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The Early Farming and Early Urban phases

Ecological Phase 2: The Early Farming Phase

Modern humans were in existence for around 200,000 years before some of them, in several different parts of the world, decided to take up farming.

It is likely that the shift from an economy based on hunting and gathering to one in which human populations were mainly dependent on farming for their food was a slow process that extended over 1,000 years or more. This deliberate manipulation of the processes of nature for human ends resulted in big changes in the interrelationships between people and the other living organisms in the ecosystems of which they were a part. Eventually, it also led to big changes in the interrelationships between humans themselves.

People started farming independently in at least three regions of the world: south-western Asia, south-eastern Asia and middle America. The earliest evidence of agriculture based on the cultivation of seeds, notably wheat and barley, and the domestication of goats and sheep dates back to about 12,000 years ago. It is found in high country in a broad area known as the Fertile Crescent, extending eastwards from Greece to a region to the south of the Caspian Sea.

Farming eventually spread northward from the Middle East and, by 6,000 to 7,000 years ago, it had reached southern Germany and Holland, where people were growing einkorn, emmer, barley, peas, beans and flax, and keeping goats, sheep, cattle and pigs. Meanwhile, other farming people were also moving through Spain and Switzerland to France and eventually Britain. By 4,500 years ago, they had reached the southern edges of the vast coniferous forests of Scandinavia and Russia.

The domestication of plants for food production was well established in Thailand by 9,000 years ago. Instead of cultivating wheat and barley, these farmers grew various roots, like taro and yams, as well as cucumbers, peppers, bottle gourds and beans of different kinds. They also systematically and deliberately encouraged the growth of banana, coconut, sago and breadfruit trees, and they domesticated pigs and poultry.

It is likely that maize had been domesticated in the Americas by 8,000 or 7,000 years ago and, by 5,000 years ago, squash, beans, avocados, gourds, pumpkins and chillies were also cultivated. Potatoes were grown in Peru 7,000 years ago.

Health and disease

The changed conditions of life associated with farming had important effects on the relationships between human populations and potential parasites and disease-producing microorganisms. Microbial and parasitic diseases became more common. It has been suggested that it was the introduction of slash-and-burn agriculture to tropical and subtropical regions that allowed malaria to become an important cause of ill health and death, because it brought humans into close contact with populations of mosquitoes breeding in stagnant pools of water. This situation, combined with the relatively high density and immobility of the population, was particularly favourable for the maintenance of the malarial parasite's life cycle.

Schistosomiasis occurs everywhere in the world where large-scale irrigation is practised, and there is good evidence that it was already common in Mesopotamia, Egypt and the Indus Valley several thousand years BC. This disease is due to infection with one of several species

of blood fluke that spends part of its life cycle in the body of certain species of snail. It has been estimated that about 200 million people in 72 countries suffer from schistosomiasis today.

The increase in mortality due to various parasitic diseases did not, however, outweigh the biological advantages of village life. By the time that the early Mesopotamian cities came into being, there were probably between 50 and 100 million people on the Earth.

The ecological impacts of early farming

Although farming took on many different forms in different places, all early food-producing activities consisted in essence of the deliberate redistribution of plant and animal species in a given area, aimed at increasing the local concentrations of edible species and at reducing concentrations of species of little or no food value. As a result, instead of covering big distances in search of food, people spent most of their time in and around one place, protecting and propagating the desired plants and animals and keeping out unwanted species. Special techniques were developed to enhance plant productivity in the different regions in which people settled, such as hoeing, irrigation and, eventually, ploughing and manuring.

The end result of this change in subsistence behaviour was that a given area of land yielded much more food for humans than had been the case in hunter-gatherer ecosystems. A larger proportion of the energy fixed by photosynthesis in the local area was available, as somatic energy, to pass into and flow through human beings. Population densities of hunter-gatherer communities ranged from around 0.02 to 0.2 persons per square kilometre and, in early farming societies, they ranged from 25 to 1,000 persons per square kilometre. It has been claimed that peasant farming in southern China supported 7,500 persons per square kilometre.

Generally speaking, the amount of food produced per hour of human effort in early farming societies was probably not very different from that acquired by hunter-gatherers in the same length of time.

One of the ecological consequences of farming was the dispersal of animal and plant species, not just locally in and around the farm, but eventually across the whole world. The invasion of the Americas by Europeans was an especially important development in this context,

resulting in the introduction into Europe of maize, potatoes, squash, gourds, pumpkins, peppers, chillies and turkeys. It also caused movement in the opposite direction, with the introduction into the American continent of the cereal crops of Europe, and of cattle, sheep and pigs. Later, all the main European food sources of the northern hemisphere were introduced to New Zealand and Australia, where they now form by far the greater part of people's diet.

To be successful in the long term, farming practices had to be ecologically sustainable, which is to say they had to maintain the bioproductivity of the food-producing ecosystems indefinitely. In many regions farming practices were sustainable in this sense, although this often required temporarily abandoning, or resting, a food-producing area to allow it to regain fertility, as in the case of slash-and-burn agriculture and the two- and three-field systems adopted in Europe. This rotation was necessary because farming involved the continual removal from a plot of land of nutrients, which were incorporated in edible plants or animals. These nutrients were ultimately deposited somewhere else, in the form of excrement, corpses or other organic waste material, thereby disrupting the natural nutrient cycles. Such resting was not necessary in rice paddies, because incoming water continually brought in a new supply of nutrients.

In some regions, however, farming led to progressive loss of productivity, either due to soil loss through erosion, as in parts of northern Africa, or because of salinisation, as in the irrigation farming ecosystems in Mesopotamia.

Diseases of plant or animal food sources due to parasites or disease-causing microbes were also a frequent cause of serious, but temporary, food shortages. One reason for this is the fact that high population densities, or monocultures, of any particular species of plant or animal are especially susceptible to infectious or parasitic diseases. Important examples affecting plant foods have been wheat rust, ergot (a disease of rye) and potato blight. This last was responsible for the Irish famine of 1845 and 1846, which caused hundreds of thousands of deaths and widespread human distress. It also had long-lasting political repercussions.

Ecological Phase 3: The Early Urban Phase

By around 9,000 years ago, some farms in the south-western corner of Asia and the south-eastern corner of Europe were producing more food than was necessary to satisfy the nutritional needs of the farming communities. The existence of this surplus made it possible for fairly large clusters of people, sometimes consisting of several thousand individuals, to aggregate together in townships, with many of them no longer playing any part in food production.

An extraordinarily interesting example of one of these early townships is Çatal Hüyük in Anatolia, where a thriving community of 5,000 or more people lived between 8,000 and 9,000 years ago. Their food sources were primarily barley, wheat, peas, lentils, sheep, goats and, later in the period, cattle.

Twelve building levels have been uncovered at Çatal Hüyük, spanning a period of at least 1,000 years. There is no sign of any invasion or sudden cultural change during this period, and accidental fires may have been responsible for the rebuilding that occurred. The mud-brick buildings were built close together and, in each case, the entrance was through an opening in the roof. There were few lanes or passages, but plenty of courtyards, which were apparently used as depositories for rubbish.

By 5,500 years ago, cities had formed in the valley of the Tigris and Euphrates rivers in Mesopotamia, and some of them had populations of 50,000 to 60,000 people. There is evidence that thriving cities and trading centres with pyramids, temples and ordinary houses existed 5,000 years ago in Peru.

Most of the early cities in Sumer, Mesopotamia, had populations of 10,000–20,000, possibly reaching 50,000 in the case of Uruk. Athens probably had a population of about 100,000 in the days of Pericles and Socrates.

Until the 17th and 18th centuries AD, the populations of cities in Europe and the Middle East did not, with a few exceptions, exceed 100,000. The exceptions were Rome, with a population variously estimated at between 350,000 and 1 million at about the time of Jesus Christ and, about 300 years later, Constantinople, with a population of about 1 million.

During the 17th century there were big increases in the populations of some cities and, by the end of the 18th century, Paris had a population of over 670,000, Naples of over 430,000 and London of over 800,000.

From the biological standpoint, three fundamental changes lie at the root of all other factors that set cities apart from earlier human societies, and all of them had far-reaching biological and cultural repercussions.

First, there was the spectacular increase in population density, which meant that there was an enormous increase in the number of other members of the human species encountered by the average person in the course of his or her daily activities. Unlike the case in farming and primeval societies, many of those encountered were not members of the individual's personal in-group.

Second, most of the people living in cities were not farmers. For the first time in human history, a significant proportion of the population went through life without participating in the intimate interactions with the natural environment associated with the food quest. For sustenance they relied on the activities of others. This was not only a novel development in the history of the human species, it was unique among the vertebrates.

The third outstandingly important development accompanying urbanisation was the shift from relative homogeneity to heterogeneity in human populations. This change was made up of three basic interrelated elements: occupational specialism, political stratification and wealth stratification. Material wealth was itself a new factor in human experience.

Division of labour, or occupational specialism, has been described as the hallmark of civilisation. Already in the cities of Mesopotamia 5,000 years ago there were leather workers, cabinet-makers, potters, metalworkers, basket-makers, shopkeepers, brewers, stonecutters, weavers, gardeners, artists, music-makers, soldiers, scribes, priests, and other officials in the administration and members of the ruling families. Relatively permanent social hierarchies came into existence, ranging from kingship, priesthood and the aristocracy through to commoners and slaves.

Health and disease

The conditions of life of early urban dwellers deviated even more than those of farmers from the conditions to which our species was adapted through evolution. As would be expected from the evolutionary health principle (Chapter 2), this led to further new patterns of ill health and mortality. Moreover, because there were big differences in the conditions of life in different sections of the population, different groups of people experienced different patterns of health and disease.

It is an epidemiological principle that, when animal populations become significantly more dense than in the evolutionary environment of the species, disturbances occur in host–parasite relationships. Overcrowded conditions provide greatly increased opportunities for the spread of parasites and pathogenic microbes.

The concentration of large numbers of people in urban settings greatly facilitated the spread of potentially pathogenic organisms in various ways. One of the most important of these was spread of infection by touch — either when infected persons touch non-infected persons or when infected persons touch objects, such as tools and doorhandles, which are then touched by non-infected persons.

Many pathogenic organisms, such as those responsible for typhoid, cholera, infantile diarrhoea and dysentery, are spread by direct or indirect contact with human urine or faeces. In many early cities, accumulating masses of human excrement were a constant menace to health, especially when they contaminated water supplies.

Another reason why the increase in the size and density of human populations resulted in greater prevalence of infectious diseases is the fact that many pathogenic microorganisms require a large contiguous population in order to exist. It has been calculated that the measles virus needs a contiguous population of 300,000 people to keep it going. If the measles virus had come into existence in primeval times and had infected a member of a hunter–gatherer band, it would have passed on to other members of the group, some of whom might have died, while others would have recovered and then been immune; and so the measles virus itself would have died out. This would also be true of the several hundred relatively mild acute virus infectious diseases that circulate in human populations today. They are all products of civilisation.

So it came about that microbial disease became firmly established as a feature of urban living, and it played a major role in human affairs well into the 20th century. Sometimes it caused terrible epidemics but some diseases, such as tuberculosis and infantile diarrhoea, were constantly present in human populations. Infectious disease was by far the most important cause of death in the early urban societies, and it remained so until the processes of cultural reform came into play in the second part of the 19th century. Apart from smallpox, typhus and the plague, the most important of the infectious diseases during the Early Urban Phase were dysentery, enteric fever, typhoid, tuberculosis and, late in the period, cholera.

Turning to nutrition, the tendency for some urban populations to rely on one or two staple foods resulted in specific deficiency diseases, like rickets, scurvy, pellagra, beri-beri, and vitamin A deficiency. Urban populations were also often affected by famine, leading to under-nutrition and starvation.

In summary, while urban conditions provided protection from some of the important causes of death in hunter-gatherer and early farming societies, such as attack by predators and schistosomiasis, the new diseases of early civilisation caused death rates in cities to be very high — probably considerably higher than in rural areas.

The populations of these urban societies were probably maintained by continuing immigration from rural areas, where by far the greater part of the total human population lived. The end result was an overall increase in the total human population from around 5 to 10 million when farming was first introduced to about 600 million in 1700 AD. This is a doubling time, on average, of around 1,500 to 2,000 years.

The world population just before the beginning of the present Exponential Phase of human history, around 200 years ago, was about 1 billion.

Ecological impacts of early cities

In the early days of towns and cities, their main ecological impact was probably deforestation, due to the demand for timber for the construction of buildings and for burning to provide heat for cooking, comfort and various industrial activities. In the Middle East, the great forests of cedars of Lebanon disappeared early on, as did

the evergreen forests of southern Europe. Deforestation occurred progressively throughout the rest of Europe, and also around urban areas in Middle America.

Other sources of extrasomatic energy were watermills and windmills. Wind power also played a role as the driving force for sailing ships.

Taking society as a whole, however, the use of extrasomatic energy per person did not increase dramatically in the Early Farming and Early Urban phases and, on average, probably seldom exceeded 30 megajoules per day.

Culture

The topics of conversation among the inhabitants of the early cities were very different from those of hunter-gatherers or farmers, reflecting the new occupational structure of society, the elaboration of religion and people's lack of involvement in the acquisition of food.

One of the most significant cultural developments in the first part of the Early Urban Phase was the introduction of writing. It has been suggested that very simple forms of writing to record information may go back to around 11,000 years ago. But it was in the early cities that it became important for keeping economic records, such as tallies of cattle and sheep, measures of grain and jars of butter. It also came to be used for royal inscriptions, legal codes, religious texts and recording legends and political events.

The biohistorical importance of writing lies in the fact that it meant that information could be stored outside human brains. The storage capacity of the brain was no longer a limiting factor, so that society came to amass vastly more information than had been possible previously; and writing enabled people to communicate about things in some detail without having to see each other.

The concept of ownership of physical property, which was only weakly developed in hunter-gatherer communities, became much stronger in urban society. Eventually it came to apply not only to land, animals and material objects, but also to other members of the human species. In the early Mesopotamian cities, slaves were plentiful, and slavery

persisted in the Western world until the lifetime of the grandparents of some of us alive today. It still exists in one form or another in many parts of the world today.

A significant economic development was the introduction and increasing importance of a cash economy. The desire to exchange things is as old as humankind, but it is not older. No other species engages in exchange of material objects, although giving and taking is common among animals. When such exchange took place in hunter-gatherer and early farming societies, it usually involved simple barter. In early urban societies and in some early farming communities, however, a different system was introduced involving a new factor, namely money, which eventually became an all-important element in human society. Money is essentially an arrangement in which the prevailing culture bestows a certain agreed symbolic value on certain objects that can then be used as a medium for the exchange of goods and services among individuals and groups. It has taken many different forms, including sea shells, coins of silver, gold or other metal and paper notes, all of which can be given in exchange for goods or services. Today the modern equivalent of money sometimes exists only in the memories of computers.

Another important development in the early cities was the introduction of formalised codes aimed at controlling, or preventing, various forms of aggressive behaviour. Punishments, ranging from monetary fines to death, were imposed for transgression of these laws. This was a cultural adaptive response to the fact that many different groups of humans were now living in close proximity to each other, creating a potentially inflammatory situation because there is no innate tendency in humans to avoid aggressive behaviour between out-groups.

Perhaps the most significant of all cultural changes associated with urbanism resulted from the fact that large numbers of people were separated from the natural environment and played no role in the acquisition of food, so that they no longer felt part of nature — and urban cultures evolved that regarded the natural world as alien and threatening.

Cultural maladaptations

There are countless instances of cultural maladaptation in the Early Farming and Early Urban phases of human history. A particularly tragic example was the ancient Chinese custom of foot binding, which prevented the normal growth of the feet of young girls and caused them excruciating pain. This extraordinary practice well illustrates the propensity of culture to influence people's mindsets in ways that result in activities that are not only nonsensical in the extreme, but also sometimes cruel, destructive and contrary to nature. This particular cultural maladaptation was mutely accepted by the mass of the Chinese population for some 40 or more generations. Such is the brainwashing power of culture.

Only a few generations ago, Western culture regarded slavery as entirely appropriate and British imperialism was completely acceptable in the lifetimes of the parents of some of us alive today.

Throughout the history of civilisation, different cultures, including our own, have come up with a fascinating range of delusions about how social well-being, or prosperity, can best be achieved, and some of these have led to patent examples of cultural maladaptation. According to the dominant culture of the Mayan civilisation, prosperity could best be achieved by pleasing the gods, and the best way to please the gods was to torture, mutilate and then sacrifice human beings. This behaviour can be regarded as a cultural maladaptation because it was the cause of a great deal of unnecessary human suffering, and it clearly did not do the Mayans any good. Their civilisation collapsed suddenly, perhaps for ecological reasons, around 900 AD.

Again the point to be emphasised is the fact that, while there may well have been a handful of sceptics among the Mayans, the great majority of them believed that the torture and sacrifice of humans was an entirely appropriate behaviour.

Another example is provided by the Jukun people of Nigeria in the 19th century. At that time their culture included the belief that their king, who was elected for a period of seven years, was a kind of 'living reservoir' of the various forces that caused the soil to be fertile and the seeds to flourish, and that generally brought health and well-being to the people. The king therefore had to be protected from any kind of injury because, if he became sick or lost blood, some of

the beneficial forces might escape, with undesirable consequences for the population. Indeed, if he fell off a horse, became seriously ill or impotent, he was quickly strangled and a new king was elected. In any case, the king was put to death when the seven years of his reign were up, strangulation being used so that no blood would be spilled. This particular instance is perhaps not a cultural maladaptation, in that it does not seem to have done any real harm, except from the point of view of the king himself at the end of his reign.

Cultural gullibility is indeed a fundamental characteristic of our species.

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