CHAPTER 2

The Reign of the Farmer

At the end of the last Ice Age, around 12,000 years ago, the Neolithic revolution began to unfold. This revolution, first and foremost a socioeconomic and technological transformation, involved a shift from food-gathering to food-producing. It originated in a few regions before eventually spreading around the globe. In habitats suitable only as pasture it led to pastoral nomadism or herding animal flocks; in others it led to farming and settled village life. Thus arose the Neolithic or New Stone Age.

Growing Your Own

A surprising but grand fact of prehistory: Neolithic communities based on domesticated plants and animals arose independently several times in different parts of the world after 10,000 BCE (before the common era)—the Near East, India, Africa, North Asia, Southeast Asia, and Central and South America. The physical separation of the world's hemispheres—the Old World and the New World—decisively argues against simple diffusion of Neolithic techniques, as do the separate domestications of wheat, rice, corn, and potatoes in different regions. On the time scale of prehistory the transformation appears to have been relatively abrupt, but in fact the process occurred gradually. Nonetheless, the Neolithic revolution radically altered the lives of the peoples affected and, indirectly, the conditions of their habitats. Although different interpretations exist concerning the origin of the Neolithic, no one disputes its world-transforming effects.

The Neolithic was the outcome of a cascading series of events and processes. In the case of gardening—low-intensity farming—we now know that in various locales around the world human groups settled down in permanent villages, yet continued to practice hunting, gathering, and a Paleolithic economy before the full transition to a Neolithic mode of production. These settled groups lived by complex foraging in

limited territories, intensified plant collection, and exploitation of a broad spectrum of secondary or tertiary food sources, such as nuts and seafood. They also lived in houses, and in this sense early sedentary humans were themselves a domesticated species. (The English word "domestic" derives from the Latin word *domus,* meaning "house." Humans thus domesticated themselves as they domesticated plants or animals!) But the inexorable pressure of population against dwindling collectible resources, along with the greater nutritional value of wild and domesticated cereal grains, ultimately led to increasing dependence on farming and a more complete food-producing way of life.

In most places in the world people continued a Paleolithic existence after the appearance of Neolithic settlements 12,000 years ago. They were blissfully unpressured to take up a new Neolithic mode of food-producing, and as a cultural and economic mode of existence even today a few surviving groups follow a Paleolithic lifestyle. As a period in prehistory, the Neolithic has an arc of its own that covers developments from the first simple horticulturists and pastoralists to complex late Neolithic groups living in "towns." In retrospect, especially compared to the extreme length of the Paleolithic period, the Neolithic of prehistory lasted just a moment before civilization in Mesopotamia and Egypt began to usher in further transformations around 5,000 years ago. But even in its diminished time frame the Neolithic spread geographically and persisted in particular locales over thousands of years from roughly 12,000 to 5,000 years ago, when the Neolithic first gave way to civilization in the Near East. To those experiencing it, Neolithic life must have proceeded over generations at a leisurely seasonal pace.

Two alternative paths toward food production led out of the Paleolithic: one from gathering to cereal horticulture (gardening), and then to plow agriculture; the other from hunting to herding and pastoral nomadism. A distinct geography governed these Neolithic alternatives: in climates with sufficient atmospheric or surface water, horticulture and settled villages arose; in grasslands too arid for farming, nomadic people and herds of animals retained a nomadic way of life. Of these very different paths, one led historically to nomadic societies such as the Mongols and the Bedouins. The other, especially in the form that combined farming and domestication of animals, led to the great agrarian civilizations and eventually to industrialization.

Opportunistic and even systematic hunting and gathering persisted alongside food-producing, but where Neolithic settlements arose the basic economy shifted to raising crops on small cleared plots. Gardening contrasts with intensified agriculture using irrigation, plows, and draft animals which later developed in the first civilizations in the Near East. Early Neolithic peoples did not use the plow but, where necessary, cleared land using large stone axes and adzes; they cultivated their plots using hoes or digging sticks. In many areas of the world, espe-

cially tropical and subtropical ones, swidden, or "slash and burn," agriculture developed where plots were cultivated for a few years and then abandoned to replenish themselves before being cultivated again. The Neolithic toolkit continued to contain small chipped stones, used in sickles, for example, but was augmented by larger, often polished implements such as axes, grinding stones, and mortars and pestles found at all Neolithic sites. Animal antlers also proved useful as picks and digging sticks. And grain had to be collected, threshed, winnowed, stored, and ground, all of which required an elaborate set of technologies and social practices.

Human populations around the world independently domesticated and began cultivating a variety of plants: several wheats, barleys, rye, peas, lentils, and flax in Southwest Asia; millet and sorghum in Africa; millet and soybeans in North China; rice and beans in Southeast Asia; maize (corn) in Mesoamerica; potatoes, quinoa, beans, and manioc in South America. Domestication constitutes a process (not an act) that involves taming, breeding, genetic selection, and occasionally introducing plants into new ecological settings. In the case of wheat, for example, wild wheat is brittle, with seeds easily scattered by the wind and animals, a trait that enables the plant to survive under natural conditions. Domesticated wheat retains its seeds, which simplifies harvesting but which leaves the plant dependent on the farmer for its propagation. Humans changed the plant's genes; the plant changed humanity. And, with humans raising the grain, the rat, the mouse, and the house sparrow "self-domesticated" and joined the Neolithic ark.

The domestication of animals developed out of intimate and longstanding human contact with wild species. Logically, at least, there is a clear succession from hunting and following herds to corralling, herding, taming, and breeding. The living example of the Sami (Lapp) people who follow and exploit semiwild reindeer herds illustrates how the shift from hunting to husbandry and pastoral nomadism may have occurred. As with plant culture, the domestication of animals involved human selection from wild types, selective slaughtering, selective breeding, and what Darwin later called "unconscious selection" from among flocks and herds. Humans in the Old World domesticated cattle, goats, sheep, pigs, chickens, and, later, horses. In the New World Andean communities domesticated only llamas and the guinea pig; peoples in the Americas thus experienced a comparative deficiency of animal protein in the diet.

Animals are valuable to humans in diverse ways. Some of them convert inedible plants to meat, and meat contains more complex proteins than plants. Animals provide food on the hoof, food that keeps from spoiling until needed. Animals produce valuable secondary products that were increasingly exploited as the Neolithic unfolded in the Old World. Cattle, sheep, pigs, and the rest are "animal factories" that produce more cattle, sheep, and pigs. Chickens lay eggs, and cows, sheep,

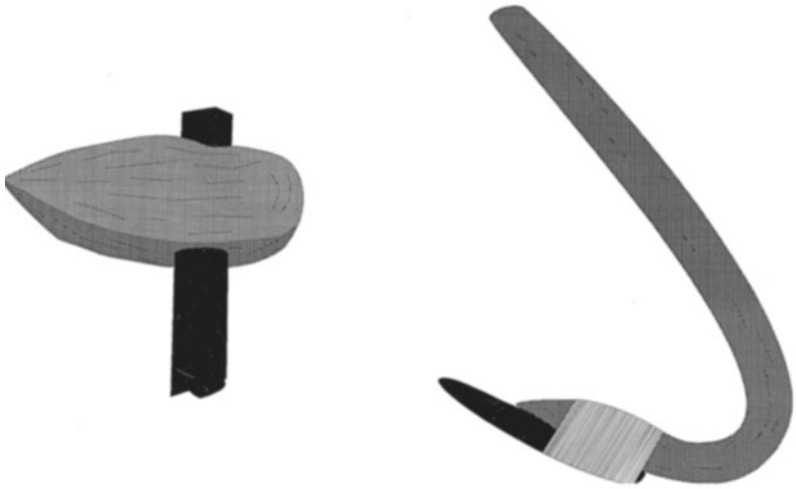


Fig. 2.1. Neolithic tools. Neolithic horticulture required larger tools for clearing and cultivating plots and for harvesting and processing grains.

goats, and horses produce milk. Treated and storable milk products in yogurts, cheeses, and brewed beverages sustained the great herding societies of Asia and pastoralists everywhere. Manure later became another valuable animal product as fertilizer and fuel. Animal hides provided raw material for leather and a variety of products, and sheep, of course, produced fleece. (Wool was first woven into fabric on Neolithic looms.) Animals provided traction and transportation. The Neolithic maintained the close dependence on plants and animals that humankind had developed over the previous 2 million years. But the technologies of exploiting them and the social system sustained by those technologies had changed radically.

After a few thousand years of the Neolithic in the Near East, mixed economies that combined the technologies of horticulture and animal husbandry made their appearance. Late Neolithic groups in the Old World apparently kept animals for traction and used wheeled carts on roads and pathways that have been favorably compared to those of medieval Europe. The historical route to intensified agriculture and to civilization was through this mixed Neolithic farming. If biology and evolution were partly responsible for the character of our first mode of existence in the Paleolithic, then the Neolithic revolution represents a change of historical direction initiated by humans themselves in response to their changing environment.

Complementing the many techniques and skills involved in farming and husbandry, several ancillary technologies arose as part of the shift to the Neolithic. First among these novelties was textiles, an innovation independently arrived at in various parts of the Old and New Worlds. Recent findings show that some Paleolithic groups occasionally practiced techniques of weaving, perhaps in basketry, but only in the Neolithic did the need for cloth and storage vessels expand to the point where textile technologies flourished. The production of textiles involves several interconnected sets of technologies: shearing sheep or

growing and harvesting flax or cotton, processing the raw material, spinning thread (an ever-present part of women's lives until the Industrial Revolution 10,000 years later), constructing looms, dyeing, and weaving the cloth. In considering the advent of textile production in the Neolithic, one cannot overlook design considerations and the symbolic and informational role of dress in all societies.

Pottery, which also originated independently in multiple centers around the world, is another new technology that formed a key part of the Neolithic revolution. If only inadvertently, Paleolithic peoples had produced fired-clay ceramics, but nothing in the Paleolithic economy called for a further development of the technique. Pottery almost certainly arose in response to the need for a storage technology: jars or vessels to store and carry the surplus products of the first agrarian societies. Neolithic communities used plasters and mortars in building construction, and pottery may have arisen out of plastering techniques applied to baskets. Eventually, "manufacturing centers" and small-scale transport of ceramics developed. Pottery is a "pyrotechnology," for the secret of pottery is that water is driven from the clay when it is "fired," turning it into an artificial stone. Neolithic kilns produced temperatures upwards of 900°C. Later, in the Bronze and Iron Ages, the Neolithic pyrotechnology of pottery made metallurgy possible.

In Neolithic settings, hundreds if not thousands of techniques and technologies large and small melded to produce the new mode of life. Neolithic peoples built permanent structures in wood, mud brick, and stone, all of which testify to expert craft skills. They twisted rope and practiced lapidary crafts, and Neolithic peoples even developed metallurgy of a sort, using naturally occurring raw copper. The technology of cold metalworking produced useful tools. The now-famous "Ice man," the extraordinary frozen mummy exposed in 1991 by a retreating glacier in the Alps, was first thought to belong to a Bronze Age culture because of the fine copper axe he was carrying when he perished. As it turns out, he lived in Europe around 3300 BCE, evidently a prosperous Neolithic farmer with a superior cold-forged metal tool.

The Neolithic was also a social revolution and produced a radical change in lifeways. Decentralized and self-sufficient settled villages, consisting of a dozen to two dozen houses, with several hundred inhabitants became the norm among Neolithic groups. Compared to the smaller bands of the Paleolithic, village life supported collections of families united into tribes. The Neolithic house doubtless became the center of social organization; production took place on a household basis. The imaginative suggestion has been made that living inside houses forced Neolithic peoples to deal in new ways with issues concerning public space, privacy, and hospitality. Neolithic peoples may have used hallucinatory drugs, and they began to experiment with fermented beverages. Although a sexual division of labor probably persisted in the Neolithic, horticultural societies, by deemphasizing hunt-

ing, may have embodied greater gender equality. A comparatively sedentary lifestyle, a diet higher in carbohydrates, and earlier weaning increased fertility, while freedom from the burden of carrying infants from camp to camp enabled women to bear and care for more children. And one suspects that the economic value of children—in tending animals or helping in the garden, for example—was greater in Neolithic times than in the Paleolithic. At least with regard to Europe, some archaeologists have made compelling claims for the existence of cults devoted to Neolithic goddesses and goddess worship. There were doubtless shamans, or medicine "men," some of whom may also have been women. Neolithic societies remained patriarchal, but males were not as dominant as they would become with the advent of civilization.

In the early Neolithic, little or no occupational specialization differentiated individuals who earned their bread solely through craft expertise. This circumstance changed by the later Neolithic, as greater food surpluses and increased exchange led to more complex and wealthier settlements with full-time potters, weavers, masons, toolmakers, priests, and chiefs. Social stratification kept pace with the growth of surplus production. By the late Neolithic low-level hierarchal societies, tribal chiefdoms, or what anthropologists call "big men" societies appeared. These societies were based on kinship, ranking, and the power to accumulate and redistribute goods sometimes in great redistributive feasts. Leaders now controlled the resources of 5,000 to 20,000 people. They were not yet kings, however, because they retained relatively little for themselves and because Neolithic societies were incapable of producing truly great wealth.

Compared to the Paleolithic economy and lifestyle, one could argue that the standard of living actually became depressed in the transition to the Neolithic in that low-intensity horticulture required more labor, produced a less varied and nutritious diet, and allowed less leisure than Paleolithic hunting and gathering in its heyday. But—and this was the primary advantage—Neolithic economies produced more food and could therefore support more people and larger population densities (estimated at a hundredfold more per square mile) than Paleolithic foraging.

Populations expanded and the Neolithic economy spread rapidly to fill niches suited for them. By 3000 BCE thousands of agrarian villages dotted the Near East, usually within a day's walk of one another. Wealthier and more complex social structures developed, regional crossroads and trading centers arose, and by the late Neolithic real towns had emerged. The classic example is the especially rich Neolithic town of Jericho, which by 7350 BCE already had become a well-watered, brick-walled city of 2,000 or more people tending flocks and plots in the surrounding hinterland. Jericho had a tower nine meters high and ten meters in diameter, and its celebrated walls were three meters thick, four meters high, and 700 meters in circumference. The walls were nec-

essary because the surplus stored behind them attracted raiders. Warlike clashes between Paleolithic peoples had undoubtedly occurred repeatedly over the millennia in disputes over territory, to capture females, or for cannibalistic or ritual purposes. But with the Neolithic, for the first time, humans produced surplus food and wealth worth stealing and hence worth protecting. Paleolithic groups were forced to adapt to the Neolithic economies burgeoning around them. Thieving was one alternative; joining in a settled way of life was another. In the long run, Neolithic peoples marginalized hunter-gatherers and drove them virtually to extinction. Idealized memories of the foraging lifestyle left their mark in "Garden of Eden" or "happy hunting grounds" legends in many societies.

Blessed or cursed with a new economic mode of living, humans gained greater control over nature and began to make more of an impact on their environments. The ecological consequences of the Neolithic dictated that the domestic replace the wild, and where it occurred the Neolithic revolution proved irreversible—a return to the Paleolithic was impossible because Paleolithic habitats had been transformed and the Paleolithic lifestyle was no longer sustainable.

Moonshine

The Neolithic revolution was a techno-economic process that occurred without the aid or input of any independent "science." In assessing the connection between technology and science in the Neolithic, pottery provides an example exactly analogous to making fire in the Paleolithic. Potters made pots simply because pots were needed and because they acquired the necessary craft knowledge and skills. Neolithic potters possessed practical knowledge of the behavior of clay and of fire, and, although they may have had explanations for the phenomena of their crafts, they toiled without any systematic science of materials or the self-conscious application of theory to practice. It would denigrate Neolithic crafts to suppose that they could have developed only with the aid of higher learning.

Can anything, then, be said of science in the Neolithic? In one area, with regard to what can be called Neolithic astronomy, we stand on strong ground in speaking about knowledge in a field of science. Indeed, considerable evidence makes plain that many, and probably most, Neolithic peoples systematically observed the heavens, particularly the patterns of motion of the sun and moon and that they regularly created astronomically aligned monuments that served as seasonal calendars. In the case of Neolithic astronomy, we are dealing not with the prehistory of science, but with science in prehistory.

The famous monument of Stonehenge on the Salisbury Plain in southwest England provides the most dramatic and best-understood case in point. Stonehenge, it has now been determined by radiocarbon

Fig. 2.2. Jericho. Neolithic farming produced a surplus that needed to be stored and defended. Even in its early phases, the Neolithic settlement of Jericho surrounded itself with massive walls and towers, as shown in this archaeological dig.

dating, was built intermittently in three major phases by different groups over a 1,600-year period from 3100 BCE to 1500 BCE, by which time the Bronze Age finally washed across the Salisbury Plain. The word "Stonehenge" means "hanging stone," and transporting, working, and erecting the huge stones represents a formidable technological achievement on the part of the Neolithic peoples of prehistoric Britain.

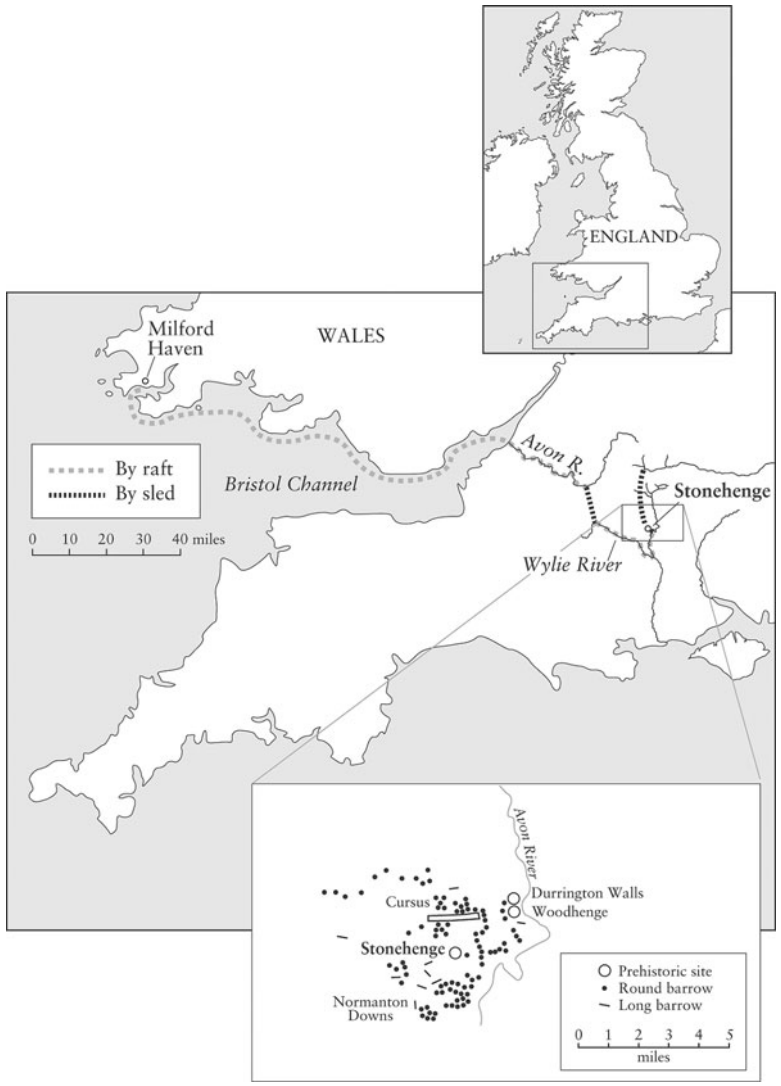
A huge amount of labor went into building Stonehenge—estimates range to 30 million man-hours, equivalent to an annual productive labor of 10,000 people. In order to create a circular ditch and an embankment 350 feet in diameter, 3,500 cubic yards of earth were excavated. Outside the sanctuary the first builders of Stonehenge erected the so-called Heel Stone, estimated to weigh 35 tons. Eighty-two "bluestones" weighing approximately five tons apiece were brought to the site (mostly over water) from Wales, an incredible 240 kilometers (150

miles) away. Each of the 30 uprights of the outer stone circle of Stonehenge weighed in the neighborhood of 25 tons, and the 30 lintels running around the top of the ring weighed seven tons apiece. More impressive still, inside the stone circle stood the five great trilithons or three-stone behemoths. The average trilithon upright weighs 30 tons and the largest probably weighs over 50 tons. (By contrast, the stones that went into building the pyramids in Egypt weighed on the order of five tons.) The great monoliths were transported 40 kilometers (25 miles) overland from Marlborough Downs, although the suggestion has been made that ancient glaciers may have been responsible for moving them at least part way to Stonehenge. The architects of Stonehenge appear to have laid out the monument on a true circle, and in so doing they may have used some practical geometry and a standard measure, the so-called megalithic yard.

The labor was probably seasonal, taking place over generations. A stored food surplus was required to feed workers, and some relatively centralized authority was needed to collect and distribute food and to supervise construction. Neolithic farming and ranching communities appeared on the Salisbury Plain by the fourth millennium BCE and evidently reached the required level of productivity. Although Neolithic farming never attained the levels of intensification later achieved by civilized societies, Stonehenge and the other megalithic ("large stone") structures show that even comparatively low-intensity agriculture can produce sufficient surpluses to account for monumental building.

Recognition that Stonehenge is an astronomical device has been confirmed only in our day. As literate peoples encountered Stonehenge over the centuries, any number of wild interpretations emerged as to who built it and why. Geoffrey of Monmouth in his twelfth-century *History of the Kings of Britain* has Merlin from King Arthur's court magically transporting the stones from Wales. Other authors have postulated that the Romans or the Danes built Stonehenge. A still-current fantasy holds that the Druids built and used Stonehenge as a ceremonial center. (In fact, the Celtic Iron Age Druids and their culture only appeared a thousand years after Stonehenge was completed.) Even in the 1950s, when

Fig. 2.3. Stonehenge. Neolithic and early Bronze Age tribes in Britain built and rebuilt the famous monument at Stonehenge as a regional ceremonial center and as an "observatory" to track the seasons of the year.



Map 2.1. The Salisbury plain. Stonehenge was set among a cluster of Neolithic sites, indicating the relative wealth and resources of the region. Some of the smaller stones that went into making Stonehenge were transported 150 miles by rollers and raft from Western Wales; some of the largest stones came from 25 miles north of the site.

the possibility became clear that Neolithic peoples from the Salisbury Plain themselves were responsible for Stonehenge, there was considerable resistance to the idea that "howling barbarians" might have been capable of building such an impressive monument, and some supposed that itinerant contractors from the Near East built it. All scholars now agree that Stonehenge was a major ceremonial center and cult site built by the people of the Salisbury Plain. Its astronomical uses indicate that it functioned as a Neolithic religious center for the worship of the sun and the moon and for establishing a regional calendar.

The English antiquarian William Stukeley (1687–1765) was the first modern to write about the solar alignment of Stonehenge in 1740. The sun rises every day at a different point on the horizon; that point moves back and forth along the horizon over the course of a year, and each year at midsummer the sun, viewed from the center of the sanctuary at

Stonehenge, rises at its most northern point, which is precisely where the builders placed the Heel Stone. The monument's primary astronomical orientation toward the midsummer sunrise is confirmed annually and has not been disputed since Stukeley.

In the 1960s, however, controversy erupted over claims for Stonehenge as a sophisticated Neolithic astronomical "observatory" and "computer." The matter remains disputed today, but wide agreement exists on at least some larger astronomical significance for Stonehenge, especially with regard to tracking cyclical movements of the sun and the moon. The monument seems to have been built to mark the extreme and mean points of seasonal movement of both heavenly bodies along the horizon as they rise and set. Thus, the monument at Stonehenge marks not only the sun's rise at the summer solstice, but the rise of the sun at winter solstice and at the fall and spring equinoxes. It also indicates the sun's settings at these times, and it tracks the more complicated movements of the moon back and forth along the horizon, marking four different extremes for lunar motion.

The construction of Stonehenge required sustained observations of the sun and the moon over a period of decades and mastery of horizon astronomy. The monument embodied such observations, even in its earliest phases. The ruins testify to detailed knowledge of heavenly move-

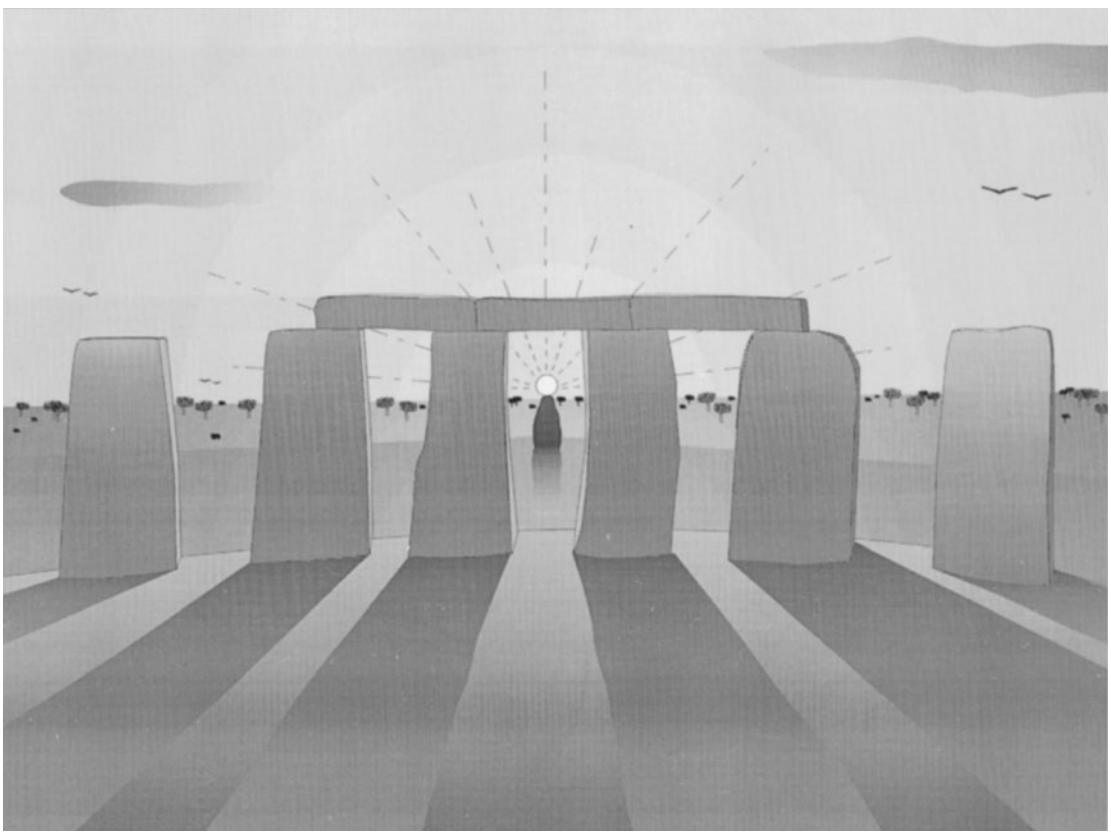


Fig. 2.4. Midsummer sunrise at Stonehenge. On the morning of the summer solstice (June 21) the sun rises along the main axis of Stonehenge and sits atop the Heel Stone.

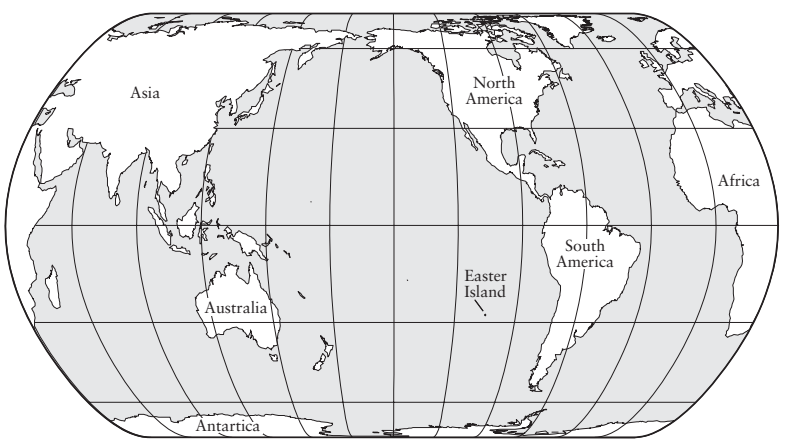
Fig. 2.5. Neolithic society on Easter Island. A society based on low-intensity agriculture flourished here for hundreds of years before it was extinguished by ecological ruin. During its heyday it produced megalithic sculptures called *moai* comparable in scale to Stonehenge and other monumental public works that are typical of Neolithic societies.

ments and to a widespread practice of "ritual astronomy." We have no access to what megalithic Europeans thought they were doing; their "theories" of the sun and the moon, if any, may have been utterly fantastic, and we would probably label their explanations more religious than naturalistic or scientific. Still, megalithic monuments embody a scientific approach in that they reflect understanding of regularities of celestial motions and they bespeak long-term systematic interest in and observations of nature. Although religious elders, hereditary experts, or priestly keepers of knowledge doubtless tended Stonehenge, it probably goes too far to suggest that megalithic monuments provide evidence for a class of professional astronomers or for astronomical research of the sort that later appeared in the first civilizations. Stonehenge may better be thought of as a celestial orrery or clock that kept track of the major motions of the major celestial bodies and possibly some stars. In addition, Stonehenge certainly functioned as a seasonal calendar, accurate and reliable down to a day. As a calendar, Stonehenge kept track of the solar year and, even more, harmonized the annual motion of the sun with the more complicated periodic motion of the moon. It may even have been used to predict eclipses, although that possibility seems unlikely. In these telling ways—systematically observing the heavens, mastering the clock-like movement of the sun and the moon, gaining intellectual control over the calendar—it is possible and even necessary to speak of Neolithic "astronomy" at Stonehenge. The further development of astronomy awaited the advent of writing and cohorts of full-time experts with the patronage of centralized bureaucratic governments. But long before those developments, Neolithic farmers systematically investigated the panorama of the heavens.

On the other side of the globe the remarkable giant statues of Easter

Island (also known as Rapa Nui) provide mute testimony to the same forces at play. Easter Island is small and very isolated: a 46-square-mile speck of land 1,400 miles west of South America and 900 miles from the nearest inhabited Pacific island. Polynesian peoples reached Easter Island by sea sometime after 300 of the common era (CE) and prospered through cultivating sweet potatoes, harvesting in a subtropical palm forest, and fishing in an abundant sea. The economy was that of settled Paleolithic or simple Neolithic societies, but local resources were rich, and even at slow growth rates over a millennium the founding population inevitably expanded, reaching 7,000 to 9,000 at the peak of the culture around 1200 to 1500 CE. (Some experts put the figure at over 20,000.)

Islanders carved and erected more than 250 of their monumental moai statues on giant ceremonial platforms facing the sea. Notably, the platforms possessed built-in astronomical orientations. Reminiscent of the works of the peoples of Stonehenge or the Olmecs of Central America, the average moai stood over 12 feet in height, weighed nearly 14 tons, and was transported up to six miles overland by gangs of 55 to 70 men; a few mammoth idols rose nearly 30 feet tall and weighed up to 90 tons. Hundreds more statues—some significantly larger still—remain unfinished in the quarry, where all activity seems to have stopped suddenly. Remote Easter Island became completely deforested because of the demand for firewood and construction material for seagoing canoes, without which islanders could not fish for their staple of porpoise and tuna. By 1500, with the elimination of the palm tree and the extinction of native bird populations, demographic pressures became devastatingly acute, and islanders intensified chicken-raising and resorted to cannibalism and eating rats. The population quickly crashed to perhaps one-tenth its former size, the sad remnant "discovered" by Europeans in 1722. Only 100 souls lived there in 1887. The wealth of the pristine island had provided rich resources where a human society evolved in a typically Neolithic (or settled Paleolithic) pattern. But



Map 2.2. Easter Island. This isolated speck of land in the South Pacific lies 1,400 miles off the coast of South America and 900 miles from the nearest inhabited island to the west. Polynesian seafarers, probably navigating by star charts and taking advantage of their knowledge of wind and current changes, arrived at Easter Island around CE 300. Europeans "discovered" the island in 1722.

human appetites and the island's narrow ecological limits doomed the continuation of the stone-working, heaven-gazing, and wood-burning culture that evolved there.

In general, through observation of the sun and the moon Neolithic peoples around the world established markers, usually horizon markers, that monitored the periodic motion of these bodies across the sky, tracked the year and the seasons, and provided information of great value to communities of farmers. In some cases the devices they created to reckon the year and predict the seasons became quite elaborate and costly and were possible only because of the surplus wealth produced in favored places.

Before Stonehenge and long before the settlement and ruination of Easter Island, in certain constricted environments growing populations pressed against even enlarged Neolithic resources, setting the stage in Egypt, Mesopotamia, and elsewhere for a great technological transformation of the human way of life—the advent of urban civilization.