chips on alternate sides of the cutting edge, giving it a saw-like effect. This retouching further made the stone usable, by blunting any sharp edges which might injure the hand of the user. Often the smooth, water-worn end of the flint was preserved for this purpose. The name of these typical stones is hand-stone, or the French *coup de poing*.

Among the types of implements and weapons are the following: the planing tool, the scraper, the borer, the knife, the hammer-stone, the throwing-stone, and the hand-stone or *coup de poing*.

The user of many of these implements was discovered at Piltdown, in Sussex, England. This lies between two branches of the River Ouse, west of Kent, in which many eoliths have been found. The discoverer, Dawson, places the age of the remains as during the first half of the Pleistocene, or Ice Age. About 1911, two portions of a skull were found here.

Careful search revealed a broken jaw, a tooth, two nose bones, and other sections of the skull; all of these were fossilized. Nearby were Pliocene mammals, such as the mastodon, the mammoth, and the hippopotamus; in the same heap from which the Piltdown skull was taken were found portions of a rhinoceros, hippopotamus, beaver, and deer. There was also found a single flint, worked on one side, of a very primitive or pre-Chellean type.

This indicates that the Piltdown man, who has been named *Eoanthropos* or dawn man, belonged to the period before the true Chellean. The skull is much less like the apes than any previously discovered. The nose was flattened, resembling in this some of the existing Malay and African races. The chin was extremely receding; the teeth are relatively longer and narrower than those in the modern human jaw. The face projected forward; the teeth may be called ape-like. Ape-like chin, parallel grinding teeth, narrow human lower molar teeth, steep forehead, practically no brow ridges (such as the later Neanderthal race possessed) —this was the dawn man. The authorities are inclined to the opinion that the race may have existed at about the same time as the Heidelberg man. But the Heidelberg man was probably an ancestor of the Neanderthal race, which largely disappeared later; while the Piltdown man was a probable ancester of the recent species of *Homo sapiens*, to which we belong. Some, it is true, hold that the Piltdown jaw does not belong to the Piltdown skull; but in any case it is clear that the Piltdown man

was either a direct ancestor of the modern human, or a near side-branch.

Out of the eoliths and the later pre-Chellean implements came that stage of human industry called the true Chellean. These workers improved the older types of implements, and invented new ones. The flint worker was still largely dependent upon the natural shape of the shattered fragment of flint; he had not yet learned to shape it symmetrically. Half a dozen definite varieties of the hand-stone or *coup de poing* can be distinguished; De Mortillet speaks of this as the only tool of the Chellean tribes, used for all the purposes of axe, chisel, saw, and awl—an early combination tool. The pointed form was undoubtedly used as a dagger, both in war and in the chase.

There was plenty of game to chase, even if the larger mammals had still to be avoided. Roaming Europe at this period were the Southern mammoth, the hippopotamus, the straight-tusked elephant, the broad-nosed rhinoceros, the hyena, lion, and bison. The hyena now found is the spotted one, which had replaced the older striped hyena; the lion has taken the place of the great sabre-tooth tiger. Red deer and giant deer crashed through the brush; the brown bear appears for the first time; there are varieties of wild horses, and a primitive species of wolf. Some of these the Chellean men hunted; among their regular prey were badgers, martens, otters, beavers, and still smaller mammals.

In all the continents, except Australia, we find stone implements similar, in their main

outline, to the Chellean; but there are always minor differences. This indicates that the development was probably a natural one occurring to primitive man widely scattered, rather than that the Chellean culture spread over the world.

It is noteworthy that not a single pre-Chellean or Chellean station has been found in Germany, Switzerland, or the rest of central Europe. But the next stage, the Acheulean, is found throughout these regions. During Chellean times this land might have been unfavorable for human habitation; or the traces of man's occupancy might have been washed away, or may be still undiscovered. The Rhine, the Danube, even north Germany, exhibit traces of the next period. In general, the Acheulean flint workers, like the Chellean, preferred open country to caves and grottoes. Up to this time man has been largely an outdoor dweller. But a noteworthy exception to this is found in the great grotto of Castillo, near Puente Viesgo, in Santandar, northern Spain. This cavern was filled with deposits to the depth of 45 feet, from the floor to the roof; Obermaier, who first explored these deposits thoroughly, found here thirteen layers, covering eleven stages of industry, and presenting a natural museum of the history of western Europe from Acheulean times to the Age of Bronze, in Spain. For fifty thousand or more years this great grotto was used, and then abandoned, by tribe after tribe. It is a monumental volume of prehistory, which can be read by the archeologist almost as clearly and

precisely as if it were in printed type. It is in the first period found here, the Acheulean, that the first positive evidence of the use of fire by man is found, in the shape of charred wood and bones. The discovery of fire has been made. Man is on his road to what we call progress.

The Acheulean stone implements and weapons are increasingly numerous. We find half a dozen varieties of the hand-stone, used for many purposes; we find choppers, planing tools, scrapers, drills, borers, knives, blades, and points. For the war and chase there are lance-points, throwing stones, knives, and dart and spear heads. The core or center of the flint is still used for the large typical instruments; but the flakes are coming into wider use in a great variety of forms. Gradually the blades grow finer and sharper; they were probably used for butcher knives for dismembering the carcasses of game, and for cutting up the skins; other tools were used as scrapers to clean the hides, which were finally dressed by the aid of the planing tool. The smaller implements are much improved. The knives are fine and perfect, although lacking the symmetrical shape of later stages. In all probability, the women of the tribe were the ones who dressed the hides. Some of the finer implements were used to split marrow bones, and furnish a choice feast. The stone work is a great improvement over the crudity of the Chellean workers; but it seems rough indeed, compared to the work of the Upper Paleolithic

age, and rougher still when contrasted with the polished stone of the Neolithic Age.

These first three races, the Ape-man or *Pithecanthropos erectus*, the Heidelberg man, and the Piltdown or Dawn Man, have left few skeletal remains. We are next to study a race about which we can speak with much more certainty—the Neanderthal Men.

CHAPTER IV

THE NEANDERTHAL MEN

Croatia was a section of Hungary, before the World War altered geographical boundaries. In the northern portion of this district, near the small town of Krapina, in the valley of the Krapinica River, is the famous cavern of Krapina. Here, in 1899, a discovery of men of the Neanderthal race was made. The animal remains point to the late Acheulean period; there are a rhinoceros, the cave bear, a species of horse, and other mammalian remains. When the cavern was explored, it was found to contain thousands of animal bones, mingled with hundreds of human bones, and hundreds of stone implements and chips. In 1906 Gorjanovic-Kramberger published the result of his researches among these remains. He had found about three hundred pieces of human bone, many well preserved. From these the Neanderthal race can be reconstructed.

These men were short-skulled. The race was somewhat dwarfed, with a broad head.

The chin is still retreating. The broken condition of these bones has led some to suggest that the Neanderthal men were cannibals. But none of the bones were split lengthwise, as would have been done to extract the marrow; and there is no other evidence of cannibalism during the whole Old Stone period. These people lived here at the close of the Third Interglacial period, and perhaps during the Fourth Glacial period which followed. During this time the mammoth disappeared, and then the hippopotamus; the rhinoceros and the straight-tusked elephant lingered on for a time. The Neanderthal races slowly passed from the Acheulean industry into that called the Mousterian, which closed the Lower Paleolithic Age. This Fourth Glaciation is estimated as beginning 40,000 years ago, and ending some 20,000 years ago. When it is recalled that the whole Neolithic period, the Bronze Age, and then the Iron and Steel Ages, have only occupied part of the last 20,000 years, and that we have some written record of about half of this period, it becomes apparent how close in point of years the Neanderthal race is to us. Cold tundra animals from the north came in to replace the rhinoceros and the straight-tusked elephant, in the shape of the woolly rhinoceros and the woolly mammoth. Arctic trees and plants spread over Europe. This is the beginning of the reindeer period.

In Southern Britain, some unusually interesting remains have been found. At Crayford, near the mouth of the Thames, and along the Lea, have been found working floors of Mous-

terian culture, buried beneath four to five feet of sand and loam, and resting upon the surface of the older river-gravels. There are spots occupied by unabraded stone implements and flakes, which obviously lie today just as they were left by the Old Stone workmen. At one place there is evidence that the flint shaper squatted over his work, with his knees slightly apart; for the chips are thrown to right and left in small piles.

The discovery of the Neanderthaloid (Neanderthal-like) races has extended over about seventy years. There is no evidence of burial, it is well to remember, in the cases of the Trinil, the Heidelberg, and the Piltdown remains; the bones apparently were washed down by the river, and mingled with those of other mammals. It is possible that the bodies of the dead and of the aged were thrown out to the scavenger beasts and birds, as some African tribes do today. In the Krapina cavern there was no evidence of burial, but to the contrary there was slight evidence of cannibalism. As we get into the Mousterian period, all this has changed. The custom of burial, or the orderly laying out of the remains of the dead in the floors of protected caves, came in. The colder climate drove this race into the close quarters of caves and grottoes; perhaps this turned attention to dead bodies, and slowly led to forms of burial. This habit has afforded us a much fuller knowledge of the race and its industry than we were able to obtain of previous races.

The first discovery of a Neanderthaloid was

made in 1848. This was near Forbes Quarry, on the north face of the Rock of Gibraltar; the skull found here is called the Gibraltar skull. The brain is extremely small, even for this race, and the ridges above the orbits of the eyes are only slightly developed. It is regarded as a primitive type of this race, probably the skull of a female. A female, just as an infant, as pointed out in the masterly studies of Lester Ward, is less specialized and closer to the race stem than the adult male. In 1856 workmen clearing out a cave in the valley known as the Neanderthal, on the Dussel flowing between Elberfield and Dusseldorf, discovered some human bones, probably an entire skeleton. These were carelessly thrown aside; but a scientist rescued what he could, including the skullcap, both thigh bones, portions of the arm, bones of both sides, the right collar bone, and fragments of the pelvis, shoulder-blade, and ribs. All were well preserved, and are now in the museum of Bonn. For forty years scientists argued concerning these remains, with wild theories ranging to the classic hypothesis that each peculiarity in the skeleton was caused by some bone disease. But in 1901 Schwalbe's great work gave the skeleton supreme importance, as the type of the Neanderthal race. Since then, there have been more than twenty separate discoveries of remains of the race, in France, Moravia, Belgium, and on the Isle of Jersey. The worked stones accompanying them range from the early type found in Krapina, Croatia, which are late Acheulean or early Mousterian, through the whole Mous-

terian period, with half a dozen skeletons accompanied by tools of slightly later epochs. The two finely preserved skulls and skeletons found at Spy, Belgium, in 1887, and the numerous finds since 1908 in the Dordogne region, France, were preludes to the skeleton discovered the same year in a grotto near La Chapelle-aux-Saintes, nearby to Le Moustier, France, which gave its name to the Mousterian culture. This was the perfectly preserved skeleton of an individual between fifty and fifty-five years of age, which had been given ceremonial burial. The body was laid out in an east and west direction in a small natural depression. Even the bones of the face were in position; this gave the first opportunity to measure the actual size and proportions of the brain, with only slight possibility of error. In a Mousterian cavern on St. Brelade's Bay, on the Island of Jersey, thirteen human teeth were discovered, associated with the bones of the woolly rhinoceros, the reindeer, and two types of horse, as well as Mousterian hearths and stone implements of the same period. This long group of more than a score of discoveries, commencing in 1848 and multiplying recently, gives us a comparatively complete knowledge of the bony structure of the men, women, and children of the Neanderthal race. We are able to state positively the relative brain developments and heights of the sexes. We know that this race, and this race only, inhabited all of western Europe during the late Acheulean and the whole Mousterian period. From their custom of ceremonial burial we know that they

possessed a reverence for the dead, which may have been accompanied by some belief in an existence after death.

It is not difficult to distinguish the features of the Neanderthal race, which mark it off from previous and subsequent races of men. Most noticeable of all were the heavy, overhanging brows and the retreating forehead. Many recent races have a decided ridge over the eyes; but in recent races the outer edge of this ridge turns upward at the outer line of the eyebrows. In the Neanderthal men, to the contrary, this ridge surrounds the whole upper edge of the eye socket, extending around the outside borders of the forehead; this forms a regular roof over the eye sockets, which appear like two deep caverns. Certain living Australians exhibit this form of ridge, without other Neanderthal characteristics.

The face is an exceptionally high one. From upper jaw to the line of the eyes it is much longer than that of more recent man; this suggests the faces of the man-like apes. The jaw is less powerful than the Heidelberg jaw; but, like it, it is very thick and massive. The chin is receding; the Heidelberg man entirely lacked a chin. The teeth are more human than in the Piltdown or Dawn Man. The skull-cap is flat, the forehead retreats, the ridges above the eyes are prominent, the face is long, the cutting teeth are prominent, the chin recedes. There you have the face of the Neanderthal man.

Most of these characteristics may be found in certain specimens of the heads of living in-

ferior races; but all of them are never found in any living race. In many ways the Neanderthal race was closer to the man-like apes than to *Homo sapiens*, or thinking man. The brain capacity varied from 1,296 cubic centimeters, for the Gibraltar skull, to 1,723 c. cm. for the skull known as Spy II, found in Spy, Belgium. The left hemisphere of the brain is larger than the right, indicating that the race was right-handed. Like the man-like apes, the frontal portion of the brain is relatively smaller than in recent man. As far as height is concerned, the Neanderthals were distinctly a short race. They ranged from 5 feet 1 inch to 5 feet 5 inches for the male; the females were approximately 4 feet 10 inches.

The head was very large, in proportion to the body. The thigh is relatively long, the lower leg much shorter than in any existing human race. In this respect the Neanderthal man had a shorter shinbone, compared to the thigh, than even the man-like apes. This indicates that the Neanderthal men were clumsy and slow of foot. Similarly the forearm of the Neanderthals was very short, distinctly shorter than any of the man-like apes. This points to the fact that the immediate ancestors of the Neanderthals were ground dwellers, rather than tree dwellers. To sum up these characteristics, the head was large, compared to the body; the arm was short, compared to the leg; both forearm and lower leg were short, compared to upper arm and thighbone respectively. The chest and midbody were muscular and robust, the shoulders very broad.

The hand was extremely large, but the thumb was not as fully developed as in recent races. There is one invariable feature of the Neanderthals. The relation of the kneecap to the shinbone shows that this bone could not be straightened wholly, but was always bent slightly backward. This indicates too that the race squatted, instead of sitting. They could not stand wholly erect; they were a bent or squatting race.

The spinal column was short and thick-set; the back curved upward into the neck, more as in the chimpanzee than as in modern humans. This caused a habitual stooping of the Neanderthal man at the neck and shoulders, and prevented his ever holding his head erect. Legs that could not be wholly straightened out, a head permanently stooped forward—this squatting race would never appear quite human; it would bear resemblance to certain man-like apes.

The position of the Neanderthal race in the development of human culture and industry can be ascertained best from a table. It should be remembered that it is the testimony of the stone implements and weapons that determines the stage of culture.

The localities presenting evidence of the Mousterian culture, called Mousterian stations, are more than fifty in number, and are almost as many as the Acheulean stations. In England we find Kent's Hole, in Devonshire, where among the Mousterian flints were found teeth of the sabre-tooth tiger. There were three other stations on what was then the mainland

TABLE OF IMPLEMENT CULTURE

Years Ago	*Age*	*Culture*	*Race of Men*
2,500	Later Iron Age	Modern	Recent
3,000	Earlier Iron Age	Ancient	Recent
4,000	Bronze	Ancient	Recent
10,000	Neolithic (New or Polished Stone Age)		Recent
14,000	Upper Paleolithic (Old or Chipped Stone Age)	Azilian	Cro-Magnon, etc.
18,000		Magdalenean	Cro-Magnon, etc.
		Solutrean	Cro-Magnon, etc.
		Aurignacian	Cro-Magnon, etc. Grimaldi Race
40,000	Lower Paleolithic (Old or Chipped Stone Age)	Mousterian	Neanderthal
		Acheulean	Neanderthal
100,000		Chellean	
		Pre-Chellean	Piltdown Heidelberg
475,000	Eolithic		Trinil Ape-man

of England, one, on the Island of Jersey, yielding thirteen Neanderthal teeth. In the Dordogne region of France are eight sites; Spain, Italy, Switzerland, Germany, Austria, Moravia, and even Russia have remains indicating that the Neanderthal men of the Mousterian culture inhabited these scattered localities. At Dewlish, in Dorset, England, an artificial trench has been found which is supposed to have been a Neanderthal trap for elephants. Usually they could not kill such prey; but they undoubtedly consumed the wounded or dead bodies of the larger mammals, when they could find them. Part of the kill they ate where it fell; they brought back the big marrow bones to their caves, to crack at their leisure. These are almost the only mammalian bones found in the caves. In addition to these rare feasts on the forest monsters, the Neanderthal man's regular diet included the hare, the rabbit, and the rat—a fare supplemented by nuts, acorns, wild fruit and buds, roots, birds' eggs, young birds, honey from wild bees, snails and frogs, fish, mussels, seaweed, and even caterpillars.

Compared to previous cultures, Mousterian life was dense and crowded. It centered chiefly in caverns and grottoes, located near some convenient stream. Primitive man had as yet no pots or vessels to transport water. Fire was probably made by striking iron pyrites against flint, near dried leaves; chips of these two stones are often found together. The fire was probably banked when not needed; it was needed most at night, as a protection against wild beasts. The herding together must have

developed something of tribal tradition, and the germs of religious belief, as indicated in the ceremonial burials. There is, of course, little industrial progress or invention shown in the remains. The stone industry is quite distinct from the Acheulean, although evidently descended from it. The change from the free and open life of Chellean and early Acheulean times to the crowded grottoes and shelters of Mousterian times may have had a dwarfing effect upon the human beings and their industry. One characteristic of Mousterian flints is that they are often retouched on only one side, leaving the opposite side smooth, just as it had been rounded by natural forces, such as water. The Mousterian points and scrapers usually have this appearance. The Mousterians were the first to make widespread use of the flake, instead of the core of the flint; this led to the decline of the *coup de poing* or hand-stone, used in so many ways by the Acheuleans. When these hand-stones are found, the workmanship has degenerated. This implement has run its course as a human tool, in the same way that the great reptiles and prehistoric beasts had largely run their courses; only rude, small vestiges remained. The implement had its beginning in pre-Chellean times; it reached its maturity and perfection, and gradually fell into degeneration and final disuse. This occurred when it came into competition with another form of implement, based upon a different and superior plan; in the struggle for existence it gradually disappeared, because of the greater usefulness of the replacing type.

The use of the bone anvil came in during this stage of industry. Many small tools, chiefly made of flakes, were developed at the same time, most of these being retouched on one side only. The industrial implements are the degenerating hand-stones, the chopper, planing tool, drill or borer, six varieties of scraper —knife-edged, saw-edged, double-edged, etc.— the hand-point, and the hammer stone; the weapons of war and chase are the hand-point, the spear head, the hand-stone, throwing-stone, and knife. The planing tool is disappearing; the scraper is the tool most used. There are very few knives; the drill and the scraper have taken their places in industry.

There is no definite proof of the attachment of any of these stones to a shaft or handle; there are yet no barbed or headed points. This industry gradually blends into the first of the Upper Stone Age industries, the Aurignacian.

For many thousands of years these Neanderthal men dwelt throughout Europe. This long stay must have brought forth a distinct evolution from lower to higher types, and into numerous varieties. These variations we find in the skeletal remains, ranging from the primitive Gibraltar skull and Krapina bones to the skeleton Spy II, more like the modern races. The height remained fairly constant. As to what became of the race, authorities differ. Hrdlicka and others hold that they partly evolved into the lowest races of *Homo sapiens*, the thinking man, to which modern races belong; that they contributed to the Brunn and other races of the Upper Old Stone Age times,

and even to the higher race of the Cro-Magnons, which succeeded them. These scientists also hold that traces of Neanderthal blood and physiognomy are present in some modern Europeans. On the other side of the question stands H. F. Osborn, the distinguished American anthropologist, and a number of followers. These hold that the Neanderthals represent a side branch of the human race, which became wholly extinct in western Europe.

The evidence undoubtedly points to a sudden racial change, more abrupt than any other known, at the end of the Mousterian culture. Apparently the Neanderthals disappeared bodily, to be replaced everywhere by the Cro-Magnon race. From geological evidence, the date of this transition is usually placed at between 20,000 and 25,000 years before our era. No trace of the pure Neanderthals has been found in any of the Upper Old Stone Age burial places; nor is there definite proof that the Neanderthal influence appears in any later race. It may have been that, during the rigor of the Fourth Glacial Period, the Neanderthals were degenerating physically and industrially. In any event, toward the end of the Lower Old Stone Age a new race entered Europe, a race highly superior. Probably the new race competed for a time with the Neanderthals, before they drove them out of the country, or killed them in battle. The Neanderthals must have fought with wooden weapons and with the stone-headed dart and spear, but there is no evidence that they used the bow and arrow. There is a possibility that the newly arrived

Cro-Magnon race possessed this superior weapon; a barbed arrow or spear-head appears in drawings of a later stage of Cro-Magnon culture, the Magdalenean. In any case, the Neanderthals virtually disappeared.

We are guided here by the evidence of skeletal and stone remains, which in general are more trustworthy than early written records. Yet these remains depend upon human interpretation, which is liable to long error. Darwin thus attached no significance to the Neanderthal skull, considering that it could not have been *Pre-Homo sapiens* in part because of its large brain capacity. Written records are at least as deceptive. The ancient historical writings of the Hebrews state repeatedly that all of the primitive inhabitants of Canaan were wiped out: "Joshua left none remaining; he utterly destroyed all that breathed" (Joshua 10:40) sums up the story. The group of historical books commencing with Judges tells a different story: "And it came to pass, after the death of Joshua, that the children of Israel asked of Jehovah, saying, Who shall go up for us first against the Canaanites, to fight against them? And Jehovah said, Judah shall go up.... And Jehovah was with Judah, and he drove out the inhabitants of the hill-country; for he could not drive out the inhabitants of the valley, because they had chariots of iron." (Judges, 1:1, 2, 19.) This apparent contradiction is capable of simple explanation. In this case, there was no central organized government among the Canaanites, as far as can be ascertained; the

first kingdom was established some years after the conquest by the victorious Israelites. Accordingly, even members of the conquered race would desire to forget their kinship with the conquered, and claim membership with the conquerors; until the story became current that all of the first inhabitants had been destroyed.

This errancy of written records does not apply with equal force to the records of anthropological remains. At the same time, a caution must be observed. It is hardly conceivable that the lower race could be entirely destroyed; there would in all probability be some intermarriage, or some enslavement of the women at least of the Neanderthals, who would bring forth offspring mingling the racial streams. A wholesale destruction is only conceivable, if there were so much physical difference between the races that the conquerors could not bring themselves to mate with the vanquished. We know that the Neanderthals were a squatting race, whose heads were always stooped; there is evidence that they were an excessively hairy race. These factors would decrease the probability of widespread intermingling. Perhaps a dim racial remembrance of this bent, hairy race remains in the ogre of folk fairy tales. Some mating must have taken place; future excavations may bring to light intermediate types, future researches may find in living European veins some trace of this first race whose widespread occupancy of western Europe is shown by the enduring record of the stones.

CHAPTER V

THE GRIMALDI OR NEGROID RACE

The date of the ending of the Neanderthal race and the beginning of the Cro-Magnon supremacy is the first date that can be given with any confidence. Geologists are agreed that this, which corresponds roughly with the ending of the Fourth Glacial Period and the beginning of the present Postglacial time, took place about 25,000 years ago. This race came in with the Aurignacian culture. The early stations of this period are scattered along the north and south shores of the Mediterranean Sea, and are not found in eastern or central Europe. Apparently they came from Asia through the land of Phoenicia, part of them passing along the northern coast of Africa, including Tunis, into Spain; and perhaps part along the northern coast of the Mediterranean through Italy. Where they came from we cannot with any certainty state. It was probably from somewhere on the continent of Asia; for their physical structure is of the Asiatic type, and hardly at all of the African or Ethiopian type. The reason that we cannot speak with definiteness of Asia as their homeland, is that this continent has been only slightly explored for anthropological remains. At the present time several large expeditions are at work in Asia, especially in the backlands of Thibet north of the Himalayas; it is confidently be-

lieved that here, or in northern India, the central scattering point of the human race may be discovered, with the possibility of the discovery of remains of a race closely akin to the Trinil Man, the Ape-man of Java. Without this evidence, we can only indicate the probability that these Cro-Magnons came from Asia, and followed the trail later taken by the true Mediterranean race, dark-haired, long-headed, narrow-faced people, who followed this coast in early Neolithic years, or, again, like the wave of Arabian Moslem advance which pushed forward along the north coast of Africa into Spain and as far as mid-France, more than a thousand years ago.

An additional support to this theory of migration along the north coast of Africa is given by the presence of the skeletons of two members of an entirely distinct race, which were found in the Grotto of Grimaldi, near Mentone, France. These skeletons were found in 1906 by Vernau. They are called the negroids of Grimaldi, because they are the only Upper Old Stone Age race discovered in Europe resembling the African negroid race. Anatomically they are not closely related to either the Neanderthals or the Cro-Magnons. Their culture seems to have been Aurignacian, because their skeletal remains were found just above the layer which marked the close of Mousterian times. There are nine grottoes of Grimaldi, which yielded the remains of sixteen individuals, fourteen of which apparently belonged to the Cro-Magnon race, and two to the Grimaldi negroids. At this time, along this southerly

shore, the hippopotamus, the straight-tusked elephant, and the rhinoceros still roamed, as the last members of the great African-Asiatic animals. Vernau, the discoverer of the Grimaldi negroids, is inclined to regard them as of a very ancient race, much older than the Cro-Magnons. He believes that they belonged to a new racial type which formerly played an important role in Europe, and enjoyed wide geographic distribution. A professor in Cambridge has recently elaborated this theory, holding that the negroid race was the first human race to separate from the parent stock in Asia; that its members divided, part going south into Africa, and part more directly westward into Europe, where they scattered widely and blended into subsequent stocks. There is as yet small evidence for this enlarged theory. Osborn is one who holds that these two skeletons were probably true negroids who found their way into Europe from Africa, but never became fully established as a race in Europe.

Of the two skeletons found by Vernau, one is that of a middle-aged woman; the other that of a youth of sixteen or seventeen. Both clearly belong to the existing species of man, *Homo sapiens*. In the Grotto of the Infants, in which the bodies were found, there is at the bottom traces of Mousterian fire-hearths, probably used by Neanderthals; above that, the two Grimaldi negroids; above and in close proximity to these, various remains of the Cro-Magnon race. The Grimaldi negroids were not a tall race, averaging 5 feet 2 inches; this is

noticeably shorter than the Cro-Magnon women and youths. There are many negroid characteristics in the skull, the hip-girdle, and the proportions of the limbs. In common with the man-like apes, there are found the long forearm, the curved thigh-bone, and the marked projection of the teeth. The nose is broad and flat, the jaw heavy without much chin. Somewhat to the contrary implications is the fact that the head is long and disharmonic, as are the Cro-Magnon heads. By disharmonic is meant that, with a long head, the face is short and quite broad. The brain capacity is relatively high, being estimated at 1,580 c. cm. The forearm and thigh-bone resemble the man-like apes; the proportions of the leg are similar to the Cro-Magnons.

Upon the subject, Vernau writes: "The fact remains that at a very remote period of the Pleistocene there existed in Europe, beside the Neanderthal race, a type of man that in many of his cephalic (head) characters, in the structure of his pelvis, and in his limb proportions, showed striking analogies to the negro of today. In their remarkable proportions they exaggerate some of the peculiarities of the recent Negroes; their teeth resemble those of the Australian type. There is evidence of the establishment and spread of the Grimaldi race throughout western Europe, namely, in cases of partial reversion to this type among the skeletal remains of the Neolithic Age, the Bronze Age, and the early Iron Age in Brittany, Switzerland, and northern Italy. Extreme prognathism (projection of the face) is the characteristic that most frequently appears, and in some in-

stances there is the broad nose, with the same osteological peculiarities that mark the Grimaldi type. In every instance these individuals show dolichocephaly (long-headedness), nearly always combined with a short, broad face. Until the discovery of the Grimaldi type we were at a loss to explain the existence of these individuals among a population from which they differed so radically."

In view of the divergence of the authorities, it may be safer to conclude with Keith that the Grimaldi people represent an intermediate type in the evolution of the typical white and black races. The Grimaldi negroids constitute one of the great puzzles of anthropology. By the ratio of skeletons preserved to probable human beings existing, these two bodies indicate that a large number of negroids inhabited Europe at this period. Whether they were as widely spread and as influential as Vernau contends is problematical. Future excavations may throw further light upon them, even if it be only in a negative way.

CHAPTER VI

THE CRO-MAGNON RACE

The evidence of the rocks points rather definitely to a clash between the Cro-Magnons and the Neanderthals. There are places, such as the valley of the Somme, where early Aurignacian retouched stones, probably of Cro-Magnon working, appear below a layer of the latest Mousterian implements, typical of the Neanderthals. The same is true of other stations. This indicates that the Cro-Magnons held the station, temporarily abandoned it to the Neanderthals and then repossessed themselves of it.

A brief resume of the history of the stone implements will throw light upon the problem. Of industrial and domestic implements, the Pre-Chellean culture had the planing tool, scraper, borer, knife, and hammer stone. The Chellean added to these the *coup de poing*, or hand-stone, with its varied uses. The Acheulean brought this tool to perfection, and added the chopper; the Mousterian added nothing, but perfected the scraper. In the Upper Old Stone Age, chopper and hand-stone disappear; the anvil stone comes in, and disappears after the Azilian, while the others continue. The Solutrean adds the polisher, the Magdalenean supplements with the lamp and the mortar. This is the story in brief of the industrial implements.

Of weapons of war and the chase, the Pre-

Chellean begins only with the knife. The Chellean adds the hand-stone as a hand-axe and dagger; the Acheulean brings on the throwing-stone and the point; these are all appearing in the Lower Old Stone Age. In the Upper division, the hand-stone disappears, while the Aurignacian includes the lance or lance-knife, and the lance-head; the Magdalenean for the first time shows the arrow point. Only the arrow-point and the knife persist in the later stages of the Upper Old Stone Age.

No implements of art, sculpture, or engraving appear in the lower divisions of the Paleolithic. Beginning with the Aurignacian, the drill, the chisel, the etching tool, and the graver appear, and continue until the end of the Old Stone Age.

Bone implements are not found until the Mousterian, when we have the anvil and the awl. The Aurignacian brings in bone blades, javelin points, spear points, needles, smoothers, wedges, chisel, and the ceremonial staff; the Solutrean adds the dagger, fishhook, and harpoon; the Magdalenean has the spear-thrower, shuttle, pin and wand. These taper off at the end of the Paleolithic.

One of the chief sources of the change which swept over western Europe was in the increased brain power of the Cro-Magnons, especially in the development of the almost modern forehead and forebrain. Their brains were capable of ideas, of reasoning, of imagination; they were more highly endowed artistically than any uncivilized race which has ever been discovered. The Neanderthals, except in the slow develop-

ment of symmetry in their implements, seem to have lacked the artistic instinct entirely; the Cro-Magnon artistic capacity was nearly as great as that of the modern races. They were apparently capable of advanced education; had a developed aesthetic and religious sense; and were organized into highly specialized communities.

One interesting thing about the Europe of the Upper Old Stone Age is that there were at least five differing races in it at the same time. There were, first, the Grimaldi negroids; secondly, the Cro-Magnons, noted for their artistic ability; thirdly, the Brunn race, probably entering Europe directly from Asia through Hungary; fourthly, a long-headed race with a narrow face, perhaps forerunners of the Neolithic or polished stone invasion; fifthly, the Furfooz or Grenelle race, very broad-headed, entering Europe probably from central Asia, bringing the Azilian industry already developed. There may have been other races. All of this happened in the last 25,000 years.

During Aurignacian times, France was still connected with England by a broad land highway; the British Isles were united to each other. The Aurignacian life, which was chiefly Cro-Magnon, centered in grottoes or caverns. Throughout western Europe the climate was still dry and chilly; in the Postglacial period, now commencing, there were three Postglacial advances of the Alps ice-caps, although there was no great glacial period. In addition to the caverns, there were a few notorious open camps, such as the one at Solutre, the famous hunting

station for wild horse, which gave its name to the Solutrean culture. The remains of 100,000 skeletons of horses have been located here. These wild horses here and elsewhere were not bred and reared by men, as far as the evidence goes; they were hunted for food. It was the far East, not Europe, which discovered that the horse could be used as a beast of burden.

In 1823 the first Cro-Magnon skeleton was discovered, in the Paviland cave, in western Wales. The bones were stained red. This was long called the "Red Lady"; it is identified now as a Cro-Magnon male. In 1852, seventeen skeletons were discovered at Aurignac, in France; these gave the name to the culture. In 1868, in Cro-Magnon, in the Dordogne, France, portions of five skeletons were unearthed; these gave the name to the race. A number of subsequent discoveries have been made, including the fourteen skeletons in the Grimaldi grottoes. The race was exceptionally tall; the face was broad, the eye-orbits long and narrow; the skull was long and large, with marked brain capacity, indicating that here was a high racial type belonging to *Homo sapiens*. The head is disharmonic, that is, long and at the same time broad across the face. The upper part of the face is almost vertical, as in modern races. The men of this race varied from 5 feet 11 inches to 6 feet 4; the women were noticeably shorter. With an average male height well over six feet, it may well be said that "there were giants in those days." The shin-bones were long, indicating fleetness of foot. The flattened form of this bone indi-

cates that the men were used to squatting, while engaged in industrial occupations. The long leg and strong thigh bone are both typical of a hunting race. The shoulders were broad, the arms relatively short. The race, with a cranial capacity avering 1,800 c. cm., was one of the finest that the world has ever seen. The appearance of the face most resembles tribes living today north and south of the Himalayas. The characteristics were definitely Asiatic rather than African.

In 1909 O. Hauser discovered, in the shelter of Combe-Capelle, a skeleton which has been called the Aurignacian man. The height is only 5 feet 3 inches. In many characteristics it resembles the Cro-Magnon; and, until further evidence is adduced, it may be best included as a transition type of the Cro-Magnons.

The burial customs during the Aurignacian times were decidedly quaint. The use of color to paint the skeletons, as in the Paviland skeleton found in Wales, is characteristic. The Grimaldi infant skeletons are not colored, but are accompanied by a vast number of small perforated shells, evidently forming a sort of burial mantle. The female skeleton here was wrapped in a bed of unperforated shells; the legs were extended, the arms stretched beside the body. One of the large male skeletons had legs extended and arms folded, and was decorated with a crown of perforated shells. Another rested on its left side, with the limbs slightly flexed, the forearm folded, and the head decorated with a circle of perforated stones colored red. Other skeletons have been found

in a layer of red earth containing iron; two of these skeletons rest on the left side, the limbs extended or slightly flexed, and with shells in abundance surrounding the forehead, chest, and one limb. The ornaments, weapons, and, in some cases, food placed beside these bodies, indicated some sort of belief in survival of existence. The use of color points to its probable use as a decoration for the bodies while alive.

The Aurignacian marks the beginning of definite art. The art products of this and succeeding ages range from the primitive mammoth. painted in red ochre in the cavern of Pindal, showing only two limbs, to the exquisite tinted bisons on the ceiling of Altamira, Spain, representing a high stage of art, in which four colors were used. There were drawings in all stages of completion, and carved figurines in talc, limestone, and soapstone. Elaborate carvings were made on reindeer horn. Human skulls were shaped into drinking cups. There is a marked similarity between the human figures and primitive African art, which lends color to the theory that the Cro-Magnon people traveled along the north shore of Africa, bringing with them the Aurignacian industry, which may have been modified along the route by contact with African sources. Small carved figures similar to the Aurignacian, especially representations of the female form, are found in baked clay along the valley of the Nile. These figurines have in common the great development of the parts connected with maternity, and in some cases a headdress simi-

lar to early Egyptian art. There are many silhouettes of hands on the walls of these grottoes, of which a large number are mutilated in one or more fingers.

Above the Aurignacian culture came the Solutrean. In the west of Europe, during this period, were the Cro-Magnons; in the east, were the men of Brunn. In 1871 a skullcap was discovered at Brux, in Bohemia; in 1891 a skeleton, evidently belonging to the same race, was discovered at Brunn, in Moravia, deeply embedded. These are of a much lower type than the Cro-Magnons; but, differing sharply from the Neanderthals, are entitled to be regarded as members of *Homo sapiens*. The Predmost "mammoth hunters," remains of twenty of whom were excavated in 1880 in Moravia, also belong to this race. The Solutrean industry, carried on by both Brunn and Cro-Magnon men, brought to its highest development the art of chipping flints. The famous laurel-leaf points, thin and exquisitely shaped, are characteristic of this culture. This culture apparently came from the east, from Asia, just as the Aurignacian apparently entered Europe from the south, along the northern coast of Africa and the northern coast of the Mediterranean. In purely artistic work this period does not rank as high as the Aurignacian; the chief energy apparently went to the fashioning of flint weapons. At the same time, artistic advance can be discovered.

The Solutrean was succeeded by the Magdalenean period, the most fascinating of all the stages of the Old Stone Age. This period marks

the height of Paleolithic civilization; it marks the crest of the development of the Cro-Magnons, prior to their sudden decline and disappearance as the dominant type in western Europe. The men of this time are commonly known as the Magdaleneans, taking their name from the typical culture station of La Madeleine, France. The period probably reached from 16,000 B. C. onward. There are elaborately decorated javelin points of bone, fitted for attachment to a wooden shaft. The art of the period is the culmination of the art begun in the Aurignacian and continued through the Solutrean. We find numberless representations both of individual animals and of herds. Most frequently the subjects chosen were the bison, mammoth, wild horse, reindeer, wild cattle, deer, and rhinoceros; less often the ibex, wild boar, and wolf appear; there are hardly ever pictures of fishes or of plant life. We find the lion and the bear, but not the hyena, now disappearing from Europe. The elaborate carved wands, made of reindeer horn, point to a tribal organization. It is possible that the tribesmen were specialized into chieftains, priests, and medicine men, hunters, fishermen, flintworkers, hide-dressers, makers of clothing and footwear, makers of ornaments, engravers, sculptors in wood, bone, ivory, and stone, artists with color and brush, and numerous other pursuits. A strong sense of truth animated their artistic work, as well as a distinct feeling for beauty.

The human remains of the time are predominantly Cro-Magnon, of a modified type. The

height of the race has grown much less; this may have been due to the severe climatic conditions of the Postglacial Era. New features creep into the burial ceremony, such as the separation of the head from the body. Elaborate bone harpoons, at first barbed on one side only, later on both sides, have been found widespread. Flint blades with toothed edges, elaborate bone needles, are often located; but toward the end of the period, the workmanship of these degenerates. But no primitive art has touched the Magdalenean at its height. Herds are pictures, with detailed study of the first and last animal, and symbolic horns or heads for the remainder. There are elaborate frescoes, showing great processions of mammoths, bison, reindeer, and horse. The cavern of Altamira, in northern Spain, is in many ways the most remarkable of all the Magdalenean stations.

And then there was a sudden decline. We cannot with any certainty fix upon the cause; the psychic circle of growth, maturity, and decline, may have run its course. There is no distinct environmental alteration, which can be held responsible. The race did not disappear; it apparently broke up into many colonies, which can perhaps be traced through Neolithic and even recent times. The shape of the Cro-Magnon head, long and with a broad face, the type known as disharmonic, is still found in the region around Dordogne, France, today. These people are not degenerate in any particular; they are keen and alert. It is quite possible that these people of Dordogne today represent by far the oldest race living in west-

ern Europe; it is a significant fact that the oldest speech spoken in Europe, the Basque among the northern Pyrenees, is spoken near by, within two hundred miles. Authorities suggest a possible connection between the Basque language, different from all the other tongues of Europe, and the vanished language of the Cro-Magnons. Ripley suggests that it is not inconceivable that the ancestors of the Basques conquered the Cro-Manons dwelling there, and took over in whole or in part their ancient speech.

Among other localities where the skulls resemble the Cro-Magnon are certain portions of Thuringia, and the recently extinct race of Guanches of the Canary Islands. Such skulls have been discovered in northern Africa, among living Berbers. But the chief centers of modern heads resembling the Cro-Magnons are the Dordogne region, at Landes near the Garonne in southern France, at Lannion in Brittany, where a third of the population are of the Cro-Magnon type, and on the island of Oleron off the west coast of France. Perhaps the inhabitants of Trysil, on the Scandinavian peninsula, who show the same disharmonic features, are an offshoot of the Cro-Magnons.

It may be worth while to look for a moment at the vanished Guanches of the Canary Islands, who were conquered by Spain in the 15th Century. The average height was over six feet for the males, and less for the females. The heads had points of resemblance to the Cro-Magnons. The offensive weapons in warfare consisted of three stones, a club, and several

stone knives; the defensive weapon was a simple lance. They also used wooden swords with great skill. They lived in large, well-sheltered caverns, whose walls were always decorated. The ceilings were covered with red ochre, the sidewalls with various geometric designs in red, black, gray, and white. Hollowed-out stones served as lamps. Here is surely evidence of kinship to the vanished Cro-Magnons.

CHAPTER VII

END OF THE OLD STONE AGE

We have now reached the end of the Old Stone Age, a period some 9,000 or 12,000 years ago. Certain new races entered Europe, and played a part in the downfall of the tall artists. Two new races found their way along the Danube, as revealed by the burials at Ofnet, in eastern Bavaria. One of these is broad-headed and apparently from central Asia, the other long-headed and perhaps of Mediterranean origin. These races had a relatively high brain development. The first of these is called the Furfooz-Grenelle race; the second was probably a Mediterranean race, not related to the Brunn. This latter race, or still another Mediterranean race, also entered Europe from north Africa, into Spain; it is distinguished by conventionalized art. There may have been another race, perhaps ancestral to the Teutonic, coming along the shores of the Baltic. These races correspond to the Azilian culture, which closed the Paleolithic Age. Its art is marked by numerous flattened and painted pebbles, whose use is problematical, in spite of many ingenious theories; the flints are a degenerate type of Magdalenean stonework. There are as yet no polished stone implements. The ceremonial burial at Ofnet is one of the strange exhibits of this period.

Here was found a ceremonial burial of thirty-

three skulls of two distinct races, one short-headed, one long-headed, and neither related to the Cro-Magnons. Twenty-seven of these were embedded in ochre and arranged in a sort of nest, with the faces all looking westward. The inner skulls were crushed, as if the outer ones had been added from time to time. A yard away a nest of six more skulls was found, arranged in the same manner. The interment must have taken place just after death, for the lower jaws and some of the neck vertebrae were found with each skull. The heads had been severed from the necks by a sharp flint; its marks were visible on some of the vertebrae. These skulls were mainly of women and children; only four were adult males. Ingenious theories have been offered to explain this, ranging from cannibalism to captivity and blood sacrifice. But the presence of ornaments, and the novel arrangement of heads facing westward, indicate that these theories must be held in abeyance until further evidence is discovered.

This is the first burial in Europe (with the possible exception of Grimaldi) which presents two or more races.

The broad-headed race here is probably kin to the late Paleolithic race known as the Furfooz-Grenelle men. In 1867, in a cave near Furfooz, Belgium, sixteen skeletons were discovered. These were short-headed men. The Grenelle skulls, found near Paris, are probably Neolithic; but this is no reason for denying them kinship with the Furfooz race, whom they closely resemble. The bulk of the evidence

points to their migration from central Asia.

The narrow-headed Mediterranean race is another matter; they probably came from the south. At about the same time, the retreat of the northern icefield permitted a migration along the shores of the Baltic, which may have been the advance wave of the Teutonic peoples. They are known today only by their industries; no skeletons have as yet been discovered. Their art was entirely unconventionalized, and much cruder than the Cro-Magnon art. It is probably contemporaneous with the Azilian culture in the south.

The brain capacity of these various races may be compared in a table:

TABLE OF BRAIN CAPACITIES

	Brain Capacity c. cm.
Recent European (average)	1400-1500
Ofnet race (short-headed)	1400
Ofnet race (long-headed)	1500
Cro-Magnon (average)	1800
Grimaldi race (negroid)	1580
Brunn race	1350
Neanderthal race	1296-1723
Piltdown race	1400
Trinil race (Ape-man)	950
Apes (maximum)	600

There is no evidence for the migration routes of the earlier races—although their cultures point to a southerly entrance, in the cases of the Trinil, Piltdown, Heidelberg, and Neanderthal men. Industrial evidence points to the north African route as the path of the Cro-Mag-

nons; the Grimaldi negroids came from the same direction. The succeeding culture, the Solutrean, apparently came from the east, as did the Brunn race which followed. Toward the close of the Upper Old Stone Age we find another southerly or Mediterranean invasion; during the same period there is the Furfooz-Grenelle approach from the East, and perhaps the Baltic from the north.

Whether the Neolithic or polished stone workers suddenly appeared and overcame the chipped stone wielders, or whether these gradually filtered in, science cannot now with certainty answer. It is certain that the men using the polished stones appeared in France, then in the Swiss lake region, where they built their lake-dwellings on high piles driven into the lake-bed. Along with the disappearing chipped stone implements we find more and more made of polished stone. Agriculture began, together with implements for preparing the soil and harvesting the crops. Nomadic life began to be abandoned, in favor of more settled dwellings. Even more distinctive is the appearance of pottery, used first in the preparation and preservation of food. The art began over with crude naturalistic drawings. Man had entered upon another upward step in his slow progress from his lowly ancestry.

Thus we have seen the Old Stone Age in its entirety, its beginning, its height, and its decline. It has been read from the slow carving of vast natural forces, glaciers and seas, upon the ancient rocky skeleton of the earth; it has been deciphered from the scattered remains of

tree apes and ground apes, from ape-men, dawn men, and true men; it has been pieced together from the rude implements fashioned out of this same stone by these early workers. Man has as yet read hardly the first page of the great Record of the Rocks. The fascinating task of perusing the rest of the record is still before us.

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