

CHAPTER PREVIEW

- Why and how did the Industrial Revolution emerge in Britain?
- How did countries outside Britain respond to the challenge of industrialization?
- How did work and daily life evolve during the Industrial Revolution?
- What were the social consequences of industrialization?

Life in the Industrial Revolution

Daily life for industrial workers was harsh, especially for the many child laborers who worked in the new factories and in other industries, like the coal sorting workshop pictured here. Long hours of work, strict discipline, and low wages were the lot of most industrial workers, whose living standards did not improve until the 1840s. (*Coal Riddling workshop, at the Mines of Blanzy*, by François Ignace Bonhomme [1809–1881]/CNAM, Conservatoire National des Arts et Métiers, Paris, France/Archives Charment/Bridgeman Images)

Why and how did the Industrial Revolution emerge in Britain?

The Industrial Revolution began in Great Britain, the nation created in 1707 by the formal union of Scotland, Wales, and England. The transformation in industry was something new in history, and it was unplanned. With no models to copy and no idea of what to expect, Britain pioneered not only in industrial technology but also in social relations and urban living. Just as France was a trailblazer in political change, Britain was the leader in economic development, and it must therefore command special attention.

Why Britain?

Perhaps the most important debate in economic history focuses on why the Industrial Revolution originated in western Europe, and Britain in particular, rather than in other parts of the world, such as Asia. Historians continue to debate this issue, but the best answer seems to be that Britain possessed a unique set of possibilities and constraints—abundant coal deposits, high wages, a relatively peaceful and centralized government, well-developed financial systems, an innovative culture, highly skilled craftsmen, and a strong position in empire and global trade—that spurred its people to adopt a capital-intensive, machine-powered system of production. The long-term economic advantages of this system were not immediately apparent, and its adoption by the British was more a matter of circumstance than a planned strategy.

Thus a number of factors came together over the long term to give rise to the Industrial Revolution in Britain. The Scientific Revolution and the Enlightenment fostered a new worldview that embraced progress and the role of research and experimentation in understanding and mastering the natural world. Britain's intellectual culture extended across many institutions: scientific societies, universities, museums, and workers' associations. The institutions constituted a network for the public sharing of knowledge, including the work of scientists and technicians from other countries. The British Royal Society of Arts, for example, sponsored prizes for innovations in machinery and agriculture and played a pivotal part in the circulation of "useful knowledge."

In the economic realm, the seventeenth-century expansion of rural industry produced a surplus of English woolen cloth. Exported throughout Europe, English cloth brought commercial profits and high wages to the detriment of traditional producers in

Flanders and Italy. By the eighteenth century the expanding Atlantic economy and trade with India and China were also serving Britain well. The mercantilist colonial empire Britain aggressively built, augmented by a strong position in Latin America and in the transatlantic slave trade, provided raw materials like cotton and a growing market for British manufactured goods. Strong demand for British manufacturing meant that British workers earned high wages compared to the rest of Europe and that capital was available for investment in new industrial development.

Agriculture also played an important role in bringing about the Industrial Revolution in Britain. English farmers were second only to the Dutch in productivity in 1700, and they were continually adopting new methods of farming. The result, especially before 1760, was a period of bountiful crops and low food prices. Because of increasing efficiency, landowners were able to produce more food with a smaller workforce. The enclosure movement had deprived many small landowners of their land, leaving the landless poor to work as hired agricultural laborers or in cottage industry. By the 1760s, on the eve of the Industrial Revolution, less than 40 percent of Britain's population worked in agriculture (as compared to 60 percent in 1700), while fully one-third worked in the manufacturing sectors, weaving textiles and producing other craft goods.

Abundant food and high wages in turn meant that many English families no longer had to spend almost everything they earned just to buy bread. Thus the family could spend more on manufactured goods—a razor for the man or a shawl for the woman. They could also pay to send their children to school. Britain's populace enjoyed high levels of literacy and numeracy (knowledge of mathematics) compared to the rest of Europe. Moreover, in the eighteenth century the members of the average British family were redirecting their labor away from unpaid work for household consumption and toward work for wages that they could spend on goods, a trend reflecting the increasing commercialization of the entire European economy.

Britain also benefited from rich natural resources and a well-developed infrastructure. In an age when it was much cheaper to ship goods by water than by land, no part of England was more than fifty miles from navigable water. Beginning in the 1770s a canal-building boom enhanced this advantage. Rivers and canals provided easy movement of England's and Wales's enormous deposits of iron and coal, resources that would be critical raw materials in Europe's early industrial age. The abundance of coal combined with high wages in manufacturing placed Britain in a unique position among European nations:

Industrial Revolution A term first coined in 1799 to describe the burst of major inventions and economic expansion that began in Britain in the late eighteenth century.

TIMELINE

1775	1800	1825	1850	1875
<p>ca. 1765 Hargreaves invents spinning jenny; Arkwright creates water frame</p> <p>1769 Watt patents modern steam engine</p>	<p>1802–1833 Series of Factory Acts passed by British government to limit the workday of child laborers and set minimum hygiene and safety requirements</p> <p>1805 Egypt begins process of modernization</p>	<p>1829 Stephenson's Rocket, an early locomotive</p> <p>1830s Industrial banks in Belgium</p>	<p>1834 <i>Zollverein</i> erected among most German states</p>	<p>1860s Germany and the United States begin to rapidly industrialize</p>
<p>ca. 1780–1850 Industrial Revolution; population boom in Britain</p>	<p>1810 Strike of Manchester cotton spinners</p>	<p>1842 Mines Act passed in Britain</p>	<p>1844 Engels, <i>The Condition of the Working Class in England</i></p>	
	<p>1799 Combination Acts passed in England</p>	<p>ca. 1815 Western European countries seek to adopt British industrial methods</p>	<p>1824 Combination Acts repealed</p>	<p>1850s Japan begins to adopt Western technologies; industrial gap widens between the West and the rest of the world</p>
			<p>1851 Great Exhibition held at Crystal Palace in London</p>	

its manufacturers had strong incentives to develop technologies to draw on the power of coal to increase workmen's productivity. In parts of the world with lower wages, such as India and China, the costs of mechanization at first outweighed potential gains in productivity.

A final factor favoring British industrialization was the heavy hand of the British state and its policies, especially in the formative decades of industrial change. Despite its rhetoric in favor of "liberty," Britain's parliamentary system taxed its population aggressively. The British state collected twice as much per capita as the supposedly "absolutist" French monarchy and spent the money on a navy to protect imperial commerce and on an army that could be used to quell uprisings by disgruntled workers. Starting with the Navigation Acts under Oliver Cromwell (see "The Puritan Protectorate" in Chapter 15), the British state also adopted aggressive tariffs, or duties, on imported goods to protect its industries.

All these factors combined to initiate the **Industrial Revolution**, a term first coined by contemporaries in 1799 to describe the burst of major inventions and technical changes under way. This technical revolution contributed to an impressive quickening in the annual rate of industrial growth in Britain. Whereas industry had grown at only 0.7 percent between 1700 and 1760 (before the Industrial Revolution), it grew at almost 3 percent between 1801 and 1831 (when industrial transformation was in full swing).¹



Cottage Industry and Transportation in Eighteenth-Century Great Britain

Technological Innovations and Early Factories

The pressure to produce more goods for a growing market and to reduce the labor costs of manufacturing was directly related to the first decisive breakthrough of the Industrial Revolution: the creation of the world's first machine-powered factories in the

British cotton textile industry. Technological innovations in the manufacture of cotton cloth led to a new system of production and social relationships. This was not the first time in European history that large numbers of people were systematically put to work in a single locale; the military arsenals of late medieval Venice are one example of a much older form of “factory.” The crucial innovation in Britain was the introduction of machine power into the factory and the organization of labor around the functioning of highly productive machines.

The putting-out system that developed in the seventeenth-century textile industry involved a merchant who loaned, or “put out,” raw materials to cottage workers who processed the raw materials in their own homes and returned the finished products to the merchant. There was always a serious imbalance in textile production based on cottage industry: the work of four or five spinners was needed to keep one weaver steadily employed. Cloth weavers constantly had to find more thread and more spinners. During the eighteenth century the putting-out system grew across Europe, but most extensively in Britain. There, pressured by growing demand, the system’s limitations began to outweigh its advantages around 1760.

Many a tinkering worker knew that a better spinning wheel promised rich rewards. It proved hard to spin the traditional raw materials—wool and flax—with improved machines, but cotton was different. Cotton textiles had first been imported into Britain from India by the East India Company as a rare and delicate luxury for the upper classes. In the eighteenth century, as the transatlantic slave trade reached its peak, a lively market for cotton cloth emerged in West Africa, where the English and other Europeans traded it for human captives. By 1760 a tiny domestic cotton industry had emerged in northern England, but it could not compete with cloth produced in India and other parts of Asia. At this time, Indian cotton textiles dominated the world market because of their workers’ mastery over design and dyeing techniques, easy access to raw materials, and relatively low wages. International competition thus drove English entrepreneurs to invent new technologies to bring down labor costs.

After many experiments over a generation, a gifted carpenter and jack-of-all-trades, James Hargreaves, invented his cotton-spinning jenny about 1765. At almost the same moment, a barber-turned-manufacturer named Richard Arkwright invented (or possibly pirated) another kind of spinning machine, the water

frame. These breakthroughs produced an explosion in the infant cotton textile industry in the 1780s, when it was increasing the value of its output at an unprecedented rate of about 13 percent each year. In 1793, Eli Whitney’s invention of the cotton gin, a machine for separating cotton fibers from seeds, vastly increased the productivity of cotton fields in the United States, leading to an expansion of slavery and an influx of raw materials for British manufacturers. In the 1790s, the new machines were producing ten times as much cotton yarn as had been made in 1770.

Hargreaves’s **spinning jenny** was simple, inexpensive, and powered by hand. In early models from six to twenty-four spindles were mounted on a sliding carriage, and each spindle spun a fine, slender thread. The machines were usually worked by women, who moved the carriage back and forth with one hand and turned a wheel to supply power with the other. Now it was the male weaver who could not keep up with the vastly more efficient female spinner.

Arkwright’s spinning frame employed a different principle, using a series of rollers to stretch the yarn. It quickly acquired a capacity of several hundred spindles and demanded much more power than a single operator could provide. A solution was found in water-power. The **water frame** required large specialized mills located beside rivers in factories that employed as many as one thousand workers. The water frame did not completely replace cottage industry, however, for it could spin only a coarse, strong thread, which was then put out for respinning on hand-operated cottage jennies. Around 1780 a hybrid machine—called a mule—invented by Samuel Crompton proved capable of spinning very fine and strong thread in large quantities. (See “Individuals in Society: Samuel Crompton,” page 597.) Gradually, all cotton spinning was concentrated in large-scale water-powered factories.

These revolutionary developments in the textile industry allowed British manufacturers to compete successfully in international markets in both fine and coarse cotton thread. At first, the machines were too expensive to build and did not provide enough savings in labor to be adopted in continental Europe or elsewhere. Where wages were low and investment capital was scarce, there was little point in adopting mechanized production until significant increases in the machines’ productivity, and a drop in the cost of manufacturing them, occurred in the first decades of the nineteenth century.²

Families using cotton in cottage industry were freed from their constant search for adequate yarn from scattered part-time spinners, since all the thread needed could be spun in the cottage on the jenny or obtained from a nearby factory. The income of weavers, now hard-pressed to keep up with the spinners,

■ **spinning jenny** A simple, inexpensive, hand-powered spinning machine created by James Hargreaves in 1765.

■ **water frame** A spinning machine created by Richard Arkwright that had a capacity of several hundred spindles and used waterpower; it therefore required a larger and more specialized mill—a factory.

INDIVIDUALS IN SOCIETY

Samuel Crompton

Samuel Crompton's life story illustrates the remarkable ingenuity and determination of the first generation of inventors of the Industrial Revolution as well as the struggles they faced in controlling and profiting from their inventions. Crompton was born in 1753 in Bolton-in-the Moors, a Lancashire village active in the domestic production of cotton thread and cloth. Crompton descended from small landowners and weavers, but his grandfather had lost the family land and his father died shortly after his birth.

Crompton's mother was a pious and energetic woman who supported the family by tenant farming and spinning and weaving cotton. Crompton spent years spinning in childhood until he was old enough to begin weaving. His mother ensured that he was well educated at the local school, and as a teenager he attended night classes, studying algebra, mathematics, and trigonometry.

This was the period when John Kay's invention of the flying shuttle doubled the speed of handloom weaving, leading to a drastic increase in the demand for thread (see "The Lives of Rural Textile Workers" in Chapter 17). Crompton's family acquired one of the new spinning jennies— invented by James Hargreaves—and he saw for himself how they advanced production. He was also acquainted with Richard Arkwright, inventor of the water frame, who then operated a barbershop in Bolton.

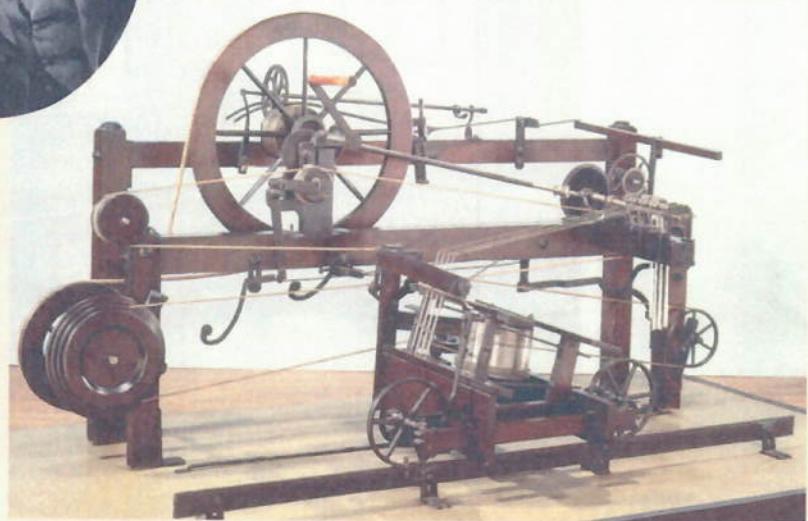
In 1774 Crompton began work on the spinning machine that would consume what little free time, and spare money, he possessed over the next five years. Solitary by nature, and fearful of competition and the violence of machine breakers, Crompton worked alone and in secret. He earned a little extra money playing violin in the Bolton theater orchestra, and he possessed a set of tools left over from his father's own mechanical experiments.

The result of all this effort was the spinning mule, so called because it combined the rollers of Arkwright's water frame with the moving carriage of Hargreaves's spinning jenny. With the mule, spinners could produce very fine and strong thread in large quantities, something no previous machine had permitted. The mule effectively ended England's reliance on India for the finest muslin cloth.

In 1780, possessed of a spectacular technological breakthrough and a beloved bride, Crompton seemed poised for a prosperous and happy life. Demand surged for the products of his machine, and manufacturers were desperate to learn its secrets. Too poor and naïve to purchase a patent for his invention, Crompton shared it with manufacturers through a subscription agreement. Unfortunately, he received little of the promised money in return.



Samuel Crompton, inventor of the spinning mule.
(Science & Society Picture Library/Getty Images)



Replica of the spinning mule, a hybrid machine that combined features from Hargreaves's spinning jenny and Arkwright's water frame. (Science & Society Picture Library/Getty Images)

Once exposed to the public, the spinning mule quickly spread across Great Britain. Crompton continued to make high-quality yarn, but he had to compete with all the other workshops using his machine. Moreover, he could not keep skilled workers, since they were constantly lured away by his competitors' higher wages.

As others earned great wealth with the mule, Crompton grew frustrated by his relative poverty. In 1811 he toured Great Britain to document his invention's impact. He estimated that 4,600,000 mules were then in operation that directly employed 70,000 people. Crompton's supporters took these figures to Parliament, which granted him a modest reward of £5,000. However, this boost did little to improve his fortunes, and his subsequent business ventures failed. In 1824 local benefactors took up a small subscription to provide for his needs, but he died in poverty in 1827 at the age of seventy-four.

QUESTIONS FOR ANALYSIS

1. What factors in Crompton's life enabled him to succeed as an inventor?
2. Why did Crompton fail to profit from his inventions?
3. What does the contrast between Richard Arkwright's fantastic success and Crompton's relative failure tell us about innovation and commercial enterprise in the Industrial Revolution?



Woman Working a Spinning Jenny

The loose cotton strands on the slanted bobbins shown in this illustration of Hargreaves's spinning jenny passed up to the sliding carriage and then on to the spindles (inset) in back for fine spinning. The worker, almost always a woman, regulated the sliding carriage with one hand, and with the other she turned the crank on the wheel to supply power. By 1783 one woman could spin by hand a hundred threads at a time. (spinning jenny:

© Mary Evans Picture Library/The Image Works; spindle: Picture Research Consultants & Archives)

rose markedly until about 1792. They were among the highest-earning workers in England. As a result, large numbers of agricultural laborers became handloom weavers, while mechanics and capitalists sought to invent a power loom to save on labor costs. This Edmund Cartwright achieved in 1785. But the power looms of the factories worked poorly at first and did not replace handlooms until the 1820s.

The creation of the world's first machine-powered factories in the British cotton textile industry in the 1770s and 1780s, which grew out of the putting-out system of cottage production, was a major historical development. Both symbolically and substantially, the big new cotton mills marked the beginning of the Industrial Revolution in Britain. By 1831 the largely

mechanized cotton textile industry accounted for fully 22 percent of the country's entire industrial production. British cotton textiles cost half as much as Indian ones even though labor costs were many times higher.

The Steam Engine Breakthrough

Human beings have long used their toolmaking abilities to construct machines that convert one form of energy into another for their own benefit. In the medieval period, Europeans began to adopt water mills to grind their grain and windmills to pump water and drain swamps. More efficient use of water and wind in the sixteenth and seventeenth centuries enabled them to accomplish more. Nevertheless, even into the eighteenth century Europe, like other areas of the world, continued to rely mainly on wood for energy, and human beings and animals continued to perform most work. This dependence meant that Europe and the rest of the world remained poor in energy and power.

By the eighteenth century wood was in ever-shorter supply in Britain. Processed wood (charcoal) was the fuel that was mixed with iron ore in the blast furnace to produce pig iron, crude iron molded into ingots called "pigs" that could be processed into steel, cast

iron, or wrought iron. The iron industry's appetite for wood was enormous, and by 1740 the British iron industry was stagnating due to the depleted supply of fuel. Vast forests enabled Russia in the eighteenth century to become the world's leading producer of iron, much of which was exported to Britain. As wood became ever more scarce, the British looked to coal (combustible rock composed of fossilized organic matter) as an alternative. They had first used coal in the late Middle Ages as a source of heat. By 1640 most homes in London were heated with coal, and it was also used in industry to provide heat for making beer, glass, soap, and other products. The breakthrough came when industrialists began to use coal to produce mechanical energy and to power machinery.

To produce more coal, mines had to be dug deeper and deeper and, as a result, were constantly filling with water. Mechanical pumps, usually powered by animals walking in circles at the surface, had to be installed. But animal power was expensive and bothersome. In an attempt to overcome these disadvantages, Thomas Savery in 1698 and Thomas Newcomen in 1705 invented the first primitive **steam engines**. Both engines burned coal to produce steam, which was then used to operate a pump. Although both models were extremely inefficient, by the early 1770s many of the Savery engines and hundreds of the Newcomen engines were operating successfully in English and Scottish mines.

In 1763 a gifted young Scot named James Watt (1736–1819) was drawn to a critical study of the steam engine. Watt was employed at the time by the University of Glasgow as a skilled craftsman making scientific instruments. Scotland's Enlightenment emphasis on practicality and social progress had caused its universities to become pioneers in technical education. In 1763 Watt was called on to repair a Newcomen engine being used in a physics course. After a series of observations, Watt saw that the Newcomen engine's waste of energy could be reduced by adding a separate condenser. This splendid invention, patented in 1769, greatly increased the efficiency of the steam engine.

To invent something is one thing; to make it a practical success is quite another. Watt needed skilled workers, precision parts, and capital, and the relatively advanced nature of the British economy proved essential. A partnership in 1775 with Matthew Boulton, a wealthy English industrialist, provided Watt with adequate capital and exceptional skills in salesmanship. Among Britain's highly skilled locksmiths, tinsmiths, and millwrights, Watt found mechanics who could install, regulate, and repair his sophisticated engines. This support allowed him to create an effective vacuum in the condenser and regulate a complex engine. In more than twenty years of constant effort, Watt

made many further improvements. By the late 1780s the firm of Boulton and Watt had made the steam engine a practical and commercial success in Britain.

The coal-burning steam engine of Watt and his followers was the Industrial Revolution's most fundamental advance in technology. For the first time, inventors and engineers could devise and implement all kinds of power equipment to aid people in their work. The steam-power plant began to replace waterpower in cotton-spinning factories during the 1780s, contributing to that industry's phenomenal rise. Steam also gradually took the place of waterpower in flour mills, in the malt mills used in breweries, in the flint mills supplying the pottery industry, and in the mills exported by Britain to the West Indies to crush sugarcane.

The British iron industry was radically transformed. Originally, the smoke and fumes resulting from coal burning meant that coal could not be substituted for charcoal in smelting iron. Starting around 1710, ironmakers began to use coke—a smokeless and hot-burning fuel produced by heating coal to rid it of water and other impurities—to smelt pig iron. After 1770 the adoption of steam-driven bellows in blast furnaces allowed for great increases in the quantity of pig iron produced by British ironmakers.

In the 1780s Henry Cort developed the coke-fired puddling furnace, which allowed for brittle pig iron to be refined into malleable wrought iron. Strong, skilled ironworkers—the puddlers—"cooked" molten pig iron in a great vat, raking off globes of refined iron for further processing. Cort also developed steam-powered rolling mills, which quickly and efficiently pressed the molten iron into bars, further purifying them in the process. These technical innovations fostered a great boom in the British iron industry. In 1740 annual British iron production was only 17,000 tons. With the spread of coke smelting and the impact of Cort's inventions, production had reached 250,000 tons by 1806. In 1844 Britain produced 3 million tons of iron. Once expensive, iron became the cheap, basic, indispensable building block of the British economy, used to manufacture railway tracks, textile machines, bridges, iron frames for factories and warehouses, weapons, pipes, gears, and steam engines themselves, among other goods.

Steam-Powered Transportation

The coal industry had long used plank roads and rails to move coal wagons within mines and at the surface. Rails reduced friction and allowed a horse or a human

steam engines A breakthrough invention by Thomas Savery in 1698 and Thomas Newcomen in 1705 that burned coal to produce steam, which was then used to operate a pump; the early models were superseded by James Watt's more efficient steam engine, patented in 1769.



Environmental Impact of Industrialization Flames from a coke-fired blast furnace light up the night sky in the village of Coalbrookdale, an early center of the English iron ore smelting industry. With smoke billowing from the furnace and broken machinery scattered in the foreground, this painting highlights the environmental degradation that accompanied industrialization. (WHA/World History Archive/akg-images)

being to pull a much heavier load. Thus, once a rail capable of supporting a heavy locomotive was developed in 1816, all sorts of experiments with steam engines on rails went forward.

The first steam locomotive was built by Richard Trevithick after much experimentation. George Stephenson acquired glory for his locomotive named *Rocket*, which sped down the track of the just-completed Liverpool and Manchester Railway at a maximum speed of 35 miles per hour, without a load, in 1829. (See “Evaluating Visual Evidence: Rain, Steam, and Speed—the Great Western Railway,” page 601.) The line from Liverpool to Manchester was the first modern railroad, using steam-powered locomotives to carry customers to the new industrial cities. It was a financial as well as a technical success, and many private companies quickly began to build more rail lines. Within twenty years they had completed the main trunk lines of Great Britain (Map 20.1). Other countries were quick to follow, with the first steam-powered trains operating in the United

States in the 1830s and in Brazil, Chile, Argentina, and the British colonies of Canada, Australia, and India in the 1850s.

The arrival of the railroad had many significant consequences. It dramatically reduced the cost and uncertainty of shipping freight over land. Previously, markets had tended to be small and local; as the barrier of high transportation costs was lowered, markets became larger and even nationwide. Larger markets encouraged manufacturers to build larger factories with more sophisticated machinery in a growing number of industries. Such factories could make goods more cheaply and gradually subjected most cottage workers and many urban artisans to severe competitive pressures. In all countries, the construction of railroads created a strong demand for unskilled labor and contributed to the growth of a class of urban workers.

The steam engine also transformed water travel. French engineers completed the first steamships in the 1770s, and the first commercial steamships came into use in North America several decades later. The *Clermont* began to travel the waters of the Hudson River in New York State in 1807, shortly followed by ships

■ **Rocket** The name given to George Stephenson's effective locomotive that was first tested in 1829 on the Liverpool and Manchester Railway at 35 miles per hour.

Rain, Steam, and Speed—the Great Western Railway

The last and culminating invention of the Industrial Revolution, the railroad dramatically revealed the power and increased the speed of the new age. Until the coming of the railroad, travel was largely measured by the distance that a human or a horse could cover before becoming exhausted. Steam power created a revolution in human transportation, allowing a constant, rapid rate of travel with no limits on its duration. Time and space suddenly and drastically contracted, as faraway places could be reached in one-third the time or less. As the poet Heinrich Heine proclaimed in 1843, "What changes must now occur, in our way of looking at things, in our notions! . . . I feel as if the mountains and forests of all countries were advancing on Paris. Even now, I can smell the German linden trees; the North Sea's breakers are rolling against my door."^{*}

Racing down the track at speeds that reached 50 miles per hour by 1850 was an overwhelming experience. Some great painters, notably Joseph M. W. Turner (1775–1851), succeeded in expressing this sense of power and awe. This 1844 painting by Turner depicts a train on the newly laid Great Western Railway line crossing the Thames River on the Maidenhead bridge. The view is looking toward the city of London.

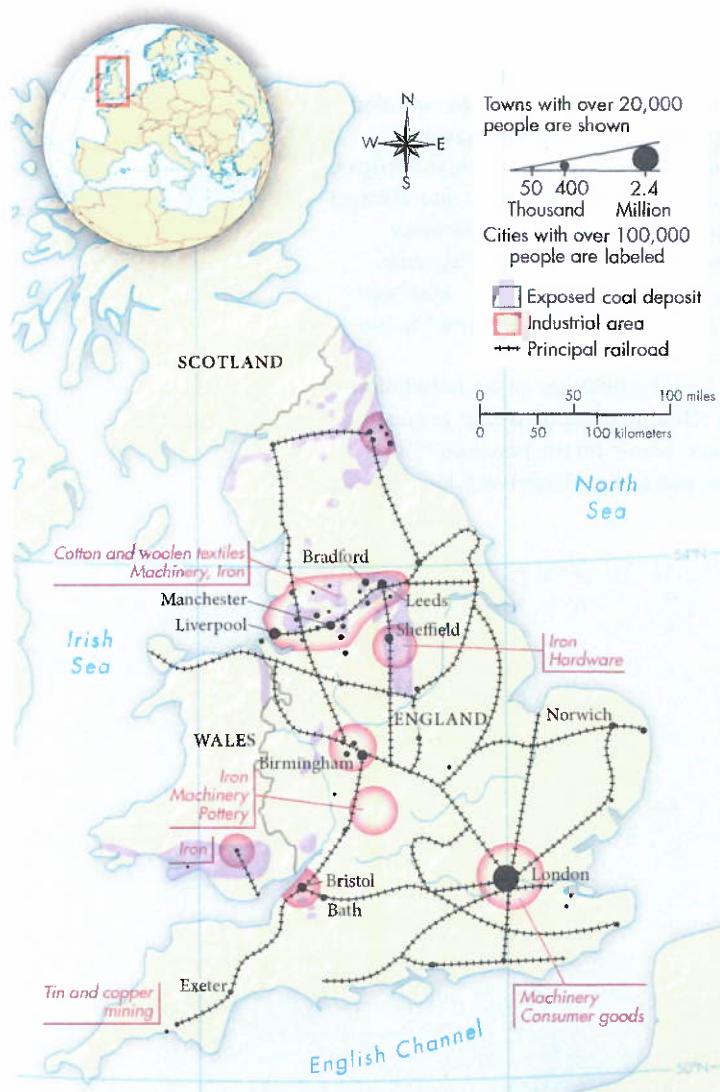


(National Gallery, London, UK/Bridgeman Images)

EVALUATE THE EVIDENCE

1. What is the mood of this painting, and what impression of train travel does it convey? How does the artist use composition, color, and painting technique to convey this impression?
2. How would you compare this representation of travel by train to images you have seen in current media of travel by automobile or airplane? How would you explain differences or similarities between nineteenth-century and contemporary representations of automated travel?

^{*}Quoted in Wolfgang Schivelbusch, *The Railway Journey: The Industrialization of Time and Space in the Nineteenth Century* (Berkeley: University of California Press, 1986), p. 37.



MAP 20.1 The Industrial Revolution in Great Britain, ca. 1850
Industry concentrated in the rapidly growing cities of the north and the center of England, where rich coal and iron deposits were close to one another.

belonging to brewer John Molson on the St. Lawrence River. The steamship brought the advantages of the railroad—speed, reliability, efficiency—to water travel.

Industry and Population

In 1851 Great Britain celebrated the new era of industrial technology and its role as a world economic leader through an industrial fair in London called the Great Exhibition. Sponsored by the British royal

■ **Crystal Palace** The location of the Great Exhibition in 1851 in London; an architectural masterpiece made entirely of glass and iron.

■ **iron law of wages** Theory proposed by English economist David Ricardo suggesting that the pressure of population growth prevents wages from rising above the subsistence level.

family and situated in the newly built **Crystal Palace**, the fair drew more than 6 million visitors from all over Europe who marveled at the gigantic new exhibition hall set in the middle of a large, centrally located park. The building was made entirely of glass and iron, both of which were now cheap and abundant.

Britain's claim to be the "workshop of the world" was no idle boast, for it produced two-thirds of the world's coal and more than half of all iron and cotton cloth. More generally, in 1860 Britain produced a remarkable 20 percent of the entire world's output of industrial goods, whereas it had produced only about 2 percent of the total in 1750.³ As the British economy significantly increased its production of manufactured goods, the gross national product (GNP) rose roughly fourfold at constant prices between 1780 and 1851. At the same time, the population of Britain boomed, growing from about 9 million in 1780 to almost 21 million in 1851. Thus growing numbers consumed much of the increase in total production.

Rapid population growth in Britain was key to industrial development. More people meant a more mobile labor force, with many young workers in need of employment and ready to go where the jobs were. The dramatic increase in population, in turn, was only sustained through advances in production in agriculture and industry. Based on the lessons of history, many contemporaries feared that the rapid growth in population would inevitably lead to disaster. In his *Essay on the Principle of Population* (1798), Thomas Malthus (1766–1834) examined the dynamics of human populations. He argued:

There are few states in which there is not a constant effort in the population to increase beyond the means of subsistence. This constant effort as constantly tends to subject the lower classes of society to distress, and to prevent any great permanent melioration of these conditions.⁴

Given the limited resources available, Malthus concluded that the only hope of warding off such "positive checks" to population growth as famine and disease was "prudential restraint." That is, young men and women had to limit the growth of population by marrying late in life. But Malthus was not optimistic about this possibility. The powerful attraction of the sexes, he feared, would cause most people to marry early and have many children.

Economist David Ricardo (1772–1823) spelled out the pessimistic implications of Malthus's thought. Ricardo's depressing **iron law of wages** posited that over an extended period of time, because of the pressure of population growth, wages would always sink to subsistence level. That is, wages would be just high enough to keep workers from starving.



Interior View of the Crystal Palace Built for the Great Exhibition of 1851, the Crystal Palace was a spectacular achievement in engineering, prefabricated from 300,000 sheets of glass. With almost 15,000 exhibitors, the event constituted the first international industrial exhibition, showcasing manufactured products from Britain, its empire, and the rest of the world. Later, the building was disassembled and moved to another site in London, where it stood until destroyed by fire in 1936. (Engraved by William Simpson [1823–1899]/London Metropolitan Archives [City of London]/Bridgeman Images)

Malthus, Ricardo, and their followers were proved wrong by the second half of the nineteenth century, largely because industrialization improved productivity beyond what they could imagine. However, until the 1820s, or even the 1840s, contemporary observers might reasonably have concluded that the economy and the total population were racing neck and neck, with the outcome very much in doubt. There was

another problem as well. Perhaps workers, farmers, and ordinary people did not get their rightful share of the new wealth. Perhaps only the rich got richer, while the poor got poorer or made no progress. We will turn to this great issue after situating the process of industrialization in its European and global context (see “Living Standards for the Working Class” later in this chapter).

How did countries outside Britain respond to the challenge of industrialization?

As new technologies and a new organization of labor began to revolutionize production in Britain, other countries took notice and began to emulate its example. With the end of the Napoleonic Wars, the nations of the European continent quickly adopted British inventions and achieved their own pattern of technological innovation and economic growth. By the last decades of the nineteenth century, western European countries as well as the United States and Japan had industrialized their economies to a considerable, albeit variable, degree.

Industrialization in other parts of the world proceeded more gradually, with uneven jerks and national and regional variations. Scholars are still struggling to explain these variations as well as the dramatic gap that emerged for the first time in history between Western and non-Western levels of economic production. These questions are especially important because they may offer valuable lessons for poor countries that today are seeking to improve their material condition through industrialization and economic development. The latest findings on the nineteenth-century experience are

encouraging. They suggest that there were alternative paths to the industrial world and that there was and is no need to follow a rigid, predetermined British model.

National and International Variations

Comparative data on industrial production in different countries over time help give us an overview of what happened. One set of data, the work of a Swiss scholar, compares the level of industrialization on a per capita basis in several countries from 1750 to 1913. These data are far from perfect, but they reflect basic trends and are presented in Table 20.1 for closer study.

Table 20.1 presents a comparison of how much industrial product was produced, on average, for each person in a given country in a given year. All the numbers are expressed in terms of a single index number of 100, which equals the per capita level of industrial goods in Great Britain in 1900. Every number in the table is thus a percentage of the 1900 level in Britain and is directly comparable with other numbers. The countries are listed in roughly the order that they began to use large-scale, power-driven technology.

What does this overview tell us? First, one sees in the first column that in 1750 all countries were fairly close together, including non-Western nations such as China and India. Both China and India had been extremely important players in early modern world trade; both were sophisticated, technologically advanced, and economically powerful up to 1800. However, the column headed 1800 shows that Britain had opened up a noticeable lead over all countries by 1800, and that gap progressively widened as the Industrial Revolution accelerated through 1830 and reached full maturity by 1860.

Second, the table shows that Western countries began to emulate the British model successfully over the course of the nineteenth century, with significant variations in the timing and in the extent of industrialization. Belgium, achieving independence from the Netherlands in 1831 and rich in iron and coal, led in adopting Britain's new technology, and it experienced a great surge between 1830 and 1860. France developed factory production more gradually and did not experience "revolutionary" growth in overall industrial output.

Slow but steady growth in France was overshadowed by the spectacular rise of the German lands and the United States after 1860 in what has been termed the "Second Industrial Revolution." In general, eastern and southern Europe began the process of modern industrialization later than northwestern and central Europe. Nevertheless, these regions made real progress in the late nineteenth century, as growth after 1880 in Austria-Hungary, Italy, and Russia suggests. This meant that all European states as well as the United States managed to raise per capita industrial levels in the nineteenth century.

These increases stood in stark contrast to the decreases that occurred at the same time in many non-Western countries, most notably in China and India, as Table 20.1 shows. European countries industrialized to a greater or lesser extent even as most of the non-Western world stagnated. Japan, which is not included in this table, stands out as an exceptional area of non-Western industrial growth in the second half of the nineteenth century. After the forced opening of the country to the West in the 1850s, Japanese entrepreneurs began to adopt Western technology and manufacturing methods, resulting in a production boom by the late nineteenth century. Different rates of wealth- and power-creating industrial development, which heightened disparities within Europe, also greatly magnified existing inequalities between Europe and the rest of the world.

Industrialization in Continental Europe

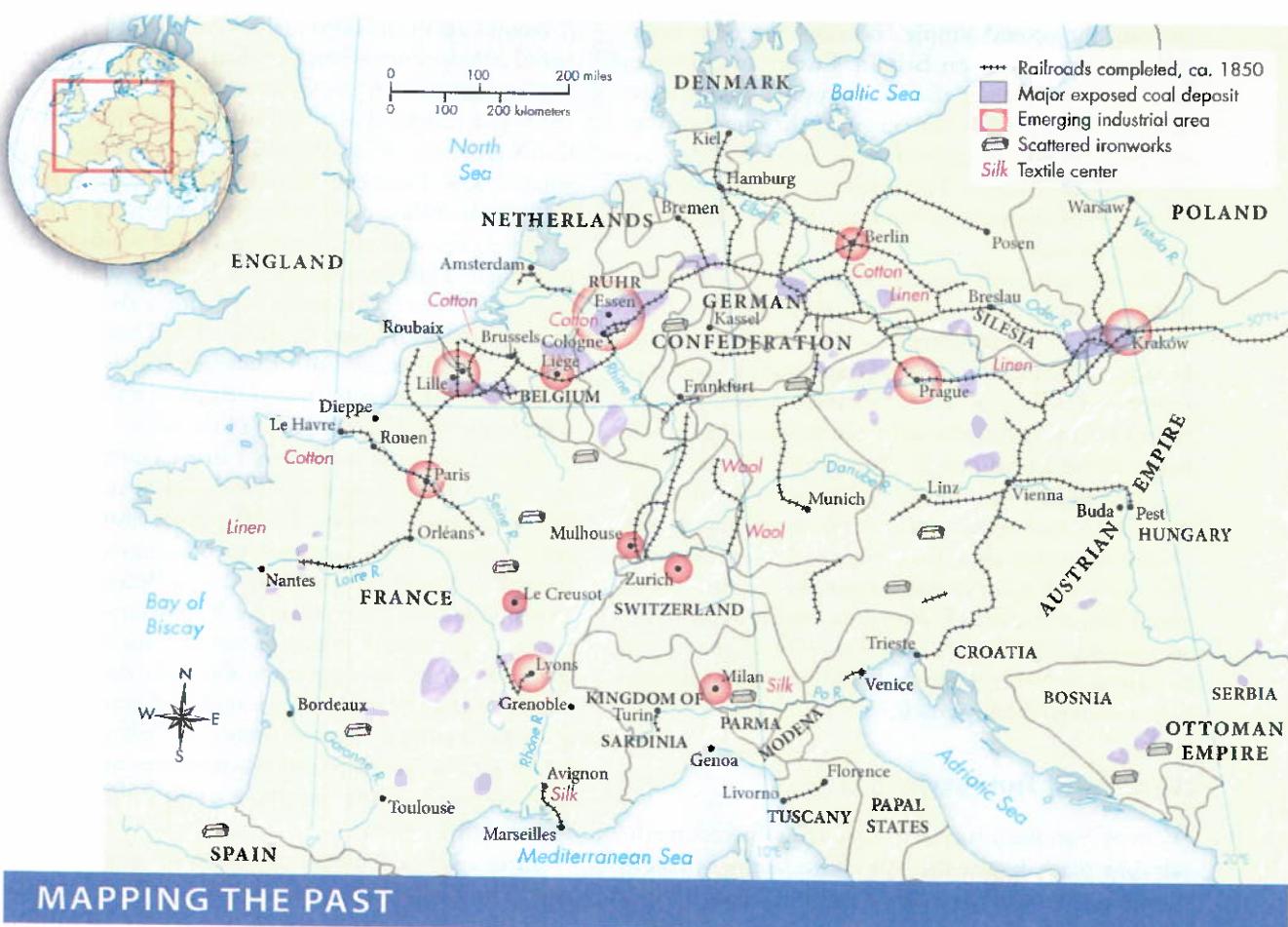
Throughout Europe the eighteenth century was an era of agricultural improvement, population increase, expanding foreign trade, and growing cottage industry. Thus, when the pace of British industry began to accelerate in the 1780s, continental businesses began to emulate the new methods. British industry enjoyed clear superiority, but the European continent was close behind. During the period of the revolutionary and Napoleonic wars, from 1793 to 1815, however, western Europe experienced tremendous political and social upheaval that temporarily halted economic development. With the return of peace in

TABLE 20.1 Per Capita Levels of Industrialization, 1750–1913

	1750	1800	1830	1860	1880	1900	1913
Great Britain	10	16	25	64	87	100	115
Belgium	9	10	14	28	43	56	88
United States	4	9	14	21	38	69	126
France	9	9	12	20	28	39	59
Germany	8	8	9	15	25	52	85
Austria-Hungary	7	7	8	11	15	23	32
Italy	8	8	8	10	12	17	26
Russia	6	6	7	8	10	15	20
China	8	6	6	4	4	3	3
India	7	6	6	3	2	1	2

Note: All entries are based on an index value of 100, equal to the per capita level of industrialization in Great Britain in 1900. Data for Great Britain includes Ireland, England, Wales, and Scotland.

Source: P. Bairoch, "International Industrialization Levels from 1750 to 1980," *Journal of European Economic History* 11 (Spring 1982): 294, U.S. Journals at Cambridge University Press.



MAP 20.2 Continental Industrialization, ca. 1850

Although continental countries were beginning to make progress by 1850, they still lagged far behind Great Britain. For example, continental railroad building was still in an early stage, whereas the British rail system was essentially complete (see Map 20.1). Coal played a critical role in nineteenth-century industrialization, both as a power source for steam engines and as a raw material for making iron and steel.

ANALYZING THE MAP Locate the major exposed (that is, known) coal deposits in 1850. Which countries and areas appear rich in coal resources, and which appear poor? Is there a difference between northern and southern Europe?

CONNECTIONS What is the relationship between known coal deposits and emerging industrial areas in continental Europe? In Great Britain (see Map 20.1)?

1815, western European countries again began to play catch-up.

They faced significant challenges. In the newly mechanized industries, British goods were being produced very efficiently, and these goods had come to dominate world markets. In addition, British technology had become so advanced that few engineers or skilled technicians outside England understood it. Moreover, the technology of steam power had grown much more expensive. It involved large investments in the iron and coal industries and, after 1830, in railroads. Continental business people had difficulty

amassing the large sums of money the new methods demanded, and laborers bitterly resisted the move to working in factories. All these factors slowed the spread of machine-powered industry (Map 20.2).

Nevertheless, western European nations possessed a number of advantages that helped them respond to these challenges. First, most had rich traditions of putting-out enterprise, merchant capitalists, and skilled urban artisans. These assets gave their firms the ability to adapt and survive in the face of new market conditions. Second, continental capitalists did not need to develop their own advanced technology.

Instead, they could simply “borrow” the new methods developed in Great Britain. European countries also had a third asset that many non-Western areas lacked in the nineteenth century: they had strong, independent governments that did not fall under foreign political control. These governments would use the power of the state to promote industry and catch up with Britain.

Most continental businesses adopted factory technology slowly, and handicraft methods lived on. Indeed, for a time continental industrialization usually brought substantial but uneven expansion of handicraft industry in both rural and urban areas. Artisan production of luxury items grew in France as the rising income of the international middle class created increased foreign demand for silk scarves, embroidered needlework, perfumes, and fine wines. Focusing on artisanal luxury production made sense for French entrepreneurs given their long history of dominance in that sector. Rather than being a “backward” refusal to modernize, it represented a sound strategic choice that allowed the French to capitalize on their know-how and international reputation for high-quality goods.

Agents of Industrialization

Western European success in adopting British methods took place despite the best efforts of the British to prevent it. The British realized the great value of their technical discoveries and tried to keep their secrets to themselves. Until 1825 it was illegal for artisans and skilled mechanics to leave Britain; until 1843 the export of textile machinery and other equipment was forbidden. Many talented, ambitious workers, however, slipped out of the country illegally and introduced the new methods abroad.

One such man was William Cockerill, a Lancashire carpenter. He and his sons began building cotton-spinning equipment in French-occupied Belgium in 1799. In 1817 the most famous son, John Cockerill, built a large industrial enterprise in Liège in southern Belgium, which produced machinery, steam engines, and then railway locomotives. He also established modern ironworks and coal mines. Cockerill's plants in the Liège area became a center for the gathering and transmitting of industrial information across Europe. Many skilled British workers came to work for Cockerill, and some went on to found their own companies throughout Europe.

Thus British technicians and skilled workers were a powerful force in the spread of early industrialization.

■ **tariff protection** A government's way of supporting and aiding its own economy by laying high taxes on imported goods from other countries, as when the French responded to cheaper British goods flooding their country by imposing high tariffs on some imported products.

A second agent of industrialization consisted of talented entrepreneurs such as Fritz Harkort (1793–1880), a pioneer in the German machinery industry. Serving in England as a Prussian army officer during the Napoleonic Wars, Harkort was impressed with what he saw. He set up shop building steam engines in the Ruhr Valley, on the western border with France. In spite of problems obtaining skilled workers and machinery, Harkort succeeded in building and selling engines. However, his ambitious efforts also resulted in large financial losses for himself and his partners. His career illustrates both the great efforts of a few important business leaders to duplicate the British achievement and the difficulty of the task.

National governments played an even more important role in supporting industrialization in continental Europe than in Britain. **Tariff protection** was one such support, and it proved to be important. The French, for example, responded to a flood of cheap British goods in 1815 after the Napoleonic Wars by laying high taxes on imported goods. Customs agreements emerged among some German states starting in 1818, and in 1834 a number of states signed a treaty creating a customs union, or *Zollverein*. The treaty allowed goods to move between member states without tariffs, while erecting a single uniform tariff against other nations.

After 1815 continental governments also bore the cost of building roads, canals, and railroads to improve transportation. Belgium led the way in the 1830s and 1840s. Built rapidly as a unified network, Belgium's state-owned railroads stimulated the development of heavy industry and made the country an early industrial leader. In France, the state shouldered all the expense of acquiring and laying roadbed, including bridges and tunnels. In short, governments helped pay for railroads, the all-important leading sector in continental industrialization.

Finally, banks also played a larger and more creative role on the continent than in Britain. Previously, almost all banks in Europe had been private. Because of the possibility of unlimited financial loss, the partners of private banks tended to be conservative and were content to deal with a few rich clients and a few big merchants. They generally avoided industrial investment as being too risky.

In the 1830s two important Belgian banks pioneered in a new direction. They received permission from the growth-oriented government to establish themselves as corporations enjoying limited liability. That is, if the bank went bankrupt, stockholders could now lose only their original investments in the bank's common stock, and they could not be forced by the courts to pay for any additional losses out of other property they owned. Limited liability helped these Belgian banks attract investors. They mobilized



The Circle of the Rue Royale, Paris, 1868 The Circle of the Rue Royale was an exclusive club of aristocrats, bankers, railway owners, and other members of Parisian high society. This group portrait exemplifies the consolidation of social and economic power that took place in the second half of the nineteenth century.

impressive resources for investment in big companies, became industrial banks, and successfully promoted industrial development.

Similar corporate banks became important in France and the German lands in the 1850s and 1860s. Usually working in collaboration with governments, corporate banks established and developed many railroads and many companies working in heavy industry, which were also increasingly organized as limited liability corporations.

The combined efforts of governments, skilled workers, entrepreneurs, and industrial banks meshed successfully after 1850 and the financial crash of 1873. In Belgium, France, and the German states, key indicators of modern industrial development—such as railway mileage, iron and coal production, and steam engine capacity—increased at average annual rates of 5 to 10 percent. As a result, rail networks were completed in western and much of central Europe, and the leading continental countries mastered the industrial technologies that had first been developed by the British. In the early 1870s Britain was still Europe's most industrial nation, but a select handful of nations had closed the gap.

The Global Picture

The Industrial Revolution did not have a transformative impact beyond Europe prior to the 1860s, with the exception of the United States and Japan, both early adopters of British practices. In many countries, national governments and pioneering entrepreneurs did make efforts to adopt the technologies and methods of production that had proved so successful in Britain, but they fell short of transitioning to an industrial economy. For example, in Russia the imperial government brought steamships to the Volga River and a railroad to the capital, St. Petersburg, in the first decades of the nineteenth century. By mid-century ambitious entrepreneurs had established steam-powered cotton factories using imported British machines. However, these advances did not lead to overall industrialization of the country, most of whose people remained mired in rural servitude. Instead, Russia confirmed its role as provider of raw materials, especially timber and grain, to the hungry West.

Egypt, a territory of the Ottoman Empire, similarly began an ambitious program of modernization after a reform-minded viceroy took power in 1805. This

program included the use of imported British technology and experts in textile manufacture and other industries. These industries, however, could not compete with lower-priced European imports. Like Russia, Egypt fell back on agricultural exports to European markets, like sugar and cotton.

Such examples of faltering efforts at industrialization could be found in many other regions of the Middle East, Asia, and Latin America. Where European governments maintained direct or indirect political control, they aggressively acted to monopolize colonial markets as sources of raw materials and as consumers for their own products, rather than encouraging the spread of industrialization. Such regions could not respond to low-cost imports by raising tariffs, as the United States and western European nations had done, because they were controlled by imperial powers that did not allow them to do so. In India, for example, which was a British colony, millions of poor textile workers lost their livelihood and experienced dire poverty because they could not compete with industrially produced British cottons. The British charged stiff import duties on Indian cottons entering the kingdom, but prohibited the Indians from doing the same to British imports. As a British trade encyclopedia boasted in 1844:

The British manufacturer brings the cotton of India from a distance of 12,000 miles, commits it to his spinning jennies and power-looms, carries back their products to the East, making them again to travel 12,000 miles; and in spite of the loss of time, and of the enormous expense incurred by this voyage of 24,000 miles, the cotton manufactured by his machinery becomes less costly than the cotton of India spun and woven by the hand near the field that produced it.⁵

Latin American economies were disrupted by the early-nineteenth-century wars of independence. As these countries' economies recovered in the mid-nineteenth century, they increasingly adopted steam power for sugar and coffee processing and for transportation. Like elsewhere, this technology first supported increased agricultural production for export and only later drove domestic industrial production. As in India, the arrival of cheap British cottons destroyed the pre-existing textile industry that had employed many people.

The rise of industrialization in Britain, western Europe, and the United States thus caused other regions of the world to become increasingly economically dependent. Instead of industrializing, many territories underwent a process of deindustrialization due to formal and informal European imperialism and economic competition. In turn, relative economic weakness made them vulnerable to the new wave of imperialism undertaken by industrialized nations in the second half of the nineteenth century (see Chapter 24).

As for China, it did not adopt mechanized production until the end of the nineteenth century, but continued as a market-based, commercial society with a massive rural sector and industrial production based on traditional methods. Some regions of China experienced slow economic growth, while others were stagnant. In the 1860s and 1870s, when Japan was successfully adopting industrial methods, the Chinese government showed similar interest in Western technology and science. However, China faced widespread uprisings in the mid-nineteenth century, which drained attention and resources to the military. With China now poised to surpass the United States in global economic production, scholars wonder whether the ascension of Europe and the West from 1800 on was merely a brief interruption in a much longer pattern of Asian dominance.

How did work and daily life evolve during the Industrial Revolution?

Having first emerged in the British countryside in the late eighteenth century, factories and industrial labor began migrating to cities by the early nineteenth century. As factories moved from rural to urban areas, their workforce evolved as well, from pauper children to families to men and women uprooted from their traditional rural communities. Many women, especially young single women and poor women, continued to work, but married women began to limit their participation in the workforce when possible. For some people, the Industrial Revolution brought improvements, but living and working conditions for the poor stagnated or even deteriorated until around 1850, especially in overcrowded industrial cities.

Work in Early Factories

The first factories of the Industrial Revolution were cotton mills, which began functioning in the 1770s along fast-running rivers and streams and were often located in sparsely populated areas. Cottage workers, accustomed to the putting-out system, were reluctant to work in the new factories even when they received relatively good wages. In a factory, workers had to keep up with the machine and follow its relentless tempo. Moreover, they had to show up every day, on time, and work long, monotonous hours under the constant supervision of demanding overseers, and they were punished systematically if they broke the work

rules. For example, if a worker was late to work, or accidentally spoiled material, the employer deducted fines from the weekly pay. Employers frequently beat children and adolescents for their infractions.

Cottage workers were not used to that way of life. All members of the family worked hard and long, but in spurts, setting their own pace. They could interrupt their work when they wished. Women and children could break up their long hours of spinning with other tasks. On Saturday afternoon the head of the family delivered the week's work to the merchant manufacturer and got paid. Saturday night was a time of relaxation and drinking, especially for the men.

Also, early factories resembled English poorhouses, where destitute people went to live at public expense. Some poorhouses were industrial prisons, where the inmates had to work in order to receive food and lodging. The similarity between large brick factories and large stone poorhouses increased the cottage workers' fear of factories and their hatred of factory discipline. It was cottage workers' reluctance to work in factories that prompted early cotton mill owners to turn to pauper children. Mill owners contracted with local officials to take on large numbers of such children as "apprentices," boys and girls as young as five or six years of age who had no say in the matter.

Housed, fed, and locked up nightly in factory dormitories, the young workers labored thirteen or fourteen hours a day for little or no pay and for periods up to fourteen years. Harsh physical punishment maintained brutal discipline. Attitudes began to change in the last decade of the eighteenth century, as middle-class reformers publicized the brutal toil imposed on society's most vulnerable members.

Working Families and Children

By the 1790s the early pattern had begun to change. The use of pauper apprentices was in decline, and in 1802 it was forbidden by Parliament. Many more textile factories were being built, mainly in urban areas, where they could use steam power rather than water-power and attract a workforce more easily than in the countryside. People came from near and far to work in the cities, as factory workers and as porters, builders, and domestic servants. Collectively, these wage laborers came to be known as the "working class," a term first used in the late 1830s.

In some cases, workers accommodated to the system by carrying over familiar working traditions. Some came to the mills and the mines in the family units in which they had labored on farms and in the putting-out system. The mill or mine owner bargained with the head of the family and paid him or her for the efforts of the whole family. In the cotton mills, children worked for their mothers or fathers, collecting scraps and "piecing" broken threads together. In

the mines, children sorted coal and worked the ventilation equipment. Their mothers hauled coal in the tunnels below the surface, while their fathers hewed with pick and shovel at the face of the seam.

Ties of kinship were particularly important for newcomers, who often traveled great distances to find work. Many urban workers in Great Britain migrated from Ireland, either on a seasonal or a permanent basis. They were forced out of rural Ireland by population growth and deteriorating economic conditions from 1817 on, and their numbers increased dramatically in the desperate years of the potato famine, from 1845 to 1851 (see "Ireland and the Great Famine" in Chapter 21). As early as 1824 most of the workers in the Glasgow cotton mills were Irish; in 1851 one-sixth of the population of Liverpool was Irish. Like many other immigrant groups held together by ethnic and religious ties, the Irish worked together, formed their own neighborhoods, and preserved their cultural traditions.

In the early decades of the nineteenth century, however, technical changes made it less and less likely that workers could continue to labor in family groups. As control and discipline passed into the hands of impersonal managers and overseers, adult workers began to protest against inhuman conditions on behalf of their children. Some enlightened employers and social reformers in Parliament argued that more humane standards were necessary, and they used widely circulated parliamentary reports to influence public opinion. For example, Robert Owen (1771–1858), a successful manufacturer in Scotland, testified in 1816 before an investigating committee on the basis of his experience. He argued that employing children under ten years of age as factory workers was "injurious to the children, and not beneficial to the proprietors."⁶ Workers also provided graphic testimony at such hearings as reformers pressed Parliament to pass corrective laws. These efforts resulted in a series of British **Factory Acts** from 1802 to 1833 that progressively limited the workday of child laborers and set minimum hygiene and safety requirements. The Factory Act of 1833 installed a system of full-time professional inspectors to enforce the provisions of previous acts. Children between ages nine and thirteen could work a maximum of eight hours per day, not including two hours for education. Teenagers aged fourteen to eighteen could work up to twelve hours, while those under nine were banned from employment. The Factory Acts constituted significant progress in preventing the exploitation of children. One unintended drawback of restrictions on child labor, however, was that they broke the pattern of whole families working together

■ Factory Acts English laws passed from 1802 to 1833 that limited the workday of child laborers and set minimum hygiene and safety requirements.



Women Workers on Break This painting from mid-nineteenth-century northern England shows women textile workers as they relax and socialize on their lunch break. Most of the workers are young and probably unmarried. (*The Dinner Hour, Wigan, 1874*, by Eyre Crowe [1824–1910]/Manchester Art Gallery, UK/Bridgeman Images)

in the factory because efficiency required standardized shifts for all workers. After 1833 the number of children employed in industry declined rapidly.

The New Sexual Division of Labor

With the restriction of child labor and the collapse of the family work pattern in the 1830s came a new sexual division of labor. By 1850 the man was emerging as the family's primary wage earner, while the married woman found only limited job opportunities. Generally denied good jobs at high wages in the growing urban economy, wives were expected to concentrate on their duties at home.

This new pattern of **separate spheres** had several aspects. First, all studies agree that married women from the working classes were much less likely to work full-time for wages outside the house after the first child arrived, although they often earned small amounts doing putting-out handicrafts at home and taking in boarders. Second, when married women did work for wages outside the house, they usually came

from the poorest families, where the husbands were poorly paid, sick, unemployed, or missing. Third, these poor married or widowed women were joined by legions of young unmarried women, who worked full-time but only in certain jobs, of which textile factory work, laundering, and domestic service were particularly important. Fourth, all women were generally confined to low-paying, dead-end jobs. Evolving gradually, but largely in place by 1850, the new sexual division of labor constituted a major development in the history of women and of the family.

Several factors combined to create this new sexual division of labor. First, the new and unfamiliar discipline of the **clock** and the machine was especially hard on married women of the laboring classes. Relentless factory discipline conflicted with child care in a way that labor on the farm or in the cottage had not. A woman operating earsplitting spinning machinery could mind a child of seven or eight working beside her (until such work was outlawed), but she could no longer pace herself through pregnancy or breast-feed her baby on the job. Thus a working-class woman had strong incentives to stay home, if she could afford it. Caring for babies was a less important factor in areas of continental Europe, such as northern France and

■ **separate spheres** A gender division of labor with the wife at home as mother and homemaker and the husband as wage earner.



Child Labor in Coal Mines Public sentiment against child labor in coal mines was provoked by the publication of dramatic images of the harsh working conditions children endured. The Mines Act of 1842 prohibited the employment underground of women and girls and of boys under the age of ten. (akg-images)

Scandinavia, where women relied on paid wet nurses instead of breast-feeding their babies (see “Child Care and Nursing” in Chapter 18).

Second, running a household in conditions of urban poverty was an extremely demanding job in its own right. There were no supermarkets or public transportation. Shopping, washing clothes, and feeding the family constituted a never-ending challenge. Taking on a brutal job outside the house—a “second shift”—had limited appeal for the average married woman from the working class. Thus many women might well have accepted the emerging division of labor as the best available strategy for family survival in the industrializing society.

Third, to a large degree the young, generally unmarried women who did work for wages outside the home were segregated from men and confined to certain “women’s jobs” because the new sexual division of labor replicated long-standing patterns of gender segregation and inequality. In the preindustrial economy, a small sector of the labor market had always been defined as “women’s work,” especially tasks involving needlework, spinning, food preparation, child care, and nursing.

This traditional sexual division of labor took on new overtones, however, in response to the factory system. Previously, at least in theory, young people worked under a watchful parental eye. The growth of factories and mines brought unheard-of opportunities for girls and boys to mix on the job, free of familial supervision. Such opportunities led to more unplanned pregnancies and fueled the illegitimacy explosion that had begun in the late eighteenth century and that gathered force until at least 1850. Thus segregation of jobs by gender was partly an effort by older people to control the sexuality of working-class youths.

Investigations into the British coal industry before 1842 provide a graphic example of this concern. (See “Viewpoints: The Experience of Child Labor,” page 612.) The middle-class men leading the inquiry professed horror at the sight of girls and women working without shirts, which was a common practice because of the heat, and they quickly assumed the prevalence of licentious sex with the male miners, who also wore very little clothing. In fact, many girls and married women worked for related males in a family unit that provided considerable protection and restraint. Yet

VIEWPOINTS

The Experience of Child Labor

The use of child labor in British industrialization led to investigations by parliamentary commissions that resulted in laws limiting the hours and the ages of children working in large factories. The moving passages that follow are taken from testimony gathered in 1841 and 1842 by the Ashley Mines Commission. Interviewing employers and many male and female workers, the commissioners focused on the physical condition of the youth and on the sexual behavior of workers far underground. Their work helped bring about the Mines Act of 1842 that prohibited underground work for all women and girls (and for boys younger than ten).

Mr. Payne, coal master

That children are employed generally at nine years old in the coal pits and sometimes at eight. In fact, the smaller the vein of coal is in height, the younger and smaller are the children required; the work occupies from six to seven hours per day in the pits; they are not ill-used or worked beyond their strength; a good deal of depravity exists but they are certainly not worse in morals than in other branches of the Sheffield trade, but upon the whole superior; the morals of this district are materially improving; Mr. Bruce, the clergyman, has been zealous and active in endeavoring to ameliorate their moral and religious education.

Ann Eggley, hurrier, 18 years old

We go at four in the morning, and sometimes at half-past four. We begin to work as soon as we get down. We get out after four, sometimes at five, in the evening. We work the whole time except an hour for dinner, and sometimes we haven't time to eat. I hurry [move coal wagons underground] by myself, and have done so for long. I know the corves [small coal wagons] are very heavy, they are the biggest corves anywhere about. The work is far too hard for me; the sweat runs off me all over sometimes. I am very tired at night. Sometimes when we get home at night we have not power to wash us, and then we go to bed. Sometimes we fall asleep in the chair. Father said last night it was both a shame and a disgrace for girls to work as we do, but there was naught else for us to do. I began to hurry when I was seven

and I have been hurrying ever since. I have been 11 years in the pits. The girls are always tired.

Patience Kershaw, aged 17

My father has been dead about a year; my mother is living and has ten children, five lads and five lasses; . . .

All my sisters have been hurriers, but three went to the mill. Alice went because her legs swelled from hurrying in cold water when she was hot. I never went to day-school; I go to Sunday-school, but I cannot read or write; I go to pit at five o'clock in the morning and come out at five in the evening; I get my breakfast of porridge and milk first; I take my dinner with me, a cake, and eat it as I go; I do not stop or rest any time for the purpose; I get nothing else until I get home, and then have potatoes and meat, not every day meat. I hurry in the clothes I have now got on, trousers and ragged jacket; the bald place upon my head is made by thrusting the corves; . . . I wear a belt and chain at the workings to get the corves out; the putters [miners] that I work for are naked except their caps; they pull off all their clothes; I see them at work when I go up; sometimes they beat me, if I am not quick enough, with their hands; they strike me upon my back; the boys take liberties with me, sometimes, they pull me about; I am the only girl in the pit; there are about 20 boys and 15 men; all the men are naked; I would rather work in mill than in coal-pit.

QUESTIONS FOR ANALYSIS

1. How does Payne's testimony compare with that of Ann Eggley and Patience Kershaw?
2. Describe how the young women perform in the mines. What strikes you most about the testimonies of these workers?
3. The witnesses were responding to questions from middle-class commissioners. What did the commissioners seem interested in? Why?

Source: *Voices of the Industrial Revolution: Selected Readings from the Liberal Economists and Their Critics*, pp. 87–90, edited by J. Bowditch and C. Ramsland (Ann Arbor: The University of Michigan Press, 1961).

many witnesses from the working class also believed that the mines were inappropriate and dangerous places for women and girls. Some miners stressed particularly the danger of sexual aggression for girls working past puberty. As one explained, "I consider it a scandal for girls to work in the pits. Till they are 12 or 14 they may work very well but after that it's an abomination. . . . The work of the pit does not hurt them, it is the effect

on their morals that I complain of."⁸ The **Mines Act of 1842** prohibited underground work for all women and girls as well as for boys under ten.

Some women who had to support themselves protested against being excluded from coal mining, which paid higher wages than most other jobs open to working-class women. But provided they were part of families that could manage economically, the girls and

the women who had worked underground were generally pleased with the law. In explaining her satisfaction in 1844, one mother of four provided real insight into why many married working women accepted the emerging sexual division of labor:

While working in the pit I was worth to my [miner] husband seven shillings a week, out of which we had to pay 2½ shillings to a woman for looking after the younger children. I used to take them to her house at 4 o'clock in the morning, out of their own beds, to put them into hers. Then there was one shilling a week for washing; besides, there was mending to pay for, and other things. The house was not guided. The other children broke things; they did not go to school when they were sent; they would be playing about, and get ill-used by other children, and their clothes torn. Then when I came home in the evening, everything was to do after the day's labor, and I was so tired I had no heart for it; no fire lit, nothing cooked, no water fetched, the house dirty, and nothing comfortable for my husband. It is all far better now, and I wouldn't go down again.⁹

A final factor encouraging working-class women to withdraw from paid labor was the domestic ideals emanating from middle-class women, who had largely embraced the “separate spheres” ideology. Middle-class reformers published tracts and formed societies to urge poor women to devote more care and attention to their homes and families.

Living Standards for the Working Class

Despite the best efforts of hard-working men and women, living conditions for the industrialized poor were often abysmal. Although the evidence is complex and sometimes contradictory, most historians of the Industrial Revolution now agree that overall living standards for the working class did not rise substantially until the 1840s. British wages were always high compared to those in the rest of Europe, but the stresses of war with France from 1792 to 1815 led to a decline in the average British worker’s real wages and standard of living. These difficult war years, with high unemployment and inflation, lent a grim color to the new industrial system. Factory wages began to rise after 1815, but these gains were modest and were offset by a decline in the labor of children and married women, meaning that many households had less total income than before. Moreover, many people still worked outside the factories as cottage workers or rural laborers, and in those sectors wages declined.

Thus the increase in the productivity of industry did not lead to an increase in the purchasing power of the British working classes. Only after 1830, and especially after the mid-1840s, did real wages rise substantially, so that the average worker earned roughly 30 percent more in real terms in 1850 than in 1770.¹⁰

Up to that point, the demands of labor in the new industries probably outweighed their benefits as far as working people were concerned. Many landless poor people in the late eighteenth century were self-employed cottage workers living in close-knit rural communities; with industrialization they worked longer and harder at jobs that were often more grueling and more dangerous. In England nonagricultural workers labored about 250 days per year in 1760 as compared to 300 days per year in 1830, while the normal workday remained an exhausting eleven hours throughout the entire period. In 1760 nonagricultural workers still observed many religious and public holidays by not working, and many workers took Monday off. These days of leisure and relaxation declined rapidly after 1760, and by 1830 nonagricultural workers had joined landless agricultural laborers in toiling six rather than five days a week.¹¹

As the factories moved to urban areas, workers followed them in large numbers, leading to an explosion in the size of cities, especially in the north of England. Life in the new industrial cities, such as Manchester and Glasgow, was grim. Migrants to the booming cities found expensive, hastily constructed, overcrowded apartments and inadequate sanitary systems. Infant mortality, disease, malnutrition, and accidents took such a high toll in human life that average life expectancy was only around twenty-five to twenty-seven years, some fifteen years less than the national average.¹² Perhaps the most shocking evidence of the impact of the Industrial Revolution on living standards is the finding that child mortality levels rose in the first half of the nineteenth century, especially in industrial areas.

Another way to consider the workers’ standard of living is to look at the goods they purchased. Such evidence is somewhat contradictory, but generally suggestive of stagnant or declining living standards until the middle of the nineteenth century. One important area of improvement was in the consumption of cotton goods, which became much cheaper and could be enjoyed by all classes. Now millions of poor people could afford to wear cotton slips and underpants as well as cotton dresses and shirts. However, in other areas, food in particular, the modest growth in factory wages was not enough to compensate for rising prices.

From the mid-1840s onward, matters improved considerably as wages made substantial gains and

Mines Act of 1842 English law prohibiting underground work for all women and girls as well as for boys under ten.

the prices of many goods dropped. A greater variety of foods became available, including the first canned goods. Some of the most important advances were in medicine. Smallpox vaccination became routine, and surgeons began to use anesthesia in the late 1840s. By 1850 trains had revolutionized transportation for the masses, while the telegraph made instant communication possible for the first time in human history. In addition, gaslights greatly expanded the possibilities of nighttime activity. Gas lighting is one of the most important examples of a direct relationship between the scientific advances of the eighteenth century—in this case, chemistry—and the development of new technologies of the Industrial Revolution.

More difficult to measure than real wages or life expectancy was the impact of the Industrial Revolution on community and social values. As young men and women migrated away from their villages to seek employment in urban factories, many close-knit rural communities were destroyed. Village social and cultural traditions disappeared without new generations to carry them on. Although many young people formed new friendships and appreciated the freedoms of urban life, they also suffered from the loneliness of life in the anonymous city. The loss of skills and work autonomy, along with the loss of community, must be included in the assessment of the Industrial Revolution's effect on the living conditions of workers.

What were the social consequences of industrialization?

In Great Britain, industrial development led to the creation of new social groups and intensified long-standing conflicts between capital and labor. A new class of factory owners and industrial capitalists arose. These men and women and their families strengthened the wealth and size of the middle class, which had previously been made up mainly of merchants and professional people. The demands of modern industry regularly brought the interests of the middle-class industrialists into conflict with those of the people who worked for them—the working class. (See “Thinking Like a Historian: Making the Industrialized Worker,” page 616.) As observers took notice of these changes, they raised new questions about how industrialization affected social relationships. Meanwhile, enslaved labor in European colonies contributed to the industrialization process in multiple ways (see “The Impact of Slavery” at the end of this chapter).

The New Class of Factory Owners

Early industrialists operated in a highly competitive economic system. As the careers of James Watt and Fritz Harkort illustrate, there were countless production problems, and success and large profits were by no means certain. Manufacturers therefore waged a constant battle to cut their production costs and stay afloat. Much of the profit had to go back into the business for new and better machinery.

Most early industrialists drew upon their families and friends for labor and capital, but they came from a variety of backgrounds. Many, such as Harkort, were from well-established families with rich networks of

contacts and support. Others, such as Watt and Cockerill, were of modest means, especially in the early days. Artisans and skilled workers of exceptional ability had unparalleled opportunities. Members of ethnic and religious groups who had been discriminated against jumped at the new chances and often helped each other. Scots, Quakers, and other Protestant dissenters were tremendously important in Britain; Protestants and Jews dominated banking in Catholic France.

As factories and firms grew larger, opportunities declined, at least in well-developed industries. It became considerably harder for a gifted but poor young mechanic to start a small enterprise and end up as a wealthy manufacturer. Formal education became more important for young men as a means of success and advancement, but studies at the advanced level were expensive. In Britain by 1830 and in France and Germany by 1860, leading industrialists were more likely to have inherited their well-established enterprises, and they were financially much more secure than their struggling parents had been. They also had a greater sense of class-consciousness; they were fully aware that ongoing industrial development had widened the gap between themselves and their workers.

Just like working-class women, the wives and daughters of successful businessmen found fewer opportunities for active participation in Europe's increasingly complex business world. Rather than contributing as vital partners in a family-owned enterprise, as so many middle-class women had done, these women were increasingly valued for their ladylike gentility. By 1850 some influential women writers and most businessmen assumed that middle-class wives and daughters should avoid work in offices and factories. Rather, a middle-class lady was expected to concentrate on her proper role as wife and mother, preferably in an elegant

Luddites Group of handicraft workers who attacked factories in northern England in 1811 and later, smashing the new machines that they believed were putting them out of work.

Advice for Middle-Class Women

The adoption of steam-powered machines generated tremendous profits during the Industrial Revolution. Factory owners and managers enjoyed new wealth, and skilled male workers eventually began to hope for wages high enough to keep their wives and children at home. These social changes encouraged the nineteenth-century “separate spheres” ideology, which emphasized the importance of women’s role as caretakers of the domestic realm. Sarah Stickney Ellis’s *The Women of England: Their Social Duties and Domestic Habits*, excerpted below, was one of a flood of publications offering middle-class women advice on shopping, housekeeping, and supervising servants.



“What shall I do to gratify myself—to be admired—or to vary the tenor of my existence?” are not the questions which a woman of right feelings asks awaking to the avocations of the day. Much more congenial to the highest attributes of woman’s character, are inquiries such as these: “How shall I endeavor through this day to turn the time, the health, and the means permitted me to enjoy, to the best account? Is any one sick, I must visit their chamber without delay, and try to give their apartment an air of comfort, by arranging such things as the wearied nurse may not have thought of. Is any one about to set off on a journey, I must see that the early meal is spread, to prepare it with my own hands,

in order that the servant, who was working late last night, may profit by unbroken rest. Did I fail in what was kind or considerate to any of the family yesterday; I will meet her this morning with a cordial welcome, and show, in the most delicate way I can, that I am anxious to atone for the past. Was any one exhausted by the last day’s exertion, I will be an hour before them this morning, and let them see that their labor is so much in advance. Or, if nothing extraordinary occurs to claim my attention, I will meet the family with a consciousness that, being the least engaged of any member of it, I am consequently the most at liberty to devote myself to the general good of the whole, by cultivating cheerful conversation, adapting myself to the prevailing tone of feeling, and leading those who are least happy, to think and speak of what will make them more so.”

EVALUATE THE EVIDENCE

1. What daily tasks and duties does Sarah Stickney Ellis prescribe for the mother of the family?
2. How does this document exemplify the changes in the sexual division of labor and ideals of domesticity described in the text?

Source: Sarah Stickney Ellis, “The Women of England: Their Social Duties and Domestic Habits,” in *The Past Speaks*, 2d ed., ed. Walter Arnstein (Lexington, Mass.: D. C. Heath, 1993), 2:173.

residential area far removed from ruthless commerce and the volatile working class. (See “Evaluating Written Evidence: Advice for Middle-Class Women,” above.)

Responses to Industrialization

From the beginning, the British Industrial Revolution had its critics. Among the first were the Romantic poets. William Blake (1757–1827) called the early factories “satanic mills” and protested against the hard life of the London poor. William Wordsworth (1770–1850) lamented the destruction of the rural way of life and the pollution of the land and water. Some handicraft workers—notably the **Luddites**, members of a secret textile workers organization who attacked factories in northern England in 1811 and later—smashed the new machines, which they believed were putting them out of work. Doctors and reformers wrote of problems in the factories and new towns, while Malthus and Ricardo concluded that workers would earn only enough to stay alive.

This pessimistic view was accepted and reinforced by Friedrich Engels (1820–1895), the future

revolutionary and colleague of Karl Marx (see Chapter 21). After studying conditions in northern England, this young son of a wealthy Prussian cotton manufacturer published in 1844 *The Condition of the Working Class in England*, a blistering indictment of the capitalist classes. “At the bar of world opinion,” he wrote, “I charge the English middle classes with mass murder, wholesale robbery, and all the other crimes in the calendar.” The new poverty of industrial workers was worse than the old poverty of cottage workers and agricultural laborers, according to Engels. The culprit was industrial capitalism, with its relentless competition and constant technical change. Engels’s extremely influential charge of capitalist exploitation and increasing worker poverty was embellished by Marx and later socialists (see “The Birth of Marxist Socialism” in Chapter 21).

Analysis of industrial capitalism, often combined with reflections on the French Revolution, led to the development of a new overarching interpretation—a new paradigm—regarding social relationships. Briefly, this paradigm argued that individuals were

THINKING LIKE A HISTORIAN

Making the Industrialized Worker

Looking back from the vantage point of the 1820s and 1830s, contemporary observers saw in early industrialization a process that was as much about social transformation as it was about technological transformation — a process in which changes in work conditions were closely tied to changes in workers' family lives, values, and mental habits.

1 **Peter Gaskell, *The Manufacturing Population of England: Its Moral, Social, and Physical Conditions, and the Changes Which Have Arisen from the Use of Steam Machinery, 1833.*** In this excerpt, Peter Gaskell sketches the moral, social, and physical conditions of English workers before industrialization took hold, linking these characteristics to preindustrial work conditions.

Prior to the year 1760, manufactures were in a great measure confined to the demands of the home market. At this period, and down to 1800 . . . the majority of the artisans engaged in them had laboured in their own houses, and in the bosoms of their families. . . .

These were, undoubtedly, the golden times of manufactures, considered in reference to the character of the labourers. By all the processes being carried on under a man's own roof, he retained his individual respectability; he was kept apart from associations that might injure his moral worth, whilst he generally earned wages which were sufficient not only to live comfortably upon, but which enabled him to rent a few acres of land; thus joining in his own person two classes, that are now daily becoming more and more distinct. . . .

Thus, removed from many of those causes which universally operate to the deterioration of the moral character of the labouring man, when brought into large towns . . . the small farmer, spinner, or hand-loom weaver presents as orderly and respectable an appearance as could be wished. It is true that the amount of labour gone through was but small; that the quantity of cloth or yarn produced was but limited—for he worked by the rule of his strength and convenience. They were, however, sufficient to clothe and feed himself and family decently, and according to their station; to

lay by a penny for an evil day, and to enjoy those amusements and bodily recreations then in being. He was a respectable member of society; a good father, a good husband, and a good son.

2 **Richard Guest, *A Compendious History of the Cotton-Manufacture, 1823.*** Like Peter Gaskell, Richard Guest, one of the earliest historians of the English textile industry, believed that industrialization had "introduced great changes into the manners and habits of the people." Unlike Gaskell, however, Guest was convinced that these changes had been for the better. Where Gaskell saw moral decline, Guest saw moral awakening.

The progress of the Cotton Manufacture introduced great changes into the manners and habits of the people. The operative workmen being thrown together in great numbers had their faculties sharpened and improved by constant communication. Conversation wandered over a variety of topics not before essayed; the questions of Peace and War, which interested them importantly, inasmuch as they might produce a rise or fall of wages, became highly interesting, and this brought them into the vast field of politics and discussions on the character of their Government, and the men who composed it. They took a greater interest in the defeats and victories of their country's arms, and from being only a few degrees above their cattle in the scale of intellect, they became Political Citizens. . . .

The facility with which the Weavers changed their masters, the constant effort to find out and obtain the largest remuneration for their labour, the excitement to ingenuity which the higher wages for fine manufactures and skillful

ANALYZING THE EVIDENCE

- How does Richard Guest's characterization of preindustrial workers and conditions in Source 2 compare to Peter Gaskell's in Source 1? Why did Gaskell think industrialization would harm workers' morals while Guest saw it as a force for moral improvement?
- Early-nineteenth-century artists produced many images of the new factories. How would you describe the textile mill shown in Source 4?
- According to the German doctor in Source 3, what challenges confronted working-class women in their daily lives? To what extent does he seem to blame the women themselves for their situation? How might observations like these have affected the new sexual division of labor discussed in the text?
- In what ways were Robert Owen's innovations (Source 5) a response to the negative impacts of industrialization highlighted by the German doctor (Source 3)?

workmanship produced, and a conviction that they depended mainly on their own exertions, produced in them that invaluable feeling, a spirit of freedom and independence, and that guarantee for good conduct and improvement of manners, a consciousness of the value of character and of their own weight and importance.

3 Living conditions of the working class,

1845. As middle-class reformers began to investigate working-class living conditions, they were shocked at what they found. This excerpt comes from an 1845 interview of doctors in a German industrial city.

 **QUESTION:** What is your usual experience regarding the cleanliness of these classes?

DR. BLUENNER: Bad! Mother has to go out to work, and can therefore pay little attention to the domestic economy, and even if she makes an effort, she lacks time and means. A typical woman of this kind has four children, of whom she is still suckling one, she has to look after the whole household, to take food to her husband at work, perhaps a quarter of a mile away on a building site; she therefore has no time for cleaning and then it is such a small hole inhabited by so many people. The children are left to themselves, crawl about the floor or in the streets, and are always dirty; they lack the necessary clothing to change more often, and there is no time or money to wash these frequently. There are, of course, gradations; if the mother is healthy, active and clean, and if the poverty is not too great, then things are better.



4 Power loom weaving, 1834. This engraving shows adult women operating power looms under the supervision of a male foreman, and it accurately reflects both the decline of family employment and the emergence of a gender-based division of labor in many British factories. The jungle of belts and shafts connecting the noisy looms to the giant steam engine on the ground floor created a constant din. (Time Life Pictures/Getty Images)

5 Robert Owen, *A New View of Society*, 1831. Manufacturer and social reformer Robert Owen was also interested in the lessons of the early years of industrialization. He wished not to defend or decry industrialization, but to apply those lessons to the design and operation of his textile factory at New Lanark, Scotland.

 The system of receiving apprentices from public charities was abolished; permanent settlers with large families were encouraged, and comfortable houses built for their accommodation. The practice of employing children in the mills, of six, seven, and eight years of age, was discontinued, and their parents advised to allow them to acquire health and education until they were ten years old. . . . The children were taught reading, writing, and arithmetic during five years, that is, from five to ten, in the village school, without expense to their parents. . . .

[A]ttention was given to the domestic arrangements of the community. Their houses were rendered more comfortable, their streets were improved, the best provisions were purchased, and sold to them at low rates. . . . They were taught to be rational, and they acted rationally. Thus both parties experienced the incalculable advantages of the system which had been adopted. Those employed became industrious, temperate, healthy, faithful to their employers, and kind to each other; while the proprietors were deriving services . . . far beyond those which could be obtained by any other means than those of mutual confidence and kindness.

PUTTING IT ALL TOGETHER

Using the sources above, along with what you have learned in class and in this chapter, create a comparison of industrial and preindustrial conditions, written from the perspective of a nineteenth-century observer. Your observer can come from any social background: he or she could be a scholar like Peter Gaskell or Richard Guest, a factory owner like Robert Owen, or an actual factory worker. As you write, be sure to consider the influence of your observer's background on his or her characterization of the changes brought by industrialization. What differences would your observer highlight? Why?

Sources: (1) Peter Gaskell, *The Manufacturing Population of England: Its Moral, Social, and Physical Conditions and the Changes Which Have Arisen from the Use of Steam Machinery* (London: Baldwin and Cradock, 1833), pp. 15–16, 18; (2) E. Royston Pike, *Human Documents of the Industrial Revolution in Britain* (London: George Allen & Unwin, 1970), pp. 26–28; (3) Laura L. Frader, ed., *The Industrial Revolution: A History in Documents* (Oxford: Oxford University Press, 2006), pp. 85–86; (5) Pike, *Human Documents of the Industrial Revolution in Britain*, pp. 37–42.

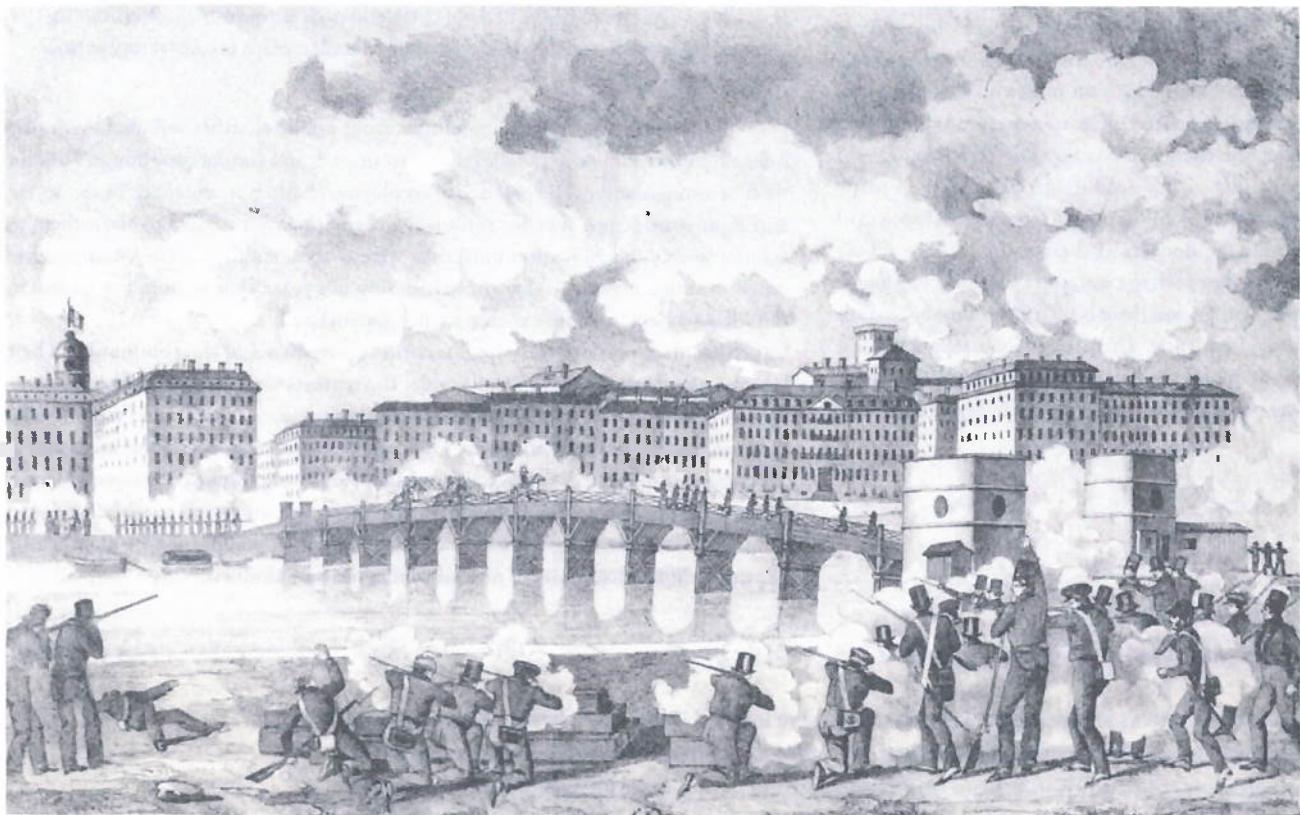
members of separate classes based on their relationship to the means of production, that is, the machines and factories that dominated the new economy. As owners of expensive industrial machinery and as dependent laborers in their factories, the two main groups of society had separate and conflicting interests. Accordingly, the comfortable, well-educated “public” of the eighteenth century came increasingly to be defined as the middle class (“middle” because they were beneath the small group of aristocracy at the top of society who claimed to be above industrial activity), and the “people” gradually began to perceive themselves as composing a modern working class. And if the new class interpretation was more of a simplification than a fundamental truth for some critics, it appealed to many because it seemed to explain the dramatic social changes wrought by industrialization. Therefore, conflicting classes existed, in part, because many individuals came to believe they existed and developed an awareness that they belonged to a particular social class—what Karl Marx called **class-consciousness**.

Meanwhile, other observers believed that conditions were improving for the working people. In his 1835

study of the cotton industry, Andrew Ure (yoo-RAY) wrote that conditions in most factories were not harsh and were even quite good. Edwin Chadwick, a government official well acquainted with the problems of the working population, concluded that the “whole mass of the laboring community” was increasingly able “to buy more of the necessities and minor luxuries of life.”¹³ Nevertheless, those who thought—correctly—that conditions were getting worse for working people were probably in the majority.

The Early British Labor Movement

Not everyone worked in large factories and coal mines during the Industrial Revolution. In 1850 more British people still worked on farms than in any other single occupation, although rural communities were suffering from outward migration. The second-largest occupation was domestic service, with more than 1 million household servants, 90 percent of whom were women. Thus many old, familiar jobs outside industry lived on and provided alternatives to industrial labor.



Uprising of French Silk Weavers, 1831 In the first decades of the nineteenth century, half of the inhabitants of Lyon, the second-largest city in France, earned a living in the silk industry. The industry was controlled by large-scale merchants, who distributed orders to weavers toiling fifteen to eighteen hours a day on handlooms in their cramped lodgings. In 1831, with a depressed economy causing a drastic fall in silk prices and workers' wages, the silk weavers rose in revolt, briefly seizing control of the city before an army arrived to restore order. (Bibliothèque Nationale, Paris/akg-images)

Within industry itself, the pattern of artisans working with hand tools in small shops remained unchanged in many trades, even as others were revolutionized by technological change. For example, the British iron industry was completely dominated by large-scale capitalist firms by 1850. Many large ironworks had more than one thousand people on their payrolls. Yet the firms that fashioned iron into small metal goods, such as tools, tableware, and toys, employed on average fewer than ten wage workers who used handicraft skills. The survival of small workshops gave many workers an alternative to factory employment.

Working-class solidarity and class-consciousness developed both in small workshops and in large factories. In the northern factory districts, anticapitalist sentiments were frequent by the 1820s. Commenting in 1825 on a strike in the woollen center of Bradford and the support it had gathered from other regions, one newspaper claimed with pride that “it is all the workers of England against a few masters of Bradford.”¹⁴ Even in trades that did not undergo mechanization, unemployment and stagnant wages contributed to class awareness.

Such sentiments ran contrary to the liberal tenets of economic freedom championed by eighteenth-century thinkers like Adam Smith (see “Adam Smith and Economic Liberalism” in Chapter 17). Liberal economic principles were embraced by statesmen and middle-class business owners in the late eighteenth century and continued to gather strength in the early nineteenth century. In 1799 Parliament passed the **Combination Acts**, which outlawed unions and strikes. In 1813 and 1814 Parliament repealed an old law regulating the wages of artisans and the conditions of apprenticeship. As a result of these and other measures, certain skilled artisan workers, such as bootmakers and high-quality tailors, found aggressive capitalists ignoring traditional work rules and trying to flood their trades with unorganized women workers and children to beat down wages.

The capitalist attack on artisan guilds and work rules was bitterly resented by many craftworkers, who subsequently played an important part in Great Britain and in other countries in gradually building a modern labor movement. The Combination Acts were widely disregarded by workers. Printers, papermakers, carpenters, tailors, and other such craftsmen continued to take collective action, and societies of skilled factory workers also organized unions in defiance of the law. Unions sought to control the number of skilled workers, to limit apprenticeship to members’ own children, and to bargain with owners over wages.

They were not afraid to strike; there was, for example, a general strike of adult cotton spinners in Manchester in 1810. In the face of widespread union activity, Parliament repealed the Combination Acts in 1824, and unions were tolerated, though not fully

accepted, after 1825. The next stage in the development of the British trade-union movement was the attempt to create a single large national union. This effort was led not so much by working people as by social reformers such as Robert Owen. Owen, a self-made cotton manufacturer, had pioneered in industrial relations by combining strict discipline with paternalistic concern for the health, safety, and hours of his workers. After 1815 he experimented with cooperative and socialist communities, including one at New Harmony, Indiana. Then in 1834 Owen was involved in the organization of one of the largest and most visionary of the early national unions, the Grand National Consolidated Trades Union. When Owen’s and other ambitious labor organizing schemes collapsed, the British labor movement moved once again after 1851 in the direction of craft unions. The most famous of these was the Amalgamated Society of Engineers, which represented skilled machinists. These unions won real benefits for members by fairly conservative means and thus became an accepted part of the industrial scene.

British workers also engaged in direct political activity in defense of their interests. After the collapse of Owen’s national trade union, many working people went into the Chartist movement, which sought political democracy. The key Chartist demand—that all men be given the right to vote—became the great hope of millions of common people. Workers were also active in campaigns to limit the workday in factories to ten hours and to permit duty-free importation of wheat into Great Britain to secure cheap bread. Thus working people developed a sense of their own identity and played an active role in shaping the new industrial system. They were neither helpless victims nor passive beneficiaries.

The Impact of Slavery

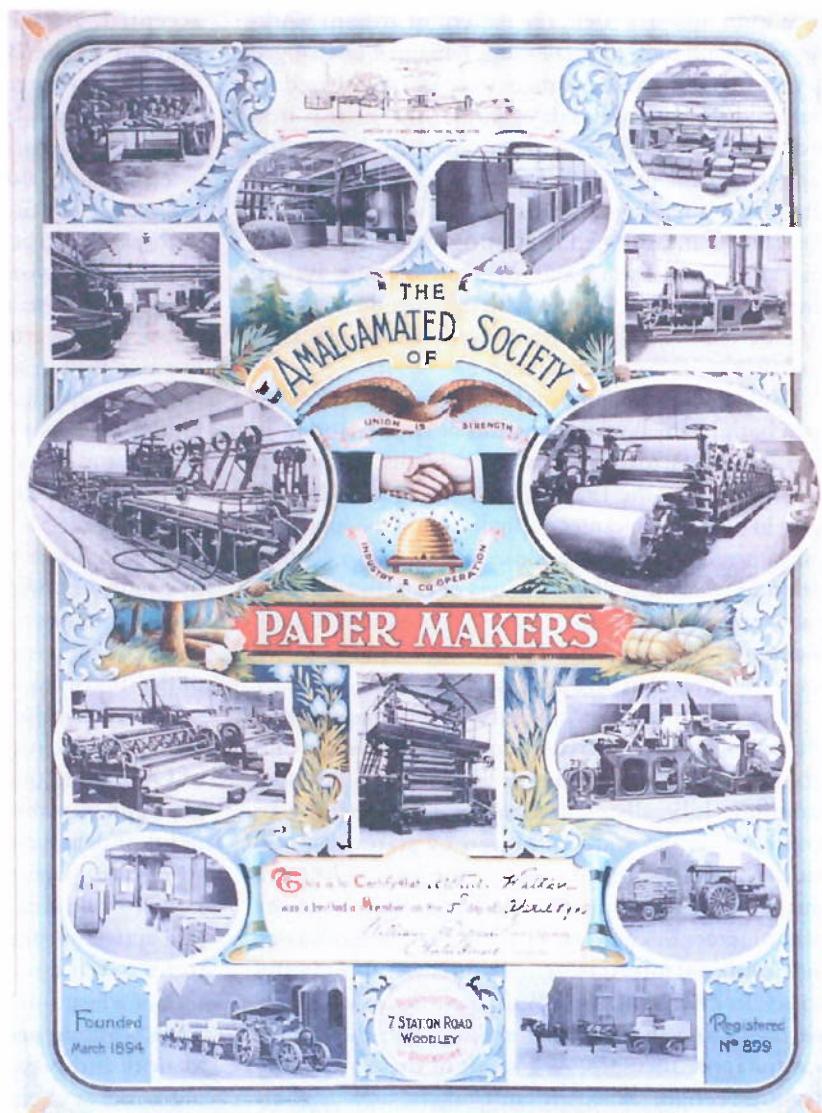
Another mass labor force of the Industrial Revolution was composed of the millions of enslaved men, women, and children who toiled in European colonies in the Caribbean and in North and South America. Historians have long debated the extent to which revenue from slavery contributed to Britain’s achievements in the Industrial Revolution.

Most now agree that profits from colonial plantations and slave trading were a small portion of British

class-consciousness Awareness of belonging to a distinct social and economic class whose interests might conflict with those of other classes.

Combination Acts British laws passed in 1799 that outlawed unions and strikes, favoring capitalist business people over skilled artisans. Bitterly resented and widely disregarded by many craft guilds, the acts were repealed by Parliament in 1824.

Union Membership Certificate This handsome membership certificate belonged to Arthur Watton, a properly trained and certified papermaker of Kings Norton in Birmingham, England. Members of such unions proudly framed their certificates and displayed them in their homes, showing that they were skilled workers. (Courtesy, Sylvia Waddell)



national income in the eighteenth century and were probably more often invested in land than in industry. Nevertheless, the impact of slavery on Britain's economy was much broader than its direct profits alone. In the mid-eighteenth century the need for items to exchange for colonial cotton, sugar, tobacco, and slaves stimulated demand for British manufactured goods in the Caribbean, North America, and West Africa. Britain's dominance in the slave trade also led to the development of finance and credit institutions that helped early industrialists obtain capital for their businesses. Investments in canals, roads, and railroads made possible by profits from colonial trade provided the necessary infrastructure to move raw materials and products of the factory system.

The British Parliament abolished the slave trade in 1807 and freed all slaves in British territories in 1833, but by 1850 most of the cotton processed by British

mills was supplied by the labor of enslaved people in the southern United States. Thus the Industrial Revolution was deeply entangled with the Atlantic world and the misery of slavery.

NOTES

1. Nicholas Crafts, "Productivity Growth During the British Industrial Revolution: Revisionism Revisited" (September 2014), Working Paper, Department of Economics, University of Warwick.
2. Robert C. Allen, *The British Industrial Revolution in Global Perspective* (Cambridge: Cambridge University Press, 2009), pp. 1–2.
3. P. Bairoch, "International Industrialization Levels from 1750 to 1980," *Journal of European Economic History* 11 (Spring 1982): 269–333.
4. Quoted in J. Bowditch and C. Ramsland, eds., *Voices of the Industrial Revolution* (Ann Arbor: University of Michigan Press, 1961), p. 55, from the fourth edition of Thomas Malthus, *Essay on the Principle of Population* (1807).

5. Quoted in Emma Griffin, *A Short History of the British Industrial Revolution* (Basingstoke, U.K.: Palgrave Macmillan, 2010), p. 126.
6. Quoted in E. R. Pike, "Hard Times": *Human Documents of the Industrial Revolution* (New York: Praeger, 1966), p. 109.
7. See especially J. Brenner and M. Rama, "Rethinking Women's Oppression," *New Left Review* 144 (March–April 1984): 33–71, and sources cited there.
8. J. Humphries, "... 'The Most Free from Objection' . . . The Sexual Division of Labor and Women's Work in Nineteenth-Century England," *Journal of Economic History* 47 (December 1987): 941; Pike, "Hard Times," p. 266.
9. Quoted in Pike, "Hard Times," p. 208.
10. Joel Mokyr, *The Enlightened Economy: An Economic History of Britain, 1700–1850* (New Haven, Conn.: Yale University Press, 2009), pp. 460–461.
11. Hans-Joachim Voth, *Time and Work in England, 1750–1830* (Oxford: Oxford University Press, 2000), pp. 118–133, 268–270.
12. Mokyr, *The Enlightened Economy*, p. 455.
13. Quoted in W. A. Hayek, ed., *Capitalism and the Historians* (Chicago: University of Chicago Press, 1954), p. 126.
14. Quoted in D. Geary, ed., *Labour and Socialist Movements in Europe Before 1914* (Oxford: Berg, 1989), p. 29.



LOOKING BACK LOOKING AHEAD

The Industrial Revolution was a long process of economic innovation and growth originating in Britain around 1780 and spreading to the European continent after 1815. The development of manufacturing machines powered first by water and then by steam allowed for a tremendous growth in productivity, which enabled Britain to assume the lead in the world's production of industrial goods. Industrialization fundamentally changed the social landscape of European countries, creating a new elite of wealthy manufacturers and a vast working class of urban wage laborers whose living conditions remained grim until the mid-nineteenth century.

One popular idea in the 1830s, first developed by a French economist, was that Britain's late-eighteenth-century "industrial revolution" paralleled the political events in France during the French Revolution. One revolution was economic, while the other was political; the first was ongoing and successful, while the second had failed and come to a definite end in 1815, when Europe's

conservative monarchs defeated Napoleon and restored the French kings of the Old Regime.

In fact, in 1815 the French Revolution, like the Industrial Revolution, was an unfinished work-in-progress. Just as Britain was still in the midst of its economic transformation and the states of northwestern Europe had only begun industrialization, so too after 1815 were the political conflicts and ideologies of revolutionary France still very much alive. The French Revolution had opened the era of modern political life not just in France but also across Europe. It had brought into existence many of the political ideologies that would interact with the social and economic forces of industrialization to refashion Europe and create a new urban society. Moreover, in 1815 the unfinished French Revolution carried the very real possibility of renewed political upheaval. This possibility, which conservatives feared and radicals longed for, would become dramatic reality in first briefly in 1830 and then again in 1848, when political revolutions swept across Europe like a whirlwind.

Make Connections

Think about the larger developments and continuities within and across chapters.

1. Why did Great Britain take the lead in industrialization, and when and how were other countries able to adopt the new techniques and organization of production?
2. How did the achievements in agriculture and rural industry of the late seventeenth and eighteenth centuries (Chapter 17) pave the way for the Industrial Revolution of the late eighteenth century?
3. How would you compare the legacy of the political revolutions of the late eighteenth century (Chapter 19) with that of the Industrial Revolution? Which seems to you to have created the most important changes, and why?

20 REVIEW & EXPLORE

Identify Key Terms

Identify and explain the significance of each item below.

Industrial Revolution (p. 595)

tariff protection (p. 606)

spinning jenny (p. 596)

Factory Acts (p. 609)

water frame (p. 596)

separate spheres (p. 610)

steam engines (p. 599)

Mines Act of 1842 (p. 612)

Rocket (p. 600)

Luddites (p. 615)

Crystal Palace (p. 602)

class-consciousness (p. 618)

iron law of wages (p. 602)

Combination Acts (p. 619)

Review the Main Ideas

Answer the section heading questions from the chapter.

1. Why and how did the Industrial Revolution emerge in Britain? (p. 594)
2. How did countries outside Britain respond to the challenge of industrialization? (p. 603)
3. How did work and daily life evolve during the Industrial Revolution? (p. 608)
4. What were the social consequences of industrialization? (p. 614)

Suggested Reading and Media Resources

BOOKS

- Allen, Robert C. *The British Industrial Revolution in Global Perspective*. 2009. Explains the origins of the Industrial Revolution and why it took place in Britain and not elsewhere.
- Davidoff, Leonore, and Catherine Hall. *Family Fortunes: Men and Women of the English Middle Class, 1750–1850*, rev. ed. 2003. Examines both economic activities and cultural beliefs with great skill.
- Freeman, Joshua B. *Behemoth: A History of the Factory and the Making of the Modern World*. 2018. An accessible history of the rise of the factory, originating in England and ending in today's global industry.
- Griffin, Emma. *A Short History of the British Industrial Revolution*. 2010. An accessible and lively introduction to the subject.
- Humphries, Jane. *Childhood and Child Labour in the British Industrial Revolution*. 2010. A moving account of the experience of children during the Industrial Revolution, based on numerous autobiographies.
- James, Harold. *Family Capitalism*. 2006. A study of the entrepreneurial dynasties of the British Industrial Revolution.
- Mokyr, Joel. *The Enlightened Economy: An Economic History of Britain, 1700–1850*. 2009. A masterful explanation of industrialization and economic growth in Britain that emphasizes the impact of Enlightenment openness and curiosity.
- Morris, Charles R. *The Dawn of Innovation: The First American Industrial Revolution*. 2012. Tells the story of the individuals, inventions, and trade networks that