PREFACE

The one thing that is constant in history is change. Twenty years ago, the focus of world politics was the conflict between communism and capitalism. That conflict largely ended in 1989–1991 with the collapse of communism in the Soviet Union and Eastern Europe and seems a distant memory to high school and college students today.

Today's concerns are with the rise of Islam as a mobilizing force, the emergence of China and India as new economic powerhouses, and possibly dramatic changes in the world's climate and its diverse environments.

The study of history has changed as well. For most of the nineteenth and twentieth centuries, students learned about world history by studying Western Civilization, which was told as the story of the "rise of the West." This story started with the emergence of democracy and philosophy in ancient Greece and Rome; continued with the rule of Europe's kings and knights in the Middle Ages; moved on to the arts and explorations of the Renaissance; and concluded with the military, economic, and political domination of the world by the nations of Western Europe and North America. The peoples of Africa, Latin America, and Asia were mentioned only when they encountered European explorers or colonizers—their "history" thus beginning with European contact and conquest.

In the last half-century, however, the study of World History has focused far more attention on the areas outside of Europe and on the centuries-old patterns of exchange and interaction among all the world's civilizations. It is certainly true that the modern world owes much to the political and philosophical inventions of the Greeks. However, it is also true that the modern world obtained its religions, its systems of numbers and counting, much of its fundamental principles of mathematics and chemistry, and its most common consumer goods (cotton clothing, fine china, paper, printed books) from Asia and north Africa. While politicians worry today about a clash of civilizations, historians are trying to achieve a better understanding of how the modern world developed from the contributions of many civilizations. Historians today are also trying to understand how people's responses to varying climates and environments shaped history in different times and places. Finally, the histories

of religion, of law, and of science and technology—once somewhat separated as specialized studies—are now all deemed essential to understanding the larger story of World History.

In the last dozen years, a group of young economic and social historians has made some new and surprising arguments about World History. Instead of seeing the rise of the West as a long process of gradual advances in Europe while the rest of the world stood still, they have turned this story around. They argue that societies in Asia and the Middle East were the world leaders in economics; in science and technology; and in shipping, trade, and exploration until about AD 1500. At the time Europe emerged from the Middle Ages and entered its Renaissance, these scholars contend, Europe was well behind many of the advanced civilizations elsewhere in the world and did not catch up with and surpass the leading Asian societies until about AD 1800. The rise of the West was thus relatively recent and sudden and rested to a large degree on the achievements of other civilizations and not merely on what happened in Europe. Indeed some of these scholars suggest that the rise of the West may have been a relatively short and perhaps temporary phenomenon, as other societies are now catching up to or even surpassing Western societies in their economic growth.[1]

This little book presents an introduction to these new approaches to World History. It offers some of the latest findings and most recent arguments about the achievements of civilizations outside the West, their relations with Europe, and their importance to the creation of the modern world. It also points out what might have been special about Europe and what factors account for the dominant position of Europe and North America in the nineteenth and twentieth centuries.

At a time when peoples throughout the world are seeking to understand how their diverse civilizations can grow and prosper, this fresh look at the past might offer some useful insights for the future.

[1]These historians include Kenneth Pomeranz, R. Bin Wong, Jack Goldstone, James Lee, Dennis Flynn, Robert Marks, the late Andre Gunder Frank, the late James Blaut, John Hobson, and Jack Goody, among many others. They are sometimes called the "California School," because many of these scholars worked at universities in California.

INTRODUCTION

EARTH: A GLOBAL VIEW

From outer space Earth shines like a jewel, brilliant green and blue against a black velvet background. Moving closer in, one sees that most of the globe is covered with shimmering oceans and a few irregularly shaped continents. Life of all kinds flourishes.

This view from space would have been unchanging for millions of years, even for the last 5,000 years of recorded history. Yet in just the last 100 years, the view has dramatically changed. If we looked at Earth with a special instrument that only measures the electrical energy produced by particular regions, the continents would look very different. In fact, if we mapped the total electrical energy produced in various regions of the world, we would find a very puzzling situation.

Some areas of the Earth produce far more energy than others. For example, the area of North America covered by Canada and the United States produces four times as much electrical energy as the rest of North America and South America combined. The relatively small peninsula of Europe produces nearly seven times as much electrical energy as all of Africa, even though Africa is much larger (see Figure I.1).

If we were interstellar explorers looking at Earth from outer space, how might we explain this oddity? We might suspect that more energy is produced and consumed where more people live. We could check this by using other instruments to estimate how many people live in various areas. But we would be shocked to learn that most of the energy production is occurring where relatively *few* people live. The 521 million people in the European peninsula produce 3,300 billion kilowatt-hours of electrical energy each year, while Africa, with 869 million people, produces only 480 billion kilowatt-hours. Two-thirds of the population of North and South America lies south of the U.S.–Mexico border, but the area north of the border produces 80 percent of the electrical energy generated in the Americas. The 120 million people in Japan produce 10 times as much electricity per year as do the 220 million people of Indonesia.[1]

Even observers from outer space would thus notice perhaps the most striking fact about the Earth at the beginning of the twenty-first century: A

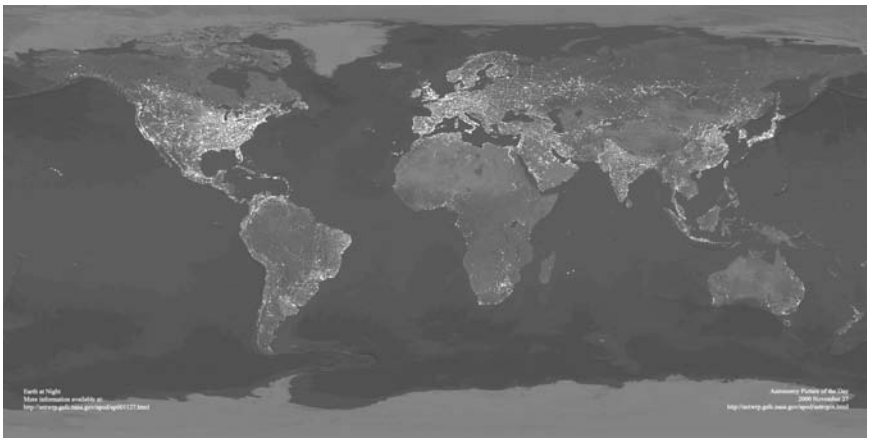

FIGURE I.1 THE EARTH AT NIGHT AS SEEN FROM SPACE
Note the differences in how various regions are lit up at night. North America is much brighter than South America, western Europe is much brighter than Africa, and Japan is much brighter than China or Indonesia. Although India shows a fair number of lights, you would not think that its population is almost five times as large as that of the eastern half of the United States. *(Source: C. Mayhew & R. Simmon (NASA/GSFC), NOAA/NGDC, DMSP Digital Archive)*

relatively small portion of the Earth's population is producing and consuming most of the electrical energy. In short, a relatively few people living in certain regions are rich, and many more people, living in other regions, are—when compared with the first group—poor.

How might one of our space observers try to explain this? Much as most people today, she might think that perhaps the rich people stole resources from the poor or prevented the poor from having equal access. Yet this turns out not to be quite right—the poor regions actually have more natural and energy resources, and they either voluntarily exchange them for other things (cars, movies, radios, machinery) or waste them (many countries burn off their natural gas, have unused hydroelectric generating capacity, or do not use the resources they grow, mine, or pump from the ground).

The observer might guess that people in the richer regions were exceptionally talented or clever and therefore mastered certain skills in producing energy. Yet this, too, is not quite correct—many of the peoples in the poor regions have long histories of high civilization, with extraordinary craftsmanship, intricate systems of philosophy, and brilliant literature.

Perhaps the richer areas just stumbled upon some great magical knowledge that allowed them to produce and use this energy, which was kept from other areas? Even that guess can't be quite right—books and education and electronic communications carry knowledge all over the

world. Yet some regions seem to make much better use of this information than other regions.

To solve the puzzle, the best way is to come down to Earth and study the history of its peoples, their societies, and their interactions over time. Of course, our poor space observer would be even more befuddled by her first discoveries in history, for she would find out that for thousands of years, the earliest civilizations and the most advanced societies were in precisely those areas that were *not* the big energy producers and consumers of the early twenty-first century. That is, for thousands of years, the leading civilizations, the richest and most technologically advanced societies on Earth, lay in northern Africa, in eastern Asia, in southern Asia, and in the areas of the Americas south of the United States. In other words, something dramatic happened relatively recently that led to a striking inequality across different world regions and reversed the older patterns.

This book examines various ideas that try to explain what happened—and when, and how—to produce this striking inequality. We would like to know how it arose, what caused it, and whether it will likely increase or diminish. Unfortunately, even the finest of Earth's scholars of economic and social history have disagreed over this issue. But scholars from all over the world are now producing new insights that help us come closer to answering this puzzle. This book presents the argument as it stands in the most up-to-date research, so that readers can better decide for themselves where they think these processes of long-term economic change are taking us.

CHAPTER ONE

The World Circa 1500: When Riches Were in the East

CHAPTER PREVIEW: In 1500, Europe was not the richest part of the world. Although Europeans had mastered some technologies and borrowed others—including clocks, gunpowder weapons, and oceanic sailing vessels—they were dazzled by the wealth, commerce, and productive skills that they encountered when visiting other centers of civilization, whether in the Middle East, southern and eastern Asia, or even in the New World. At this time, Asia generally had greater agricultural productivity and more refined craftsmanship than Europe and offered a wide variety of products, such as silk and cotton fabrics, porcelains, coffee, tea, and spices that Europeans desired. The voyages of discovery by Columbus and other seafarers—although motivated partly by a surge of curious exploration and partly by a burst of missionary zeal—were mainly attempts to help Europeans improve their access to the riches of India and China.

When Christopher Columbus sailed from Spain across the Atlantic in 1492 and returned the following year, his voyage opened a new era in the history of the world. In 1497, the Portuguese mariner Vasco da Gama made a similarly long-distance voyage and returned, this time from India, which he reached by sailing first westward into the Atlantic and then turning south to round the southern tip of Africa. These voyages opened the Atlantic Ocean to Europeans as a portal through which they could reach Asia and the Americas. From that point on, an increasingly dense web of maritime trade links, missionary activity, and colonization would connect Europe to the rest of the world.

Previously, European seafarers had been relatively limited in their reach. Prior to 1400, European ships generally traveled no farther than the Black Sea to the east, the Mediterranean Sea to the south, the English Channel and North Sea to the west, and the Baltic Sea to the north (see Figure 1.1). Hemmed in

FIGURE 1.1 EUROPE IN 1500
Before 1492, most European seafaring was limited to the surrounding seas.

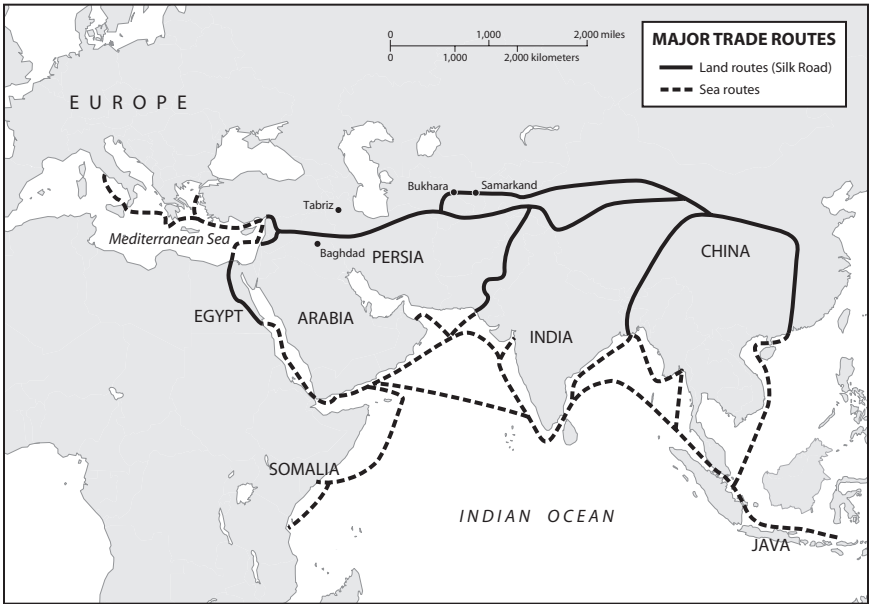

FIGURE 1.2 EUROPE AND ASIA SHOWING THE SILK ROAD AND THE SEA TRADE ROUTES

Important trade routes, including the fabled Silk Road, linked eastern, southern, and central Asia and the Middle East. Europe was on the western fringes of these networks of trade.

by the seas, as it were, European vessels usually stayed within easy reach of their own lands.[1] Prior to 1492, European ships remained confined to the far western fringes of the great Eurasian trade routes (see Figure 1.2 above).

Before 1488, when the Portuguese captain Bartolomeu Dias became the first to pilot his ship around the Cape of Good Hope at the southern tip of Africa—thereby showing that it was possible to sail from the Atlantic into the Indian Ocean—most Europeans believed there was no sea route to the east. European maps showed the Indian Ocean as fully enclosed by the east coast of Africa and the shores of Arabia, India, and southeast Asia; it appeared to be a basin of Asian trade that was closed to seafarers from Europe.

Although individual European merchants, like Marco Polo, had traveled to India and Asia in the Middle Ages, by 1500 neither European rulers nor merchants were able to project any substantial presence outside of Europe itself. South of the Mediterranean lay the Muslim kingdoms and sultanates of North Africa, whose residents fiercely resisted European intrusions. In the eastern Mediterranean, the Ottoman Turks, who claimed the great Byzantine city of Constantinople as their capital and called it Istanbul, continued to sweep forward into the Balkan Peninsula. By 1500, they had taken all of Greece and most of the Balkans and, within another 60 years, extended their reach deep into Hungary and almost to Vienna.

The greatest seafarers in Europe before the Portuguese and the Spanish were the Vikings in the north and the Italians in the Mediterranean. Although the Vikings skipped and jumped their way from the northern islands of Scotland to Iceland to Greenland and even to North America, they never crossed the belly of the Atlantic.

Meanwhile, the Venetians and Genoese, setting out from their city-states in northern Italy, sailed, traded, and settled widely throughout the eastern Mediterranean, even passing through the straits near Constantinople to the eastern shores of the Black Sea. Their ships transported the riches of Asia—silks and spices, jade and jewels—back to Europe. But the Italians rarely ventured beyond the Black Sea or the Ottoman-controlled coasts of the Mediterranean. Western Europe was thus locked in, surrounded by the open ocean to the west and the powerful Ottoman Empire to the east.

Yet the civilizations of the Middle East and Asia were not so limited. Arab merchants not only traveled all across North Africa and into Spain but also sailed along the Red Sea and down the eastern coast of Africa as far as Zanzibar, around the Arabian Peninsula, out of the Persian Gulf, and across the Indian Ocean to lands rich in pepper, rare gems, and other treasures. Arab, Persian, and Armenian merchants also traveled by caravan all the way to the borders of China on the overland routes known as the Silk Road, stopping at the wealthy cities of Baghdad, Tabriz, Bukhara, and Samarkand. Indian merchants traveled west around the Indian Ocean to Arabia and Africa and east around the Bay of Bengal to southeast Asia; they even established trading communities in Russia.

Almost a century before Columbus's voyages, the Chinese had built huge sailing fleets, dwarfing Columbus's tiny caravels, and sailed them from China around Southeast Asia, to India, and beyond the Indian Ocean to Africa. In short, while Europeans remained bottled up behind a wall of Islamic states, other traders moved freely across the entire Asian world (see Figure 1.2).

This explains why Columbus took his daring journey across the Atlantic, and why the Portuguese kept pushing down the coast of Africa until they sailed east and north into the heart of the Indian Ocean. Both sought a direct route to the riches of the East—a way for the Spanish, Portuguese, and other Europeans to participate in the thriving trade beyond the Ottoman border.

By sailing across the open ocean to the west, Columbus hoped to go around the world and arrive in China or India, the fabulously wealthy lands known to Europeans as the Orient. Columbus hoped to enrich himself and to find and claim the fabled "spice islands" of the East for his king, queen, and Christian god. Yet the most important result of his voyage, and of those of other Atlantic explorers, was to end the relative isolation of Europeans and connect them directly with the flourishing trade of the Asian civilizations lying beyond the Ottoman lands.

Columbus's voyage did just that, although in ways he could not possibly have expected. For in between Europe and Asia lay another entire continent—North and South America, joined at the narrow tail of Central America. (Not knowing this, and believing he had landed in India, Columbus labeled the Native Americans of the Carib tribe that he encountered "Indians"; the misnaming has stuck ever since.)

Columbus's discovery of the Americas got Europeans into the trading circuits of Asia. Before their contact with the New World, Europeans had relatively few things of value to offer for global trade. Although gold and ivory from Africa and furs and glass objects from Europe were valued in Asia, the Europeans had little of their own to trade for the costly spices, silks, and other Asian goods that they desired. But thanks to Columbus, they found their fortune.

The Americas held huge mines and storehouses of silver and gold, enough to allow Europeans to expand their trade with Asia greatly. Such riches had to be separated from their Native American owners, but the Europeans had no scruples about doing so. Through conquest, slavery, and the spread of diseases that decimated the native population, Europeans took control of the wealth of the Americas.

Why did the Europeans go through all that trouble? Why was it that India and China appeared to Europeans as the lands of riches at the time of Columbus?

The answer is that these regions *were* richer, in almost every way. The fields of India and China were more fertile and productive, and their technology for production was superior. China was the first region in the world to manufacture a host of products, including paper, gunpowder, oceangoing ships with sternpost rudders and multicompartmented hulls, the compass, the lateen sail, cast-iron tools, and high-quality porcelains. India led the world in the production of luxurious and brilliantly colored cotton textiles, and China and Persia were world leaders in the production of silk. The people of India and China clothed themselves in soft cotton, while Europeans wore coarser garments of linen and wool.

How did this come about?

Climate, Soil, and Agricultural Zones in Eurasia: Agricultural Productivity as the First Key to Wealth

We can get some insights by thinking of the vast Eurasian continent as divided into zones—zones of different climate, soils, and crops. The first zone is Europe. The weather over the Atlantic Ocean blows into Europe, carrying cold winds and rain in the winter, but milder and dryer air in

the summer. The southern or Mediterranean region tends to be hotter, dryer, and more dependent on mountain-fed rivers for irrigation, while the northern region from Britain to Russia gets heavier rains and is cooler. Yet all of Europe enjoys a climate with sufficient moisture in the winter and sufficient dryness and warmth in the summer to support an agriculture based on growing dry cereals (wheat, barley, oats, or rye) as well as fruit and vegetable crops.

The second zone is the huge mass of central Asia and the Middle East, roughly from the Ural Mountains to the borders of China. In this region, not enough rain falls in most places to sustain forests or settled agriculture, so much of central Asia is grassland, providing a home to nomads who graze their herds of horses, sheep, camels, goats, and oxen. The main exceptions are the areas subject to seasonal flooding from great rivers, such as the Nile River in Egypt and the Tigris and Euphrates rivers in Mesopotamia or the areas in high plateaus or near mountains that catch enough snowfall to provide summer water for irrigation, as in northern Persia. In these places the concentration of water and extensive irrigation has allowed for rich agriculture and the support of great civilizations.

Farther to the south and east, in India, China, Korea, Japan, and Southeast Asia, a third climate zone prevails. This is the monsoon zone of strong seasonal winds, dry winters, and rainy summers. Winter winds come from central Asia, bringing dry cool air. However, in summer the winds change direction, coming from over the warm waters of the western Pacific and the Indian oceans. The winds pick up moisture from the oceans and drop heavy rains over the monsoon zone. The result is a warm summer with heavy rains for India, China, Korea, Japan, Southeast Asia, and parts of Africa (see Figure 1.3).

To sum up, Europe's weather comes mainly from air patterns over the Atlantic, giving it cool wet winters and dry summers. Most of central Asia and the Middle East get little rain from the oceans and thus form a dry zone of deserts and grasslands, except for the rich irrigated lands along major rivers, and the mountain valleys and plateaus that catch more rain and snow. In eastern and southern Asia, by contrast, the weather is driven by seasonally shifting winds. The most striking feature of the latter is the monsoon season, when summer winds coming from the Pacific and Indian Oceans drop warm, heavy rains throughout the region.

This difference in seasonal rainfall patterns has large implications for agriculture, especially when combined with regional differences in soils. In Europe, much of the soil is thin and chalky, or sandy, or rocky, or covered with immense hardwood forests. To produce food, the land must be heavily worked to be cleared and fertilized. This means large numbers of

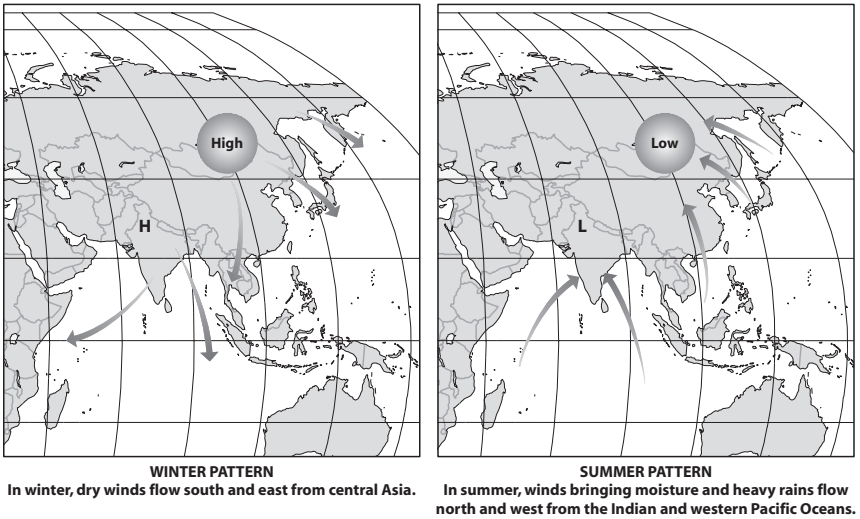

FIGURE 1.3 THE ASIAN MONSOON WIND PATTERNS
In winter, dry winds flow south and east from central Asia. In summer, winds bringing moisture and heavy rains flow north and west from the Indian and western Pacific oceans.

farm animals are essential, both for their work effort and their manure. The heavy soils of the forest regions could not be worked until the Middle Ages (from about the tenth century), when the use of new iron-tipped, heavy plows allowed farmers to churn up the old forest roots and bring fresh topsoil to the surface. But even these plows were fairly primitive, because iron was scarce and hard to shape; plows therefore had simple iron cutting shares lashed at a right angle to flat wooden (or sometimes iron) moldboards. The plowshare would cut through the soil, and the moldboard would lift a ridge of soil and turn it over, creating a furrow. This cleared the soil of weeds and aerated it, allowing nitrogen to re-enter the soil. But dragging that moldboard through heavy soil was enormous work, requiring large teams of animals and often a driver to encourage the animals as well as a plowman to guide the plow.

Because most rain in Europe falls in the winter, not in the summer growing season, farmers need to plant crops that are hardy. Europeans thus planted crops like barley and wheat, oats and beans and millet, as their main food source. But because the soils were poor and animals needed to be fed, almost two-thirds of the available land had to be left unplanted to provide grazing or held in a fallow or "resting" period for a year between plantings to improve soil fertility.

By contrast, farmers in the eastern monsoon zone had superior soils and got their wet weather in the summers. They thus organized their

agriculture quite differently. The northern Chinese plain was covered by a very light and fertile loess soil, which could be easily worked, and during the summer the high flow of the Yellow River and its tributaries provided plentiful water for irrigation.

Chinese farmers could work this soil using a lighter plow, and indeed China's technology produced a far more efficient one. The Chinese had developed a fairly sophisticated iron technology at an early date. By the fourth century AD, they were already using ceramic-coated ovens to generate high enough temperatures to melt iron for casting into a variety of shapes—something that Europeans would not master for centuries to come. Instead of a simple iron tip lashed to a moldboard, the Chinese would cast the plowshare and moldboard as a single smooth curve of metal with a sharpened leading edge and flanged sides. The result was a plow that cut through the soft loess soils like a knife through butter and allowed plowing by only a single worker and an animal or two.

Chinese farmers thus did not need to devote much land to grazing, nor did they need to rest any land in fallows, because irrigation and light manuring (usually from pigs) carried the needed nutrients into the light but deep soils. Even though the northern Chinese plain grew crops similar to those of Europe—wheat, millet, and beans—the Chinese were able to produce more food per acre and per farmer, to feed more craft and urban workers, and to support more and larger cities than Europeans could.

In India, southern China, southeastern Asia, and the southern parts of Japan and Korea, the monsoons dropped so much water that farmers could flood their fields in the growing season and grow the more productive and water-tolerant crop of rice. Rice plants have many more seeds or kernels per plant than wheat; thus much less of the crop had to be kept for seeding the next harvest, and more edible food could be harvested per acre. In addition, because flooding the fields helped fertilize the soil and keep down weeds, and far less animal power was needed for plowing, rice cultivation needed no fallow period and required little land for grazing. The methods of rice farming and the properties of rice thus allowed for higher productivity than did European farming, leading to greater output per person and per acre in Asia. This greater output allowed Asian societies to support a larger class of cultured and leisured elites, and to engage more craftspeople to produce specialized products for consumption and trade.

There was a downside to monsoon farming, however. Every so often, the rains would fail. This periodic effect is called the El Niño-Southern Oscillation (ENSO) and occurs when the normally warm waters that supply the monsoon rains in the western Pacific and Indian Oceans move away to the eastern Pacific instead. These shifting ocean currents affect the air currents, greatly weakening the southeasterly monsoon winds and

resulting in a terrible drought in eastern or southern Asia. Crops wither and millions starve. Conversely, in some years the monsoon rains fall earlier and much more heavily than usual. Fields and homes are swept away as rivers overflow their banks. The great agricultural productivity and wealth of Asia thus was always punctuated by occasional periods of drought or flood, leading to extremes of poverty and misery.

Climate and soil made a huge difference, but as we have seen with the comparison of Asian and European plows, Asian peoples also developed superior technologies that let them take the best advantage of what nature offered. In fact, because nature was often cruel—bringing ruinous floods and droughts when the monsoons came too soon, too harsh, or not at all—the Chinese and other Asian peoples developed a variety of technologies to diversify their economies and to control their essential water supplies.

Technologies to Shape the Environment and Create Marketable Products

Throughout Asia, agricultural societies developed elaborate networks of canals, ditches, and levees to divert river water to their farms. Although it was once believed that these water-control projects could only have been built by harshly dictatorial states, we now know that most of the irrigation projects that created wonderfully fertile fields from Iran to Bali and that operated all across India and China were built and maintained under the supervision of local elites and their communities.

Where the government was involved, it focused mainly on creating water projects to improve trade and travel, such as China's Grand Canal, built to take tribute grain from the rice-growing area of the Yangzi River delta to the northern capital of Beijing. Stretching over 1,000 miles from north to south, linking numerous bodies of water and crossing rivers and mountains, it remains the world's longest canal, and its main sections were largely completed by the seventh century AD. In the tenth century, the Chinese invented canal locks to float barges over uneven terrain, eliminating the need to remove, carry, and reload cargoes when traversing hills. (This was 400 years before canal locks were used in Europe.) Yet this was just one of many projects that the Chinese and other Asian nations built to control flooding, channel irrigation waters, and maintain port facilities in coastal trading centers.

In addition to their prowess in agriculture and water control, the peoples of Asia also produced a variety of valuable materials unavailable in Europe. From the time of the Roman Empire, the Chinese had been producing silk: raising silkworms, steaming the cocoons to kill the worms and prevent them from breaking out as moths, and then skillfully unreeling the cocoon into

threads. Woven silk textiles were one of the main luxury items traded across Asia for centuries, giving their name to the Silk Road trade route. Silk production spread to Persia and the Middle East in the early Middle Ages, and Europeans had learned to produce silk by the thirteenth century. But the demand for fine silks was so great that local production in Europe and the Middle East could not keep up with it, and Chinese (and other Asian countries') silk continued to be exported to the West through modern times.

By the time of Columbus, China and India were also beginning to produce another luxury fabric unavailable in the West: fine cotton. It may be hard to believe today, but until the eighteenth century, the cotton that Europeans now rely on for their shirts, undergarments, and jeans was only available from Asia. The British imported huge amounts of woven cotton cloth to Europe. Even in the late 1700s, as the British were developing their own machine-driven cotton-spinning industry, they feared they would never be able to produce such fine cotton cloths as were produced in India.

In addition to higher agricultural productivity and superior textiles, eastern Asia also had great advantages in what we would today call materials engineering. The Chinese mastered heavy bronze casting almost as soon as they developed writing and became skilled in casting iron utensils 1,000 years before the Europeans. The Chinese (and Koreans and Japanese as well) also developed the magnificent ceramics—ornately glazed and almost translucent—that we admire today as fine china. Indeed Chinese ceramics were in such demand throughout Asia that, as early as the seventeenth century, the Chinese developed coal-fired factories with thousands of workers to turn out pieces with designs carefully tailored to appeal to Middle Eastern or European customers.

The Chinese also developed inexpensive paper and woodblock printing and hence had vast libraries of books centuries before large-scale book printing and libraries developed in Europe. Even paper money (also made possible by cheap paper and printing) was used in China long before it was used in Europe. Europeans used expensive animal skins (vellum or parchment) for most writing in the Middle Ages. Arab middlemen sold Asian paper to Europeans for roughly 400 years, from AD 800 to 1200, before Europeans learned to manufacture it themselves. Costly pigments (for dyeing cloths and creating paints), gunpowder, and matches all came from various parts of Asia.

Finally, Asian lands were also the source of precious spices, ointments, and perfumes—mainly pepper, but also cinnamon, cloves, cardamom, myrrh, and frankincense. Somewhat later, Arabia, India, and China became the source of Europeans' daily tea and coffee, but that trade only developed over 100 years after Columbus's voyage.

Having enjoyed a more productive agriculture and more advanced technology for many centuries before 1500, most Asian societies appeared

fabulously wealthy to Europeans. The volume of shipping on Chinese rivers is said to have stunned Marco Polo, himself a Venetian trader, who visited China in the thirteenth century. Through 1750, Europeans marveled at the riches, technological skills, and beautifully crafted products of the East.

The Puzzling Rise of Europe

How then is it possible that by 1850, perceptions had reversed, and Asians began to seem poor and backward to Europeans? By 1911, when the Chinese Empire collapsed, Europeans considered China a land of wretchedness and dulling tradition, not an advanced civilization. Europe had spread its political and economic domination around the world, colonizing some regions, dictating terms of trade to others, and enjoying technological superiority and material wealth that seemed beyond the reach of non-Europeans. Given where the world stood in 1492, how did all of this come about?

For most of the last 200 years, Europeans justified their sudden rise to global domination in terms of their own superior virtues. Singling out elements in their history borrowed from ancient Greece and Rome and proceeding through the Renaissance, Europeans prided themselves on having achieved special insights into nature. They congratulated themselves on having greatly developed their cities and their trade, sometimes forgetting that when they joined the global trading circuits, great cities and immense trade already existed in Asia.

Sometimes Europeans explained their success in terms of their religion, arguing that Christianity provided a superior foundation for economic activity. At other times, Europeans pointed to their system of government—the competition among diverse states in early modern Europe—as the reason for their success.

Some explanations are more humble, suggesting that Europeans did not deserve their greater riches, but had stolen them. Starting with Columbus's construction of forts in the Caribbean, Europeans became global invaders, stealing wealth and resources from native peoples wherever they went.

Finally, some explanations suggest that Europe was just fortunate in having certain resources—coal and iron for industry in Europe, or the depopulated lands of the Americas—in places where Europeans could put them to good use and thus gain an advantage over other world regions.

All these and other ideas are worthy of consideration. Yet they must also be carefully examined and tested. We should not assume so easily that any factors we think made Europe special were in fact absent in Asia or Africa. We may just have to look a bit harder. Nor should we assume that,

just because Europe was different in some way from other places, such differences produced a better outcome. Such differences could just as easily have produced worse outcomes, so we have to trace cause and effect very carefully to be sure a given factor did indeed produce a particular outcome.

The following chapters thus undertake a study in comparisons—what really were the important differences that led to Europe's great and sudden rise to world domination? And will they last?

Additional Reading

Fagan, Brian. *The Long Summer: How Climate Changed Civilization.* New York: Basic Books, 2004.

Pomeranz, Kenneth. *The Great Divergence.* Princeton, NJ: Princeton University Press, 2001.

CHAPTER TWO

Patterns of Change in World History

CHAPTER PREVIEW: We tend to think of change in history as always moving forward: people getting richer and learning more, and cities and countries growing. But that has not always been the case. Changes in world history often move in up-and-down cycles. Bursts of progress are followed by reversals or long periods of stagnation. This was true in both Europe and other major civilizations for most of history.

Some scholars have pointed to episodes of progress in Europe before 1700 in the areas of social change, or technology, or population control as responsible for the rise of the West. However, when placed in broader context, these are often seen to be part of longer up-and-down cycles and very similar to episodes that took place at roughly the same time in other civilizations.

When we think about long-term social change, our natural tendency is to think of change as something that is always with us—prices go up, populations grow, cities expand, technology improves. If we think of modern times as different from what went before, we mainly see the rate of change as different, with changes in the modern world coming much faster.

Yet the reality is considerably more complicated. Long before modern times, history saw episodes of rapid advances in population, in prices, in urbanization, and in technology. Most of the great empires of history started with a "bang" of rapid expansion and social change. However, the total effect of such changes was limited because they were not sustained. Instead, they were interrupted by sudden reversals, in which plagues, harvest failures, wars, revolutions, and other disasters sharply reduced population. Urbanization and trade usually declined as well, and prior technological advances were sometimes lost. These declines were often

followed by long periods of relative stability in which population, prices, cities, and technology hardly changed for centuries.

To take just one example, we now think that the population of England reached over 4 million during the late Roman Empire (around AD 300), was over 4 million again around AD 1300, and was over 4 million again in 1600.[1] But this does not mean that the population of England was constant for over 1,000 years. Rather, the population went through several periods of increase, then decline and stagnation, followed by slow recovery. England's population probably plunged to around 2 million by AD 500 and reached that level again around AD 1400. Nor was England alone—in Italy, Germany, Turkey, and China, from ancient times until the nineteenth century, records tell of periods when disease, war, and famine carried off one-quarter to one-third of the population within a generation.

What makes the modern world different, in other words, is much more than merely the pace of change. Before the nineteenth and twentieth centuries, the typical pattern of economic change was cyclical: There were periods in which population, prices, urbanization, and technical growth all rose, but also long periods when they fell or remained unchanged. By contrast, since 1800 in Europe (and since 1900 in most of the rest of the world), the pattern of economic change has been one of accelerating growth, in which populations, cities, and technological inventions have generally increased more rapidly in every succeeding decade than they had ever done before. Population and technology have advanced faster and still faster, interrupted only by relatively mild downturns or brief periods of stability.

Two centuries of accelerating change have meant that the advance of prices, population, urbanization, and technology since 1800 has dwarfed anything that came before. In 1800, the population of the world had grown to a total of about 1 billion people. It had taken tens of thousands of years for the world's population to reach that number. Then, in merely the next century, the world gained almost that many people once again, with global population nearly doubling to reach 1.7 billion people by 1900. In the century after that, global population grew so fast that the number of people more than tripled, reaching 6 billion by the year 2000. In fact, by the late twentieth century, in every 20 years the number of people being born was greater than the entire population of the world 200 years before.

Other social factors also changed rapidly. In the world before 1800, in most large societies no more than 10 to 15 percent of the population lived in big cities. Methods of farming, manufacturing, and transportation underwent major changes only every century or two. Farmers in Europe and America in 1760 used pretty much the same equipment that had been

used since the introduction of the horse collar and the iron-tipped heavy plow in 1300. As late as 1800, people all around the world who traveled on land either walked or rode horses or were carried in horse-drawn carriages, as they had been for thousands of years.

In the past 200 years, things have changed dramatically. Today in most large societies more than half the population live in big cities. New methods of manufacturing and transport have appeared every decade. Changes in just the past 50 years have been enormous. Before 1950 there was no public jet travel, and no man-made object, much less a human being, had ever left earth's atmosphere to enter outer space. Before 1975, there were no personal computers, no cell phones, no Internet, no cable or satellite TV.

When and where did this shift from premodern cyclical change to modern accelerating change begin? This is another way of asking how the rise of the modern world began. To understand how the world became modern, we need to inquire into the kinds and patterns of social change that occurred in different parts of the world.

Was Change Different in Asia and Europe?

Some scholars have suggested that the patterns of social change in Europe diverged from those elsewhere in the world long ago, perhaps as long ago as the Middle Ages, and certainly by the end of the Renaissance, or about AD 1600.

Karl Marx, for example, argued that Western European society moved through a series of distinct social formations, which he called patterns of class relations, over the last 2,000 years.[2] Marx observed that in ancient Greece and Rome, society was led by a small elite of citizens who ruled over slaves. In the Middle Ages, society was led by feudal nobles and lords who ruled over peasants. By the Renaissance, an urban elite of bureaucrats, financiers, and traders emerged to challenge the feudal lords. By the nineteenth century, wealthy capitalists were firmly in control of an industrial society in which most people were wage-earning workers. By contrast, according to Marx, as late as the 1800s major Asian societies such as China and India were large but stagnant empires, never progressing beyond the ancient or feudal stage of development, with their class relations remaining unchanged across the centuries.

Other scholars have made similar arguments based not on class relations, but on changes in technology. David Levine, for example, has argued that technological changes began to intensify in Europe from about AD 1000, when water mills, windmills, and new heavy iron plows began to spread widely in northern Europe. Alfred Crosby has argued that a uniquely European mania for precise counting spread from the thirteenth century and

led to improvements in clocks, music, artwork, and eventually navigation, science, and manufacturing. Jan de Vries and Ad van der Woude looked to the sixteenth century, focusing on the Netherlands (also known as "Holland" after its largest province), and suggested that its highly commercialized agriculture; high rates of urbanization (with roughly 25 percent of its people living in cities); and large number of dominant manufacturing, transport, and financial activities (including fishing, shipping, warehousing, insurance, brewing, glassmaking, and printing) made it the first modern nation. By contrast, these authors have presumed that any technical changes in Asia were relatively smaller and unimportant.[3]

Finally, still another set of authors have suggested that the pattern of growth in European populations was different than the pattern elsewhere. John Hajnal, E. A. Wrigley, and Roger Schofield have suggested that northern European populations were better able to conserve and accumulate resources than other populations because they were better at restraining population growth.[4] Europeans accomplished this by making it the custom that women not marry until they reached their early to mid-20s, and that they not marry at all in hard economic times. By contrast, these scholars observed that in most Asian societies, marriages occurred when women were much younger (in their mid-to late teens), and that nearly all women married. They assumed that this pattern of early universal marriage would naturally lead to larger families and more rapid population growth in Asia, so that fast-rising populations would literally eat up any economic growth. Therefore no accumulation of resources could take place, and the standard of living would remain stuck at a low level while population grew and grew.

All of these suggestions are plausible. The problem is that they are all mistaken. Each of these approaches has exaggerated the ways in which European class relations, or technology, or population growth were different from the richer Asian societies before 1800.

Some of the errors come simply from comparing a fairly detailed and learned understanding of change in Europe with a rather vague and oversimplified understanding of change in Asia. In fact, Chinese history over the last 2,000 years shows many periods of crisis and changes in social relations, government structure, and technology, as we will show in the chapters to come.

Other mistakes come from isolating and examining a single dramatic period of change in Europe. Focusing on a particular time period—such as the early Middle Ages, or the sixteenth century—that formed an upswing in a long cycle of population, urbanization, and technical growth can make it appear that Europe was dynamic and advancing from an early date. But this overlooks the downswings that almost always followed. A longer-term

perspective shows that none of the countries in Europe—or anywhere else for that matter—managed to escape from the cyclic character of long-term social change that prevailed everywhere before 1800. The same European societies that flourished in the eleventh and twelfth centuries faltered in the thirteenth century and collapsed in the fourteenth century. Even the wonderfully prosperous society of sixteenth and seventeenth century Holland underwent a sharp reduction in living standards and economic decline in the eighteenth century.

Similarly, pointing to specific changes in European technology can make Europe appear more inventive, when in fact different but equally powerful changes in Asian technology were occurring at the same time, if only we are open to seeing them. From the sixteenth to the eighteenth centuries, for example, China developed new farming techniques that gave higher output of a wide variety of crops, including millet and soy, rice and beans, wheat and cotton. China also developed new technologies for the production of ceramics, cotton, and silk textiles and expanded its coal mining and its overseas trade. These new developments raised the standard of living in China beyond European levels.

Finally, although it is true that in northern Europe women married later, this did not mean that only European populations controlled their growth during difficult times. Asian populations used other methods: In hard times, men would leave their families for many years to look for work in distant cities or regions; widows would be discouraged from remarrying; and infants would be starved or killed. The result was that even though Asian women married earlier, in the end they had no more surviving adult children than did European women. Completed family sizes in China were hardly different from those in Europe throughout the seventeenth and eighteenth centuries.[5]

In short, many of the supposedly critical distinctions between European and non-European societies melt away when longer-term trends are considered and when one looks with equal care at Western and non-Western societies. Until 1750, changes in population, agriculture, technology, and living standards were not fundamentally different in eastern Asia from those in western Europe.

This should, after all, not be surprising. Until very recently, long-term cycles of social change were caused mainly by factors that no society could escape and that worked equally on all populations of the world: climate and disease. All societies depended upon the food they could grow and on the same basic materials (animal skins, plant fibers, mud, wood, and stones) for clothing and shelter. This meant that harsh winters—with heavy snows, floods, or hail—or harsh summers with withering droughts could reduce the output of the vital plant and animal products on which people everywhere depended for food and shelter.

All societies kept some domestic animals for food and other products and relied on some long-distance trade to supply them with materials or products that they could not produce for themselves. This meant that almost all societies (except for those living in relatively isolated lands, such as Australia or the Americas before Columbus) also were subject to infection from animal- or human-borne disease.

Understanding the patterns of climate and disease and how these affected human societies is therefore the first step in understanding broader patterns of social change.

Climate Change, Disease, and Long-Term Cycles of History

We all know, of course, that the Ice Ages made life much tougher for our ancestors. Wrapped in furs and hunting large animals with spears, they struggled through brutal winters that kept large areas of the world covered with ice and snow. It was only with the end of the most recent Ice Age, about 8,000 to 10,000 years ago, that agriculture and farming developed.

We are now gaining knowledge—from the study of tree rings and ice cores drilled from glaciers—that the end of the Ice Ages did not simply mean that global climate had improved. Rather, it seems that eras of harsh winters have periodically returned, even in the last few thousand years, and again made life tougher for our recent ancestors. We are still not exactly certain why noticeable climate shifts have occurred every few hundred years. What is increasingly clear, however, is that every three to four centuries for the last few thousand years, the world has undergone a period of marked cooling. These cooling periods have generally shortened growing seasons; produced more disastrous floods, frosts, and hailstorms; and made it impossible to farm marginal lands that had previously been successfully brought under cultivation.

More hostile weather and less certain food supplies would likely make societies more vulnerable to disease. And indeed, each of the cooling periods appears to have been associated with outbreaks of ravaging epidemics. In the second and third centuries AD, massive plagues wreaked havoc on the early Roman Empire. Three centuries later, the Justinian plague of the sixth century killed perhaps one-third of the population of the eastern Roman Empire. In the ninth century, records are sparse in Europe, where the collapse of the Roman Empire had left civilization in chaos. However, records from China and Japan note epidemics—probably plague—that are reputed to have killed half the population of coastal China and Japan.

The four centuries from 900 to 1300 were a period of great prosperity and population growth all across Eurasia. However, from the early 1300s the plague spread from China across Asia and Europe all the way to

England, where it became known as the Black Death. From one-quarter to one-third of the population of Europe and Asia died. The Middle East and North Africa, especially Egypt, were equally affected. Recovery began only after 1450.

From about 1500 to the early or mid-1600s, population grew rapidly all over Europe, in the Middle East, and in China. Then once again—about three centuries after the first appearance of the Black Death, in the early and mid-1600s—new epidemics returned to Europe. This time smallpox and typhus joined a resurgence of the plague. Nonetheless, European death rates were not as high as before. In some war-ravaged areas, such as Germany (which was the main battleground in the Thirty Years' War [1618–1648]), combined war and disease deaths may have reached one-third of the population. But for most of Europe, not more than 10 to 15 percent of the population died, still a massive toll.

However, the lightness of disease mortality in Europe was more than offset by the devastating effects that European diseases had when they were introduced into the Americas. Before the arrival of Columbus, the temperate regions of North and South America appear to have been heavily settled. From the huge numbers of arrowheads and fishing hooks scattered across coastal regions of the United States to the impressive earthen mounds—many hundreds of feet across—raised by the Mississippi River Valley civilizations, there is evidence of large Native American populations who were never seen by subsequent explorers. And we know from direct observation by Cortés and Pizarro that the highlands and valleys of Mexico and Peru were teeming with people. Yet within a century of Europeans' arrival on the mainland of the Americas, these lands appeared nearly empty to later settlers. In the sixteenth and seventeenth centuries perhaps 80 to 90 percent of the pre-Columbian population perished by exposure to toxic germs—plague, smallpox, and others—introduced by Europeans and Africans to a population with no prior exposure, and hence no resistance, to these scourges.

Whether it was mainly the weather or just independent cycles of disease evolution that became worse during periods of harsh climate, few parts of the world were exempt from bouts of depopulation that occurred every three or four centuries and were generally followed by periods of stagnation or slow recovery. The result was a pattern of rise and fall of populations all across the globe.

What we do know, to sum up, is that all across Eurasia, from England to Japan, the last few thousand years have seen repeated, regular changes in climate and disease patterns, which in turn have produced cyclical changes in population. These changes in population in turn had visible

effects on other aspects of society. Population cycles were linked to long-term changes in prices, urbanization, and incomes.

Patterns in Prices, Population, Urbanization, and Incomes

Figure 2.1, taken from *The Great Wave* by David Hackett Fischer, shows the long-term change in the price of items consumed in English households from the thirteenth to early twentieth century.[6] There are long periods in which prices rose considerably, and long periods in which they stagnated or fell. Similar patterns can be found in the prices of consumables in other countries in Europe and even in the Ottoman Empire and in China.

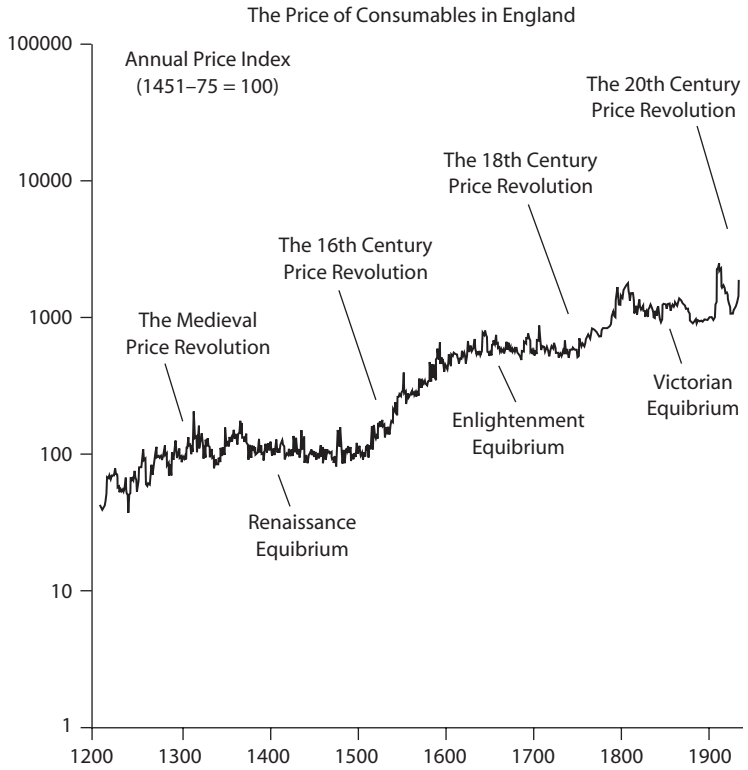

Figure 2.1 The Long Waves of Price Advance and Stagnation in England, 1200–1900

Since 1200, England has had 150- to 200-year periods of population growth and price inflation alternating with equally long periods of population decline or stability and price stagnation.

Generally speaking, periods when prices were rising were also times of economic and population booms, when population grew steadily, trade increased, and urban centers expanded. In England, during the sixteenth century Price Revolution (roughly from 1550 to 1650), the population rose from 3 million to 5.2 million, increasing by about 70 percent. But during the Enlightenment Equilibrium (roughly from 1650 to 1730), population first fell to less than 5 million, then stagnated; it was only 5.3 million at the end of this period—essentially no change at all. Then growth resumed, and during the eighteenth century Price Revolution (roughly from 1730 to 1850), England's population tripled to almost 17 million.[7] The growth rate of major cities followed a similar pattern: The population of England's five largest cities more than doubled between 1600 and 1675, but increased by only 50 percent in the following 75 years.[8]

Similar patterns hold all across Eurasia. Throughout Europe, in the Ottoman Empire, and in China, the sixteenth century was a time of growth in total population; of very rapid expansion of cities; and of rising prices for land, grains, and animal products. The later seventeenth century, however, was a period of stagnation and decline for these same factors.

These factors moved together because they were all closely linked through people's activities. If better weather or less disease allowed the population in an area to grow, that generally pushed up the price of food; people would then produce more food or more goods to trade for it, and trade would increase. Urban centers—where merchants met to make those trades—would increase in size. And people who could not find work or land in the countryside came to the city as well, to try their hand at manufacture or trade. Adding their products meant more things to trade, which kept the cycle going.

These cycles went into reverse during times of bad weather or disease that suppressed population growth for decades at a time. During these downswings, trade was often disrupted, merchants went bankrupt, not as many people moved from the country to cities, and prices of foodstuffs stabilized or even fell.

Oddly, the one thing that was good during these downswings was that the real wages of ordinary workers generally went up—as food prices went down, people could often afford more food (provided that they could find work). As Figure 2.2 shows, during the latter part of the long Renaissance price equilibrium (from 1450 to 1500), real average earnings rose to their highest level before the 1900s. In many ways, it was the worst of times—population had been devastated by the Black Death and its terrible mortality, and the Hundred Years' War (from 1337 to 1453) had raged across western Europe. But the result was that labor was scarce, and earnings for those who survived were relatively high.

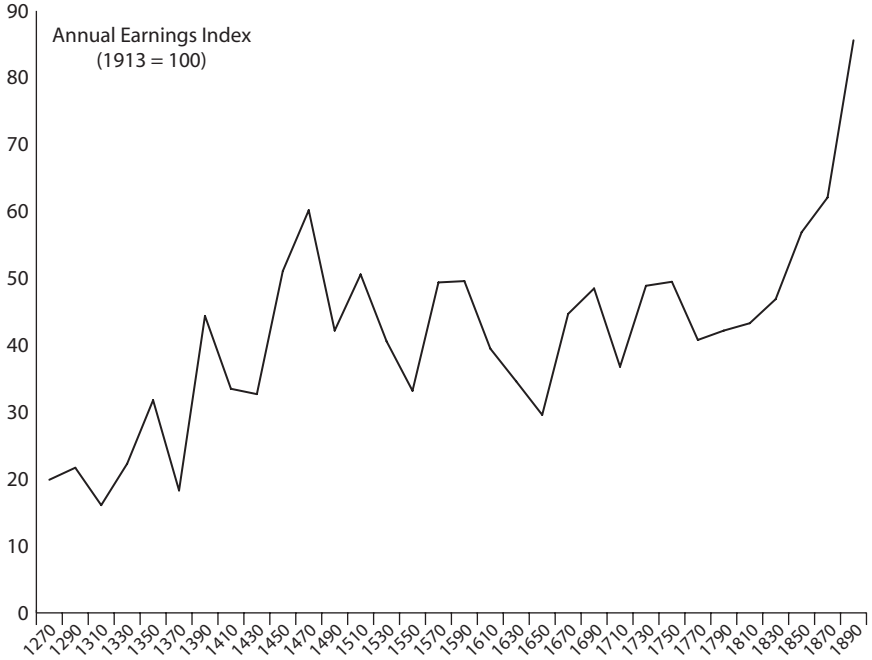

FIGURE 2.2 AVERAGE EARNINGS IN THE LONG RUN IN ENGLAND, 1270–1890 (INDEXED TO AVERAGE EARNINGS IN 1913 = 100)

After a rise following the Black Death (1350–1410), English workers' earnings remained basically unchanged for four centuries, to 1830. Only then did earnings suddenly start to rise, so that by 1890 workers' earnings had grown to double the level that had prevailed for the period from 1410 to 1830.

In short, the history of material life for most of the last 1,000 or 2,000 years has been one of long ups and downs but with little overall progress. As late as 1800, ordinary workers in England and Holland received roughly the same average earnings as workers in those countries 300 years earlier. Ordinary people in 1800 may have had access to a greater variety of products from expanding local and international trade, but they could not afford any more food or better shelter than their great-great-great-great-great-great-grandparents could.

As the centuries passed, there were periods of good times for merchants and landlords (who bought and sold foodstuffs and did best when prices were rising) interspersed with periods of good times for ordinary workers (who depended on wages or on subsistence farming combined with craft work and did best when food prices were stable or even declining). World economic history before 1800 shows many ups and downs, differing a bit across different areas and for different groups of people, but with relatively little overall change.

Living standards thus moved within a fairly fixed range for many centuries. Still we might ask: Weren't there big differences among different regions? Even if both Europeans and Chinese had their ups and downs, didn't the overall course of change leave Europeans richer and better off by 1800?

So far, the evidence does not support that view. If we look at basic measures of the physical well-being of the population—such as life expectancy or the calorie intake of an average family—we find that the Chinese and the English were about equal in 1800, and that both of those societies were well ahead of other regions in Europe such as Italy or Germany. (We look at all these things in more detail in Chapter 5.)

How long people lived depended a great deal on how well they ate, and here too we find evidence of very similar conditions across Eurasia. Robert Allen, Jack Goldstone, and Ken Pomeranz have all estimated the available income for Chinese and English families in terms of calories or the amount of food they could purchase. Their data show that in the years around 1750, the majority of Chinese families probably consumed as much as or more food than the majority of English families. These families did not necessarily carry out the same routines: By 1750 most Chinese families were still peasants engaged in farming and home crafts, while most English families were headed by wage workers in farming or manufacturing. Still, their average calorie consumption appears to have been very nearly the same, or slightly higher for the Chinese.[9]

One might immediately think that such a balance of income is astonishing—didn't Europeans have the lead in technology? Wasn't there an agricultural revolution in seventeenth century England that greatly increased productivity? Didn't the Dutch (that is, the people of the Netherlands, who spoke the Dutch language) have fantastic cargo ships, fishing vessels and windmills that did everything from sawing wood and pounding pulp to pumping water to clear swamps and irrigate canals? Didn't the Portuguese and Spanish (and later the English) lead the way in mastering the oceans and sailing the seas?

Long-Term and Global Patterns of Technological Change Before 1800

Just as ignoring the generally cyclical nature of change in long stretches of history can lead one to seize upon isolated or short-term upswings as breakthroughs, looking at only a few episodes of technological change can also be misleading. Let us look more closely at the global history of technology, and here too we will find more parallels than divergences between East and West in the period prior to 1800.

The first thing to realize about technological change before 1800 is that it certainly did occur. Roman aqueducts, Gothic cathedrals, and Islamic domed mosques were breakthroughs in architecture (skip ahead and look at Figure 7.1 to see what Roman builders could do almost 2,000 years ago). At different times, mounted knights, longbows, mounted archers, stone and earthen fortifications, gunpowder, the magnetic compass, sternpost rudders, and firearms all transformed exploration and warfare. The technology of organizing human activity changed as well. Trade shifted from caravans to corporations of merchants. In military organization, companies of knights and foot soldiers who could do little more than advance or retreat in response to orders gave way to well-drilled regiments that could execute hundreds of discrete movements and maneuvers at the shout of a command. States changed from little more than family-run endeavors to large and complex bureaucracies.

However, the second important thing to recognize about such technological and organizational changes is that they were widely scattered over space and time and tended to be isolated, rather than generating continuous and cumulative further change. A new technological complex—such as the military formations of the Roman legion or the earthwork fortifications of the Renaissance—might be invented and transform warfare but then would remain unchanged for hundreds of years. A millennium separates the invention of the Roman arch, used in the coliseums and aqueducts of the empire, from the invention of the flying buttress that supported soaring Gothic cathedrals. It took hundreds of years for even relatively simple technologies, such as wheelbarrows or clocks, to diffuse across Eurasia. Once people had discovered what seemed to be a superior way of doing things, they generally stuck to it rather than immediately seeking to change or further improve it.

Moreover, it is difficult to speak of overall technological leadership in this era, since so many different technologies were developed in different places and at different times. China took the lead in inventing or developing the wheelbarrow, canals and canal locks, the magnetic compass, exact mapping of large regions, the sternpost rudder ship, the oceangoing sailing vessel, gunpowder, cast iron, porcelain, silk, printing, and paper.

To illustrate China's early lead in shipbuilding, a complex technology requiring expertise in creating watertight joinery, strong rigging and sails, and overall design, Figure 2.3 compares the ships Columbus used to sail to America with the Chinese sailing ships commanded by Admiral Zheng He. Admiral He's fleet sailed from northern China to the coast of Africa and back—a far longer voyage than Columbus's trip from Spain to North America—some 80 years before Columbus.[10]

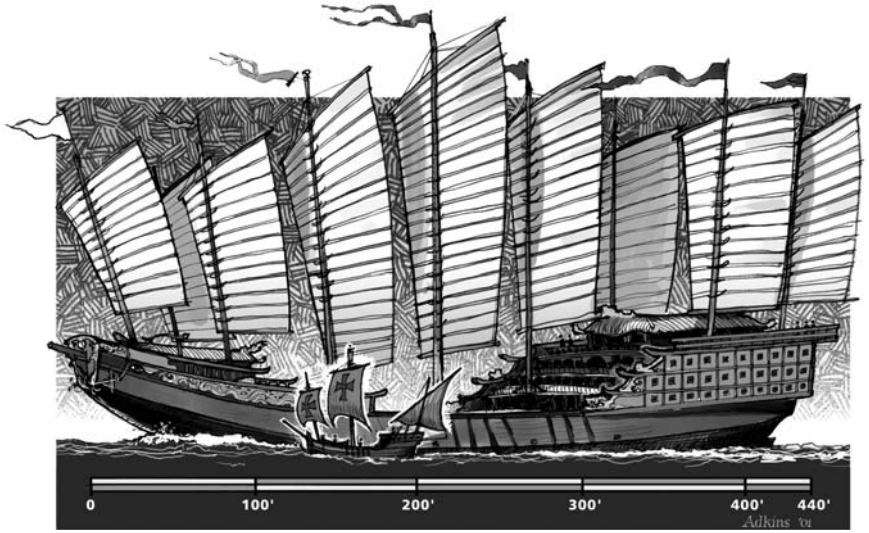

FIGURE 2.3 ADMIRAL ZHENG HE'S FLAGSHIP, COMPARED WITH COLUMBUS'S *SANTA MARIA*

In this drawing, Columbus's main ship, the *Santa Maria,* is pictured in front of the flagship of Zheng He's oceangoing fleet. Zheng He's flagship measured 135 meters, dwarfing the *Santa Maria,* which was only about 20 meters (or about 66 feet) in length.

India held the global lead in producing cotton textiles of outstanding variety and quality. The Muslim world excelled in producing spices and working in brass and wood inlay and was preeminent (as it remains to this day) in producing fine rugs and carpets. In Europe, Venice produced the world's finest and purest glass; England produced an outstanding variety and quality of woolen cloth; and the Netherlands excelled in fishing, printing, and brewing. Spain was famous for the silver it imported from the Americas, which it minted into coins—called pieces of eight—of such uniform weight and fineness that for much of the sixteenth and seventeenth centuries they became the first worldwide currency.

Japan and southeast Asia, Russia and Africa, all had their unique products and artisanal industries in which they achieved eminence—Russian furs and Japanese swords, for example, were the highest quality of their kind in the world, while Africa was the leading source of gold and ivory and exotic animal products. It was precisely this dispersion of technological talents that fueled the global trade linking Europe, Asia, and Africa that had been carried out by merchants since Roman times.

The best way to describe technological innovation and change before 1800 is to say that it was sporadic—different technologies were developed at different times and in different places and then not developed much

further if at all. It is true that each such technological innovation conferred substantial benefits, in trade, in agricultural output, in transport, or in war. But because those innovations remained sporadic and isolated, they could not carry whole societies forward in leaps and bounds as the linked and accelerating technological changes of the past 200 years have done.

Let us look a bit more closely at two major technological changes in Britain to see how this worked—the agricultural revolution and the early stages of the Industrial Revolution." Both these events had certainly occurred by 1800—how is it possible that they left no mark on Britain's level of material well-being, compared with other leading societies and civilizations?[11]

Change or Revolution? Agricultural and Industrial Change Before 1800

For many years, school children in Europe and the Americas were taught that the rise of the West began in England in the seventeenth and eighteenth centuries. In this period, England was said to have created an agricultural revolution that boosted agricultural productivity to unprecedented levels. This increase in agricultural production was then said to have provided the basis for feeding large numbers of workers in manufacturing, who toiled in new water-powered factories to spin bale upon bale of cheap cotton thread that undercut competitors worldwide and thus launched the Industrial Revolution.

We now know that this story is something of a myth. There were changes in English agriculture, to be sure, and they did produce higher output. But they were hardly a revolution, if by that is meant pushing productivity to historically new levels. As early as the Middle Ages, farmers in Norfolk county near the thriving commercial city of Norwich had produced as much as 25 bushels of wheat per acre by planting clover and other fodder crops to feed sheep and using the sheep manure as intensive fertilizer to increase their yield of barley and wheat. This level of productivity, achieved in Norfolk in 1300, was not exceeded for another 500 years. The "Norfolk rotation" was thus an old success story. Flemish farmers in Flanders, in northern France, had been doing something similar for generations as well.

In the sixteenth and seventeenth centuries, first the Dutch and then the English began to experiment with more varieties of seeds and fodder crops and more breeds of animals to extend these intensive farming methods to more and more regions. By using more animal manure, different combinations of grain and fodder crops, and learning to make the best use of specialized soil and climate zones for particular kinds of farming, English farmers were not only able to feed a population in 1750 that was about the same size as the population in 1650 (and even export surplus

grain abroad), but also achieved this with about one-third fewer farm workers than had been required earlier.[12]

Where did those workers go? Some simply went into terrible rural poverty. Others were herded into workhouses by the authorities or moved to city slums. Some, after 1770, went to work in the new factories producing cotton thread and woolen yarn. But those factories, using new machines invented in the 1760s, only employed a few percent of England's population by 1800—nowhere near the roughly one-third of its population that was no longer needed in farming to feed the population. Those millions went mainly into traditional urban and rural crafts or unskilled labor. Many worked at producing textiles and clothing, whether becoming handicraft weavers who set up small looms in their cottages to weave thread into cloth, or doing embroidery, lacework, or tailoring. Others worked for wealthy households as domestic servants or toiled on construction sites or in breweries. Still others took up traditional crafts in wood, leather, and metalwork or labored in shops, taverns, and market stalls.

Those workers now also exhibited another characteristic—they no longer needed to wait to inherit a farm to start a family; they merely needed to find a job or set up a loom to make an income from weaving. So these workers began to marry at younger ages, propelling a population boom in England. But this created another problem: The improvements in agriculture had not boosted total production enough to keep pace with yet a further population surge.

From roughly 1660 to 1760, England's population was nearly constant, so the improvements in agriculture had allowed England to feed itself and even export extra grain with far fewer farm workers. But after 1760, when population growth resumed, this situation changed. Population grew, while agricultural productivity hardly increased any further. By 1800, food production had clearly fallen behind population growth, real wages had fallen, and England had to import grain from Ireland, the Netherlands, and Germany to feed its people.

In short, we find another cycle, not a revolution. A substantial increase in agricultural output did occur from 1600 to 1760 as a result of the improvement and spread of better farming methods. But there was no breakthrough to completely new methods of farming or unprecedented levels of output per acre. The vast majority of those who left farming did not go into new industries, but into traditional crafts and occupations. And from 1760 to 1800, England's agriculture again was failing to produce enough food to feed its population.

At the same time, China too was experiencing major improvements in its agriculture. In China, people grew and ate mostly rice, not wheat and rye as did Europeans. One advantage of rice is that it can be planted in

low and wet fields and in mud. This meant the soil required less plowing to break up and aerate the clods, and so far less animal power was needed for farming. This in turn meant more land could be planted for human food. As a further bonus, rice plants produced far more edible grain per plant than wheat or rye. The problem for rice farmers was that low-lying rice fields were often too severely flooded or were hard to farm if the weather was too dry. Seasonal monsoons—which delivered the rains, but sometimes brought too much or too little—made rice farming possible, but also precarious.

In the fifteenth and sixteenth centuries, Chinese farmers began to experiment with more varieties of seeds and animals. They found that one particular strain of rice, the champa variety from the Vietnam area, grew very fast and matured early. These characteristics allowed the rice crop to be grown and harvested in a short enough time that farmers could then grow another crop of wheat or beans on the same land later in the year. This double-cropping of the same land greatly increased output. In addition, new strains of rice were developed that were more tolerant of dryness, or flooding, or salty water, allowing rice to be grown on more lands. The cultivation of cotton, corn, and soybeans also spread in areas not well suited for growing rice.

Over the sixteenth and seventeenth centuries, the Chinese developed a wide array of double and multiple crop rotations adapted to different areas and crops. In the north, where it was too dry for rice, the Chinese grew sorghum and soybeans and cotton in rotation; in the south they grew rice and wheat or rice and beans; in certain upland areas they grew corn and beans; in other areas they grew tea. By the eighteenth century, the Chinese grew such a variety of crops in such vast amounts that it fueled an enormous trade—larger than that of Europe and North America—in cotton, beancake, rice, wheat, and other products. The growth in food output was such that unlike England, China did not have to import food grains. China's population was able to more than double from 1700 to 1800, with very little change in the standard of living. In fact, as of 1800 the average Chinese farmer probably ate better than the average English farm worker or urban laborer.

Chinese and Indian production of cotton textiles in the eighteenth century also exceeded that of Britain, in quality and quantity. The Chinese had started growing cotton, spinning it into thread, and weaving it into cloth on a large scale from the late fourteenth century. The Chinese had developed water-powered spinning machinery to draw out threads from ramie, a rough plant fiber, a century earlier.[13] But for spinning cotton, they preferred to use small spinning wheels in family homes. Unlike most European spinners, however, the more skilled among the Chinese used

multispindle machines powered by foot treadles, which allowed spinning two, three, or even more spindles at once. The best Chinese home spinners were thus two or three times as productive as their European counterparts and thus had less to gain from the simple water-powered machinery introduced in Britain in the 1760s. The Chinese excelled in producing very fine yarns and weaving them into light cloth so that even in the early 1800s, European merchants were still buying bolts of high quality Chinese cotton to sell in Europe.

In India, cotton had been produced for thousands of years and was exported as a luxury good to the Romans and Persians. Even though cotton cultivation spread throughout Asia and the Middle East, India remained the world's highest quality producer of lightweight, brightly colored cotton cloth. In the seventeenth and eighteenth centuries, the Indian region of Bengal was a global export center, sending high-quality cottons to England, central Asia, and the Middle East.

In fact, in the late 1700s, although the British were producing good strong cotton thread from water-powered factories, this thread was too coarse for the taste of many Asians, who preferred their own finer yarns. Among woven and dyed fabrics, the calicoes of India and prints of China remained finer than anything European craftspeople could produce. China and India thus continued to dominate global trade in cotton textiles until 1800.

Britain's early Industrial Revolution—until 1800—consisted mainly of a substantial expansion of the production of cotton thread by water-powered spinning factories, increased output and use of coal, the development of a domestic pottery industry capable of creating quality porcelain, and the production of a wide range of iron and steel goods from medium-size forges. These were all striking advances for Britain, but in many ways were actually a catching up with the advanced civilizations of Asia, which already produced high-quality cotton cloth, porcelain, and cast iron in vast quantities.

In most parts of Asia during the seventeenth and eighteenth centuries, the silk, cotton, and porcelain industries underwent a huge expansion of manufacturing that dwarfed anything seen in Europe. In these centuries the English, Dutch, Portuguese, and Spanish sent hundreds of ships bearing silver to Asia, ships whose goal was to return laden with Indian and Chinese cotton cloth and with Chinese silks and porcelains. Even in the early nineteenth century, the British were desperate to find goods that they could trade with China, for the Chinese placed little value on what they saw as inferior European manufactured goods. It was for this reason that the British encouraged the growing of the addictive drug opium in India and forced the Chinese to accept a trade in opium as the means

to finance British trade. Far from experiencing a revolution in manufacturing, Britain in the eighteenth century was merely achieving a certain amount of parity with more advanced manufacturing processes in Asia. The days in which British and European exports of manufactured goods would dominate the world still lay in the future.

In short, by 1800, both Britain and China had experienced substantial changes in their economies and seen major increases in their output of both foodstuffs and cotton textiles. Yet neither had experienced any true breakthrough to a higher standard of living. Both societies were still operating within the range of the long-term cycles of prior centuries as to how well people lived. Long-terms ups and downs in climate, population, and earnings produced ups and downs in living standards as well. The true breakthroughs that created a different world still lay ahead. The pattern of accelerating economic growth does not appear until after 1800, when it begins in Britain and then spreads to western Europe, eastern Asia, and the rest of the world.

The advanced agrarian civilizations of Europe and Asia thus lived at much the same level in 1800. What then accounts for their rapid divergence? If it was not how they lived, perhaps it was how they thought or what they believed that made the crucial difference. Let us now take a comparative look at world religions.

Additional Reading

Fischer, David Hackett. *The Great Wave: Price Revolutions and the Rhythm of History.* Oxford: Oxford University Press, 1996.

Hatcher, John. *Plague, Population, and the English Economy 1348–1530.* London: Macmillan, 1977.