The World to 1500: A Global History

L.S. Stavrianos

PRENTICE HALL, Englewood Cliffs, NJ 07632
Humans as Food Gatherers

Anthony holds up a great mirror to man and lets him look at himself in his infinite variety.

Clyde Kluckhohn

One of the outstanding achievements of modern peoples is their study and reconstruction of the past. The ancients had little understanding of what had happened before them. Thucydides, the most objective of Greek historians, began his study of the Peloponnesian War by stating that nothing of great importance had happened before his time. His ignorance of history prevented him from recognizing the unique glory and contribution of Athens. By contrast, our age is more history-minded than any other. We know more about the early history of the Egyptians, the Greeks, or the Chinese than they themselves knew. Furthermore, knowledge of our early human ancestors is being increased every year by the findings of scientists in various fields such as geology, archeology, anthropology, paleontology, and biology. To this list of fields should be added space technology, which is being used to survey the surface and even the subsurface of the earth from satellites, space shuttles, and airplanes. These are equipped with sensors that can measure subtle variations in temperatures on the ground. Because sand, cultivated soil, vegetation, and different types of rocks have distinctive temperatures and emit heat at different rates, the sensors can identify loose soils that had been prehistoric agricultural fields, or were covering ancient caravan routes or architectural ruins. Thus radar imaging systems have been used to map the ancient intercontinental Silk Road traversing Central Asia, as well as Maya causeways in the Guatemalan jungle and footpaths along the shore of Lake Arenal in Costa Rica.

Ongoing research in all these fields has extended our knowledge back before the beginning of civilization, even before there were written
records. This is very important, for it was only about 5,000 years ago that humans learned to write, whereas their hominid beginnings have been traced back over 4 million years. We shall consider these long prehistoric *millennia* when people became human. They existed, as did the other animals, by collecting food wherever it was to be found, rather than by growing it as their agriculturist descendants would learn to do.

I. FROM HOMINIDS TO HUMANS

Our globe revolves around the sun, which is one of 10 billion stars in our galaxy. This in turn is one of millions of galaxies that make up the universe. The enormity of this scale should be kept in mind while we trace through our human experiences and human concerns in the following pages. It is well to remember that in the context of the universe our planet earth is literally like a speck of dust on the Pacific Ocean.

Earth took form about 5 billion years ago, and the first life appeared on it about 4 billion years ago in the form of single-celled creatures. Although such primitive life traditionally has been viewed as qualitatively different from nonlife, scientists no longer accept this assumed dichotomy between organic and inorganic. Rather they think of living matter as having evolved naturally from nonliving matter. They classify all matter into a hierarchy of states of organization. At a certain level in this hierarchy the transition occurs from inorganic to organic. More specifically, electrons, protons, and neutrons combine to form atoms, and the atoms form molecules. The molecules become more or less well-organized aggregates, and one class of these is living matter.

Organic matter in turn went through a comparable hierarchical evolution: from the original microorganisms to primitive plants such as seaweeds, to animals without backbones (invertebrates) such as jellyfish and worms, and ultimately to animals having backbones (vertebrates). These vertebrates, with some of their invertebrate and plant cousins, began their successful adaptation to life on land about 300 million years ago. First came the amphibians, followed by the great army of prehistoric reptiles, then the birds, and finally the mammals. For the past 60 million years, mammals have been the dominant form of life on earth.

Almost all scientists accept the proposition that humans belong to the animal kingdom—more specifically to the order of Primata, which they share with the tree shrews, lemurs, tarsiers, monkeys, and apes. Evidence from several fields of study supports this conclusion. Anatomists have found basic similarities between humans and the other higher animals in the general plan of their skeletal, muscular, and organic structures. Embryologists have noted that the human embryo displays, at different stages of its development, characteristics of some of the lower forms of life, such as gill arches at the end of one month and a rudimentary tail at two months. Anthropologists have shown that human fossil remains show a consistent trend away from the general anthropoid type, or hominids, toward *Homo sapiens*. Other scientists have discovered many similar indications of our ties to the other animals, including close resemblance between the chemical composition of the blood of apes and of humans, possession of common parasites, and similarities in their ways of learning.

The differentiation of the human stock occurred during the *Pleistocene epoch*, with its six or seven glacial and five or six interglacial periods. These drastic environmental changes compelled all animals to adapt and readapt themselves continually to new conditions. Success in this crucial matter depended not on brute strength nor on the ability to resist cold but rather on the continuous growth of intelligence and the use of that intelligence to work out satisfactory adaptations. This, of course, is the secret of the unchallenged primacy of human beings on earth. Humans have been, first and foremost, generalists. They never adapted exclusively to one type of environment, as the gibbon did to the forest with its long lithe arms, or the polar bear to the arctic with its heavy white fur. Rather humans relied on their brains, not their bodies, to adapt to any environment.

The human species is the product of *natural selection* from a succession of humanlike ancestors, or hominids, some of which were capable of
using simple stone tools and weapons. The earliest of these hominids was Australopithecus, believed to have appeared first in the savannas of eastern and southern Africa over 4 million years ago. The pelvis and leg of this hominid were strikingly similar to that of modern humans, but the cranial capacity was only about one-third that of a human, or hardly larger than that of living apes. Thus a humanlike system of walking erect on two legs rather than on all fours was combined with an apelike brain. The low level of intelligence meant a correspondingly low level of speech and of toolmaking. The significance of this evolutionary sequence is that the human brain did not appear first and then proceed to create human culture. Rather there was interaction back and forth. Speech and toolmaking were both the causes and the effects of brain development.

The African savannas were ideal for primates at that level of development. The climate was warm enough to make the lack of clothing bearable, and the open grasslands, in contrast to dense forests and deserts, afforded both water and animal foods. Thus, despite their simple tools, the australopithecines subsisted on an adequate diet, including eggs, crabs, tortoises, birds, rodents, and young antelopes. The last were easy prey because they “freeze” in the grass when faced with danger.

Australopithecus roamed the African plains for over 2 million years, during which time several species of this hominid appeared, flourished, and disappeared. Anthropologists are not agreed on details because many new finds are made each year, and theories change with these finds. Over half a million years ago, Australopithecus gave way to our immediate ancestor, the hominid Homo erectus, whose brain was about twice as large as that of the australopithecine brain, or two-thirds that of a modern human. Homo erectus designed the hand axe, usually almond shaped, from six to eight inches long, several inches wide, and about one inch thick. The butt end was rounded for grasping in the palm of the hand, whereas the other end was pointed and sharpened on one side. This tool was used for all purposes (as axe, knife, scraper, or awl), and the huge quantities of skeletal remains of large slaughtered animals—deer, rhinos, pigs, ele-
phant, buffalo, hippos, horses, antelopes, and gazelles—demonstrate its effective use. Such large-scale hunting of big game also reflects efficient group organization and action, including speech communication. Another indication of social life is the first known evidence of reverence for the dead. From Neanderthal fossils we know that the earth-covered remains were scattered with red ochre or hematite, which almost certainly represented some kind of ritual burial. Along the same lines there is evidence of the dawn of the decorative sense in the beads and perforated teeth and shells that have been found in association with the fossils. Finally there are the all-important telltale signs of the use of fire—circular dark discs in the soil, five to six inches in diameter. The earliest evidence of human campfires has been found in caves in South Africa, with charred bones indicating that those controlled fires dated back 1 to 1.5 million years ago.

The mastery of fire had fundamental and far-reaching repercussions. It freed our ancestors from the bondage of the limited energy supply of their own bodies. It helped them to survive the advancing glaciers of the ice ages. It increased their available food supply tremendously because now it was possible for them to cook a great range of roots and seeds that hitherto had been inedible. Fire further improved the hominid diet because cooking foods liberated protein and carbohydrate materials. Fire also made it possible for the hominids to break out of the warm savanna, where they had thus far been confined, and to begin spreading throughout the globe. The results of their migrations are being felt to the present day. (See map of Global Distribution of Hominids and Homo Sapiens, p. 6.)

The evolutionary process culminating in humankind was finally completed about 40,000 years ago with the appearance of Homo sapiens, or “thinking human,” although the date perhaps should be pushed back to 100,000 years ago in light of recent excavations in Israel. Viewed in the broadest perspective, this development represents the second major turning point in the course of events on this planet. The first occurred when life originated out of inorganic matter. After that momentous step, all living forms evolved by adapting to their environments through mutation and
natural selection. That is, the genes adapted to the environment, as was evident during the climatic upheavals of the Pleistocene. But with the appearance of humans, the evolutionary process was reversed. No longer did genes adapt to environment; instead, humans adapted by changing the environment to suit their genes. Today, a third epochal turning point appears imminent as humans’ growing knowledge of the structure and function of genes may soon enable them to modify their genes as well as their environment.

Humans, and only humans, have been able to create a made-to-order environment, or culture, as it is called. The reason is that only humans can symbolize, or envision things and concepts divorced from here-and-now reality. Only humans laugh, and only they know that they will die. Only they have wondered about the universe and its origins, about their place in it and in the hereafter.

With these unique and revolutionizing abilities, humans have been able to cope with their environment without mutations. Human culture became the new, nonbiological way of having fur in the arctic, water storage in the desert, and fins in the water. More concretely, culture consists of tools, clothing, ornaments, institutions, language, art forms, and religious beliefs and practices. All these have served to adapt humans to their physical environment and to their fellow humans. Indeed, the story of humanity as related in the following chapters is simply the story of a succession of cultures that we have created, from our Paleolithic origins to the present day.

When humans used their superior brains to change their environment to suit their genes rather than the opposite, as had been the prevailing pattern in the past, they made a quantum leap ahead of all other species on this planet. This explains why humans today are the dominant species after a modest beginning in Africa’s savanna. But this raises a puzzling question. Why are humans today seemingly incapable of controlling their environment, which they themselves have created? Why are they discovering that their own homemade environment is becoming less and less fit for habitation?

The answer seems to lie in the basic difference between genetic and cultural evolution. Genetic evolution functions via gene mutations which, if favored by selection, become dominant in a population in the biologically brief period of a few thousand years. This was the evolutionary path that led through a succession of hominids from Australopithecus to Homo sapiens.

By contrast, cultural evolution, occurring through the introduction of new tools or ideas or institutions, can change and has changed societies almost overnight. Witness how steam power affected the entire globe in the nineteenth century, how the internal combustion engine did likewise in the twentieth, and how nuclear power and computers are transforming our environment today—so much so that Albert Einstein warned us that humanity now faces ei-
ther new “ways of thinking” or “unparalleled catastrophe.”

The key problem appears to be the time lag between technological change and the social change it necessitates. The reason for the lag is that technological change usually is welcomed and quickly adopted because it improves productivity and living standards, whereas social change is commonly resisted because it requires self-appraisal and adaptation, which are threatening and uncomfortable. This explains today’s paradox of humans’ acquiring more and more knowledge, and being more and more able to change their environment as they wish, yet their not being able to change their environment to make it more livable. In short, our problem as a species is to balance our ever-expanding knowledge with wisdom in how we use that knowledge. We shall see in the following chapters that learning how to balance knowledge and wisdom is becoming so urgent that, as Einstein has warned us, our future as a species depends on the outcome.

We shall see that this problem of balance has risen repeatedly throughout human history, and is rising today more frequently and urgently as our knowledge is growing with ever increasing speed, and our wisdom failing to keep up.

II. LIFE OF THE FOOD GATHERERS

Just as Homo erectus had been able to fashion a more effective tool than their australopithecine predecessors, so now Homo sapiens with their superior intelligence developed the so-called “blade technique.” They used the long, sharp flakes, or “blades,” struck off the core of a stone to fashion a variety of new tools as well as “tools to make tools.” Some of the new tools were composites of different materials, such as spears with hafted heads of bone, antler, or flint, and flint blades set in bone or wooden handles. Another departure was the construction of projectiles such as the bula, sling, spear thrower, and bow and arrow.
The latter must have been relatively inefficient at first, but it was gradually improved until it became the most formidable weapon prior to modern firearms. Other inventions of the upper Paleolithic included bone and ivory bodkins, bone needles with eyes, belt fasteners, and even buttons—all of which indicate that Magdalenian hunters wore sewn skin garments with fitted sleeves and trousers.

Although this late Paleolithic technology was advanced compared to that of the early Paleolithic a million years before, it still was primitive in the sense that productivity was low. Food gatherers had no formal political structure with full-time political leaders. Rather they formed autonomous bands that usually numbered twenty to fifty persons. Larger groups were possible, and some did exist in areas that yielded plentiful food supplies, such as the American Northwest, with its inexhaustible salmon runs, and the Dordogne valley in southern France, with its great reindeer herds in Magdalenian times. Judging from contemporary hunting societies, authority in Paleolithic times was rigidly limited and lacked an established and recognized power to control people. Leaders arose naturally for specific purposes; an old man might be the accepted planner of ceremonies because of his ritual knowledge, whereas a young person with proven skill in the chase might take the lead in hunting parties. But the important point is that all such leaders were persons of influence rather than authority since there were no institutions for imposing one’s will upon others.

Social organization necessarily was as simple as political organization, if indeed the two can be distinguished at this stage. The basic unit was the family, consisting of the parents and their immature and unmarried children. Extra wives usually were permitted, but in practice polygamy was rare. Relations between the sexes were more equal during the Paleolithic millennia than at any time since. The chief reason seems to have been that women contributed to the food supply of the band as much as did the men, if not more so. Consequently for most of human history there was none of the dependence and inferior status that is commonly associated today with the “weaker” female sex.

From a study of ninety food-gathering bands surviving to the present, anthropologists have found that the men hunt animals and provide meat, whereas the women gather everything they can find around their camp—roots, berries, nuts, fruits, vegetables, insects, lizards, snakes, rodents, shellfish, and so forth. Although the meat the men bring in is highly prized, the fact is that what the women collect is the main part of the diet. The women usually gather twice as much food as the men are able to hunt and kill and bring back to the camp. Thus the sexes have different tasks, but these tasks are equally important. Food-gathering women not only bear the children and rear them but also provide most of the food.

It is true that the men were responsible for the defense of the band and had control over the weapons, but they did not use the weapons against the women to intimidate and subjugate them. In fact, when Europeans first came into contact with food-hunting peoples in overseas lands, they usually were surprised and shocked by the equality that food-gathering women enjoyed compared to European women. The Jesuit missionary Paul le Jeune spent the winter of 1633–1634 with a band of Montagnais-Naskapi Indians on the Labrador Peninsula of eastern Canada. “The women have great power here,” le Jeune reported, and he urged the Indian men to assert themselves. “I told him that he was the master, and that in France women do not rule their husbands.” Another Jesuit father reported, “The choice of plans, of undertakings, of journeys, of workings, lies in nearly every instance in the hands of the housewife.” It is significant that anthropologist Eleanor Leacock found the same quality in sex relations amongst the Montagnais-Naskapi when she studied them in 1950–1951. “It was beautiful to see the sense of group responsibility . . . and the sense of easy autonomy in relationships unburdened by centuries of training in deferential behavior by sex and status.”

Not only was there sex equality among the food gatherers but there were also strong kinship ties. Each person had duties toward the other tribal members and in turn enjoyed rights and privileges. All helped each other in the
quest for food and in providing shelter from the elements and defense from their enemies. Some fighting between tribal groups arose from personal feuds and from competition for hunting and fishing grounds. But Paleolithic society lacked both the manpower and the resources essential for large-scale warfare, which did not become possible until the rise of agriculture, with its greatly increased productivity and correspondingly increased population. In short, the essence of Paleolithic social organization was cooperation. Families and bands were primarily mutual-aid societies working together in the harsh struggle for existence.

After observing the daily life of food gatherers in various parts of the world, anthropologist R. B. Lee concludes: "A truly communal life is often dismissed as a utopian ideal, to be endorsed in theory but unattainable in practice. But the evidence for foraging peoples tells us otherwise. A sharing way of life is not only possible but has actually existed in many parts of the world and over long periods of time."

Anthropologists recently have focused on the diets as well as the social institutions of our prehistoric ancestors, especially because what they ate seems to hold lessons for us today. What people ate thousands of years ago can be determined in two ways. One is by examining coprolites, or fossilized feces. They reveal many things, such as pollen, plant crystals, feathers, bones, hair, and eggshells, so a coprolite provides a capsule record of what passed through a person's digestive tract millennia ago. The other way to determine the diets of our food-gathering ancestors is to observe what present-day food gatherers eat.

whether they be the aborigines of Australia or the !Kung of South Africa's Kalahari desert. Such observation has revealed that present-day food gatherers have a surprisingly abundant and reliable food supply, even though they are living on undesirable lands that nobody else wanted. One reason for the plentiful food is that the food gatherers have an extraordinary knowledge of their home territory and all its plant and animal life. They cannot read or write, but they can learn and remember. The !Kung, for example, remember so much that they are now using some 500 different types of plants and animals as food and for medical, cosmetic, toxic, and other purposes. Among the insects they eat and enjoy are beetle grubs, caterpillars, bee larvae, termites, ants, and cicadas. Because of our customs, we do not consider most of these as food, yet they are nutritious. Termites, for example, are 45 percent protein, an even higher proportion than in dried fish.

The great number of foods that the food gatherers are willing to eat provides a valuable life insurance for them. Depending on a multitude of different plants and animals for their food supply, they are better off in this regard than agriculturists who grow only a few crops, and who are in danger of starvation if those crops fail because of drought, flood, frost, or pests. The food gatherers run no such danger; if they find some plants or animals in short supply, they are certain to make up the lack with the hundreds of others that they know they can find. For example, anthropologists who were studying the !Kung in the summer of 1964 noted that a serious drought that summer was hurting the neighboring Bantu farmers. Their crops had failed and their families were starving. So the Bantu women joined the !Kung women when they started out on their daily expeditions in search of roots, greens, berries, nuts, birds, eggs, and so forth. There was no shortage of these hundreds of different foodstuffs, so the Bantu as well as the !Kung families survived easily despite the drought.

The food supply of !Kung and other gatherers is not only abundant but also healthy. It is low in salt, saturated fats, and carbohydrates, and high in polyunsaturated oils, roughage, vitamins, and minerals. This diet, together with the active life they lead as nomads, explains why few food gatherers suffer from the diseases common in industrialized societies—medical problems such as high blood pressure, obesity, varicose veins, ulcers, and colitis. On the other hand, many !Kung die from accidental injuries that cannot be treated because of the lack of doctors and hospitals. So scientists find that about one-tenth of the !Kung population is over sixty years of age, which is roughly the same percentage as in industrialized countries where doctors and hospitals are readily available.

The above conclusions about prehistoric diet have been tested by the anthropologist Vaughn M. Bryant, Jr., of Texas A&M University. While doing fieldwork in an archeological dig in southwest Texas, he switched his diet to that of the prehistoric people of that region—a diet that he knew well from his coprolite research. Pleased with the results of the new diet, he continued it after returning to his campus. He also added exercise to his daily routine in order to approximate the rigor of prehistoric life. He rode his bike to school, climbed stairs instead of taking elevators, and walked across the campus instead of driving. Since changing to his new way of life, he reports:

I've felt much better, both physically and mentally. I just have more energy than I used to. . . . I haven't had a serious illness in the past four years. I haven't missed a day of work. . . . In three months or so, I lost 30 pounds . . . without counting calories and without having to go hungry. . . . Those fruits and vegetables are so low in calories. . . . I think snacking helped, too. It seems when you snack all day you eat less than if you sit down and gorge yourself at three meals. . . . When you think about it, there's nothing weird about this diet. I think we were designed by nature to eat foods similar to what primates—the great apes—generally eat: fruits and other plant foods, a little meat, a lot of complex carbohydrates and fiber, and not very much fat. Until just a few thousand years ago, everyone probably ate the way I do.*

Turning our discussion from social institutions and practices to general beliefs, we find that primitive humans were basically ahistorical and nonevolutionary in their attitudes toward themselves and their society. They assumed that the future would be identical to the present, as the present was to the past. Consequently there was
no notion of change, and hence no inclination to criticize or to tamper with existing institutions and practices. To their way of thinking, everything, including themselves, their culture, and their habitat, had appeared with the creation and was destined to continue unaltered into the future. The creation myths of hunting peoples are strikingly similar, involving heroes who fashioned the landscape, stocked it with game, brought forth the people, and taught them the arts and their customs.

The following origin myth of the Andaman islanders is fairly typical:

The first man was Jutpu. He was born inside the joint of a big bamboo, just like a bird in an egg. The bamboo split and he came out. He was a little child. When it rained he made a small hut for himself and lived in it. He made little bows and arrows. One day he found a lump of quartz and with it he sacrificed himself. Jutpu was lonely, living all by himself. He took some clay (kot) from a nest of the white ants and moulded it into the shape of a woman. She became alive and became his wife. She was called Kot. They lived together at Teraut-bulu. Afterwards Jutpu made other people out of clay. These were the ancestors. Jutpu taught them how to make canoes and bows and arrows, and how to hunt and fish. His wife taught the women how to make baskets and nets and mats and belts, and how to use clay for making patterns on the body.3

Primitive humans were very knowledgeable concerning nature. They had to be, for their very existence depended on it. Yet they had little explanatory knowledge; they could give no naturalistic explanation if floods or droughts came or if the hunting or fishing was poor. Not knowing how to cope with nature by naturalistic means, they had to resort to the supernatural. They turned to magic and spent much time in efforts to persuade or fool nature into yielding a greater abundance. By making each useful animal or plant the totem of a particular group, and by using images, symbols, and imitative dances, primitive people believed that the animal or food could be encouraged to flourish and multiply. As long as the rules of the totems were strictly observed, the reproduction of the group and of its food supply could be assured.

All group members seem to have participated at first in the ritual ceremonies, but toward the end of the Paleolithic, part-time specialists in the form of medicine men or shamans seem to have appeared. These people were thought to have peculiar relations with the forces that were supposed to control those parts of the universe or environment that mattered—primarily food and fertility but also health and personal luck. More and more, as they were relieved from the full-time work of food and tool production, they used their magical arts for the common good. Shamans are still found today in nearly every surviving food-gathering culture, including those of the Bushmen, the Eskimos, and the Australian aborigines. The earliest pictorial representation of these shamans is the “Sorcerer” of the cave of Trois-Frères in France. This “terrible masterpiece,” as it has been called, is a Paleolithic painting of a man clad in a deerskin, with the horns of a stag, the face of an owl, the ears of a wolf, the arms of a bear, and the tail of a horse. Other nearby paintings suggest that the cave was a meeting place where a sorcerer invoked animal spirits for success in the hunt and worked up his audience to the emotional pitch necessary to face danger.

Paleolithic technology, however, was not productive enough to support anything approaching a hierarchy of priests, so no cohesive theology could be developed. Conceptions of gods and spirits were hazy, and much emphasis was placed on individual visions. Religion was not used as a method of social control. Benefits did not depend on the morality of the individual. People begged or bargained with the supernatural, as we can see from the following statement made by an Eskimo to the Arctic explorer Knud Rasmussen:

We believe our Angakut, our magicians, and we believe them because we wish to live long, and because we do not want to expose ourselves to the danger of famine and starvation. We believe, in order to make our lives and food secure. If we do not believe the magicians, the animals we hunt would make themselves invisible to us; if we did not follow their advice, we should fall ill and die.4

Fear of what couldn’t be understood and the desire to bring the supernatural under human control was expressed in art as well as religion. By far the outstanding example of Paleolithic art
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Two prehistoric cave paintings from France.

consists of its extraordinary cave paintings, the best of which are located in southern France and northwestern Spain. The subjects of the drawings are usually the larger game: bison, bear, horse, woolly rhinoceros, mammoth, and wild boar. The best of the drawings are in full color, remarkably alive, and charged with energy. Despite their extraordinary artistic quality, the cave drawings apparently were designed for utilitarian reasons. They were drawn in the darkest and most dangerous parts of the caves, although the people lived only in or near the cave entrances. The artists also commonly painted one picture over another, with no apparent desire to preserve their works. Hence it appears that the reason these Paleolithic artists made their way to the depths of
the earth and created the most realistic reproductions possible of the animals they hunted was the belief that they thereby gained some sort of magic power over their game.

In conclusion, the recent findings of scientists in various fields have led us to recognize and appreciate the achievements of our prehistoric ancestors as constituting a major and decisive element in our total human heritage. Even in the realm of technology, where we consider ourselves today to be especially successful, the hunter-gatherers acquired a vast amount of data that is basic for us to the very present. They knew their habitats intimately, so they used those species of plants and animals that were beneficial, and avoided those that were useless or injurious. They developed a great variety of tools including knives, axes, scrapers, hammers, awls, and needles. They also created an equal variety of weapons such as spears, harpoons, clubs, shields, armor, blowguns, and bows and arrows. Some of their inventions—such as the nonsubmersible kayak, the snowhouse, and the outrigger canoe—and the use of numerous poisons—such as hydrocyanic acid, which South American Indians learned to remove from a species of manioc which became a staple article of their diet, and other poisons such as curare, snake venoms, hemlock and alkaloids that were used to kill game and human enemies—required considerable knowledge and skill. In preparing and preserving foods, our early ancestors used virtually all the techniques known to us today. They had earth ovens, they practiced stone boiling, they froze food in the arctic, they preserved it by drying, and they sealed foods airtight with tallow. Apart from recent inventions such as plastic containers and the harnessing of gas and electricity, Paleolithic cooks would have felt at home with modern kitchens and cuisines.

In coping with illnesses, prehistoric peoples were by no means wholly dependent on magic. They knew how to set broken bones with splints, to use tourniquets, to employ poultices and bandages, to use steam baths and massage, to practice bloodletting as therapy, and to administer enemas (which South American tribes did with rubber syringes). Preliterate peoples also had knowledge of heavenly bodies, distinguishing and naming constellations of stars. Finally, oceanic navigation was achieved in prehistoric times by the Polynesians, who made regular voyages between Hawaii and Tahiti, a distance of 2,350 miles. After reviewing these achievements in all phases of life, anthropologist Leslie A. White concludes: “The accumulated knowledge, skills, tools, machines, and techniques developed by primitive, preliterate peoples laid the basis for civilization and all the higher cultures. . . . It is indeed remarkable to see how close to the present day, primitive peoples have come at many points on the technological level.”

As impressive and significant as Paleolithic technology was the Paleolithic society. The everyday life of our prehistoric ancestors was in many ways very attractive. Its members were equal with one another. Warm bonds of kinship permeated and determined their social relationships. Paleolithic life offered everyone specific and accepted obligations and rewards. There was no problem of alienation or of anxiety in the face of an uncertain or unpredictable future. To the present day, an Australian aborigine can take a piece of broken glass, fashion it skillfully into an arrowhead or spear point, fit it to a spear thrower or to a bow that he has strung himself, set forth and kill his game, prepare his dinner with due attention to ceremony, and after dinner, round out the day with storytelling, sharing his adventures with the stay-at-homes. In this manner the Paleolithic hunter was a “complete man” to a degree that has not been approached since the agricultural revolution.

But the bonds that held Paleolithic society together were restricting as well as comforting. The individual was wholly subordinate to the band or tribe, which was viewed as a timeless procession of the dead, the living, and the unborn, attended by all the unseen powers of the spirit world. To this procession of life the individual was completely subject. Doubtless the overwhelming majority of individuals felt themselves to be participants rather than captives. Yet the fact remains that the result was stagnation along with security. Although the Paleolithic way of life was psychologically satisfying, it was also a dead-end street. Sometimes deviance from tradition actually ended in death—for example, among the Arunta of Australia, whose elders arranged with the enemy to kill those individuals who had not been living in
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We may assume that the style of human life during the Paleolithic millennia was basically the same as that of the food gatherers that fifteenth- and sixteenth-century Europeans discovered in the New World. The accounts left by the explorers, and by the settlers and missionaries who followed them, are valuable in giving us a glimpse into our common human past. The following report is by the Jesuit father Jacob Baegert, who lived between 1750 and 1767 among the Indians of California. His description of the “Californians” gives us a picture of Paleolithic ancestors, and also challenges common assumptions about “human nature.”

With all their poor diet and hardships, the Californians are seldom sick. They are in general strong, hardy, and much more healthier than the many thousands who live daily in abundance and on the choicest fare that the skill of Parisian cooks can prepare. . . .

For the small-pox the Californians are, like other Americans, indebted to Europeans, and this disease assumes a most pestilential character among them. A piece of cloth which a Spaniard, just recovered from the smallpox, had given to a Californian communicated, in the year 1763, the disease to a small mission, and in three months more than a hundred individuals died. . . .

From what I have already said of the Californians, it might be inferred that they are the most unhappy and pitiable of the children of Adam. Yet such a supposition would be utterly wrong, and I can assure the reader that they live unquestionably much happier than the civilized inhabitants of Europe. . . .


accordance with tribal tradition. It was this stultifying and constraining tradition that was the all-important other side of Paleolithic society.

Not only were some Paleolithic nonconformists killed, but so were the infants and the infirm in case of food shortage. The food gatherers had to move perpetually because sooner or later they exhausted the food supplies in the vicinity of their camp. This inescapable mobility forced them to prune ruthlessly their material possessions. It also forced them on certain occasions to prune equally ruthlessly some of their band members—the infants, the aged, and the infirm. A food-gathering mother obviously could carry only one infant at a time. A second born before the first had been weaned had to be killed at birth, as were also all but one infant in cases of multiple birth. Only a few food gatherers could
support themselves in a given area. Consequently they were easily swept aside when the agricultural revolution made possible the sustenance of relatively large numbers of food producers, or peasants, who spread irresistibly into the sparsely populated hunting grounds. This fact explains why food-gathering bands were inevitably doomed once the agricultural revolution got under way, and why today only a few such bands survive in out-of-the-way places where agriculture is not feasible for one reason or another.

We shall see that the agricultural revolution also set off a chain reaction of urbanization, class differentiation, and social cleavage that undermined the appealing equality of primitive society. But in doing so it also broke the restricting bonds of tribal traditionalism and thereby launched humanity, for good or ill, on the fateful course that was to lead from hunting ground to megalopolis, from human muscle to atomic power. Before turning to the agricultural revolution, however, it is necessary to consider the global spread of Paleolithic peoples and the ensuing repercussions this dispersal created, affecting us to the present day.

III. APPEARANCE OF RACES

It is commonly assumed that population explosion is a phenomenon peculiar to our times, but this is not so. Spectacular population spurs have occurred with each major technological breakthrough in history, and for the obvious reason that an advance in technology leads to increased productivity, which can support a larger number of people. By human standards of the time, the differential between early and late Paleolithic technology did represent a major advance. This in turn led to a population jump from an estimated 125,000 hominids in the early Paleolithic to 5.32 million Homo sapiens at the end of the Paleolithic 10,000 years ago, on the eve of the agricultural revolution. This increase of over forty-two times is thus comparable to the population explosions that, as we shall see, were to accompany each of the later technological revolutions.

Another demographic pattern set at this time and repeated in the future was the disproportionate increase of any population that took the lead in technological innovation, and hence the spread of that population over larger areas. This pattern has prevailed since the first appearance of life on earth, in accordance with the Law of Cultural Dominance propounded as follows by the anthropologists M. D. Sahlins and E. R. Service:

... that cultural system which more effectively exploits the energy resources of a given environment will tend to spread in that environment at the expense of less effective systems. ... Higher forms characteristically exploit more different kinds of resources more effectively than lower; hence in most environments they are more effective than lower; thus their greater range.

At all times, the best-adapted species, or that which is most efficiently exploiting the physical environment, is the species that has prevailed and extended its domain. Thus the Australopithecines, with their primitive pebble tools and lack of clothing, were unable to extend their range beyond the warm savanna lands. Homo erectus, by contrast, with superior tools and with clothing and control of fire, was able to expand north from Africa to the temperate zones of Eurasia—hence the discovery of their widely scattered fossil remains, such as those of Java man, Peking man, and Heidelberg man. Finally, Homo sapiens, with still more advanced technology and correspondingly more efficient adaptation, was able to push further north into the Siberian tundra as well as south into the African and Southeast Asian tropical rain forests.

Part of the superior human technology was the construction of various devices for crossing bodies of water. Depending on local natural resources, these devices were of four basic types: skin boat, bark boat, raft, and dugout. With this variety of boats, early humans were able to cross rivers and lakes and even the wider expanses of water from Africa to Europe, from Southeast Asia to Australia, and from Siberia to North America. This spreading out was greatly helped by the Ice Age, which sucked the ocean waters up into the ice caps, thus lowering the level of the oceans and creating land bridges between continents. Under these circumstances, humans occupied all continents except Antarctica. They became, together with their inseparable dog, the most widespread animal in the world. (See map of Early Human Migrations, p. 17.)
Hand in hand with the dispersal of Homo sapiens went race differentiation. A variety of so-called races appeared, with distinguishing characteristics in skin color, hair texture, and facial structure. These races are believed to have emerged because of the relative isolation of the various human populations and their adaptation to differing local environments. The significant point concerning this differentiation within the human species is that it occurred so late—well after the emergence of Homo sapiens. All modern races, then, stem from a common stock, and after it had attained its full human development. This explains why the Europeans were able to interbreed with all the races in the lands they discovered. It also explains why, as virtually all anthropologists agree, there are no significant differences in innate mental capacity among all races. Representatives of late Paleolithic or of the contemporary Australian aborigines would stand as much chance of graduating from a university as would representatives of any other living races.

The details about how the races appeared in various regions are not known, and probably never will be. But we do know that by the end of the latest Ice Age, about 10,000 years ago, the global distribution of races was beginning to be the same as today. The Caucasoids occupied Europe, North and East Africa, and the Middle East, extending into India and central Asia. The Negroids were in the Sahara (better watered then) and a bit southward, whereas the Pygmies and Bushmen, in contrast to later times, occupied the remainder of Africa. Other Pygmies, the Negritos, lived in the forests of India and Southeast Asia, while in the open country of these regions and in Australia were the Australoids. Finally in East Asia and the Americas were the Mongoloids.

Although that racial pattern is vaguely similar to today's, the map of Global Race Distribution (p. 18) shows that basic changes had occurred by A.D. 1000 and still more by today. These changes, as we shall note later, came as a direct result of later technological revolutions. It was the failure to keep up with these revolutions that explains the virtual disappearance of the Bushmen and Pygmies and Australoids, as well as the swamping of the American Indians in most of the New World. Put in other words, it explains why 10,000 years ago blonds probably were no more numerous than Bushmen, whereas today there are 100,000 blonds for every living Bushman.

The very different experiences of the Bushmen, compared with those of the Caucasoids or other races, had nothing to do with differences in ability. We will return to this important point at the end of Part IV, "Races in History," where we shall consider the reasons for the varied racial experiences.

SUGGESTED READINGS


Important recent books on early human history are by C. S. Coon, The Hunting Peoples (Little, Brown, 1971); M. Sahlins, Stone Age Economics (Aldine, 1972); J. E. Pfeiffer, The Emergence of Man (Harper & Row, 1985); R. E. Leakey and R. Lewin, Origins (Dutton, 1977), and People of the Lake (Anchor, 1978); R. Lewin, In the Age of Mankind (Smithsonian Book, 1988), presents current theories about prehistory and human prospects today.

Humans As Food Growers

It is probably very difficult for us now to conceptualize fully (or to exaggerate) the consequences of the first appearance of effective food production. The whole range of human existence, from the biological (including diet, demography, disease, and so on) through the cultural (social organization, politics, religion, esthetics, and so forth) bands of the spectrum took on completely new dimensions.

Robert J. Braidwood

During Paleolithic times humans became “human” by learning to speak, to make tools, and to use fire. These advances gave them an enormous advantage over the other animals about them, and yet in one fundamental respect humans remained akin to animals: They were still hunters among other hunters. They were still food gatherers, as were countless other species that were completely dependent on the bounty of nature. And being dependent on nature, humans were dominated by nature. They had to be constantly on the move in order to follow animals and to locate berry patches or fishing grounds. They had to live in small groups or bands because not many could find enough food to support themselves in a given area. It is estimated that even in fertile areas with mild winters only one or two food collectors could support themselves per square mile. And as much as twenty or even thirty square miles were needed for each individual in regions of cold climate, tropical jungle, or desert.

The shift from being food gatherers to being food producers changed every aspect of human life. Why the shift was made and what its results were are the subjects of this chapter.

I. ORIGINS OF AGRICULTURE

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Neolithic humans differed from their Paleolithic predecessors in two respects: They made stone tools by grinding and polishing rather than by chipping and fracturing; and, even more important, they obtained food wholly or primarily from agriculture and/or stock raising rather than from hunting animals or gathering plants. The new cutting tools made of ground stone were more durable than earlier tools and facilitated important inventions like the plow and the wheel, which appeared toward the end of the Neolithic period. But still, the trick of grinding a chipped or hewn axe to a smooth, polished edge was a rather trivial matter compared to the transformation of humans from food collectors to food producers.

This transformation was not the result of sudden inspiration. It was not a case of some prehistoric Archimedes shouting “Eureka!” as he suddenly realized how plants grow. People actually understood the mechanics of plant growth before the agricultural revolution, just as they knew before Columbus’s voyage that the earth was round—and just as modern hunting societies that are wholly without agriculture are nevertheless thoroughly familiar with the nature and behavior of plants in their habitats. They know that plants sprout from seeds, that they usually need water and sunshine to flourish, and that they grow better in one type of soil than in another. Such knowledge is acquired naturally by modern primitives because their very existence depends on practical understanding of the surrounding flora and fauna. There is no reason for doubting, and plenty of evidence for believing, that prehistoric people acquired the same practical understanding when they were in similar circumstances.

If the basic principles of plant life were known to humans thousands of years before the agricultural revolution, why did they delay so long before putting them into practice? One reason is that there was no incentive to do so. Hunting peoples did not normally live on the brink of starvation. Nor did they increase rapidly in numbers and outstrip the available food supply. Being nomads, they were always on the move and, therefore, could not have large families. Mothers had to breast feed each of their babies because they did not have farm animals to provide milk. If a new baby was born too soon after the previous birth, the mother had to let it die because she could not breast feed and carry two infants at one time from camp to camp. Usually mothers were spared the tragedy of infanticide because breast feeding tends to suppress ovulation, so mothers did not normally become pregnant during the several years they fed each baby. If this natural form of birth control failed, then our ancestors resorted to such practices as infanticide, abortion, and lactation taboos, which kept their numbers low enough to pull through the lean months of each year. Thus hunting societies continued to exist for millennia at a comfortable equilibrium, and consequently lacked stimulus for radical change.

Not only did the hunters under normal circumstances have plenty to eat, but also they had a rich variety of food. The Bushmen of South Africa provide a modern example. Although these hunters live in an unfavorable desert environment, they nevertheless collect food from 85 edible plant species and 223 animal species. Thus their diet is much richer in vitamins, minerals, and protein than that of peasants who rely on the few types of grains or tubers they grow. Historically, hunters also had a more dependable supply of food because they could draw on such a large number of plants and animals. By contrast, peasants always faced the danger of starvation if bad weather spoiled their crops.

Not only did hunters have a better and more dependable food supply than food-growing peasants, but in addition they had to work less for their food. Again, adult Bushmen living in a harsh desert spend an average of only fifteen hours per week hunting or collecting food. This is little more than two hours a day. It is not surprising, then, that Bushmen are exceptionally healthy, with 10 percent of their adults being over sixty years of age. Aiding their good health is their nomadic way of life. Since they are always on the move, they avoid diseases that develop from unsanitary conditions, such as from the human excreta and garbage that collects in the villages where peasants spend their lives.

For all these reasons, hunters did not shift to agriculture until 10,000 years ago, even though they knew much earlier how to grow things. Another reason for the late beginning of agriculture was the scarcity of plants and animals suitable for
domestication. Throughout history humans have been able to domesticate only a few hundred plants and a few dozen animals, ones that happen to possess certain essential characteristics. Plants must be potentially high-yielding and be adaptable to a variety of environments. If not, domesticating them will have little effect. This explains why, out of approximately 200,000 species of flowering plants, only about 3,000 have been used to any extent for food. Of these, fewer than thirty are of major importance. They include four grasses (wheat, rice, maize, and sugar), starchy staples (potato, yam, manioc, and banana), and legumes, which are the meat of the poor (lentils, peas, vetches, beans, peanuts, and soybeans).

Like plants, animals also must be domesticated. They must be capable of overcoming their instinctive fear of humans, of breeding in captivity, and of accepting the diet provided by humans. The peoples of the Old World were fortunate in having available a variety of such animals to provide them with meat, milk, wool, and beasts of burden. The progress of American Indians, by contrast, was retarded because they had nothing comparable; they had to make do with a group of half-domesticated Andean cameloids: the llama, alpaca, and vicuna.

As we can see from this discussion, no breakthrough to agriculture could be expected unless some change occurred to upset the comfortable equilibrium of the hunting societies, and even then agriculture could occur only in areas where domesticable plants or animals were available. This is precisely what happened.

During the comparatively short period between 10,000 and 2,000 years ago, the great majority of humans on this planet shifted to agriculture. Obviously this was a forced shift, for no hunter would voluntarily leave his easy and secure way of life for the never-ending work of the peasant tied to his fields and his cattle. What forced the change was population pressure. Over tens of thousands of years, the number of humans had increased slowly, causing the migrations from Africa to Asia, Europe, Australia, and the Americas. Finally all the continents, except Antarctica, were populated. As the number of humans continued to grow slowly but steadily, hunters were forced to supplement the food they gathered with food they grew. Undoubtedly they were unhappy about staying in one area to grow crops and raise cattle, but the fact is that many more people per square mile can be supported by agriculture than by food gathering.

Agriculture first became a full-time occupation in those few regions where there were plants and/or animals that could be domesticated. In the process of domestication the wild plants and animals became larger and provided more food. Thus the hunters spent more and more of their time as food producers rather than food gatherers, until they ended up as peasants living in villages. From the first few centers of this agricultural revolution, the new way of life gradually spread over most of the globe.

II. SPREAD OF AGRICULTURE

The process of transition from hunting to agriculture was gradual and took place independently in many parts of the world. Agriculture developed independently in the Middle East—the Nile Valley in Egypt and Sudan, the valley of the Tigris and Euphrates in Syria and Iraq, and the eastern coast of the Mediterranean in the areas of Turkey, Syria, Lebanon, and Israel—as well as in Mexico, northern China, and Peru. New discoveries being made yearly suggest that there were other independent centers in Southeast Asia, West Africa, and elsewhere. We know the most about the Middle East and Mesoamerica (roughly tropical America north of Panama), both of which had an especially large number of domesticated plants and/or animals.

In the Middle East, ancient peoples found the ancestors of modern wheat, oats, rye, and barley, as well as those of the modern goat, sheep, cattle, and pig. In Mesoamerica, the two small republics of Costa Rica and El Salvador, although comprising only 1 percent of the area of the United States, yield as many plant species as do both the United States and Canada. This extraordinary diversity is the result of the variety of climates created by the wide range of altitude,
temperature, and rainfall within a small area. Consequently, dozens of plants were successfully domesticated in Mesoamerica. The most important ones were maize, beans, and squashes.

Over a period of many centuries the various plants were adapted by humans to a variety of environmental conditions and spread to other areas, thereby creating a regional complex of multiple-species agriculture. This advanced type of agriculture had two great advantages: a high level of productivity and subsistence security. If one crop failed for climatic reasons, another with different requirements could survive. So agriculture provided the dependable food supply essential for dense populations and for the civilizations they produced.

The transition from the earliest domestication to agricultural revolution, or full dependence on agriculture, was very gradual and prolonged. Known as the phase of incipient agriculture, in the Middle East it lasted from roughly 9500 to 7500 B.C. In the New World it lasted even longer. One of the earliest centers of domestication in the New World was the Mexican valley of Tehuacán, where incipient agriculture began in approximately 7000 B.C. It is estimated that 2,000 years later only 10 percent of the diet of the local Indians was derived from their domesticated plants, primarily maize. By 3000 B.C., still only a third of the food came from domesticated sources. It was not until about 1500 B.C. that maize and other plants were hybridized to the point where their yield was sufficiently high to provide most of the food, thus completing the transition from incipient agriculture to the agricultural revolution.

From these two original centers of full-fledged agriculture, from northern China, and from other centers that will be identified in the future, the new mode of living spread to all parts of the globe. The diffusion process was sparked by the inefficiency of early agriculture, which was an intermittent or shifting type of cultivation. The land was cleared and used for crop growing for a few years; then it was abandoned to natural growth for eight to ten or more years to allow the fertility to be restored. As a result, the ratio of abandoned or recuperating land to that under cultivation at any specific time was between five and ten to one. This very land-wasteful agriculture, together with increasing population, required constant extension of the limits of the tilled land into new regions. There was a continual "budding-off" or "hiving-off" from the agricultural settlements into the less densely populated lands of the food-gathering peoples. In this way agriculture was diffused in all directions from the original centers. (See maps of Expansion of Agriculturists, p. 24, and Dispersal of Agriculture, p. 25.)

This doesn't mean that agriculture eventually spread all over the globe. A great variety of local conditions determined where agriculture was to appear early, where late, and where not at all. In the Afro-Asian desert belt and in the arctic regions, agriculture was impossible for obvious reasons. Agriculture was also absent in parts of Africa and the Americas, as well as in all of Australia, because of a combination of isolation and unfavorable physical environment. In other regions such as central and western Europe, agriculture was hampered because the heavy forests were an almost insurmountable obstacle until the Iron Age, when cheap and effective implements became available. When the iron axe replaced the stone, it was possible to increase the efficiency of forest clearing and thereby to allow larger plots to be cultivated in areas where agriculture was already practiced. Hence efficient cultivation extended from the Mediterranean coastlands to the European interior, from the Indus River valley to the Ganges, from the Yellow River valley to the Yangtze, and from Africa's savannas to the tropical rain forests.

Very little is known concerning the precise details of the spread of agriculture from region to region. From the Middle East it spread eastward to the Indus valley, northward to central Asia and eastern Europe, and westward to central and western Europe. In China, wheat and barley were introduced from the Middle East about 1300 B.C., but recent research shows that native plants had been domesticated and cultivated in that region 3,000 years earlier. These plants included rice and tea grown in south China and millets, sorghum, and soybeans grown in north China. Distinctively Chinese was the mulberry tree, whose leaves fed the silkworms, and the lac-
Quer tree, which yielded its famous varnish or lacquer.

Agriculture in Africa developed independently about 5000 B.C. around the headwaters of the Niger and in the Nile valley about 4000 B.C. Whatever its origins, African agriculture for many centuries was confined to the open savanna lands and failed to penetrate southward into areas of tropical rain forest. This was partly because the millet and sorghum commonly grown in the savanna did not do well in the rain forest. But about the beginning of the Christian era this obstacle was overcome by two important developments. One was the appearance of iron working, which may have reached Africa from its place of origin in the Middle East. The other was the arrival, apparently from Southeast Asia, of bananas and Asian yams, which flourished under forest conditions. Thus two new crops along with iron tools brought about the rapid expansion of agriculture down to the southern part of the continent.

In the Americas agriculture arose independently in Mexico and Peru; we will focus our attention on maize in Mexico. The kernels of maize are clustered together on a corn cob, and unlike other grains (such as wheat), they do not fall to the ground and germinate. Thus the cultivation of maize requires human assistance, as evidenced by the presence of maize in archeological sites. Some kind of wild maize provided the base for modern domesticated maize, as seen in fossilized maize pollen discovered in the area of Mexico City. Modern varieties of maize seem to be the result of a cross between this ancestral strain and wild teosinte grass. The hybrid was domesticated in the area of Mexico about 1500 B.C. Other domesticated crops in the Mexican region include squash (about 7000 B.C.) and beans (between 3000 and 5000 B.C.).

Many of the agricultural products in the area of Mexico were not domesticated at the same time. One must conclude that there was probably a long period of transition when the people of this area continued to forage for food while raising other crops.

Agriculture also seems to have become important in the mountains of Peru about 5600 B.C. Domesticated crops in this area include tomatoes, peanuts, lima beans, and potatoes. Also, maize different from the Mexican variety has been found there dating from between 4300 and 2000 B.C. From this original Mesoamerican center, agriculture spread both north and south. Maize arrived in the American Southwest about 3000 B.C. but did not have much effect until A.D.
750, when improvements over the first maize made its cultivation more productive than simple food collecting. Likewise, in eastern North America the Indians did not shift to dependence on agriculture until about A.D. 800, when they developed field cropping based on several varieties of maize, beans, and squash.

III. VARIETIES OF AGRICULTURE

The worldwide diffusion of agriculture led to the domestication of a variety of plants suitable to a variety of local conditions. In the Middle East wheat and barley had been the most common crops. But as the farmers moved northward they found that these crops did not do as well as rye, which originally had been a weed sown unintentionally with the wheat and barley. Hence there was a shift to rye in central Europe and, for the same reasons, another shift to oats further north.

Likewise, the extension of agriculture to sub-Saharan Africa led to the cultivation of native millets and of one type of rice, while around the shores of the Mediterranean the olive became one of the most important sources of edible oil. Across the Iranian plateau and in northwest India an essentially Middle Eastern type of agriculture was practiced. But a dividing line running north and south through central India marks the transition to an entirely different climatic zone with correspondingly different plant life. This is the monsoon region, with heavy seasonal rainfall, constant heat, and dense jungles. Seed-bearing plants of the Middle Eastern variety, which require plenty of sun, cannot thrive here, so in their place we find the yam, taro, banana, and above all, rice. Finally, in the Americas the main crop everywhere was maize, supplemented by beans and squash in North America and by manioc and potatoes of both the sweet and “Irish” varieties in South America.

The net result of this agriculture diffusion was, very generally speaking, three great cereal areas: the rice area in East and Southeast Asia; the maize area in the Americas; and the wheat area in Europe, the Middle East, North Africa, and central Asia to the Indus and Yellow River valleys. During the several millennia between the agricultural and industrial revolutions these three cereals were as fundamental for human history as coal, iron, and copper were to become later.

Early farmers not only grew different crops in different regions of the world, but also they developed different types of agricultural techniques to raise those crops. One of the earliest is known as the “slash-and-burn” method. This slash-and-burn technique was carried on against forests because the land had to be cleared of trees and bushes so that the farmers could plant their seeds. But the clearing was a very hard job because the farmers had only stone tools in those early times. So they used fire to burn down the forests and thus clear the land for farming. Live trees, however, do not burn easily because they are full of sap. So the early farmers slashed a ring around the trunk of each tree, which stopped the flow of sap and caused the tree to die. The dead and dry trees were easy to burn, and the remaining ashes were a good fertilizer. So the farmers planted their seeds in the cleared and enriched land, watered and weeded the plants that sprouted, built fences to keep out wild animals such as rabbits or deer, and finally harvested the crop when it was ripe. This slash-and-burn technique made possible the ex-
tension of farming into large areas formerly covered by forests. It is a technique still practiced in many regions of the world.

Another technique still common on all continents is terrace agriculture. It remains the preferred method in mountainous areas where, in case of heavy rains, farmers face the danger of losing their crops to flash floods pouring down hillsides. To prevent such damage, farmers built stone walls on mountain slopes, and then collected soil and piled it up behind the walls. Soil washed down the slopes and accumulated behind the walls as well. When enough soil piled up to fill the terraces, the farmers then had small level fields on which they could plant their crops without fear of losing them to floods. This is how potatoes are grown today in the Andean highlands of Peru, maize in the highlands of North China, and grapes in Mediterranean countries such as Spain, Italy, and Greece.

A third type of agriculture, vegetative root farming, is widely practiced in tropical regions. Live shoots of root plants such as taros, yams, and manioc are partly buried in moist ground where they grow into large tuberous roots that can be pulled up and fried, boiled, or baked into soup, paste, or cake. These are staple food crops that can be grown year round which provide a dietary mainstay when their starch is supplemented with fish (a common practice in East and Southeast Asia).

Finally, we should note raised field agriculture, which was developed about three thousand years ago in Peru’s highlands. It was then dropped and has been forgotten for centuries. Scientists are very interested in this old technology because after discovering its secrets and using it to grow local Peruvian crops, they find it produces bigger crops than can be grown with the more expensive modern agricultural techniques with their chemicals and machinery.

The raised fields range from 13 to 33 feet wide, are 33 to 330 feet long, and are about 3 feet high. Crops are planted on those earthen platforms, which are separated from each other by canals of similar size. The platforms are constructed from earth that was shoveled out when the canals were dug. Growing crops on these individual raised fields rather than on the surrounding flat country-side gives the farmers several advantages, which are shown in the accompanying illustration.

- Crops are protected by the canal water heat against frost, which is common during the cold nights of the Andean highlands.
- Crops are protected against floods because surplus water flows into the canals.
- Crops are protected against drought by capillary action from the canals and by the ease of hand watering.
- Crops are fertilized with organic muck (green algae, cattle droppings, and dead plant matter), which is raised from the canal bottoms to the raised fields and provides fertilizer superior to the chemical varieties and costs nothing but the labor, which is plentiful in local villages.
- Fish raised in the canals improve substantially the diet of local farmers by increasing the protein in their diet.

Thanks to these advantages, experimental raised fields in Peru were yielding 30 tons of potatoes per acre in 1984, compared to 8 tons from surrounding fields cultivated in the usual manner with imported machinery and fertilizers. Because the raised field technology is a self-sustaining as well as a more productive system, it is being tried out in the United States and in Indonesia, as well as in several Latin American countries. Perhaps a type of agriculture developed originally in the Andean highlands, then forgotten for centuries and recently rediscovered and revived by scientists, may end up reappearing all over the world. The success of this ancient technology shows that lessons can be learned from our prehistoric successors, even in technological matters, despite all the marvels of modern “high technology.”

In addition to these varieties of domesticated plants and of agricultural techniques, we should note that in those regions where there was too little rainfall for agriculture, the inhabitants turned to stock raising. They domesticated local animals rather than local plants. The first wild animal they domesticated was the dog. At first they killed and
Raised Field Agriculture

Raised-platform fields, used in the Ardeas in ancient times, yield bumper crops without modern tools or fertilizers; the main expense is for labor to dig canals and build up platforms.

Water in the canals absorbs the sun's heat by day and radiates it back by night, helping protect crops against frost. The more fields cultivated this way, the bigger the effect on the microenvironment.

The platforms are generally 13 to 33 feet wide, 31 to 330 feet long, and about 3 feet high, built with soil dug from canals of similar size and depth.

Sediment in the canals, nitrogen-rich algae and plant and animal remains, provides fertilizer for crops. In an experiment, potato yields outstripped those from chemically fertilized fields.

Reconstructed fields can be managed by relatively small groups of workers, recent experiments showed. The size of the platforms allows for hand-watering in time of drought, and capillary action feeds the roots. The elevation also protects crops from flooding. The method may be of value in many Third World areas.

ate dogs, as they did other animals. Then they found that dogs were useful to keep in the camp because they frightened off wild animals by their barking and they also helped the hunters to find game. By 10,000 B.C., hunting bands on all continents had their packs of domesticated dogs.

Soon afterwards, humans domesticated other animals that were useful to them in one way or another. Thus those people became pastoral nomads, and many continue today to live in this way, roaming the vast steppes and desert lands from the Sahara to Manchuria and the broad savannas of sub-Saharan Africa. Pastoral nomadism was late in developing because it had to await the domestication of the horse and camel, which provided suitable transport in open country. But once pastoral nomadism got under way, between 1500 and 1000 B.C., a variety of
forms developed. Some nomads depended on a single animal—camels in Arabia and cattle in East and South Africa—whereas others relied on a mix of livestock—herds of horses, cattle, camels, sheep, and goats in central Asia.

Yet regardless of the variety of animals, the pastoral nomads were poor compared to those who lived in the rich valleys of the Tigris-Euphrates, Nile, Indus, and Yellow rivers. In these valleys, a permanent type of irrigation agriculture was developed that was very productive and that in time supported great and wealthy civilizations. These valley civilizations were irresistible magnets to the comparatively poverty-stricken nomads of the central Eurasian steppes and of the Middle Eastern and North African deserts. Thus Eurasian history to modern times has been in large part the history of the rise and fall of great civilizations, with the pastoral nomads always ready to contribute to the fall of any civilization weakened by internal discord.

IV. LIFE OF THE FOOD GROWERS

The most obvious impact of the agricultural revolution was the new sedentary existence. Humans now had to settle down to care for their newly domesticated plants and animals. Thus the Paleolithic nomadic band gave way to the Neolithic village as the basic economic and cultural unit. Indeed the village remained the basis for a pattern of life that was to prevail until the late eighteenth century and that persists to the present day in the vast underdeveloped regions of the world.

Recent archeological excavations reveal that our early ancestors were not always restricted to a choice of nomadic hunting and gathering or sedentary farming. If local plant and animal food resources were unusually rich, it was possible for the local inhabitants to settle down in year-round villages, even though they depended entirely on hunting and gathering. This was the case in Abu Hureyre in northern Syria, where wild cereals, pulses, and legumes grew so densely that they yielded harvests as rich as though they were in planted gardens. Therefore it was possible for a large village of 300 to 400 gatherer-hunters to flourish in Abu Hureyre for several hundred years. Similar favorable conditions enabled food collectors to exist in permanent settlements in other regions such as the Pacific Northwest (Oregon, Washington, and British Columbia), where bountiful fish resources were available year-round. Yet such villages were the exception: Nomadism was the natural corollary of food gathering, just as a settled life was of food producing.

It is easy to romanticize Neolithic village life, but to do so would be grossly misleading. Everyone—men, women, and children—had to work, and work hard, to produce food and a few handicraft articles. Productivity was low since people learned slowly and painfully about soils, seeds, fertilizers, and crop rotation. Despite hard

Remains of a Neolithic temple discovered on Malta.
(Arberio Meila)
labor, famine was common; it often followed too much or too little rain or a plague of pests. Epidemics swept the villages repeatedly as sedentary life introduced the problem of the disposal of human excreta and other refuse. Although dogs helped with sanitation and personal modesty presumably caused people to deposit stools away from habitation, neither of these was sufficient to prevent the various diseases that follow the route from the bowel to the mouth. Furthermore, malnutrition was the rule because of inadequate food supply or unbalanced diet. Life expectancy under these circumstances was exceedingly low, but the high birthrate increased village populations everywhere until famine, epidemic, or emigration restored the balance between food supply and number of mouths to feed.

Yet Neolithic village life was not all misery and suffering. It was a time when people made technological progress at an infinitely more rapid rate than in the preceding Paleolithic period. Primarily, it was not because they had more leisure time than the hunters; we have seen that this was not so. Rather, the new sedentary life made a richer material existence physically possible. The living standards of the nomadic hunters were limited to what they could carry, whereas the Neolithic villagers could indulge in the building of substantial housing together with furnishings, utensils, implements, and assorted knickknacks. They learned to make pottery out of raw clay, at first imitating the baskets, gourds, and other containers of pre-agrarian times. Gradually they grasped the potential of pottery materials and techniques and began to fashion objects that no longer resembled the earlier containers. By the end of the Neolithic period, people in the Near East were building kilns, or ovens, that could fire pottery at a higher temperature and so allow for glazing. The glazed surface sealed the pottery and prevented seepage or evaporation. The agriculturist then had vessels that could be used not only for storing grain but also for cooking and for keeping liquids such as oil and beer.

Similar progress was made with textiles. Late Paleolithic peoples may have twisted or spun wild mountain sheep, goat, dog, or other animal fibers into coarse threads and woven them to make belts, headbands, or even rough blankets. Indeed they probably also modeled clay into crude containers. But it was during the Neolithic that people developed the textile art. They used fibers of the newly domesticated flax, cotton, and hemp plants and spun and wove the fibers on spindles and looms they had gradually evolved. Neolithic villagers also learned to build dwellings that were relatively substantial and roomy. The materials varied with the locality. The Iroquois of northern New York were known as the people of the long house because they lived in huge bark and wood structures that accommodated ten or more families. In the Middle East adobe was used for the walls, whereas in Europe the most common material was split saplings plastered with clay and dung. The roofs were probably of thatch. Dwellings were furnished with fixed beds that might be covered with canopies. Also there were modern-looking dressers with at least two tiers of shelves and various wall cupboards. Light and warmth were provided by an open fire, generally placed near the center of the room. There was no chimney to let out the smoke—only a hole in the roof or a gap under the eaves.

Sedentary life also made possible a tribal political structure in place of the individual bands of the hunting peoples. Tribes were made up of the inhabitants of the villages of a given region, and they were identified and distinguished from others by distinctive characteristics of speech and custom. Some tribes, usually those with primitive economies, were so loosely organized that they were almost at the hunting-band level. Others boasted powerful chiefs and primitive nobilities distinct from the commoners, though the lines were blurred and never reached the exclusive class structures characteristic of the later civilizations.

The basic social unit of the Neolithic village customarily was the household consisting of two or more married couples and their children. This extended family was more common than the independent nuclear family because it was better suited for coping with the problems of everyday living. If an individual producer was temporarily or permanently out of commission, the extended family could absorb the loss. It could function more efficiently during intense work periods when many hands were needed for clearing forest, harvesting, or pasturing livestock. It could also exploit a large area effectively by sending
members for long periods to care for distant gardens or grazing herds, while others tended nearby plots and did household chores.

The distinctive feature of the Neolithic village was social homogeneity. All families had the necessary skills and tools to produce what they needed, and, equally important, all had access to the basic natural resources essential for livelihood. Every family was automatically a component part of the village community, which owned the farmlands, pastures, and other resources of nature. Hence there was no division between landed proprietors and landless cultivators in tribal society. "Hunger and destitution," reports an American anthropologist, "could not exist at one end of the Indian village... while plenty prevailed elsewhere in the same village."

Precisely because of this equality, tribal societies, whether of Neolithic times or of today, have a built-in brake on productivity. Output is geared to the limited traditional needs of the family, so there is no incentive to produce a surplus. This in turn means that labor is sporadic, diversified, and correspondingly limited. The daily grind—the eight-hour day, five-day week—is conspicuously absent. The typical tribe member worked fewer hours per year than a modern man or woman and, furthermore, worked at his or her pleasure. The basic reason was that a person then labored and produced in a specific social role—as a husband or father or brother, a wife or mother or sister, or a village member. Work was not a necessary evil tolerated for the sake of making a living; rather it was a concomitant of kin and community relations. One helped one's brother in the field because of kinship ties and not because one might be given a basket of yams. This tribal society was a comfortable egalitarian society. But for precisely that reason it was a low-productivity society, as can be seen from the work schedule of the Bemba tribe. (see p. 33)

The equality in tribal social relations extended also to tribal gender relations. This equality was firmly grounded in the free access to land that tribal women enjoyed along with the men. An anthropologist who observed the Siang rice growers of central Borneo reported that widows continued to cultivate their own plots after losing their husbands. "On the whole, the women can swing an axe as effectively as the men." If the widow was encumbered by small children, "she is usually assisted by the others in the village, through gifts of rice and wild pig or by help in clearing her field, at least until such time as the children have become old enough to help her."

Women had equal rights not only in agriculture but also in the new village crafts. Excavations at Catal Huyuk, a seventh-millennium B.C. settlement in Asia Minor, reveal that women cultivated indigenous plants, baked bread in communal ovens, wove wool and cotton textiles, made mats and baskets out of the wheat straw, and fired pottery for cooking and storage. In this particular settlement, women appear to have enjoyed not merely equal status but a superior one. Pictorial representations, house furnishings, and burial remains all indicate that the family pecking order was first the mother, next the daughter, followed by the son, with the father in last place.

Turning finally to religion, the new life of the soil tillers gave rise to new beliefs and new gods. The spirits and the magic that had been used by the hunters were no longer appropriate. Now the agriculturists needed, and conceived, spirits who watched over their fields and flocks and hearths. Behind all these spirits stood a creator, usually vaguely defined. But most important, almost everywhere there was a goddess of the earth or of fertility—the earth mother. She was the source of productivity of plants and animals and of the fecundity of women. Life and well-being, the annual cycle of death and birth, ultimately depended on her, hence the creation of many fertility-goddess cults. Such cults were symbolized by the numerous clay figurines with exaggerated female characteristics—pendulous breasts and heavy thighs. They reflect the spread of agriculture from the Middle East and have been found throughout Europe and as far east as India.

V. DEMOGRAPHIC AND RACIAL RESULTS

We have seen that population increase was responsible for the agricultural revolution, but that revolution in turn caused still more population increase. Many more people can be supported per
LOW PRODUCTIVITY OF TRIBAL SOCIETY

A Western observer kept the following record of the work of the Bemba tribe of Northern Rhodesia (now Zambia) during the month of September 1933. Admittedly this is a slack time of the year, when more beer is drunk than normally. Nevertheless the following selections from the record show that the Bemba tribe members do not have to cope with the “daily grind” of modern industrial society.

September 1st, 1933. Two gourds of beer ready, one drunk by old men, one by young men. A new baby born. Women gather from other villages to congratulate, and spend two or three days in the village. Women’s garden work postponed during this time.

2nd. Old men go out to clear the bush. Young men sit at home finishing the sour dregs of the beer. More visits of neighbouring women to see the new baby. Few women go out to do garden work.

3rd. Young men and women go to a church service conducted in a neighbouring village by a visiting Mission doctor. No garden work.

6th. Old and young men working by 6:30 A.M. and hard at it till 2 P.M. Two gourds of beer divided between old and young in the evening. Women working in their gardens normally.

7th. A buck shot by observer’s party. Young men go out to fetch the meat. Women grind extra flour to eat with it. Two gourds of beer also made ready and drinking begins at 2 P.M. By 4 o’clock young men swaggering around the village, ready to quarrel, which they finally do. Dancing at night. Old women hilarious, and rebuked by their daughters for charging into a rough dance on the village square. Not enough beer for the younger women. They remain sober and express disapproval of the rest. No garden work done, except by old men.

8th. Every one off to their gardens in high spirits at 8 A.M. Back at 12 A.M. Young men sit in shelter and drink beer dregs for two hours, singing Scotch Mission hymns in sol-fa. Young girls go out on a miniature fish-poisoning expedition, but catch nothing.

15th. Three men begin digging dry-weather gardens by the river. Little boys go bird-snaring. Young women still away at the capital. Nobody to get relish. No proper meal cooked.

17th. Great heat. Young men sit about in shelter all day, comb each other’s hair, shave, and delouse each other. No relish available. Women too tired to cook.

19th. Nine men clear bush. One woman hoeing. Three women piling branches. Young women go fish-poisoning and catch one fish (about 2 lb.).

22nd. Three men clear bush. One man hoes. Four young men go fishing with three of the wives. Three piling branches.

24th. Four gourds of beer divided between whole village. Sufficient for women as well as men. Beer-drinking lasts two days off and on.

25th. Two old men only able to tree-cut. Young men afraid to climb trees because of ‘beer before the eyes.’ They sit in their shelter and make baskets. One woman only does garden work. Young boys snare birds. Remains of beer drunk.

30th. More beer. Four men clear bush.

* A. I. Richards Land, Labour and Diet in Northern Rhodesia (Oxford University, 1939), pp. 162–164.
square mile by growing rather than gathering food. It is no surprise, therefore, that between 10,000 and 2,000 years ago the human population jumped from 5.32 million to 133 million, a 25-fold increase within 8,000 years.

Not all the scattered peoples of the earth increased to the same degree. Those who switched to agriculture the earliest grew the fastest. We saw earlier that food-gathering women had few children because they breast fed each baby for several years and they were less likely to become pregnant while they were breast feeding. But with the agricultural revolution, mothers had cows, sheep, and goats that provided them with plenty of milk in addition to their own. So mothers now began using that milk to feed their babies and, therefore, they did not need to breast feed each baby for several years. But they were more likely to become pregnant as soon as they stopped breast feeding. So mothers living in villages with domesticated animals began having an average of six children, as compared to the average of four children they had during the long centuries when they were nomadic food gatherers. That is why the population of the human race skyrocketed, as we have seen, between 10,000 and 2,000 years ago.

While agriculturists were increasing so rapidly and spreading all over the world, food gatherers were left far behind in numbers and were crowded out of the most fertile lands. Since early agriculture was not very productive, population pressure soon built up in the villages. The surplus population migrated to nearby fresh lands used by the food gatherers. Sometimes the outnumbered gatherers fled to other lands that were not suitable for farming. This happened in Africa to the Bushmen, who ended up in the Kalahari Desert, and to the Pygmies, who now live in dense jungles. (See map of Global Race Distribution, p. 18, and map of Recession of Hunters, p. 34.)

More commonly, the agricultural immigrants and the local food gatherers intermarried and produced a new hybrid people. Then as population pressure built up again, the new hybrid population would "bud-off" in turn to fresh lands, where further interbreeding would take place with native peoples. In this way agricultural techniques and crops were transmitted long distances, and the people who emerged at the end of the line were of an entirely different racial type from the originals. Thus the immigrants who brought wheat, cattle, the wheel, and the plow into north China were thoroughly Mongoloid, even though these materials originated in the Middle East.

The net result of these migrations that spread agriculture over the globe was that by 1500 B.C. the hunters, who in 8000 B.C. had comprised 100 percent of the human race, had shrunk to little more than 1 percent of the population. This occupational shift led in turn to a racial shift. Ten thousand years ago the race map of the globe showed a rough balance among six races—the Caucasoid, Mongolid, Negroid, Bushman, Pygmy, and Australoid. (See map of Global Race Distribution, p. 18.) By A.D. 1000 this balance was drastically changed in favor of the agriculturist Mongoloids, Caucasoids, and Negroids, and against the Bushmen-Pygmyes, who had remained food gatherers. The only reason the Australoids held their own was that their isolated island home had not yet been discovered by any agriculturists. This had to wait for the European explorers of the eighteenth century, and, when the discovery did take place belatedly, the consequences were all the more catastrophic for the hapless aborigines. Considering the globe as a whole, then, the racial effect of the agricultural revolution was to end the millennia-old racial equilibrium and to establish the Mongolid-Caucasoid-Negroid predominance that persists to the present.

**SUGGESTED READINGS**

THE NATURE OF HUMAN NATURE

The world was surprised and excited in 1971 by the discovery of the Tasaday, a tribe of twenty-seven food-gathering people who had been living in complete isolation on Mindanao Island in the Philippines, where their tribal ancestors had lived similar lives for at least six centuries. The most striking and significant characteristic of this small band is their complete lack of aggressiveness. They have no words for weapon, hostility, anger, or war. Since contact with outsiders, they have eagerly adopted the long Filipino knife, the bolo, because it is superior to their stone tools for gathering food, chopping wood, and slashing through jungle brush. But they have turned down the spear and the bow and arrow because they cannot use them for food gathering. And all the food they collect (yams, fruit, berries, flowers, fish, crabs, frogs) they divide carefully and equally among all members of the band.

The validity of the Tasaday finding has been both questioned and defended. However, other small groups with similar social characteristics have been found all over the world, so the Tasaday remain significant as a common prehistoric type recognized by anthropologists. And the Tasaday are significant because they are food gatherers, as were all human beings before the agricultural revolution—in other words, for over 80 percent of human history. If, during all those tens of thousands of years, people everywhere were as peaceful as the Tasaday, then we cannot accept the common belief that Homo sapiens are innately aggressive.

Unfortunately, at the same time the world was learning about the Tasaday, another band of thirty people, the Fentou, were discovered in New Guinea. These tribesmen are fierce warriors, continually fighting with bows and arrows. Similar contradictions appeared historically among the American Indians. The Comanches and Apaches raised their children to be fighters, whereas the Hopis and Zunis raised theirs for peaceful living—and still do.

So where does this leave us regarding the nature of human nature? The record of history suggests that human beings are born neither peace-loving nor war-loving—neither cooperative nor aggressive. What determines how human beings act is not their genes but how their society teaches them to act. The psychologist Al-
bert Bandura, who has specialized on this subject, has concluded that human nature is "a vast potentiality that can be fashioned by social influences into a variety of forms...Aggression is not an inevitable or unchangeable aspect of man but a product of aggression-promoting conditions within a society."\(^1\)

This question about human nature is of life-and-death significance for us all. With the development of technology, wars have become more deadly. They have also become more frequent. There were not many wars during the Paleolithic period, which covers most of human history, because the small food-gathering bands could use only so much territory. They had nothing to gain by trying to take over territory of a neighboring band. In fact, they had everything to lose because bloody wars might very well have destroyed the human race at a time when so few were scattered about the globe. Human young, after all, are wholly dependent not for one year like monkeys or three to four years like apes, but for six to eight years. The survival of the human young during their long years of dependence was best assured by a system of cooperative base camps that afforded the necessary food and protection. In short, cooperative kinship societies prevailed during the Paleolithic millennia precisely because they were so well suited to the survival of the species.

All this changed with the agricultural revolution. As agriculture became more productive, populations increased, villages grew into cities, and cities grew into empires with great palaces and temples and accumulated wealth. With so much now to fight over, wars became more and more frequent. They also became more and more destructive. Although relatively few people were killed by Roman soldiers with their short swords or by medieval knights in their heavy armor, by modern times the carnage had become general. During World War I, 8.4 million military and 1.3 million civilians were killed. During World War II, the score was 16.9 million military and 34.3 million civilians. A third world war would involve a far greater jump in casualties. The International Council of Scientific Unions, comprising scientists from thirty nations, reported in September 1985 that direct blast and radiation effects of nuclear attacks would take several hundred million lives, but from 1 billion to 4 billion of the world's 5 billion people would die of famine. This would result from a "nuclear winter," when huge clouds of sooty black smoke from nuclear blasts would envelop the earth and rob global crops of warmth and light from the sun.

The important lesson that history teaches us is that such wars are not inevitable. They have occurred not because of human nature but because of human societies. And human societies have been made by human beings and can be remade by human beings. This is the gist of the following conclusion by anthropologist Ashley Montagu concerning human nature: "Certainly we are born with genetically based capacities for many kinds of behavior, but the manner in which these capacities become abilities depends upon the training they receive, upon learning...Our true inheritance lies in our ability to make and shape ourselves, not the creatures but the creators of destiny."\(^2\)

**SUGGESTED READINGS**