



□ Picturing the Past

Cave Paintings of Horses and a Horned Auroch from Lascaux Cave, Southern France, ca. 15,000 B.C.E. The artist who made these amazing animals in charcoal and red ochre first smoothed the surface, just as a contemporary artist might. This cave includes paintings of hundreds of animals, including predators such as lions, as well as abstract symbols. (JM Labat/Photo Researchers, Inc.)

ANALYZING THE IMAGE The artist painted the animals so close together that they overlap. What might this arrangement have been trying to depict or convey?

CONNECTIONS Why might Paleolithic people have made cave paintings? What do these paintings suggest about Stone Age culture and society?

The Development of Agriculture in the Neolithic Era, ca. 9000 B.C.E.

- How did plant and animal domestication develop, and what effects did it have on human society?

Foraging remained the basic way of life for most of human history, and for groups living in extreme environments, such as tundras or deserts, it was the only possible way to survive. In a few especially fertile areas, however, the natural environment provided enough

Neolithic Tools from Lakes in Switzerland These highly specialized tools include arrow points, awls, chisels, scrapers, stone ax blades in antler sockets, sickle blades, and round spindle whorls, designed to twist fibers into thread. The people who made and used them lived in wooden houses on stilts over the water, and the mud of the lake bed preserved even the bone and antler. (Courtesy of Peter A. Bostrom)



food that people could become more settled. As they remained in one place, they began to plant seeds as well as gather wild crops, to raise certain animals instead of hunting, and to selectively breed both plants and animals to make them more useful to humans. This seemingly small alteration was the most important change in human history; because of its impact it is often termed the **Agricultural Revolution**. Plant and animal domestication marked the transition from the Paleolithic to the Neolithic. It allowed the human population to grow far more quickly than did foraging, but it also required more labor, which became increasingly specialized.

The Development of Horticulture

Areas of the world differed in the food resources available to foragers. In some, acquiring enough food to sustain a group was difficult, and groups had to move constantly. In others, moderate temperatures and abundant rainfall allowed for verdant plant growth; or seas, rivers, and lakes provided substantial amounts of fish and shellfish. Groups in such areas were able to become more settled. About 15,000 years ago, the earth's cli-

mate entered a warming phase, and the glaciers began to retreat. As it became warmer, the climate became wetter, and more parts of the world were able to support sedentary or semi-sedentary groups of foragers.

In several of these places, foragers began planting seeds in the ground along with gathering wild grains, roots, and other foodstuffs. By observation, they learned the optimum times and places for planting. They removed unwanted plants through weeding and selected the seeds they planted in order to get crops that had favorable characteristics, such as larger edible parts. For grain crops, people chose plants with larger kernels clustered together that ripened all at one time and did not just fall on the ground, qualities that made harvesting more efficient. Through this human intervention, certain crops became **domesticated**, that is, modified by selective breeding so as to serve human needs, in this case to provide a more reliable source of food. Archaeologists trace the development and spread of plant-raising by noting when the seeds and other plant parts they discover show evidence of domestication.

This early crop-planting was done by individuals using hoes and digging sticks, and it is often termed **horticulture** to distinguish it from the later agriculture using plows. In some places, digging sticks were weighted with stones to make them more effective (earlier archaeologists thought these stones were the killing parts of war clubs). Intentional crop-planting developed first in the area archaeologists call the Fertile Crescent, which runs from present-day Lebanon,

- **Agricultural Revolution** Dramatic transformation in human history resulting from the change from foraging to raising crops and animals.
- **domesticated** Plants and animals modified by selective breeding so as to serve human needs; domesticated animals will behave in specific ways and breed in captivity.
- **horticulture** Crop-raising done with hand tools and human power.

Israel, and Jordan north to Turkey and then south to the Iran-Iraq border (Map 1.2). About 9000 B.C.E. people there began to plant seeds of the wild wheat and barley they had already been harvesting, along with seeds of legume crops, such as peas and lentils, and of the flax with which they made linen cloth. They then modified these crops through domestication. By about 8000 B.C.E. people were growing sorghum and millet in parts of the Nile River Valley, and perhaps yams in western Africa. By about 7000 B.C.E. they were growing domesticated rice, millet, and legumes in China, yams and taro in Papua New Guinea, and perhaps squash in Mesoamerica. In each of these places, the development of horticulture occurred independently, and it may have happened in other parts of the world as well. Archaeological evidence does not survive well in tropical areas like Southeast Asia and the Amazon Basin, which may have been additional sites of plant domestication.

Nowhere do archaeological remains alone answer the question of who within any group first began to cultivate crops, but the fact that, among foragers, women were primarily responsible for gathering plant products suggests that they may also have been the first to plant seeds in the ground. In many parts of the world, crops continued to be planted with hoes and digging sticks for millennia, and crop-raising remained primarily women's work, while men hunted or later raised animals.

Why, after living successfully as foragers for tens of thousands of years, did humans in so many parts of the world all begin raising crops at about the same time? The answer to this question is not clear, but crop-raising may have resulted from population pressures in those parts of the world where the warming climate provided more food. More food meant lower child mortality and longer life spans, which allowed communities to grow. Naturally occurring and then planted foods included cereal crops, which were soft enough for babies to eat, so that women could stop nursing their children at a younger age. They lost the contraceptive effects of breast-feeding, and children may have been born at more frequent intervals, further speeding up population growth. Thus people had a choice: they could move to a new area—the solution that foragers had relied on when faced with the same problem—or they could develop ways to increase the food supply to keep up with population growth, a solution that the warming climate was making possible. They chose the latter and began to plant more intensively, beginning cycles of expanding population

The Fertile Crescent



and intensification of land use that have continued to today.

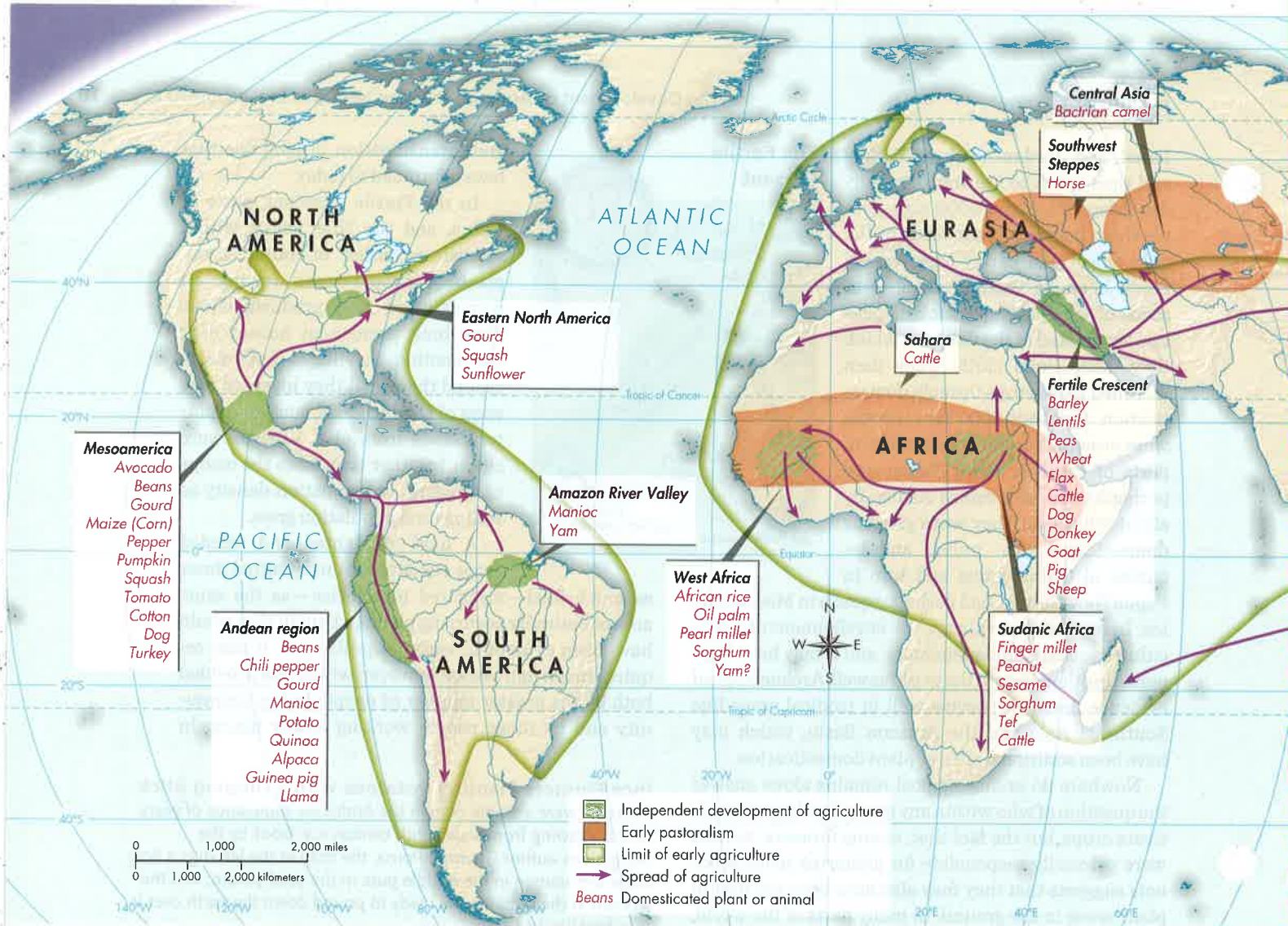
In the Fertile Crescent, parts of China, and the Nile Valley, within several centuries of initial crop-planting, people were relying on domesticated food products alone. They built permanent houses near one another in villages with fields around them, and they invented new ways of storing foods, such as in pottery made from clay. Villages were closer together than were the camps of foragers, so population density as well as total population grew.

A field of planted and weeded crops yields ten to one hundred times as much food—measured in calories—as the same area of naturally occurring plants, a benefit that would have been evident to early crop-planters. It also requires much more labor, however, which was provided both by the greater number of people in the community and by those people working longer hours. In

Inca Farmers Planting Potatoes with a Digging Stick

Potatoes were a staple crop in the Andes for thousands of years. In this drawing from a sixteenth century C.E. book by the indigenous author Guaman Poma, the man at the left digs a hole while the woman in the middle puts in the seed potato, and the woman at the right stands ready to pound down the earth over it. (John Meek/The Art Archive)





MAP 1.2 The Spread of Agriculture and Pastoralism Local plants and animals were domesticated in many different places. Agriculturalists and pastoralists spread the knowledge of how to raise them, and spread the plants and animals themselves, through migration, trade, and conquest.

contrast to the twenty hours a week foragers spent on obtaining food, farming peoples were often in the fields from dawn to dusk, particularly during planting and harvest time, but also during the rest of the growing year because weeding was a constant task.

Foragers who lived at the edge of horticultural communities appear to have recognized the negative aspects of crop-raising, for they did not immediately adopt this new way of life. Instead farming spread when a village became too large and some residents moved to a new area, cleared land, planted seeds, and built a new village, sometimes intermarrying with the local people. Because the population of farming communities grew so much faster than that of foragers, however, horticulture quickly spread into fertile areas. By about 6500 B.C.E. farming had spread northward from the Fertile Crescent into Greece and by 4000 farther northward all the way to Britain; by 4500 it had spread southward into Ethiopia. At the same time, crop-raising spread out from others areas in which it

was first developed, and slowly larger and larger parts of China, South and Southeast Asia, and East Africa were home to horticultural villages.

People adapted crops to their local environments, choosing seeds that had qualities that were beneficial, such as drought resistance. They also domesticated new kinds of crops. In the Americas, for example, by about 3000 B.C.E. corn was domesticated in southern Mexico and potatoes and quinoa in the Andes region of South America, and by about 2500 B.C.E. squash and beans in eastern North America. These crops then spread, so that by about 1000 B.C.E. people in much of what is now the western United States were raising corn, beans, and squash. In the Indus Valley of South Asia people were growing dates, mangoes, sesame seeds, and cotton along with grains and legumes by 4000 B.C.E. Crop-raising led to dramatic human alteration of the environment.

Certain planted crops eventually came to be grown over huge areas of land, so that some scientists de-



scribe the Agricultural Revolution as a revolution of codependent domestication: humans domesticated crops, but crops also “domesticated” humans so that they worked long hours spreading particular crops around the world. Of these, corn has probably been the most successful; more than half a million square miles around the world are now planted in corn, and one-quarter of the nearly fifty thousand items in the average American supermarket contain corn.

In some parts of the world horticulture led to a dramatic change in the way of life, but in others it did not. Horticulture can be easily combined with gathering and hunting as plots of land are usually small; many cultures, including some in Papua New Guinea and North America, remained mixed foragers and horticulturists for thousands of years. Especially in deeply wooded areas, people cleared small plots by chopping and burning the natural vegetation, and planted crops in successive years until the soil eroded or lost its fertility, a method termed “slash and burn.” They then moved to

another area and began the process again, perhaps returning to the first plot many years later, after the soil had rejuvenated itself. Groups using shifting slash-and-burn cultivation remained small and continued to rely on the surrounding forest for much of their food.

Animal Domestication and the Rise of Pastoralism

At roughly the same time that they domesticated certain plants, people also domesticated animals. The earliest animal to be domesticated was the dog, which separated genetically as a subspecies from wolves at least 15,000 years ago and perhaps much earlier. The mechanism of dog domestication is hotly debated: did it result only from human action, as foragers chose and bred animals that would help them with the hunt rather than attack them, or was it also caused by selective pressure resulting from wolf action, as animals less afraid of human contact came around campsites and then bred with one another? However it happened, the relationship provided both with benefits: humans gained dogs’ better senses of smell and hearing and their body warmth, and dogs gained new food sources and safer surroundings. Not surprisingly, humans and domestic dogs migrated together, including across the land bridges to the Americas and on boats to Pacific islands.

Dogs fit easily into a foraging lifestyle, but humans also domesticated animals that led them to completely alter their way of life. In about 9000 B.C.E., at the same time they began to raise crops, people in the Fertile Crescent domesticated wild goats and sheep, probably using them first for meat, and then for milk, skins, and eventually fleece (see Map 1.2). They learned from observation and experimentation that traits are passed down from generation to generation, and they began to breed the goats and sheep selectively for qualities that they wanted, including larger size, greater strength, better coats, more milk production, and more even temperaments. The book of Genesis in the Bible, written in the Fertile Crescent sometime in the first millennium B.C.E., provides an early example of selective breeding. Jacob makes a deal with his father-in-law to take only those goats and sheep that are spotted, but he secretly increases the number of spotted animals in the flock by placing a spotted stick “before the eyes . . . of the strongest of the flocks . . . whenever they were breeding” so that more and stronger spotted animals were born (Genesis 30:41). This method was based on the idea — accepted for a very long time — that what a pregnant animal or woman saw during pregnancy would influence the outcome; although this has been firmly rejected in modern science, the Bible notes that it was successful, and that Jacob “grew exceedingly rich, and had large flocks.”



A Goat Market in Mali Pastoral economies thrive in many parts of the world today, particularly in areas that are too dry for agriculture, including central Australia, Central Asia, northern and western Africa, and much of the U.S. West. As in early pastoralism, contemporary herders choose and breed their animals for qualities that will allow them to prosper in the local environment. (Ron Gilling/Lineair/Photolibrary)

After goats and sheep, pigs were domesticated somewhat later in both the Fertile Crescent and China, as were chickens in southern Asia. Like domesticated crops, domesticated animals eventually far outnumbered their wild counterparts. For example, in the United States today (excluding Alaska), there are about 77 million dogs, compared to about 6,000 wolves. (Adding Alaska would add about 150,000 dogs and 10,000 wolves.) There are more than a billion and a half cattle, with enormous consequences for the environment. Animal domestication also shaped human evolution; groups that relied on animal milk and milk products for a significant part of their diet tended to develop the ability to digest milk as adults, while those that did not remained lactose intolerant as adults, the normal condition for mammals.

Sheep and goats allow themselves to be herded, and people developed a new form of living, **pastoralism**, based on herding and raising livestock, sometimes training dogs to assist them. In areas with sufficient rainfall and fertile soil, pastoralism can be relatively sedentary, and thus easily combined with horticulture;

people built pens for animals, or in colder climates constructed special buildings or took them into their houses. They learned that animal manure increases crop yields, so they gathered the manure from enclosures and used it as fertilizer.

Increased contact with animals and their feces also increased human contact with various sorts of disease-causing pathogens, including minor illnesses such as the common cold and deadly killers such as influenza, bubonic plague, and smallpox. This was particularly the case where humans and animals lived in tight quarters, for diseases spread fastest in crowded environments. Thus pastoralists and agriculturalists developed illnesses that had not plagued foragers, and the diseases became endemic, that is, widely found within a region without being deadly. Ultimately people who lived with animals developed resistance to some of these illnesses, but foragers' lack of resistance to many illnesses meant that they died more readily after coming into contact with new endemic diseases, as was the case when Europeans brought smallpox to the Americas in the sixteenth century.

In drier areas, flocks need to travel long distances from season to season to obtain enough food, so some pastoralists became nomadic. Nomadic pastoralists

- **pastoralism** An economic system based on herding flocks of goats, sheep, cattle, or other animals.

often gather wild plant foods as well, but they tend to rely primarily on their flocks of animals for food. Pastoralism was well-suited to areas where the terrain or climate made crop-planting difficult, such as mountains, deserts, dry grasslands, and tundras. Eventually other grazing animals, including cattle, camels, horses, yak, and reindeer, also became the basis of pastoral economies in central and western Asia, many parts of Africa, and far northern Europe.

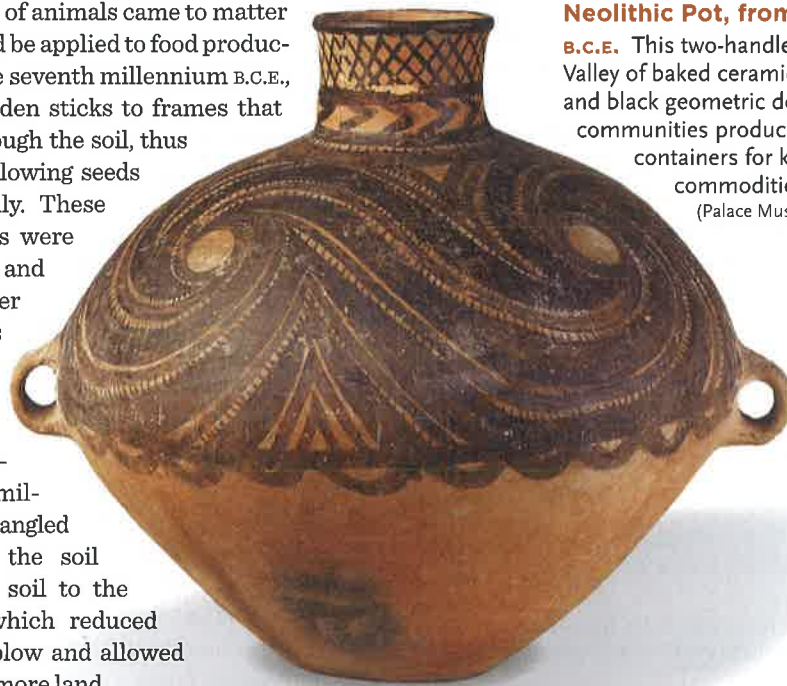
Plow Agriculture

Horticulture and pastoralism brought significant changes to human ways of life, but the domestication of certain large animals had an even bigger impact. Cattle and water buffalo were domesticated in some parts of Asia and North Africa in which they occurred naturally by at least 7000 B.C.E., and horses, donkeys, and camels by about 4000 B.C.E. All these animals consent to carry people or burdens on their backs and pull against loads dragged behind them, two qualities that are rare among the world's animal species. In many parts of the world, including North America and much of South America and sub-Saharan Africa, no naturally occurring large species could be domesticated. In the mountainous regions of South America, llamas and alpacas were domesticated to carry packs, but the steep terrain made it difficult to use them to pull loads. The domestication of large animals dramatically increased the power available to humans to carry out their tasks, which had both an immediate effect in the societies in which this happened and a long-term effect when they later encountered societies in which human labor remained the only source of power.

The pulling power of animals came to matter most, because it could be applied to food production. Sometime in the seventh millennium B.C.E., people attached wooden sticks to frames that animals dragged through the soil, thus breaking it up and allowing seeds to sprout more easily. These simple scratch plows were pulled first by cattle and water buffalo, and later by horses. (Donkeys and camels were used primarily as pack animals, but occasionally for plowing as well.) Over millennia, moldboards — angled pieces that turned the soil over, bringing fresh soil to the top — were added, which reduced the time needed to plow and allowed each person to work more land.

Using plows, Neolithic people produced a significant amount of surplus food, so that some people in the community could spend their days doing other things, increasing the division of labor. Surplus food had to be stored, and some began to specialize in making products for storage, such as pots, baskets, bags, bins, and other kinds of containers. Others specialized in making tools, houses, and other things needed in village life, or in producing specific types of food, including alcoholic beverages made from fermented fruits and grains. Families and households became increasingly interdependent, trading food for other commodities or services. In the same way that foragers had continually improved their tools and methods, people improved the processes through which they made things. Sometime in the fifth millennium B.C.E. pot-makers in Mesopotamia invented the potter's wheel, which by a millennium later had been adapted for use on carts and plows pulled by animals. Wheeled vehicles led to road-building, and wheels and roads together made it possible for people and goods to travel long distances more easily, whether for settlement, trade, or conquest.

Stored food was also valuable and could become a source of conflict, as could other issues in villages where people lived close together. Villagers needed more complex rules about how food was to be distributed and how different types of work were to be valued than did foragers. Certain individuals began to specialize in the determination and enforcement of these rules, and informal structures of power gradually became more formalized as elites developed. These elites then distributed resources to their own advantage, often using force to attain and maintain their power.



Neolithic Pot, from China, ca. 2600–2300

B.C.E. This two-handled pot, made in the Yellow River Valley of baked ceramics, is painted in a swirling red and black geometric design. Neolithic agricultural communities produced a wide array of storage containers for keeping food and other commodities from one season to the next. (Palace Museum, Beijing)

Neolithic Society

- How did growing social and gender hierarchies and expanding networks of trade increase the complexity of human society in the Neolithic period?

The division of labor that plow agriculture allowed led to the creation of **social hierarchies**, the divisions between rich and poor, elites and common people that have been a central feature of human society since the Neolithic era. Plow agriculture also strengthened differentiation based on gender, with men becoming more associated with the world beyond the household and women with the domestic realm. Social hierarchies were reinforced over generations as children inherited goods and status from their parents; even the gods were increasingly understood to be arranged in a hierarchy, and assuring fertility became the most important religious practice. People increasingly communicated ideas within local and regional networks of exchange, just as they traded foodstuffs, tools, and other products.

Social Hierarchies and Slavery

Archaeological finds from Neolithic villages, particularly burials, show signs of growing social differentiation. Some people were buried with significant amounts of jewelry, household goods, weapons, and other objects, while others were buried with very little. How were some people able to attain such power over their neighbors that they could even take valuable commodities with them to the grave? This is one of the key questions in all of human history. Written sources do not provide a clear answer because social hierarchies were already firmly in place by the time writing was invented, so that scholars have largely relied on archaeological sources. (See “Individuals in Society: The Iceman,” page 25.)

Within foraging groups, some individuals already had more authority because of their links with the world of gods and spirits, positions as heads of kin groups, or personal characteristics. These three factors gave individuals advantages in agricultural societies, and the advantages became more significant over time as there were more resources to control. Priests and shamans developed more elaborate rituals and became full-time religious specialists, exchanging their services in interceding with the gods for food. In many communities,

- **social hierarchies** Divisions between rich and poor, elites and common people that have been a central feature of human society since the Neolithic era.
- **patriarchy** Social system in which men have more power and access to resources than women and some men are dominant over other men.

religious specialists were the first to work out formal rules of conduct that later became oral and written codes of law, generally explaining that these represented the will of the gods. The codes threatened divine punishment for those who broke them, and they often required people to accord deference to priests as the representatives of the gods, so that they became an elite group with special privileges.

Individuals who were the heads of large families or kin groups had control over the labor of others, which became more significant when that labor brought material goods that could be stored. Material goods—plows, sheep, cattle, sheds, pots, carts—gave one the ability to amass still more material goods, and the gap between those who had them and those who did not widened. Storage also allowed wealth to be retained over long periods of time and handed down from one family member to another, so that over generations small differences in wealth grew larger. The ability to control the labor of others could also come from physical strength, a charismatic personality, or leadership talents, and this also led to greater wealth.

Wealth itself could command labor, as individuals or families could buy the services of others to work for them or impose their wishes through force, hiring soldiers to threaten or carry out violence. Eventually some individuals bought others outright. As with social hierarchies in general, slavery predates written records, but it developed in almost all agricultural societies. Like animals, slaves were a source of physical power for their owners, providing them an opportunity to amass still more wealth and influence. In the long era before the invention of fossil fuel technology, the ability to exploit animal and human labor was the most important mark of distinction between elites and the rest of the population. As we will see in later chapters, land ownership was often what distinguished elites from others, but that land was valuable only if there were people living on it who were required to labor for the owner.

Gender Hierarchies and Inheritance

Along with hierarchies based on wealth and power, the development of agriculture was intertwined with a hierarchy based on gender. The system in which men have more power and access to resources than women and some men are dominant over other men is called **patriarchy**. Every society in the world that has left written records has been patriarchal, but patriarchy came before writing, and searching for its origins involves interpreting many different types of sources. Some scholars see the origins of gender inequality in the hominid past, noting that male chimpanzees form alliances to gain status against other males and engage in cooperative attacks on females, which might have