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The beginnings of Filipino culture and society will never be fully known. For while human remains and artifacts, recovered from burial and habitation sites all over the Philippines, will reveal a part of what happened in the past, they cannot tell us the whole story. Nonetheless, archaeological activity has increased in the Philippines in recent years, and we now know much more than we did even five years ago.

One of the most important breakthroughs was the recovery of fossil human bones in Tabon Cave, Palawan, in 1962. This discovery had a twofold significance. First, it marked the beginning of a more systematic investigation of early man in the Philippines. For although the tools of Pleistocene man and the bones of animals he probably hunted had been recovered before, this was the first fossil human encountered in this country. Second, the recovery of this frontal bone and the artifacts tentatively associated with it was another significant event in man's search for traces of his origin in east and southeast Asia.

It is interesting to note that before the recovery of the African fossil hominids by Dart (1925), Broom (1949), and Leakey (1959), the area of east and southeast Asia was thought to be the "cradle of mankind." The present favoring of Africa as man's place of origin resulted from a series of

notable discoveries of fossilized creatures resembling modern man in some respects and differing from him in many others. For example, the size and shape of these creatures' teeth and the thickness of their skulls are ape-like, but their other bone structures are very close to those of modern man.

When we consider the widespread distribution of prehistoric men in various islands of southeast Asia in general, and in the Philippines in particular, the major question is this: By what means did these early men reach the places where their fossil remains are found today? If we are to answer this question satisfactorily, it is important to begin by considering at least in broad outline the geological history of the area. Second, since man generally acquires and develops skill and power to deal with his environment from his forebears in the course of time, it is equally important to consider, however briefly, the main steps in his emergence as a biological entity and as a tool-using and tool-making individual.

GEOLOGICAL FOUNDATION

When did man first appear on earth, and when did he arrive in southeast Asia? It is difficult to say, and it is even harder to be definite about the time at which we can safely call the ancient man-like creatures *man*. In 1654 Archbishop Ussher of Ireland said that the first man, as well as the universe in which he lived, was created at nine a.m. on October 26, 4004 B.C. The discovery of remains of extinct animals, of man-like creatures, and later of early men proved, however, that man appeared on earth somewhat earlier than Archbishop Ussher suspected.

Pre-Tertiary times. From geological and paleontological studies, we know that living things appeared on earth as many as 1,500 million years ago, during the era known in geology as the *Archeozoic*, the era when primitive forms of life became recognizable. This era was followed by the *Protozoic*, when early life-forms abounded. The Protozoic is estimated to have extended from 925 to 505 million years ago.

The era from which we have many fossil evidences of plant and animal life is the *Paleozoic*, the time when fish, amphibians, and other marine vertebrates appeared, from about 505 to 205 million years ago. The Paleozoic was followed by the *Mesozoic*, which witnessed the predominance of huge reptiles. Popularly, this era is known as the Age of Reptiles, and it extended from 205 to 75 million years ago. Our most important material on the evolution of man and his culture is found in the *Cenozoic* era, or the age of more advanced forms of animals, about 75 to one million years ago. The Cenozoic is divided into two major periods: the Tertiary, or the Age of Mammals, and the Quaternary, or the time when modern forms of man appeared on earth.

The Tertiary. Two major events occurred during the Tertiary. First, the earth's surface underwent tremendous changes, known to geologists as *land uplift.* Second, mammals came to dominate the world. Before the Tertiary uplift most of such Asiatic higher areas as the Iranian plateau, Turkestan, India, and Tibet were submerged under a sea, known geologically as the Tethys Sea. When the great uplift occurred as a result of volcanic eruptions and faulting due to erosion, this ancient sea receded and shrank into what is now the Mediterranean. The scope of this movement of land in Asia is well-documented by the Eocene sediments of the Tethys Sea found about 20,000 feet above sea level in Tibet (Fairservis 1959:15).

One can form a good mental image of the world-wide elevation of land that resulted from this massive uplift by recalling the heights of the Alps, the Rockies, the Andes, and the Everest mountain ranges. According to geologists all were formed during the Tertiary (cf. James 1943; Krauskopf 1959).

The baseline for any discussion of our little knowledge of the appearance of life-forms in the Philippines must be drawn in the early Tertiary, at the beginning of the lower Eocene (Dickerson *et al.* 1928:49) about 60 million years ago. Our information on Philippine geological history before this time is scant. In fact, from the Eocene up to the Pleisto-

cene, our understanding of what happened here geologically is fragmentary, inferential, and vague.

Dickerson and associates (1928:78) advanced the idea that the Philippines was connected with Formosa during the early part of the Tertiary. This is evidenced by the deposition of Tertiary sediments in Baguio, the Cagayan Valley, Leyte, Panay, Bondoc Peninsula, and Mindanao. The presence of some plants and animals with continental (Himalayan) affinities in northern Luzon (Dickerson *et al.* 1928:169; Dickerson 1924:12ff) and their absence in the southern Philippines and other areas strongly suggest this northern connection of the Philippines with the Asian mainland. Formosa was severed from the Philippines during the Miocene period which ended about 12 million years ago.

Small islands and narrow strips of land-mass started to appear during the Miocene period. Land above the sea at this time included eastern Davao, Samar, Leyte, the eastern coast of Luzon (starting from the Bondoc Peninsula), the Sulu archipelago in the south, and portions of western Zamboanga. Western Panay, Tablas, and Masbate were narrow strips of coral reef, as were eastern Zambales and part of the Lingayen area and of the northern Ilocos coast.

Although the Philippines was separated from Formosa about this time, its southern connection with the mainland remained. It was during this period that plants and animals from regions south of the archipelago started to enter the country through the high mountain passages. But this was not a unidirectional movement. Dickerson and associates are of the opinion (1928:283) that some of the unique animals now present in northern Luzon also moved southward and entered Celebes during this period. Through the eastern high mountain-ranges connecting Mindanao with Celebes and possibly with New Guinea, tropical Australian flora, identified by Merrill (Dickerson *et al.* 1928:301ff.), entered Mindanao. On the western side, through the Sulu connection, Malaysian forest trees and some mammalian species moved into the area and spread. Further changes in the geographical arrangement of the Philippines and its neighboring areas occurred during the Pliocene, beginning about 12 million years ago.

The geological processes which brought about changes on the surface of the earth and facilitated variation and spread of animals and plants were not sudden occurrences. Thousands of years were required for a landscape to be notably changed, and for the differentiation of animals from their original progenitors. When we speak of such events as the elevation and erosion of mountains, the rise and fall of oceans and continents, and the fluctuation of life zones, we should remember the quality and magnitude of these events.

THE PLEISTOCENE PERIOD

The era following the Tertiary is the *Quaternary*. It is divided into the Pleistocene and the Holocene periods. It was during the Pleistocene that man appeared and his culture began. This is one reason why the Pleistocene is considered extremely significant to students of geology and human evolution, despite its relatively short duration of about one million years.

The Pleistocene is commonly known as the Ice Age. This term is misleading if it evokes a picture of a continuous blanket of ice covering the whole world and enduring throughout the Pleistocene. This was not the case. There were periods when the land was free of ice. Even during the height of a glacial stage, although life zones were compressed, limited vegetational areas remained and land never totally disappeared.

Origins of the Ice Age. There are a number of theories which attempt to account for the emergence of the Ice Age. One of these ascribes it to changes in the orbital position of the earth, variations of sunspots, and the wavering of the earth's axis. The currently favored explanation is one that is known as the *cyclic theory*. This theory may be explained in the following way.

It is well known among mountain climbers that the higher one climbs, the colder the temperature becomes. Considering, then, the elevation of land after the great Tertiary uplift, it is plausible that it was the inland elevation which trig-

gered the coming of the Ice Age. But this is only one factor in the whole process. The other important factor contributing to the occurrence of the Ice Age is that of climate.

Students of elementary geology know that climate depends upon three factors: the temperature of the area, the direction of the winds, and the availability of moisture. Now when there are cool land masses and warm oceans, evaporation over the ocean increases as a result of the temperature differential. As rain clouds move from ocean areas into the land, they precipitate their moisture. Because of the low land temperature (due to the elevation of land during the Pleistocene), this precipitation fell not as rain but as snow, thus augmenting the general coolness of the area and the accumulation of snow and ice. Glaciers were formed. As these were fed by the moisture increase and sustained by the lowering of temperatures, they became heavy and started to spread to lower areas. Melting occurred as these masses of ice and snow reached lower altitudes. The melt cooled the rivers, which in turn poured their cool contents into the oceans. In polar regions the oceans cooled rapidly, and as ice blocks were formed sea water became frigid. Evaporation and precipitation caused dense clouds to appear over both the sea and the land, thus effectively reducing the heat from the sun. Mountain glaciers became ice sheets and moved down into much lower areas, and as the water of the world became bound up in snow and ice, sea level dropped considerably. Continental shelves became exposed; land bridges were formed. Thus we had the Ice Age. In Asia, the Sunda Shelf and the Bering Sea became land bridges of considerable importance.

At the height of each glacial stage, the cooling of the oceans again reduced the amount of evaporation. As the precipitation of moisture decreased, the glaciers which depended upon it for growth and existence began to diminish. This set the climatic pendulum swinging the other way. Because the amount of evaporation was low, clouds also disappeared over the surface of the land, and allowed the penetration of more solar heat. The melt from the inland glaciers warmed the rivers which in turn poured their warm contents into the sea.

As the sea ice melted, the volume of water increased, and as the sea level became higher, temperatures rose. The glaciers began to recede. The snow line moved upward to higher altitudes and the polar front retreated farther north and south. An interglacial stage emerged. The sea was once more wide and warm, and the climate everywhere became temperate or tropical (James 1943; Krauskopf 1959).

Effects of Pleistocene climate on the Philippines. The withdrawals and restorals of water resulting from widespread glaciation and deglaciation in the temperate zones caused the uniting and separating of island masses. In the Philippines, Mindanao was divided into five major islands during the Pleistocene period: Surigao in the east, Agusan in the east-central area, Lanao in the central region, Cotabato in the south, and Zamboanga in the west. This division is inferred from the distribution of Pleistocene coralline limestones in various places in Mindanao (Dickerson, quoting Moody, 1928:85-87). Leyte and Samar were composed of a series of small islands; Bohol was covered by shallow water, and Cebu was a string of coralline-topped islets which later united to form the present island. Panay, Negros, Tablas, and Ticao were connected. Palawan was connected with Borneo and together with the Calamianes formed a unit with a dominantly Bornean flora and fauna. Mindoro was separated from Palawan during the latter part of the Pleistocene and before Palawan became separated from Borneo.

Luzon was also divided into several islands. Bondoc Peninsula was an island separated from the Camarines provinces by a channel which joined Lamon Bay and the Sibuyan Sea. Most of Albay and Sorsogon were under water. Part of Batangas, notably Malbrigo Point, was above the sea. A body of water existed between Lingayen Gulf and Manila. Through the double process of uplifting and filling during the late Pleistocene, Zambales was joined with Luzon. Abra was attached to Ilocos Norte. The Baguio area, which was elevated during this time, was joined to other eastern islands which consisted of the Sierra Madre ranges. Cagayan Valley was still under the sea and became filled with sediments only

later. The Batanes group was also connected with Luzon but was later separated during more recent volcanic eruptions.

The climatic changes which accompanied the Pleistocene period had a profound effect on the adjustment and survival of both plants and animals. Some animals, such as the woolly rhinoceros and the mammoth, retreated and advanced along with their habitats. Others unable to move or to adjust to their new environment died off.

The most interesting mammalian form affected by the fluctuation of Pleistocene climate was man. As we said earlier, it is in the Pleistocene that we first encounter the so-called true types of man. Most scientists believe that man first appeared in Africa, but he is also very ancient in east and southeast Asia.

FOSSIL EVIDENCE OF THE EVOLUTION OF MAN

Before we consider how man was distributed in east and southeast Asia in response to climatic changes, we should note in passing the relationship of man to other mammalian forms. The mammals, we noted earlier, became dominant during the Tertiary period.

Man's place in nature. The class mammalia has been divided into three so-called infra-classes. The first includes the *monotremes*, animals which lay eggs, hatch them, and then nurse their young. The second includes those which give birth to their young alive, and then carry them for a time inside a pocket located on the belly of the mother. These are the *marsupials*, among which the kangaroo of Australia is the best known. The third includes those mammals whose young are nourished prenatally through a placenta. They are called *eutherian*, or placental, mammals. Examples are the horse, carabao, cat, dog, monkey, ape, and man.

The eutherian mammals which resemble man most closely are the monkeys and apes. However, the fact that monkeys, apes, and man have been placed in one order—the Primate Order—does not imply that one evolved from the other. Man

did not descend from monkeys or apes. Man has so much in common with large apes that they must have shared a common ancestry, but it is erroneous to think that one descended from the other.

Man belongs to a group of large primates—the *anthropoidea*—along with the gorilla, the orangutan, and the chimpanzee. The gorilla, the orangutan, and the chimpanzee belong to the family *Pongidae* while man belongs to the family *Hominidae*, but both of these families are of the Primate Order. The family Hominidae, which is our particular concern here, is further divided into subfamilies called *Australopithecinae* and *Homininae*. Man belongs to the Homininae group, genus *Homo*, species *sapiens*.

The Australopithecines. The earliest known fossil creatures identified as definitely man-like in form are the Australopithecines of South Africa. In 1924 some laborers working in a limestone deposit in Taungs, South Africa, recovered a skull which they thought to be that of a small man. They took the discovery to Prof. Raymond Dart at the University of Witwatersrand at Johannesburg. In 1925 Dart published his study of the specimen, which he named *Australopithecus* (the "southern ape"). Although other scientists did not readily accept Dart's conclusions, they agreed that the specimen had many man-like features. Several more skulls, teeth, and jaw fragments of the Australopithecine form have been recovered since that time, along with limb bones and hip bones. Careful analysis of these remains indicates that these were man-like creatures indeed, who walked erect.

In 1959, Dr. L. S. Leakey and his wife found in East Africa a somewhat similar skull which they named *Zinjanthropus boisei*. This man-like creature has a cranial capacity (that is, a brain size) of about 600 cc., much bigger than that of the previous finds, though still about half the average human size. The teeth of Zinjanthropus are large, like those of modern man, but the molars resemble those of the orangutan more closely than those of man. Whether the Australopithecines should be considered man or not remains undecided.

Java and Peking man. Much closer in appearance to modern man—though still much removed from him—are Java man and Peking man. The first skull of Java man was recovered by Eugene Dubois in 1891 in the Trinil deposits of the Solo River in central Java. Technically, Java man became known as *Pithecanthropus erectus*, the "erect ape-man." The bone structure of this species occupies an intermediate position between that of modern man and that of the apes.

An examination of the reconstructed features of this Javanese fossil reveals the following characteristics: the bones of the skull are very thick; the forehead is receding, and the eyebrows are broad. The molars are almost invariably longer than they are broad, while modern human teeth have exactly the reverse proportion. There is an increase in size of the molars from front to back. There is also a space—known as the *simian gap*—between the first molar and the canine teeth in the upper jaw, suggesting that the canine teeth interlocked as in the great apes. The palate—or the roof of the mouth—is smooth, as in apes.

The brain size of Java man is midway between the great apes and modern man. The skull has a cranial capacity of 900 cc., smaller than modern man who averages 1,350 cc.; the brain size of modern apes ranges from 290 to 610 cc. The frontal lobe of the brain is much bigger than that of the apes but smaller than that of man. Further analysis of the brain suggests that Java man had the power of speech.

The thigh bones of Java man are longer, more delicate, and straighter than those of the apes, which are big, curved and short. Moreover, upright posture is indicated by the fact that the ridge (*linea aspera*) on the thigh bone is more prominent in Java man than in apes. The estimated age of Java man, inferred from the age of the geological deposits where the bones were found, is Middle and Lower Pleistocene. In absolute terms, Java man was present in the area about 250,000 years ago.

Beginning in 1927, important discoveries were made at Chou Kou Tien village, about 40 miles from Peking, China. Ultimately the remains of more than 40 individuals were brought to light, and they were quite similar to Java man. So close were the similarities, in fact, that Le Gros Clark (1955:103) and other physical anthropologists decided to abandon the earlier name (*Sinanthropus pekinensis*) in favor of *Pithecanthropus pekinensis*, so placing Java man and Peking man in the same genus.

Although Peking man shares a number of important characteristics with Java man, he also differs in many. For example, the skull of Peking man is more advanced than that of the Java man. Peking man's eyebrow ridges are not so heavy, the forehead is slightly higher, and the side-bones of the skull are more rounded. The foramen magnum (the hole through which the spinal cord passes to the brain) is slightly more forward, suggesting a more erect posture than that of the Java man. Cranial capacity ranges from 850 cc. to 1,300 cc. and the limb bones differ very little from those of modern man.

Solo and Wadjak man. Aside from Java man, the island of Java has also yielded fossil remains of more advanced types of man. In 1931 a number of skulls were found near the Solo river, at the village of Ngandong in central Java. Although the Solo finds are advanced enough to be classified with modern types of men, they show some skeletal characteristics reminiscent of earlier forms. For example, they possess large brow ridges, sloping foreheads, and thick skulls. On the other hand, they have a cranial capacity of about 1,150 cc. to 1,300 cc. and limb bones which do not differ from those of modern men.

The other advanced form found in Java is known as Wadjak man. Two skulls of this type were discovered by Eugene Dubois in 1891 but were not reported until 1920. Structurally, Wadjak man is much more advanced than Solo man. The skulls of these individuals are small and resemble the skulls of the modern Australian aborigines. The cranial capacity, however, is 1,550 cc. for Wadjak I and 1,650 for

Wadjak II. The browridges of Wadjak man are somewhat larger than those of the Australian aborigines. They have a weakly developed chin, a more developed forehead, and facial features characterized by depressed nasal root, small and flat nasal bridge, and marked alveolar prognathism (Beals and Hoijer 1965:123).

Keilor and Talgai. In Keilor, a small village northwest of Melbourne, Australia, the skull of an individual similar to Wadjak was recovered in 1940. Keilor man has a cranial capacity of 1,593 cc. Authorities have said that Keilor man represents the type of people who moved out of Java during the period corresponding to the early postglacial of Europe.

Another skull, dating from about the same period and known as Talgai man, was recovered in a site 80 miles from Brisbane. The specimen had been badly broken up except for the fairly well preserved face, and because of the bad state of the skull, exact measurements could not be made. Authorities are not agreed that Talgai man is ancestral to modern Australian aborigines (Beals and Hoijer 165:124; Brothwell 1960:336-341).

Niah Cave. In 1958 skull fragments of a more advanced form of hominid were recovered at a depth of 106-110 inches in the Niah Cave, Sarawak, Borneo. By Carbon-14 dating, the age is given as 40,000 years. A tentative reconstruction and analysis of this Niah specimen indicates that it represents a person of late immaturity and unknown sex. It has a receding forehead, shallow palate, rounded skull side bones, and a fairly deep nasal root. Statistical comparisons of skeletal measurements of the Niah man with modern Asiatic types indicate that the Tasmanian and Australian groups are closest to the Niah skull, followed by Javanese and Borneo groups (Brothwell 1960:339). D. R. Brothwell, who made the laboratory analysis of the Niah specimen, is of the opinion that Niah man and other southeast Asian fossils did not belong to the same population. He states (1960:340):

> The most reasonable supposition would appear to be that within the final Palaeolithic phase of man, there was considerable variability

of physical type in South-East Asia with robust and more lightly constructed skull types present.

The first Filipino. The discovery of the Tabon skull fragment in Palawan in 1962 provided the latest fossil evidence for the wide distribution of prehistoric men in southeast Asia during the Pleistocene period. By Carbon-14 techniques apparently associated carbon remains are dated at about 22,000 years. Until detailed laboratory analysis of the fragment and other associated materials is complete, no definite morphological description is in order. An impressionistic statement, to be considered highly unauthoritative and tentative, can be made to the effect that the Palawan man is *Homo sapiens,* similar to the forms from Talgai and Niah. The recovered frontal bone shows somewhat prominent eyebrow ridges and a slightly sloping forehead.

TOOL TRADITIONS OF THE PLEISTOCENE

Aside from biological differencies, another criterion on which we base our separation of ancient ape-like men from true apes is the presence of associated cultural materials. Some authorities (Washburn 1960:63; Clark 1961:26; Oakley 1959:20ff; Childe 1956:24ff) believe that it was the use of the tools by prehuman primates which led to the appearance of modern man. They argue that as a result of climatic fluctuations during the Pleistocene period certain forested areas began to thin out, and in order to survive, animals needed "to cross open country between one area of woodland and another" (Clark 1961:26); this gave rise to bipedal locomotion, which freed the hands for tool using and ultimately for tool making.

These activities stimulated the growth of the brain, and caused a corresponding modification of the skull structure. Moreover, successful adaptation to a new environment introduced a new way of life which resulted in changes in parts of the body, notably the teeth and bone structures. The use of the canine teeth for protection and of the large incisors for seizing and pulling food was made unnecessary by tools. In the course of time, perhaps thousands of years, these teeth

became smaller and smaller owing to disuse—an anatomical drift brought about by the selection process. The consequence of these changes was "a shortening in the jaws, reduction in the ridges of bone over the eyes and a decrease in the shelf of bone in the neck area" (Washburn 1960:69).

Comparative review of tool traditions. The earliest tools used by prehuman primates were broken pebbles, usually river stones. Many of these implements do not look like tools, but because they are found in concentrations along with a few shaped ones, and in places far from their source, they are labeled tools. A good example of these unworked pebbles found in concentration is the collection discovered by Dr. and Mrs. Leakey in Tanganyika, Africa. The site is very far from the river, and the materials, though unworked, had to be carried from gravel beds some miles away. Other African sites have yielded a similar kind of tool. In Sterkfontein, Swartkrans, and Kromdrai, chipped pebbles were found associated with bones of animals; in Olduvai, these tools were recovered in direct association with bones of man-like primates (Australopithecines).

Whether Java man was a tool maker is still an open question. So far no associated tools have been recovered, but tools have been found at a geological level slightly later than Java man, across the island at Patjitan. The oldest artifacts in Asia are probably the chopping tools recovered in Chou Kou Tien. These tools, made by alternate flaking on chert pebbles, were found very near the fireplace and in association with bones of Peking man and those of the animals which he might have hunted for food. Judging from these artifactual associations, Peking man was an eater of animal flesh and knew the use of fire. In fact the manner in which some of the long bones and skulls of his kind were split and opened indicates that Peking man was a cannibal who favored human brain and bone marrow.

In Europe the earliest unquestioned tool tradition is the hand ax (or core-biface), called the Abbevillian. This tradition flourished during the first interglacial period of the Lower Pleistocene. The second interglacial period saw the develop-

ment of new tool industries, and by the third interglacial, which is about the middle of the Pleistocene, flake tools known as Mousterian had appeared. During this time there developed a new technique of flaking, in which carefully controlled retouching was done by removal of small secondary flakes. It was during this same period that great innovations occurred in the area—such as the use of caves for shelter, the use of bones for tools, extensive use of fire, and intentional burial of the dead. The flake-tool industry was later superseded by the blade-tool industry. The historical development of this industry is represented by such well known blade-tool types as the Chatelperronian and Aurignacian, which appear to have continued in use for about 70 thousand years; the Gravettian, which lasted about 20 thousand years; the Solutrian, which dates from 67 to about 55 thousand years ago; and the Magdalenian, which lasted about 50 thousand years.

In Africa, stone-tool industries are characterized by a number of assemblages which range from purely local developments to those bearing imprints of European influence. In North Africa, crudely worked pebbles, representing the Lower Pleistocene complex (Villafranchian), were recovered in association with bones of extinct animals. Throughout Tunisia, Algeria, Morocco, and the Sahara region, hand axes of both the Abbevillian and Acheulian types have been recovered. In Egypt, an African version of the English Clactonian, or flake-type, tool was encountered. In the Nile Valley, a local tool tradition has been found which developed during the latter part of the Lower Pleistocene period and is known as the Sebilian complex.

In East Africa, the oldest implements were the poorly worked pebble tools found in association with the Australopithecine. Leakey calls this the Kafuan culture complex; it is widespread in Kenya, Uganda, and Tanganyika. Consisting of simple pebbles, roughly chipped to an edge on one side, this culture developed into the biface core implements known as the Oldowan culture. In Uganda, further developments occurred. Common among these local developments were flake tools similar to the Levalloisian type of Europe. In South

Africa, the lower Pleistocene culture is represented by tool types of the Kafuan pebble-tool complex. This developed into a rough hand ax type, the Stellenbosch. Following close on the Stellenbosch are the Fauresmith assemblages, characterized by finer hand axes and flakes typical of the European Levalloisian form. Another South African tool tradition is represented by scrapers made from indurated shale: the Smithfield of the Orange Free State, and the Transvaal. Next in line, representing the latest of the African stone-age groups is the Wilton culture, characterized by microlithic projectiles and scrapers.

As we move over to Asia, we encounter sites in India which have yielded crudely worked chopper tools similar to those in Europe and Africa, and others like those found in such neighboring countries as Burma, China, and Java. From these choppers developed hand axes of the Abbevillian and Acheulian types, associated with flakes and cores. This development in India is known as the Soanian culture.

Except for the tools encountered in the Chou Kou Tien sites, our knowledge of the Pleistocene tool tradition in China is poor. The Lower Paleolithic artifacts made by Peking man or his descendants belong to the same basic type of chopper as the Soan of India and the Anyathian of Burma. The Anyathian culture is represented by tools recovered in the Irrawaddy Valley of Upper Burma. This site yielded no hand adzes, which led Hallam Movius (1944) to propose a new Lower Paleolithic culture, the chopper/chopping-tool complex. The tools are mostly single-edged core implements and large, crude flakes, made from fossilized wood and silicified tuff.

During World War II, H. R. Van Heekeren found tools of paleolithic type in Bhan-Kao village, Thailand (Movius 1948:404-6). These core tools were made from river pebbles and shaped into choppers by unifacial flaking along the upper surface of either one edge or two adjacent edges. In all cases the central portion was unworked and flat, and showed the original rolled and patinated crust of the pebble. In the Fingnoi valley in the same area, a variety of materials—quartzite, sandstones, and claystones—were employed by the prehistoric Thailanders to manufacture their stone implements.

In Indo-China, in Tam Hang, Haut-Laos area, stone implements have been recovered, but they are of doubtful nature and so far unclassified. In Malaya, H. D. Collings of the Raffles Museum, Singapore, discovered a site on the western side of the Perak River valley, south of Lenggong, which yielded a considerable number of Lower Paleolithic artifacts. The implements were found *in situ* in a river bed, presumably a terrace deposit, about 250 feet above sea level. Collings named this culture complex the Tampanian. The materials used for making these implements—which include choppers, chopping tools, proto-hand axes, and hand axes—are quartzite pebbles, like the Soan, Anyathian, Patjitanian, and Chou Kou Tienian (Movius 1944).

Many of the implements found in Java are large, massive, crudely worked cores. They represent the Lower Paleolithic complex of Java, known as the Patjitanian culture. Few of these core implements show signs of having been retouched. The worked edges are often irregular, owing to the removal of comparatively large secondary flakes. The large and medium-sized tools show coarse flaking. While the predominant color is brown, a dark-gray color is present on a few specimens, rare on those made of silicified tuffs.

Philippine Pleistocene tools. In the Philippines, the earliest surviving tools of ancient man consist of big, crudely worked choppers. The materials used for making these implements were flint, quartz, and chalcedony. In spite of their typological similarity to some dated tools found in Indonesia and neighboring countries, the Philippine tools have not been dated with certainty.

First, most of the tools were surface finds brought to Manila by ditch diggers, farmers, and mining prospectors. Only rarely was controlled excavation of any kind made or any steps taken to do *in situ* analysis of the geological-artifactual association. Second, the archeological work carried out in the Rizal, Bulacan, and Batangas areas was almost entirely exploration and survey work, in which different sites were examined with almost no systematic digging. Surface finds were gath-

ered, and around them was built a reconstruction of Filipino prehistory and culture.

The most significant contemporary archeological work bearing on early man in the Philippines is that being carried on in Palawan by the National Museum team, headed by Robert B. Fox and Alfredo Evangelista. Because work is still in progress, interpretation of material relative to Filipino prehistory is not in order. The most that can be offered at the moment are some tentative remarks on the characteristics and chronology of the cultural materials recovered. Unless otherwise stated, this description refers to materials recovered in Tabon and neighboring caves, all in Palawan.

The earliest materials in Palawan consist of flake tools made of chert, a local material extremely common in river beds. There are few choppers made of igneous rocks and very few pebble tools. Most of these finds were associated with bones of birds, bats, and small animals. Radiocarbon-14 analyses of associated materials indicate that the flake tool industry in Tabon Cave dates as early as 21-22 thousand years ago. This industry is found near the mouth of the cave in a hard, undisturbed brown soil. On both sides of the cave, as well as in the middle, the same tool complexes were found. Correlation of these distributions and Carbon-14 dates indicate that the cave was utilized by man for a long period of time.

In a stratigraphic layer in Duyong Cave, dated by radiocarbon techniques at 7,000 ± 250 years, a relatively recent period, brackish-water shells were recovered. This shows tentatively that during the period when the area was inhabited by the flake-tool-using people, the sea was very far away—as might be expected during the Pleistocene period, when the sea was at its lowest level. Although the bones of bats, birds, and other small animals may well represent the accumulated remains of the cave fauna, the formation of the area where the tools were found indicates that it would not have been inhabited by bats and swifts. It is more likely that these small bones represent the food remains of the cave's inhabitants.

Perhaps a few remarks on the method of manufacturing these early tools are appropriate. The implements recovered

at Tabon are similar to those encountered in paleolithic and mesolithic sites in both Europe and Asia. We are not inclined to believe, however, that the makers of these tools were descended from people who came here directly from Europe and Asia; rather we think that these tools were made in response to local needs. Under certain circumstances and given the same kind of available materials, people all over the world react to similar situations in more or less the same way.

The manner in which the tools were shaped indicates that the method employed was percussion flaking—striking a nodule or flake with another hard stone to knock pieces off. Most of the tools picked up in Rizal, Bulacan, and Batangas have one end left unflaked for the convenience of the hand in holding the implement. When firmly grasped, this crudely shaped tool could easily butcher large game, split wood, crush the skull of an enemy, or cut branches of trees.

In Tabon, there is no evidence of controlled secondary pressure flaking, although a preliminary study of the flake tools recovered there suggests that there were types broadly distinguished in terms of use, such as scrapers, cutting tools, and so forth. Although Carbon-14 dates have established a difference in age of more than 10,000 years between the earliest and the latest flake-tool industries, there appears to be no change in the basic technique of manufacture.

Following close on the flake-tool tradition were various tiny stone tools. They have been ascribed to a group of people said to have come by way of land bridges and to have entered the Philippines between 10,000 and 13,000 years ago. The implements of these postulated newcomers were small and made of sharp obsidian or volcanic glass (the only known source of this material is Mount Banahaw), flint, agate, and tektite glass. However, it is doubtful—in the absence of systematic excavation and sufficient evidence—that there really was such a group of people who entered the Philippines. Our only evidence is a few pieces of tools of different orientation from previous finds. At the National Museum we think that this small-tool tradition was a local development, which took place the same way that traditions of a similar type developed in Africa,

in response to the needs of the resident people and in accordance with the availability of materials. Most of the implements are crudely fashioned projectiles and round blades.

This microlithic tradition was followed by round, kidney-shaped tools, chipped on both sides to a rough edge. Specimens of this description have been identified with Hoabinian tools of Indo-China because of their striking similarities, and the period in which they appeared is known as the Mesolithic.

THE NEW STONE AGE

The appearance of new tool types in various parts of the Philippines during the period between 7,000 and 2,000 B.C (cf. Beyer 1947, 1948; Fox 1959) introduces another era in our culture history. Our early ancestors were required by the demands of precarious living in an uncertain frontier area to make new adjustments in order to survive. Through the process of continuously readjusting to the environment they developed a more competent technology. Contact, in later years, with other peoples from the neighboring areas gave impetus to their knowledge and skills in the manufacture of basic tools. More effective implements were soon fashioned in order to meet the challenge of the habitat more successfully. Instead of fracturing large stone nodules for tools, they finally developed a way of cutting the stones, usually river pebbles, to a desired shape. The implements were carefully ground, pecked, rubbed, and polished.

Introduction

Terminology. Early authorities on Filipino prehistory and culture called this period of flaked and polished stone implements the *Neolithic* period. The term Neolithic is derived from two Greek words meaning "new stone" and was applied by scholars to a cultural horizon in Europe characterized by the appearance of polished stone tools. However, later discoveries in Europe led scholars to change this view and to take the presence of farming as the major criterion of the Neolithic. Beals and Hoijer have succinctly stated (1965:304): "The reason for this shift is that farming permits an entirely new way of life whereas it makes little difference to a hunter wheth-

er his knives and arrow points are flaked or ground into shape." Moreover, it has now been established that in many European sites farming appeared earlier than polished stone tools (see Clark 1961:72-73, 81ff; Beals and Hoijer 1965:304).

In terms of associated cultural complexes, we doubt the applicability of "Neolithic" or any other such term to any particular cultural horizon in the Philippines. To quote Robert Braidwood (1959:86) of the University of Chicago, "these terms have the advantage of *sounding* very learned and the disadvantage of *being* very imprecise." There are great differences between the tool-making techniques and materials of Neolithic Europe and those of other parts of the world. This is due in part to differences in the stages of cultural development and to other ecological factors.

In this paper we shall use the term *New Stone Age* when referring to the so-called Neolithic period. *Age* refers to a space-time-cultural continuity characterized by the predominance of a particular technology. The use is highly tentative and is designed to meet our present convenience for lack of a more appropriate and precise term.

Importance of the New Stone Age. The New Stone Age is a tremendously important period in our culture history in that the development of our modern society had its immediate sources there. By learning the art of making better tools and of domesticating plants and animals, the early Filipinos were finally able to produce more than they needed for just themselves and their families. This acquisition of a surplus led to the first appearance of specialists—or semi-specialists—in the area. Evidence of this is the widespread distribution of local pottery wares throughout the Philippines during the later periods. While no dramatic developments comparable in magnitude to those which brought about the rise of city-states in the Middle East and Europe took place in the Philippines, the clustering of tool types and pottery wares along riverine and coastal areas suggests the existence of a more settled, self-sufficient economy. Of course, the early Filipinos supplemented agriculture with hunting and food-gathering.

The New Stone Age in the Philippines has been traditionally divided into three phases: the Early, the Middle, and

the Late New Stone Age, each having diagnostic tool types and associated material cultures.

Early New Stone Age

Tool types. The first known type of implements during the New Stone Age includes roughly flaked tools with ground blades or cutting edges. This type has been called the *Bacsonian*, a type-classification derived from the name of the place where this form was first recognized and identified, the Bacson Massif of Indo-China. Older scholars call these tools *protoneoliths* ("before the neoliths" or polished stone tools). They are found mostly in Bataan, Rizal, and Bulacan provinces. The body of this tool type is not polished.

A later type of implement dating from this period includes tools with oval cross-section, whose bodies and blades are ground and polished. The technique of grinding, however, was cruder than that used during the Late New Stone Age. Axes and adzes of oval form with pointed or blunt butts began to appear in the Philippines during the period between 6,000 and 7,000 years ago and persisted as the ideal type of tool for nearly two centuries.

Following the oval-shaped tools were the cylindrical "adze-chisel-gouge" type (Beyer 1948:25). The blade of the tool in this group was narrower than "the central diameter of the body of the implement itself" (*ibid.*). The peculiar gouges belonging to this type had spoon-shaped concave blades. As Beyer describes them (1948:25), "this type is undoubtedly produced by a pointing and rounding of the two ends of the implement before the spoon-shaped depression is ground out on the blade end—the butt being left usually in its original rounded and more-or-less pointed form."

In addition to the types of tools described above, another kind of stone implement appeared during this period. This type was represented by sharp-sided adzes. Again to quote Beyer (1948:26), this type "appears to be wholly absent on the southeast Asiatic mainland, and while it is sparsely known from the Philippines and Formosa it occurs here only in the lenticular form (with sharpened sides but with a blunt butt)."

Origins and associated culture. Older authorities believe that the people who used these early stone implements probably came from the Asian mainland and reached the Philippines by way of Indo-China, coming across the China Sea to Luzon. From there they moved to Formosa, Japan, and onward into nearby northeast Asia. Another route of this tool tradition, suggested by some scholars, originated in Manchuria and proceeded down to Japan, Formosa, and Luzon. The third movement was believed to have started from central China southward into Indo-China, then eastward into Luzon and Formosa, and northward into Korea, Japan, and Manchuria (cf. Beyer 1948:24; Heine-Gelden 1932:608 as quoted by Beyer).

Other technological developments which accompanied the appearance of stone implements during the Early New Stone Age cannot as yet be assessed with precision, owing largely to the fact that no habitation site belonging exclusively to this period has yet been excavated.

Beyer (1948:21) believes that no pottery was made in the Philippines during the Early New Stone Age. In part he bases this opinion on the assumption that living groups still carry on a post-paleolithic tradition, and on the fact that the Ilongot and Apayao, whom he believes (*ibid.*) to be "the most likely descendants of the Early Neolithic folk, so far as they may still survive here," do not make pottery. This assumption, we will see below, is a doubtful one. As for the fact, other anthropologists (Jones 1912; Fox 1947) who have made closer studies of Ilongot life maintain that the Ilongot do make pottery.

Middle New Stone Age

Tool types. Numerous types of tools appeared in the islands during the period from 4,000 to about 1,000 years ago. Included in this new assemblage were the true shouldered axe-adze type, the ridged-back types, and the tanged-butt tools —the form which has been identified by some scholars as ancestral to the Hawaiian and eastern Polynesian tool types. In Duyung Cave, Palawan, moreover, the National Museum team recovered in 1963 a large stone adze and four adzes made from the hinge of a giant clam, the *Tridacna gigas.* This indi-

cates that the manufacture of shell adzes was not after all an atoll development in the Pacific but was a part of Philippine technology as well. The Duyung cave has been dated by Carbon-14 at about 4,630 years before the present.

Toward the later part of this period, an early transitional type known as the Hoifung adze began to appear. Hoifung is the type site on the Asian mainland, near Hongkong. The similarity between the tools found in the Philippines and those recovered on the southern coast of China has led scholars to argue that the major stimuli for changes in the axe-adze forms in the Philippines came from the Hoifung-Hongkong area on the mainland. A number of axe-adze tool types, however, have been recovered here which do not occur elsewhere, an indication of local specialization rather than direct migration.

Origins and associated culture. Evidence provided by a comparative study of the tools in other areas of the Pacific strongly suggests that through a long period of time some peoples of the Pacific islands came from the Philippines. These movements however, can hardly be termed migration. In the words of Robert Suggs (1960:65):

> These were not large-scale one-way voyages moving quickly across large spans of oceans and skipping many island groups—few primitive migrations may be said truly to be of that type. Rather, the ancestors of Polynesians left the coast of Asia gradually over a period of several centuries in a large number of short movements, island hopping and "coasting," selecting the proper seasons for movement. Probably many voyagers returned to Asia only to depart again.

It was during the Middle New Stone Age that domestication of plants and animals intensified. Riverine and coastal settlements were now growing. Root-crops like gabi and yams were planted (Fox 1959:19).

Late New Stone Age

Tool types. During the period between 2,000 B.C. and 100 A.D., another recognizable tool type began to appear in many parts of the Philippines. The general characteristics of this new development may be summarized as follows: (1) the use of hard materials capable of being polished; (2) the use of new techniques of tool making, such as sawing and drilling;

and (3) the appearance of well-developed, beautifully polished, rectangular and trapezoidal tools, with completely flattened sides.

Alongside this development in stone tools, the use of "jade" and nephrite materials for both ornaments and tools was extensive, especially in the Batangas area. So far no local source of either jade or nephrite has been discovered in the Philippines. This led Beyer to suggest (1948:48) that these tools were brought by a people

> coming probably from South China or Indo-China, much addicted to the use of nephrite as the chief material for their stone artifacts. They either brought a large supply with them or found some local source for the materials not since rediscovered. As their supply gave out, or became scarce, they gradually shifted to the use of other stones—and began also to rework the surviving artifacts of the earlier Neolithic peoples, many of which were to be found in their locality.

On the basis of the coastal Chinese data, however, Robert Suggs suggests (1960:67) that Beyer's work should be revised somewhat and that the Middle and Late "Neolithic" might be combined. The rectangular adze, he says, can no longer be said to be a late feature in the Philippines, for it occurs in association with early cord-impressed pottery of the Yuan Shan culture of Formosa.

Pottery. Beyer (1948) found no evidence for the manufacture of any pottery in the Philippines even during the Late New Stone Age, at least not in the "Late Neolithic" of Batangas and Rizal provinces. His general conclusion is (1948:84-85) that pottery appears to have come "from a later cultural layer, and could not have been originally associated with the Late Neolithic material."

In 1956, in a series of excavations which Robert B. Fox and Alfredo Evangelista of the National Museum made in Bato (Sorsogon) and Cagraray (Albay) caves, there was revealed an assemblage of stone tools and stone beads with pottery. In effect, these discoveries proved that "the people who lived and buried their dead in Bato Caves made pottery and used stone tools and that they possessed no iron or other metals"

(Fox and Evangelista 1957:52). This corrects the earlier claim that pottery appeared for the first time during the Iron Age.

Also in Cagraray, a stone tool-jar burial complex was encountered which showed a different orientation from that discovered in the Batanes-Babuyan islands, heretofore assumed to be representative of an early jar-burial tradition in the Philippines brought in by the migrating Hakka people from the north. The difference in the provenience of the assemblage may be interpreted as a proof of stimulus diffusion, as opposed to a hypothesis of direct contact or "waves of migration."

Other cultural elements. The Late New Stone Age people were extremely competent tool-makers. Aside from bark-cloth beaters, tools made of jade, and other products, they also made a fine type of stone implement known as *stepped adzes.* The manufacture of these tools provides

> an example of the sawing technique, since the cutting out of the butt is initiated by a deeply sawn groove. This is quite different from the transitional type, in which the modification or partial "stepping" of the butt is the result of a gradual shaving or grinding away beginning first at the edges and gradually working towards the raised center in an irregular or curved line (Beyer 1948:95).

It is probable that agriculture started to become the primary source of livelihood during the Late New Stone Age, although it was still supplemented by hunting and fishing. The recovery of teeth and bones of domesticated pigs indicates that these were introduced at this time too. Dogs and other domesticated animals were also brought into the islands during this period. The first cultivation of upland rice and millet was contemporaneous with the introduction of domesticated animals. The absence however, of such great stone structures as are found at Mohenjo-Daro indicates that settlements of the Philippines never reached the city-state status in pre-Spanish times, but were organized in accordance with the mode of living which centered about fishing and shifting cultivation.

Although earlier writers (Keesing and Keesing 1934:51; Beyer 1948) have argued that the present-day compact settlements found among the peoples of the Mountain Province were

introduced into northern Luzon by migrations from eastern Asia during Late Neolithic times, it is doubtful that this was the case. First, there is no good evidence that during the period between 1500 and 500 B.C. there were large, compact communities in southeast Asia. Second, communities of this type were not possible before intensive cultivation of irrigated rice. Third, it was apparently not until the Han Dynasty, about 200 B.C. to 200 A.D., that there was expansion and migration into southeast Asia. Moreover, as Fred Eggan has pointed out (1954:330),

> small boatloads of migrants weren't likely to maintain large-scale community patterns in a new land under pioneer conditions. It is much more probable that the large compact community structures of the Mountain Province are a relatively late development related to populational increase in a region of limited resources in land and water.

CONCLUDING REMARKS

Thus far we have outlined features of the development of Filipino culture and society during prehistoric times. Much of our knowledge of this subject we owe to the pioneers of Philippine archaeology and anthropology. Yet in looking back on the historical reconstructions of these older scholars, it seems possible to discern three assumptions: *first*, that the different cultural complexes encountered in the Philippines were introduced ready-made into this country by groups of people migrating from the Asian mainland; *second*, that these migrating people constituted independent groups, each of whom had diagnostic racial and physical characteristics and arrived in the islands at specific time periods; *third*, that prehistoric tool traditions in the Philippines can be correlated with physical types and cultures of living groups (for example, the Negritos or pygmoid Filipinos are associated with tiny [microlithic] tools simply because they were pygmoid in physical type).

There were undoubtedly many groups of people that reached the Philippines during prehistoric times. It is doubtful, however, that the immigrants arrived in the periodic and deliberate fashion postulated. In like manner, there are no available definitive data to show that each "wave of migrants" constituted a culturally and racially homogeneous group.

In the past, archeological artifacts have been correlated with the sociocultural tradition of the living population in order to support the assumption that there was such a homogeneous people. However, the process is tenuous and the conclusions reached are somewhat overdrawn. In the first place, the correlation has been based on typological comparisons of insufficient archeological materials.

It is worth noting how meager were the extra-Philippine materials available to our early scholars in their attempts to establish a wider range of comparison and to indicate the origin of Filipino prehistoric cultures. To date only the Formosan sequence has been established by stratigraphic excavation. It is true that Finn's Hongkong collection, against which our scholars compared Philippine materials, was excavated, but the finds were taken from non-stratigraphic deposits, just as were almost all of the Rizal-Bulacan-Batangas archeological materials. Likewise, Maglioni's Hoifung collections, on which older authorities on Filipino prehistory based so many comparative studies, were made without any excavations at all.

The second point we wish to emphasize is that we now know it is unrealistic to assert that the characteristics of any migration would still be present and definable today after several thousands of years of racial and cultural development. A case in point may be the Apayao and the Cagayan Valley Ibanag, who, according to one authority, "form our outstanding Indonesian 'A' and 'B' groups—and are also generally considered the purest survivors of the original Neolithic peoples" (Beyer 1948:22).

Closer study of these cultural-linguistic groups shows a marked range of physical and cultural characteristics, the extremes of which differ greatly from the type description. Moreover, physical anthropological studies in Polynesia and in the United States have indicated that even in so short a period as 100 years, a group of people can differentiate considerably—both genotypically and phenotypically—from their parent racial stock. Good examples of this are the Dunker community studies in Pennsylvania and the repatriate Jews

from India. In fact, American anthropologists have discovered that after 100 years the American Negros have 20 per cent white blood in them—the end result of what geneticists call "gene flow" and "genetic drift" (cf. Roberts 1955; Glass 1955).

We now doubt the usefulness of the term migration because, as a working hypothesis, it does not allow for variant social and cultural development in response to local situations. Instead, it gives the impression that all culture traits were brought into the Philippines ready-made, which is unlikely. Philippine prehistory is far too complex to be explained by waves of migration.

In view of the growing evidence recovered each year by the anthropologists of the National Museum and other institutions, our reconstructions of Filipino prehistory and culture have to be changed. It would seem advisable, therefore, to suspend judgments as to the relationship of modern Filipinos to prehistoric cultures until we have sufficient data, and to consider these "waves of migration" as hypothetical, not historically verified.

REFERENCES CITED

BEALS, RALPH L. and HARRY HOIJER
1965 An introduction to anthropology. Third edition. New York, The Macmillan Company.

BEYER, H. OTLEY
1947 Outline review of Philippine archaeology by islands and provinces. Philippine Journal of Science 77:205-374.

1948 Philippine and East Asian archaeology and its relation to the origin of the Pacific Islands population. Bulletin of the National Research Council of the Philippines, No. 29.

BRAIDWOOD, ROBERT J.
1959 Archaeology and the evolutionary theory. *In* Evolution and anthropology: a centennial appraisal, 76-89. Washington. The Anthropological Society of Washington.

BROOM, ROBERT
1949 The ape-man. Scientific American 181, No. 5:20-24. Reprinted in Yearbook of Physical Anthropology, 1949, 65-69.

BROTHWELL, D. R.
1960 Upper Pleistocene human skull from Niah Caves, Sarawak. The Sarawak Museum Journal 9:323-49.

CHILDE, V. GORDON
1956 Piecing together the past: the interpretation of archaeological data. New York, Frederick A. Praeger.

CLARK, GRAHAME
1961 World prehistory: an outline. Cambridge, Cambridge University Press.

DART, RAYMOND A.
1925 *Australopithecus africanus*, the man-ape of South Africa. Nature 115:195-99.

DICKERSON, ROY E.
1924 Tertiary paleogeography of the Philippines. Philippine Journal of Science 25:11-50.

DICKERSON, ROY E., *et al.*
1928 Distribution of life in the Philippines. Monographs of the Bureau of Science, No. 21.

EGGAN, FRED
1954 Some social institutions in the Mountain Province, Northern Luzon, and their significance for historical and comparative studies. Journal of East Asiatic Studies 3:329-35.

FAIRSERVIS, WALTER A.
1959 The origins of Oriental civilization. Mentor: Ancient Civilizations. New York, The New American Library.

FOX, ROBERT B.
1947 Unpublished fieldnotes.

FOX, ROBERT B.
1959 The Philippines in prehistoric times: a handbook for the First National Exhibition of Filipino Prehistory and Culture. Manila, The UNESCO National Commission of the Philippines.

FOX, ROBERT B. and ALFREDO EVANGELISTA
1957a The Bato Caves, Sorsogon Province, Philippines: a preliminary report of a stone tool-jar burial culture. Journal of East Asiatic Studies 6, No. 1.

1957b The cave archaeology of Cagraray Island, Albay Province. Journal of East Asiatic Studies 6, No. 1.

GLASS, BENTLEY
1955 On the unlikelihood of significant admixture of genes from the North American Indians in the present composition of the Negroes of the United States. American Journal of Human Genetics 7:368-85. Reprinted in Stanley M. Garn, ed., Readings on race. Springfield, Illinois, Charles C. Thomas, 1960.

HEINE-GELDERN, ROBERT VON
1932 Urheimat und frühste Wanderunger der Austronesier. Anthropos 17:543-619.

JAMES, PRESTON
1943 An outline of geography. Boston, Ginn and Company.

JONES, WILLIAM
1912 Unpublished diary and fieldnotes. Philippine Studies Program, University of Chicago.

KEESING, FELIX M. and MARIE KEESING
1934 Taming Philippine headhunters. London, Allen and Unwin.

KRAUSKOPF, KONRAD BATES
1959 Fundamentals of physical science. New York, McGraw-Hill Book Company, Inc.

LE GROS CLARK, W. E.
1955 The fossil evidence for human evolution: an introduction to the study of paleoanthropology. Chicago, The University of Chicago Press.

LEAKEY, L. S. B.
1959 Newly-discovered skull from Olduvai. Illustrated London News 235:288-9.

MOVIUS, HALLAM
1944 Early man and Pleistocene stratigraphy in southern and eastern Asia. Papers of the Peabody Museum of American Archaeology and Ethnology Vol. 19, No. 3.

1948 The lower paleolithic cultures of southern and eastern Asia. Transactions of the American Philosophical Society, New Series, Vol. 38, Part 4.

OAKLEY, KENNETH P.
1959 Man the tool-maker. Chicago, University of Chicago Press.

ROBERTS, D. F.
1955 The dynamics of racial admixture in the American Negro: some anthropological considerations. American Journal of Human Genetics 7:361-7. Reprinted in Stanley M. Garn, ed., Readings on race. Springfield, Illinois, Charles C. Thomas, 1960.

SUGGS, ROBERT C.
1960 The island civilization of Polynesia. Mentor: Ancient Civilizations. New York, The New American Library.

WASHBURN, SHERWOOD L.
1960 Tools and human evolution. Scientific American 203, No. 3:63-75.