THE CHANGING FACE OF ARCHAEOLOGY

By FROELICH RAINEY

Sweeping in over the roof of the jungle, a twin-engined passenger plane settles down on the landing strip hacked out of the wilderness at Tikal. Already parked beside the strip are two other planes.

A bright, clear Sunday like this will bring more than a hundred trippers from Guatemala City, an hour away by air—people from all over the world, come to take a look at the ancient Maya capital emerging stone by stone after more than a thousand years of entombment beneath the jungle.

Three years of excavation and restoration by the University Museum in Philadelphia have turned this most spectacular among the dead Maya cities into a major tourist attraction. Soon there will be a bigger runway for international planes, a hotel, and a museum—all being planned by the Guatemala Government.

At dozens of other sites across the world today, much the same thing is happening. For nowadays archaeology is big news. It has captured the imaginations of great masses of people everywhere. In London long lines of men and women queue up to see the remains of a Roman temple unearthed in the heart of the city. The discovery of the Dead Sea Scrolls creates a sensation throughout most of the civilized world. Along the Mediterranean shore scores of amateur skin-divers search the sea bottom near reefs for the wrecks of ancient Greek and Roman galleys.

In nearly every country on earth, "diggers," both professional and amateur, are uncovering the records of the past as never before, and the accounts of their discoveries are headline news in Peking as well as in London. In our time, the science of archaeology, born only about a hundred years ago, has entered on a period of amazing growth and development.

Before the Second World War the field belonged mostly to a number of European and American scholars, more or less inadequately subsidized and operating in a few selected areas. Except for an occasional spectacular find like the tomb of King Tutankhamon, in Egypt, their discoveries attracted the interest chiefly of other scholars.

But since the war, social and political revolution, sweeping Asia and Africa, has created new nations and new nationalisms. Most of the new or re-born nations, in pride of independence, have begun making intensive studies of their own cultural history. Other nations, longer established, are looking to the background out of which their national identity emerged.

Soviet Russia and Red China, for example, now have scores of archaeological expeditions in the field each year with impressive government backing. Professional diggers in Turkey, Iraq, Egypt, Pakistan, and India have made startling discoveries in recent years, and the newest nations in North and West Africa are beginning to establish their own government departments of antiquity.

Along with this growth in the range of activity, has come the development of wholly new archaeological techniques.

Atomic physicists have made it possible to determine the age of old tombs, ruined cities, or cave dwellings, by measuring the amount of radioactive carbon in objects removed from such ancient deposits. This is done with an elaborate Geiger counter equipped to measure infinitesimal amounts of radioactivity remaining in organic substances up to thirty thousand years after death. Hence it is now possible to analyze bits of charcoal from a Stone-Age campfire, mummy cloth from an Egyptian tomb, or wood from an ageless city in Babylonia, and state with remarkable accuracy just when the fire was burned, the cloth woven, or the tree felled. For the first time, the diggers have a way of dating precisely events which took place long before the age of written history.

Other spectacular tools now being developed include "resistivity" equipment and the "proton-magnetometer," both of which explore the earth electronically and make it possible to chart the remains of ancient dwelling sites beneath the surface of the soil without turning a spadeful of earth.

Aerial photography has been used to reveal vast man-made earthworks not noticeable from the ground, as, for example, along the desert coasts of Peru.

Though underseas archaeology is just beginning, it has already chalked up some spectacular discoveries, and it holds out rich promises for the future. It is probable that underseas television cameras will soon be at work spotting wrecked ships and the submerged ruins of forgotten cities.

All these developments are helping to bring closer the day when man can hope at last for an answer to the big questions now facing archaeologists:

When and where on this earth did evolution, in its slow process, produce the first truly human being?

How long ago did man turn from his immemorial life as a nomadic huntsman to found his first cities and learn the first simple techniques which were to lead to our present complex technological civilization?

Did the earliest civilization develop in one place and spread from there across the world or did civilization develop spontaneously and independently in many places?

In the century or so before World War II, archaeologists had worked out a set of partial answers to these questions which were pretty generally accepted, though far from proven.

In the "Cradle of Civilization," that region lying between the Nile and the Indus, archaeologists, over the years, had developed a calendar of events going back to about 3000 B. C. Utilizing ancient Greek records, traditional lists of Egyptian and Babylonian kings, and ancient inscriptions, it was possible to make an absolute correlation between recorded events and our own calendar from about 1800 B. C. to the present. The dating of events between 1800 B. C. and 3000 B. C. was not precise because there are gaps in the record and uncertainties about the exact time, in terms of our own calendar, of events mentioned in the earliest written records.

Nevertheless, the discoveries of a series of eminent archaeologists had brought a more-or-less general agreement that by 3000 B. C. men had passed through their first great technological revolution and were living a civilized, urban existence with large cities, a system of writing, a knowledge of mathematics, engineering, astronomy, and a complex social and political system. Just when, where, and how this change from savagery to civilization took place was still largely a matter of conjecture.

Since the war, extended digging in Iraq, Iran, and Jordan, aided by the atomic dating method, has opened up a whole new epoch of human history.

In Iraq, in 1947, the Government Department of Antiquities discovered near Biblical Nineveh the site of a village carbon-dating from at least 5,000 B. C. Materials excavated on the site included fired pottery, showing that by so early a date its people had learned to use heat in manufacture—the basic secret which lies behind all technological advance. Furthermore, the presence of grain indicates that they had learned to grow crops—the development which triggered the fantastic growth of human population and made firm man's ascendancy over all other creatures of the earth.

But perhaps the most dramatic discovery bearing upon the antiquity of our civilization was made in 1958 at another Biblical town—Jericho, in Jordan. There, after years of digging deeper and deeper down through the mounds of refuse left by thousands of years and unnumbered generations, a British expedition led by Kathleen Kenyon found the remains of what is certainly the oldest fortified town yet discovered. It is radio-carbon dated at 7,000 years before Christ. There were no traces of metal tools, or even of fired pottery. But there were evidences of an irrigation system, and hence a knowledge of engineering as well as of architecture.

Thanks to carbon-dating, our calendar of events in the story of the origins and growth of civilization has now been extended by at least four thousand years, and we know that man took to urban living far earlier than anyone had believed possible.

But whether this earliest known civilization in the Near East was the beginning of all civilization, or whether other peoples elsewhere were developing techniques and building cities of their own, no one can yet say with certainty.

We have long known that there were many contacts between the various civilizations springing up around the Mediterranean—between the Egyptians and the Minoans and the Babylonians. And these were in touch with the civilization growing up farther east in the Indus Valley. But were there

interchanges of any kind among remoter civilizations—between the Mediterranean peoples and China, between the Maya of Central America and the people of the Near East? Here, again, there have been only conjecture and deduction.

There may be a clue in one rather remarkable fact: always archaeology shows early advances in civilization beginning in the Near East and turning up elsewhere much later. The making of bronze, for example, started in the Near East around 3,000 B.C. It had reached Europe, in one direction, and China in the other by 1500 B.C. Many hundreds of years later it appeared in South America, sometime before the Spanish Conquest.

The spoke-wheeled chariot was first used in Iraq around 2,000 B.C. It had reached Egypt by 1600 B.C. A hundred years later it was in China, and by 1,000 B.C. it was being used by the barbarian tribes of Baltic Europe.

Over and over again, early history repeats the same pattern. Yet it may be that as we go on digging someone will find new evidence to reverse this pattern. No one can tell what surprises lie hidden under the earth the centuries have piled up.

Today the answer to the whole question may not be far off, thanks to the impetus of national feeling in Asia and Africa which has set many countries to digging up their past. With full government backing, archaeologists of these nations are now penetrating into areas rarely touched by the spade and are coming up with one startling discovery after another bearing on the story of man's progress toward civilization.

Southeast Asia is one of these little-known areas. Recently, an expedition from the Sarawak Museum, exploring North Borneo, discovered in the Great Cave of Niah a site which is everything an archaeologist can hope for. It is a cave so vast that it could contain the British Museum and St. Paul's Cathedral, with endless unexplored galleries left over.

In the labyrinth of dry, cool galleries inside Mt. Subis—proof against light and rain—the archaeologist in charge found traces of a long sequence of cultures. There were Stone Age implements dating from the Ice Age thirty thousand years ago. There were remains from the Neolithic, the Bronze, and the Iron Ages parallel to similar remains found in the Near East. And there were deposits of T'ang and Sung dynasty pottery showing an important trade between China and the Western Pacific Islands as long ago as the 7th century A.D.

Then last year, in one of the many unexplored chambers, the expedition came upon what is described as "one of the strangest, loveliest and quietest death-scenes an archaeologist can wish to see. High above the valley floor, in a grotto beautifully colored with green, purple and orange lichens and mosses, there is a perfectly dry, dusty floor. In a scattered line along this floor lay a number of what at first appeared to be ordinary Dyak 'perahu' river boats. They lay beached, pointing inwards on the dry dust." Bowsprits were carved to represent sabre-toothed dragons or crocodiles. All about them lay human bones and early Chinese pottery.

Here was a ship-of-the-dead cult coming to light in Borneo only a year or so after the front pages of the Western world had recorded the discovery of a ship-of-the-dead more than five thousand miles away, in the tomb of an

Egyptian king. Were these two cults somehow connected far back in the dim reaches of time? It will take a lot more digging in little known parts of Asia before we can hope to find out. But one by one, the reports are coming in.

Excavations at Anyang, south of Peking in China, before the last war unearthed the earliest known Bronze Age civilization in eastern Asia. Dating from about 1200 B.C., Anyang has been identified as a capital of the Shang Dynasty, perhaps the earliest ruling family of civilized China. In recent months, stories of a dramatic discovery south of the Yellow River, in China, have begun filtering through the bamboo curtain. At Chengchow, one of many groups of Chinese archaeologists has excavated an earlier capital of the Shang dynasty, dating from about 1500 B.C. The reports indicate rich discoveries and a complex Bronze Age civilization similar to, but somewhat later in time than, comparable civilizations of the Near East.

In Soviet Russia, teams of scientists carrying on one of the most extensive archaeological programs of any nation are probing innumerable sites in Siberia, Central Asia, and South Russia. If there is evidence of direct relations between the earliest civilizations of the West and the Far East, the Russians should come up with it, sooner or later. They have made important discoveries. In the Altai mountains at Pazirik just north of Mongolia, for example, they have found a whole group of spectacular tombs of the 4th and 5th centuries B.C. containing elaborate burial furniture, all beautifully preserved beneath a layer of ice. Some of the textiles in the tombs can have come only from ancient Persian workshops. The frozen body of one of the buried chieftains was tattooed in an art style characteristic of South Russia in 500 B.C.

And with all of Asia and the Southwest Pacific coming under the archaeologist's scrutiny, we may yet hope to find the long-sought evidence proving that here was the take-off point for the venturesome groups which headed out across the ocean thousands of years ago to carry the germs of civilization to Central and South America.

The first European explorers in the Pacific found all the island groups in Polynesia occupied by people speaking an Asian language. Thus we know that long before Magellan, Asiatics had struck out across the open sea at least as far as Easter Island. Since the last war, work on Saipan in Micronesia has shown that men from Asia had reached that island two thousand miles from their own coast before 1500 B.C. There is, however, no convincing evidence that Asiatic voyagers ever reached America in sufficient numbers to affect the growth of the great centers of civilization there. Most archaeologists believe that these grew up isolated from the Old World. Nevertheless, there is much yet to be explained. Large pyramidal structures are found in Egypt, Babylonia, Southeast Asia—and in Central America. Cotton domesticated in India was grown on the coast of South America many centuries before the birth of Christ. Sweet potatoes domesticated in South America were found by European explorers in the Pacific Islands. The wheel, so far as we know, was never used in America before Columbus; but not long ago archaeologists digging an ancient burial in Central America found clay toys in the form of wheeled carts. Architectural designs on stone buildings in Central America are remarkably like certain designs on ancient monuments in China and India. Is all this coincidence?

But beyond the question of how our civilization began and developed, there is the larger question of how man, himself, developed—where on this earth and at what point in time he emerged from the condition of an animal to take on the full stature of thinking man.

The first fossil bones of ancient men and man-like creatures were found during the last century in Europe and in Asia. Lying in earth strata which yielded up the corroborating bones of extinct animals and other evidence of great geological antiquity, they made it clear that men, or man-like beings, had inhabited the European-Asiatic land mass for some hundreds of thousands of years.

Central Asia and India were the regions favored by scientists as the likely place of origin of man. The various types of fossil man known from bones found in Europe, in Java, and in China were until quite recently organized into a developmental series demonstrating biological evolution from the very primitive Java man to the modern Homo Sapiens—true man. The oldest known remains of men like ourselves belonged to the Late Ice Age period in Europe, so the origin of Homo Sapiens was generally set at thirty to fifty thousand years ago during the era when ice sheets covered much of the Northern Hemisphere.

But recent discoveries in the field, particularly in Africa, are now making drastic changes in our ideas about human evolution. A great many new types of fossil men found in recent years have shown that the biological history of man is much more complex than we thought. Several strange man-like species found their way into a biological dead-end to become extinct. While our search for the record of man's biological history may bring further surprises, we can now be fairly sure that large-brained species very much like modern men were contemporaries of very primitive subhuman types. Moreover, individuals not very different from ourselves developed much earlier in the Ice Age than we thought possible a generation ago. Today most scientists look to Africa as the place of origin of man and they have come to expect dramatic new discoveries there which will alter our ideas of human evolution.

Only last July, Dr. L. S. B. Leakey and his wife found the skull and part of the skeleton of a new genus, Nutcracker man *(Zinjanthropus boisei),* lying deep in a gorge in Tanganyika, East Africa. This strange creature, less than five feet in height, had a man-like face and teeth, a skull crest something like a gorilla, and a brain capacity probably only about half that of a modern man. Yet he was a maker of stone tools. Lying with the skeleton were crude flint implements, a hammerstone, and bones of animals he had hunted. Many of the animals living at that time in Africa were gigantic—wild sheep standing seven feet high at the shoulder with a twelve-foot span of horns, wild pigs as large as rhinoceros. Nutcracker man could have killed only the infants of such animals, so he probably lived mostly on plant foods.

All this has brought up another question for scientists to debate: what is the dividing line between a man-like animal and true man. Did ape-men use fire and make tools, or does tool-making mark the emergence of animal into human?

In any case, Africa has now become the primary hunting ground for the remains of fossil men and their earliest tools. There are many who believe that the ancestors of all men are to be found there.

Moreover, the archaeologist may soon have the means to determine much more precisely the dates for ancient man and the Ice Age. For some time, radioactive carbon has been utilized to establish the age of organic material up to thirty thousand years old. Farther back than that, there was only uncertainty. But today a new method of dating is becoming available—a method known as Potassium-Argon, also based on radioactivity. Though its discovery has barely been announced, the world's scientists are confident that it will enable them to fix the absolute age of fossil men and their stone implements as far back as four hundred thousand years!

The number of human fossil bones so far discovered is, of course, infinitesimal compared to the number of individuals and physical types which must have existed. But rare as they are, they are yet enough to tell us much of the story we seek, and few can doubt that today's diggers equipped with their new techniques of carbon-dating are well on their way to answering archaeology's most fundamental question: what is the life-span of the human race in actual years?

Thus, at mid-point in the last century of our present millennium, we seem well on the way to the knowledge, fairly complete and precise, of where we, as human beings, came from and how we got where we are. But facing us is still another question, perhaps the most profound of all: where are we going?

We have studied man during his long day on earth, all but the last few minutes of which he has lived as a savage and a hunter. We have observed his civilizations rising and flourishing and falling, with one elbowing another aside and being elbowed aside in turn.

Out of the timeless processes of history, is there any insight we can gain and bring to bear on this question of our own future and that of our Western Civilization? Has our civilization a predictable life expectancy like all the others? Will we be elbowed aside, too, in our turn?

On the evidence of history, very likely. Yet it is a fact that there are no precedents in history for the kind of civilization we have developed.

The civilization of Western Man is the first to embrace the whole world and its peoples. Except for a few semi-civilized tribes fast learning the ways of the West, there exists no rival culture. There are rival nations and rival economic systems, but they are all a part of the one all-embracing civilization. Furthermore, our civilization has reached the stage of development where it is able to alter the physical aspect of the very world we live in.

Whence, save from itself, is its destruction to come? Lacking an outside force capable of toppling it, will Western Civilization survive indefinitely, or in some climax of madness will man use the technology he has developed over the millennia to destroy himself and all his world?