Steam train on the Nancha Bank, China

Power plant in West Virginia, United States

1

The Beginnings of Industrialization

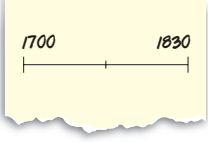
MAIN IDEA	WHY IT MATTERS NOW	TERMS & NAMES
SCIENCE AND TECHNOLOGY The Industrial Revolution started in England and soon spread to other countries.	The changes that began in Britain paved the way for modern industrial societies.	• Industrial Revolution • enclosure • crop rotation • industrialization • factors of production • factory • entrepreneur

SETTING THE STAGE In the United States, France, and Latin America, political revolutions brought in new governments. A different type of revolution now transformed the way people worked. The **Industrial Revolution** refers to the greatly increased output of machine-made goods that began in England in the middle 1700s. Before the Industrial Revolution, people wove textiles by hand. Then, machines began to do this and other jobs. Soon the Industrial Revolution spread from England to Continental Europe and North America.

Industrial Revolution Begins in Britain

TAKING NOTES

Following Chronological Order On a time line, note important events in Britain's industrialization.



In 1700, small farms covered England's landscape. Wealthy landowners, however, began buying up much of the land that village farmers had once worked. The large landowners dramatically improved farming methods. These innovations amounted to an agricultural revolution.

The Agricultural Revolution Paves the Way After buying up the land of village farmers, wealthy landowners enclosed their land with fences or hedges. The increase in their landholdings enabled them to cultivate larger fields. Within these larger fields, called **enclosures**, landowners experimented with more productive seeding and harvesting methods to boost crop yields. The enclosure movement had two important results. First, landowners tried new agricultural methods. Second, large landowners forced small farmers to become tenant farmers or to give up farming and move to the cities.

Jethro Tull was one of the first of these scientific farmers. He saw that the usual way of sowing seed by scattering it across the ground was wasteful. Many seeds failed to take root. He solved this problem with an invention called the seed drill in about 1701. It allowed farmers to sow seeds in well-spaced rows at specific depths. A larger share of the seeds took root, boosting crop yields.

Rotating Crops The process of **crop rotation** proved to be one of the best developments by the scientific farmers. The process improved upon older methods of crop rotation, such as the medieval three-field system discussed in Chapter 14. One year, for example, a farmer might plant a field with wheat, which exhausted soil nutrients. The next year he planted a root crop, such as turnips, to restore nutrients. This might be followed in turn by barley and then clover.

▶ An English farmer plants his fields in the early 1700s using a seed drill.

Livestock breeders improved their methods too. In the 1700s, for example, Robert Bakewell increased his mutton (sheep meat) output by allowing only his best sheep to breed. Other farmers followed Bakewell's lead. Between 1700 and 1786, the average weight for lambs climbed from 18 to 50 pounds. As food supplies increased and living conditions improved, England's population mushroomed. An increasing population boosted the demand for food and goods such as cloth. As farmers lost their land to large enclosed farms, many became factory workers.

A. Answer It pushed farmers off the land, sent workers to the cities, and created a ready market for new goods.

MAIN IDEA

Recognizing Effects

How did population growth spur the Industrial Revolution?

Why the Industrial Revolution Began in England In addition to a large population of workers, the small island country had extensive natural resources. **Industrialization**, which is the process of developing machine production of goods, required such resources. These natural resources included

- water power and coal to fuel the new machines
- iron ore to construct machines, tools, and buildings
- rivers for inland transportation
- harbors from which merchant ships set sail

In addition to its natural resources, Britain had an expanding economy to support industrialization. Businesspeople invested in the manufacture of new inventions. Britain's highly developed banking system also contributed to the country's industrialization. People were encouraged by the availability of bank loans to invest in new machinery and expand their operations. Growing overseas trade, economic prosperity, and a climate of progress led to the increased demand for goods.

Britain's political stability gave the country a tremendous advantage over its neighbors. Though Britain took part in many wars during the 1700s, none occurred on British soil. Their military successes gave the British a positive attitude. Parliament also passed laws to help encourage and protect business ventures. Other countries had some of these advantages. But Britain had all the **factors of production**, the resources needed to produce goods and services that the Industrial Revolution required. They included land, labor, and capital (or wealth).

Inventions Spur Industrialization

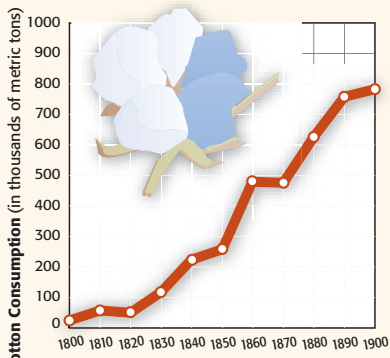
In an explosion of creativity, inventions now revolutionized industry. Britain's textile industry clothed the world in wool, linen, and cotton. This industry was the first to be transformed. Cloth merchants boosted their profits by speeding up the process by which spinners and weavers made cloth.

Changes in the Textile Industry As you will learn in the feature on textile technology on page 719, by 1800, several major inventions had modernized the cotton industry. One invention led to another. In 1733, a machinist named John Kay made a shuttle that sped back and forth on wheels. This flying shuttle, a boat-shaped piece

Textiles Industrialize First

The Industrial Revolution that began in Britain was spurred by a revolution in technology. It started in the textile industry, where inventions in the late 1700s transformed the manufacture of cloth. The demand for clothing in Britain had greatly increased as a result of the population boom caused by the agricultural revolution. These developments, in turn, had an impact worldwide. For example, the consumption of cotton rose dramatically in Britain (see graph at right). This cotton came from plantations in the American South, where cotton production skyrocketed from 1790 to 1810 in response to demand from English textile mills.

British Cotton Consumption, 1800–1900



Source: *European Historical Statistics, 1750–1975*

▶ John Kay's flying shuttle (below) speedily carried threads of yarn back and forth when the weaver pulled a handle on the loom. The flying shuttle greatly increased the productivity of weavers.

▲ Flying shuttle

Patterns of Interaction

Technology Transforms an Age: The Industrial and Electronic Revolutions

Inventions in the textile industry started in Britain and brought about the Industrial Revolution. This revolution soon spread to other countries. The process of industrialization is still spreading around the world, especially in developing countries. A similar technological revolution is occurring in electronics today, transforming the spread of information around the world.

Connect *to* Today

1. **Synthesizing** How might the technological innovation and industrialization that took place in the textile industry during the Industrial Revolution have provided a model for other industries?

See Skillbuilder Handbook, Page R21.

2. **Recognizing Effects** Research the textile industry today to learn how it has been affected by new technology, including computerization. Prepare a two-paragraph summary on the effects of the new technology.

History in Depth

Inventions in America

In the United States, American inventors worked at making railroad travel more comfortable, inventing adjustable upholstered seats. They also revolutionized agriculture, manufacturing, and communications:

1831 Cyrus McCormick's reaper boosted American wheat production.

1837 Samuel F. B. Morse, a New England painter, first sent electrical signals over a telegraph.

1851 I. M. Singer improved the sewing machine by inventing a foot treadle (see photograph).

1876 Scottish-born inventor Alexander Graham Bell patented the telephone.

INTEGRATED TECHNOLOGY

INTERNET ACTIVITY Create a photo exhibit on American inventions of the 19th century. Include the name of the inventor and the date with each photograph. Go to **classzone.com** for your research.

of wood to which yarn was attached, doubled the work a weaver could do in a day. Because spinners could not keep up with these speedy weavers, a cash prize attracted contestants to produce a better spinning machine. Around 1764, a textile worker named James Hargreaves invented a spinning wheel he named after his daughter. His spinning jenny allowed one spinner to work eight threads at a time.

At first, textile workers operated the flying shuttle and the spinning jenny by hand. Then, Richard Arkwright invented the water frame in 1769. This machine used the waterpower from rapid streams to drive spinning wheels. In 1779, Samuel Crompton combined features of the spinning jenny and the water frame to produce the spinning mule. The spinning mule made thread that was stronger, finer, and more consistent than earlier spinning machines. Run by waterpower, Edmund Cartwright's power loom sped up weaving after its invention in 1787.

MAIN IDEA

Summarizing

What inventions transformed the textile industry?

B. Answer flying shuttle; spinning jenny; water frame; spinning mule; power loom

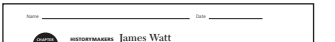
The water frame, the spinning mule, and the power loom were bulky and expensive machines. They took the work of spinning and weaving out of the house. Wealthy textile merchants set up the machines in large buildings called **factories**. Factories needed waterpower, so the first ones were built near rivers and streams:

PRIMARY SOURCE

A great number of streams . . . furnish water-power adequate to turn many hundred mills: they afford the element of water, indispensable for scouring, bleaching, printing, dyeing, and other processes of manufacture: and when collected in their larger channels, or employed to feed canals, they supply a superior inland navigation, so important for the transit of raw materials and merchandise.

EDWARD BAINS, *The History of Cotton Manufacture in Great Britain* (1835)

England's cotton came from plantations in the American South in the 1790s. Removing seeds from the raw cotton by hand was hard work. In 1793, an American inventor named Eli Whitney invented a machine to speed the chore. His cotton gin multiplied the amount of cotton that could be cleaned. American cotton production skyrocketed from 1.5 million pounds in 1790 to 85 million pounds in 1810.


Name _____ Date _____
HISTORYMAKERS James Watt

Improvements in Transportation

Progress in the textile industry spurred other industrial improvements. The first such development, the steam engine, stemmed from the search for a cheap, convenient source of power. As early as 1705, coal miners were using steam-powered pumps to remove water from deep mine shafts. But this early model of a steam engine gobbled great quantities of fuel, making it expensive to run.

Watt's Steam Engine James Watt, a mathematical instrument maker at the University of Glasgow in Scotland, thought about the problem for two years. In 1765, Watt figured out a way to make the steam engine work faster and more efficiently while burning less fuel. In 1774, Watt joined with a businessman named Matthew Boulton. Boulton was an **entrepreneur** (AHN•truh•pruh•NUR), a person who organizes, manages, and takes on the risks of a business. He paid Watt a salary and encouraged him to build better engines.

Water Transportation Steam could also propel boats. An American inventor named Robert Fulton ordered a steam engine from Boulton and Watt. He built a steamboat called the *Clermont*, which made its first successful trip in 1807. The *Clermont* later ferried passengers up and down New York's Hudson River.

In England, water transportation improved with the creation of a network of canals, or human-made waterways. By the mid-1800s, 4,250 miles of inland channels slashed the cost of transporting both raw materials and finished goods.

Road Transportation British roads improved, too, thanks largely to the efforts of John McAdam, a Scottish engineer. Working in the early 1800s, McAdam equipped road beds with a layer of large stones for drainage. On top, he placed a carefully smoothed layer of crushed rock. Even in rainy weather heavy wagons could travel over the new "macadam" roads without sinking in mud.

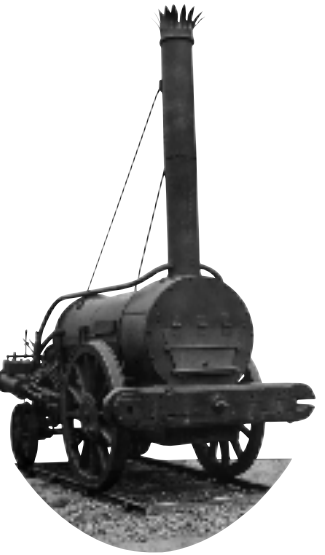
Private investors formed companies that built roads and then operated them for profit. People called the new roads turnpikes because travelers had to stop at tollgates (turnstiles or turnpikes) to pay tolls before traveling farther.

The Railway Age Begins

Steam-driven machinery powered English factories in the late 1700s. A steam engine on wheels—the railroad locomotive—drove English industry after 1820.

Steam-Driven Locomotives In 1804, an English engineer named Richard Trevithick won a bet of several thousand dollars. He did this by hauling ten tons of iron over nearly ten miles of track in a steam-driven locomotive. Other British engineers soon built improved versions of Trevithick's locomotive. One of these early

▼ First-class passengers on the Liverpool-Manchester Railway in the 1830s rode in covered cars; all others, in open cars.



▲ George Stephenson's *Rocket*

railroad engineers was George Stephenson. He had gained a solid reputation by building some 20 engines for mine operators in northern England. In 1821, Stephenson began work on the world's first railroad line. It was to run 27 miles from the Yorkshire coal fields to the port of Stockton on the North Sea. In 1825, the railroad opened. It used four locomotives that Stephenson had designed and built.

The Liverpool-Manchester Railroad News of this success quickly spread throughout Britain. The entrepreneurs of northern England wanted a railroad line to connect the port of Liverpool with the inland city of Manchester. The track was laid. In 1829, trials were held to choose the best locomotive for use on the new line. Five engines entered the competition. None could compare with the *Rocket*, designed by Stephenson and his son.

Smoke poured from the *Rocket*'s tall smokestack, and its two pistons pumped to and fro as they drove the front wheels. The locomotive hauled a 13-ton load at an unheard-of speed—more than 24 miles per hour. The Liverpool-Manchester Railway opened officially in 1830. It was an immediate success.

Railroads Revolutionize Life in Britain The invention and perfection of the locomotive had at least four major effects. First, railroads spurred industrial growth by giving manufacturers a cheap way to transport materials and finished products. Second, the railroad boom created hundreds of thousands of new jobs for both railroad workers and miners. These miners provided iron for the tracks and coal for the steam engines. Third, the railroads boosted England's agricultural and fishing industries, which could transport their products to distant cities.

Finally, by making travel easier, railroads encouraged country people to take distant city jobs. Also, railroads lured city dwellers to resorts in the countryside. Like a locomotive racing across the country, the Industrial Revolution brought rapid and unsettling changes to people's lives.

C. Answer Canals cut the cost of transporting materials; improved roads fostered the movement of heavy wagons; railroads linked manufacturing cities with raw materials.

MAIN IDEA

Synthesizing

How did improvements in transportation promote industrialization in Britain?

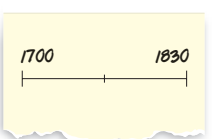
SECTION 1 ASSESSMENT

TERMS & NAMES **1.** For each term or name, write a sentence explaining its significance.

• Industrial Revolution • enclosure • crop rotation • industrialization • factors of production • factory • entrepreneur

USING YOUR NOTES

2. Which of the events listed do you think was the most important? Explain.



MAIN IDEAS

3. What were four factors that contributed to industrialization in Britain?

4. How did rising population help the Industrial Revolution?

5. What American invention aided the British textile industry?

CRITICAL THINKING & WRITING

6. EVALUATING Was the revolution in agriculture necessary to the Industrial Revolution? Explain.

7. MAKING INFERENCES What effect did entrepreneurs have upon the Industrial Revolution?

8. FORMING AND SUPPORTING OPINIONS Do you agree or disagree with the statement that the steam engine was the greatest invention of the Industrial Revolution? Why?

9. WRITING ACTIVITY SCIENCE AND TECHNOLOGY Write a **letter,** as a British government official during the Industrial Revolution, to an official in a nonindustrial nation explaining how the railroad has changed Britain.

CONNECT TO TODAY **CREATING AN ILLUSTRATED NEWS ARTICLE**

Find information on a recent agricultural or technological invention or improvement. Write a two-paragraph **news article** about its economic effects and include an illustration, if possible.

2

Industrialization

Case Study: Manchester

MAIN IDEA	WHY IT MATTERS NOW	TERMS & NAMES
ECONOMICS The factory system changed the way people lived and worked, introducing a variety of problems.	Many less-developed countries are undergoing the difficult process of industrialization today.	• urbanization • middle class

SETTING THE STAGE The Industrial Revolution affected every part of life in Great Britain, but proved to be a mixed blessing. Eventually, industrialization led to a better quality of life for most people. But the change to machine production initially caused human suffering. Rapid industrialization brought plentiful jobs, but it also caused unhealthy working conditions, air and water pollution, and the ills of child labor. It also led to rising class tensions, especially between the working class and the middle class.

Industrialization Changes Life

TAKING NOTES
Outlining Organize main ideas and details.

I. Industrialization Changes Life
  A.
  B.
II. Class Tensions Grow

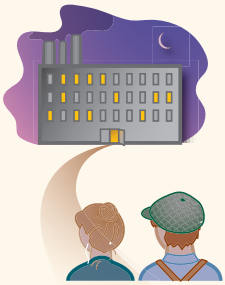
The pace of industrialization accelerated rapidly in Britain. By the 1800s, people could earn higher wages in factories than on farms. With this money, more people could afford to heat their homes with coal from Wales and dine on Scottish beef. They wore better clothing, too, woven on power looms in England's industrial cities. Cities swelled with waves of job seekers.

Industrial Cities Rise For centuries, most Europeans had lived in rural areas. After 1800, the balance shifted toward cities. This shift was caused by the growth of the factory system, where the manufacturing of goods was concentrated in a central location. Between 1800 and 1850, the number of European cities boasting more than 100,000 inhabitants rose from 22 to 47. Most of Europe's urban areas at least doubled in population; some even quadrupled. This period was one of **urbanization**—city building and the movement of people to cities.

◀ As cities grew, people crowded into tenements and row houses such as these in London.

The Day of a Child Laborer, William Cooper

William Cooper began working in a textile factory at the age of ten. He had a sister who worked upstairs in the same factory. In 1832, Cooper was called to testify before a parliamentary committee about the conditions among child laborers in the textile industry. The following sketch of his day is based upon his testimony.



5 A.M. The workday began. Cooper and his sister rose as early as 4:00 or 4:30 in order to get to the factory by 5:00. Children usually ate their breakfast on the run.

12 NOON The children were given a 40-minute break for lunch. This was the only break they received all day.

Factories developed in clusters because entrepreneurs built them near sources of energy, such as water and coal. Major new industrial centers sprang up between the coal-rich area of southern Wales and the Clyde River valley in Scotland. But the biggest of these centers developed in England. (See map on page 715.)

Britain's capital, London, was the country's most important city. It had a population of about one million people by 1800. During the 1800s, its population exploded, providing a vast labor pool and market for new industry. London became Europe's largest city, with twice as many people as its closest rival (Paris). Newer cities challenged London's industrial leadership. Birmingham and Sheffield became iron-smelting centers. Leeds and Manchester dominated textile manufacturing. Along with the port of Liverpool, Manchester formed the center of Britain's bustling cotton industry. During the 1800s, Manchester experienced rapid growth from around 45,000 in 1760 to 300,000 by 1850.

Living Conditions Because England's cities grew rapidly, they had no development plans, sanitary codes, or building codes. Moreover, they lacked adequate housing, education, and police protection for the people who poured in from the countryside to seek jobs. Most of the unpaved streets had no drains, and garbage collected in heaps on them. Workers lived in dark, dirty shelters, with whole families crowding into one bedroom. Sickness was widespread. Epidemics of the deadly disease cholera regularly swept through the slums of Great Britain's industrial cities. In 1842, a British government study showed an average life span to be 17 years for working-class people in one large city, compared with 38 years in a nearby rural area.

Elizabeth Gaskell's *Mary Barton* (1848) is a work of fiction. But it presents a startlingly accurate portrayal of urban life experienced by many at the time. Gaskell provides a realistic description of the dank cellar dwelling of one family in a Manchester slum:

▼ Elizabeth Gaskell (1810–1865) was a British writer whose novels show a sympathy for the working class.

PRIMARY SOURCE

You went down one step even from the foul area into the cellar in which a family of human beings lived. It was very dark inside. The window-panes many of them were broken and stuffed with rags . . . . the smell was so fetid [foul] as almost to knock the two men down. . . . they began to penetrate the thick darkness of the place, and to see three or four little children rolling on the damp, nay wet brick floor, through which the stagnant, filthy moisture of the street oozed up.

ELIZABETH GASKELL, *Mary Barton*

A. Answer by describing their terrible living conditions

MAIN IDEA

Analyzing Primary Sources

How does Gaskell indicate her sympathy for the working class in this passage?

But not everyone in urban areas lived miserably. Well-to-do merchants and factory owners often built luxurious homes in the suburbs.

3 P.M. The children often became drowsy during the afternoon or evening hours. In order to keep them awake, adult overseers sometimes whipped the children.

6 P.M. There was no break allowed for an evening meal. Children again ate on the run.

9 P.M. William Cooper's day ended after an exhausting 16-hour shift at work.

11 P.M. Cooper's sister worked another two hours even though she had to be back at work at 5:00 the next morning.

Working Conditions To increase production, factory owners wanted to keep their machines running as many hours as possible. As a result, the average worker spent 14 hours a day at the job, 6 days a week. Work did not change with the seasons, as it did on the farm. Instead, work remained the same week after week, year after year.

Industry also posed new dangers for workers. Factories were seldom well lit or clean. Machines injured workers. A boiler might explode or a drive belt might catch an arm. And there was no government program to provide aid in case of injury. The most dangerous conditions of all were found in coal mines. Frequent accidents, damp conditions, and the constant breathing of coal dust made the average miner's life span ten years shorter than that of other workers. Many women and children were employed in the mining industry because they were the cheapest source of labor.

Class Tensions Grow

Though poverty gripped Britain's working classes, the Industrial Revolution created enormous amounts of wealth in the nation. Most of this new money belonged to factory owners, shippers, and merchants. These people were part of a growing **middle class**, a social class made up of skilled workers, professionals, businesspeople, and wealthy farmers.

B. Answer upper class–landowners and aristocrats; upper middle class–managers, merchants, government employees, doctors, lawyers; lower middle class–factory overseers, skilled workers; a working class of unskilled laborers

MAIN IDEA

Summarizing Describe the social classes in Britain.

The Middle Class The new middle class transformed the social structure of Great Britain. In the past, landowners and aristocrats had occupied the top position in British society. With most of the wealth, they wielded the social and political power. Now some factory owners, merchants, and bankers grew wealthier than the landowners and aristocrats. Yet important social distinctions divided the two wealthy classes. Landowners looked down on those who had made their fortunes in the "vulgar" business world. Not until late in the 1800s were rich entrepreneurs considered the social equals of the lords of the countryside.

Gradually, a larger middle class—neither rich nor poor—emerged. The upper middle class consisted of government employees, doctors, lawyers, and managers of factories, mines, and shops. The lower middle class included factory overseers and such skilled workers as toolmakers, mechanical drafters, and printers. These people enjoyed a comfortable standard of living.

The Working Class During the years 1800 to 1850, however, laborers, or the working class, saw little improvement in their living and working conditions. They watched their livelihoods disappear as machines replaced them. In frustration, some smashed the machines they thought were putting them out of work.

One group of such workers was called the Luddites. They were named after Ned Ludd. Ludd, probably a mythical English laborer, was said to have destroyed weaving machinery around 1779. The Luddites attacked whole factories in northern England beginning in 1811, destroying laborsaving machinery. Outside the factories, mobs of workers rioted, mainly because of poor living and working conditions.

Positive Effects of the Industrial Revolution

Despite the problems that followed industrialization, the Industrial Revolution had a number of positive effects. It created jobs for workers. It contributed to the wealth of the nation. It fostered technological progress and invention. It greatly increased the production of goods and raised the standard of living. Perhaps most important, it provided the hope of improvement in people's lives.

The Industrial Revolution produced a number of other benefits as well. These included healthier diets, better housing, and cheaper, mass-produced clothing. Because the Industrial Revolution created a demand for engineers as well as clerical and professional workers, it expanded educational opportunities.

The middle and upper classes prospered immediately from the Industrial Revolution. For the workers it took longer, but their lives gradually improved during the 1800s. Laborers eventually won higher wages, shorter hours, and better working conditions after they joined together to form labor unions.

Long-Term Effects The long-term effects of the Industrial Revolution are still evident. Most people today in industrialized countries can afford consumer goods that would have been considered luxuries 50 or 60 years ago. In addition, their living and working conditions are much improved over those of workers in the 19th century. Also, profits derived from industrialization produced tax revenues. These funds have allowed local, state, and federal governments to invest in urban improvements and raise the standard of living of most city dwellers.

The economic successes of the Industrial Revolution, and also the problems created by it, were clearly evident in one of Britain's new industrial cities in the 1800s—Manchester.

CASE STUDY: Manchester

The Mills of Manchester

Manchester's unique advantages made it a leading example of the new industrial city. This northern English town had ready access to waterpower. It also had available labor from the nearby countryside and an outlet to the sea at Liverpool.

"From this filthy sewer pure gold flows," wrote Alexis de Tocqueville (ah•lehk•SEE duh TOHK•vihl), the French writer, after he visited Manchester in 1835. Indeed, the industrial giant showed the best and worst of the Industrial Revolution. Manchester's rapid, unplanned growth made it an unhealthy place for the poor people who lived and worked there. But wealth flowed from its factories. It went first to the mill owners and the new middle class. Eventually, although not immediately, the working class saw their standard of living rise as well.

Manchester's business owners took pride in mastering each detail of the manufacturing process. They worked many hours and risked their own money. For their efforts, they were rewarded with high profits. Many erected gracious homes on the outskirts of town.

To provide the mill owners with high profits, workers labored under terrible conditions. Children as young as six joined their parents in the factories. There, for six days a week, they toiled from 6 A.M. to 7 or 8 P.M., with only half an hour for

Industrialization

Industrialization is the process of developing industries that use machines to produce goods. This process not only revolutionizes a country's economy, it also transforms social conditions and class structures.

Effects of Industrialization

Industrialization

Working Conditions
- Industry created many new jobs. Factories were dirty, unsafe, and dangerous. Factory bosses exercised harsh discipline.
- **Long-Term Effect** Workers won higher wages, shorter hours, better conditions.

Social Classes
- Factory workers were overworked and underpaid.
- Overseers and skilled workers rose to lower middle class. Factory owners and merchants formed upper middle class.
- Upper class resented those in middle class who

Long-Term Effect Standard of living generally rose.

Size of Cities
- ties.
- Urban areas doubled, tripled, or quadrupled in size.
- Many cities specialized in certain industries.

Long-Term Effect Suburbs grew as people fled crowded cities.

Living Conditions
- Cities lacked sanitary codes or building controls.
- Housing, water, and social services were scarce.
- Epidemics swept through the city.

Long-Term Effect Housing, diet, and clothing improved.

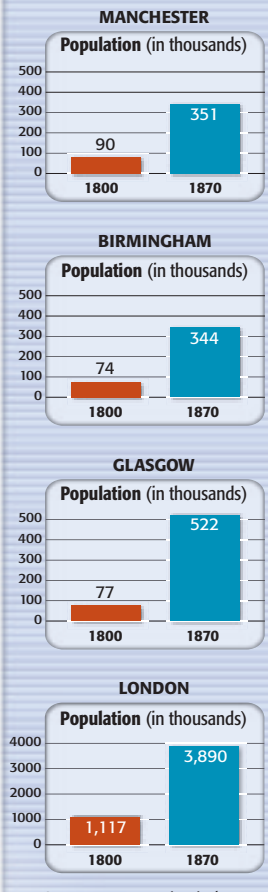
▼ This engraving shows urban growth and industrial pollution in Manchester.

INTEGRATED TECHNOLOGY

RESEARCH LINKS For more on industrialization, go to **classzone.com**

DATA FILE

GROWTH OF CITIES



Source: European Historical Statistics, 1750–1975

Connect *to* Today

1. **Recognizing Effects** What were some advantages and disadvantages of industrialization?

See Skillbuilder Handbook, page R6.

2. **Making Inferences** Many nations around the world today are trying to industrialize. What do you think they hope to gain from that process?

Connect to Today

Child Labor Today

To save on labor costs in the 1990s and 2000s, many corporations moved their manufacturing operations overseas to developing countries. There, in sweatshops, young children work long hours under wretched conditions. They are unprotected by child labor laws. For mere pennies per hour, children weave carpets, sort vegetables, or assemble expensive athletic shoes.

Several organizations are working to end child labor, including the Child Welfare League of America and the International Labor Rights Fund.

lunch and an hour for dinner. To keep the children awake, mill supervisors beat them. Tiny hands repaired broken threads in Manchester's spinning machines, replaced thread in the bobbins, or swept up cotton fluff. The dangerous machinery injured many children. The fluff filled their lungs and made them cough.

Until the first Factory Act passed in 1819, the British government exerted little control over child labor in Manchester and other factory cities. The act restricted working age and hours. For years after the act passed, young children still did heavy, dangerous work in Manchester's factories.

Putting so much industry into one place polluted the natural environment. The coal that powered factories and warmed houses blackened the air. Textile dyes and other wastes poisoned Manchester's Irwell River. An eyewitness observer wrote the following description of the river in 1862:

PRIMARY SOURCE

Steam boilers discharge into it their seething contents, and drains and sewers their fetid impurities; till at length it rolls on—here between tall dingy walls, there under precipices of red sandstone—considerably less a river than a flood of liquid manure.

HUGH MILLER, *"Old Red Sandstone"*

Like other new industrial cities of the 19th century, Manchester produced consumer goods and created wealth on a grand scale. Yet, it also stood as a reminder of the ills of rapid and unplanned industrialization.

As you will learn in Section 3, the industrialization that began in Great Britain spread to the United States and to continental Europe in the 1800s.

MAIN IDEA

Drawing Conclusions

Whose interests did child labor serve?

C. Possible Answer Factory owners profited by being able to pay children low wages; families also benefited from the wages children earned.

SECTION 2 ASSESSMENT

TERMS & NAMES **1.** For each term or name, write a sentence explaining its significance.

- urbanization
- middle class

USING YOUR NOTES

2. Which change brought about by industrialization had the greatest impact?

I. Industrialization Changes Life
  A.
  B.
II. Class Tensions Grow

MAIN IDEAS

3. Why did people flock to British cities and towns during the Industrial Revolution?

4. What social class expanded as a result of industrialization?

5. What were some of the negative effects of the rapid growth of Manchester?

CRITICAL THINKING & WRITING

6. SUMMARIZING How did industrialization contribute to city growth?

7. EVALUATING How were class tensions affected by the Industrial Revolution?

8. FORMING AND SUPPORTING OPINIONS The Industrial Revolution has been described as a mixed blessing. Do you agree or disagree? Support your answer with text references.

9. WRITING ACTIVITY ECONOMICS As a factory owner during the Industrial Revolution, write a **letter** to a newspaper justifying working conditions in your factory.

CONNECT TO TODAY **CREATING A COMPARISON CHART**

Make a **comparison chart** listing information on child labor in three developing nations—one each from Asia, Africa, and Latin America—and compare with data from the United States.

Steam train on the Nancha Bank, China

Power plant in West Virginia, United States

3

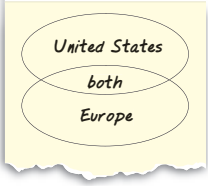
Industrialization Spreads

MAIN IDEA	WHY IT MATTERS NOW	TERMS & NAMES
EMPIRE BUILDING The industrialization that began in Great Britain spread to other parts of the world.	The Industrial Revolution set the stage for the growth of modern cities and a global economy.	• stock • corporation

SETTING THE STAGE Great Britain's favorable geography and its financial systems, political stability, and natural resources sparked industrialization. British merchants built the world's first factories. When these factories prospered, more laborsaving machines and factories were built. Eventually, the Industrial Revolution that had begun in Britain spread both to the United States and to continental Europe. Countries that had conditions similar to those in Britain were ripe for industrialization.

Industrial Development in the United States

TAKING NOTES
Comparing Use a Venn diagram to compare industrialization in the United States and in Europe.



The United States possessed the same resources that allowed Britain to mechanize its industries. America had fast-flowing rivers, rich deposits of coal and iron ore, and a supply of laborers made up of farm workers and immigrants. During the War of 1812, Britain blockaded the United States, trying to keep it from engaging in international trade. This blockade forced the young country to use its own resources to develop independent industries. Those industries would manufacture the goods the United States could no longer import.

Industrialization in the United States As in Britain, industrialization in the United States began in the textile industry. Eager to keep the secrets of industrialization to itself, Britain had forbidden engineers, mechanics, and toolmakers to leave the country. In 1789, however, a young British mill worker named Samuel Slater emigrated to the United States. There, Slater built a spinning machine from memory and a partial design. The following year, Moses Brown opened the first factory in the United States to house Slater's machines in Pawtucket, Rhode Island. But the Pawtucket factory mass-produced only one part of finished cloth, the thread.

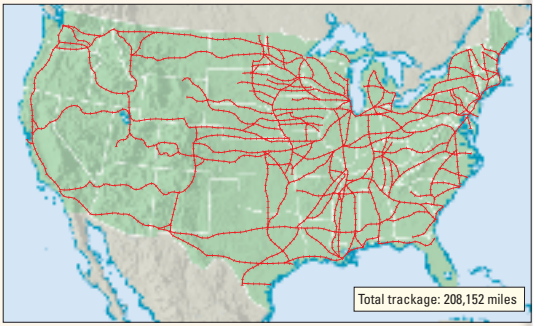
▼ Teenage mill girls at a Georgia cotton mill

In 1813, Francis Cabot Lowell of Boston and four other investors revolutionized the American textile industry. They mechanized every stage in the manufacture of cloth. Their weaving factory in Waltham, Massachusetts, earned them enough money to fund a larger

The Growth of Railroads in the United States

Railroad System, 1840

Railroad System, 1890



GEOGRAPHY SKILLBUILDER: Interpreting Maps

1. **Region** *In what part of the country were the first railroads built? By 1890, what other part of the country was densely covered by railroad tracks?*
2. **Movement** *In what direction did the railroads help people move across the country?*

operation in another Massachusetts town. When Lowell died, the remaining partners named the town after him. By the late 1820s, Lowell, Massachusetts, had become a booming manufacturing center and a model for other such towns.

Thousands of young single women flocked from their rural homes to work as mill girls in factory towns. There, they could make higher wages and have some independence. However, to ensure proper behavior, they were watched closely inside and outside the factory by their employers. The mill girls toiled more than 12 hours a day, 6 days a week, for decent wages. For some, the mill job was an alternative to being a servant and was often the only other job open to them:

PRIMARY SOURCE

Country girls were naturally independent, and the feeling that at this new work the few hours they had of everyday leisure were entirely their own was a satisfaction to them. They preferred it to going out as "hired help." It was like a young man's pleasure in entering upon business for himself. Girls had never tried that experiment before, and they liked it.

LUCY LARCOM, *A New England Girlhood*

MAIN IDEA

Analyzing Primary Sources

Why did Lucy Larcom think mill work benefited young women?

A. Answer Larcom believed that mill work offered women more free time and suited the independence of their country upbringing.

Textiles led the way, but clothing manufacture and shoemaking also underwent mechanization. Especially in the Northeast, skilled workers and farmers had formerly worked at home. Now they labored in factories in towns and cities such as Waltham, Lowell, and Lawrence, Massachusetts.

Later Expansion of U.S. Industry The Northeast experienced much industrial growth in the early 1800s. Nonetheless, the United States remained primarily agricultural until the Civil War ended in 1865. During the last third of the 1800s, the country experienced a technological boom. As in Britain, a number of causes contributed to this boom. These included a wealth of natural resources, among them oil, coal, and iron; a burst of inventions, such as the electric light bulb and the telephone; and a swelling urban population that consumed the new manufactured goods.

Also, as in Britain, railroads played a major role in America's industrialization. Cities like Chicago and Minneapolis expanded rapidly during the late 1800s. This

was due to their location along the nation's expanding railroad lines. Chicago's stockyards and Minneapolis's grain industries prospered by selling products to the rest of the country. Indeed, the railroads themselves proved to be a profitable business. By the end of the 1800s, a limited number of large, powerful companies controlled more than two-thirds of the nation's railroad tracks. Businesses of all kinds began to merge as the railroads had. Smaller companies joined together to form a larger one.

The Rise of Corporations Building large businesses like railroads required a great deal of money. To raise the money, entrepreneurs sold shares of **stock**, or certain rights of ownership. Thus people who bought stock became part owners of these businesses, which were called corporations. A **corporation** is a business owned by stockholders who share in its profits but are not personally responsible for its debts. Corporations were able to raise the large amounts of capital needed to invest in industrial equipment.

In the late 1800s, large corporations such as Standard Oil (founded by John D. Rockefeller) and the Carnegie Steel Company (founded by Andrew Carnegie) sprang up. They sought to control every aspect of their own industries in order to make big profits. Big business—the giant corporations that controlled entire industries—also made big profits by reducing the cost of producing goods. In the United States as elsewhere, workers earned low wages for laboring long hours, while stockholders earned high profits and corporate leaders made fortunes.

Continental Europe Industrializes

European businesses yearned to adopt the "British miracle," the result of Britain's profitable new methods of manufacturing goods. But the troubles sparked by the French Revolution and the Napoleonic wars between 1789 and 1815 had halted trade, interrupted communication, and caused inflation in some parts of the continent. European countries watched the gap widen between themselves and Britain. Even so, industrialization eventually reached continental Europe.

▼ Danish workers labor in a steel mill in this 1885 painting by Peter Severin Kroyer.

Global Impact

Industrialization in Japan

With the beginning of the Meiji era in Japan in 1868, the central government began an ambitious program to transform the country into an industrialized state. It financed textile mills, coal mines, shipyards, and cement and other factories. It also asked private companies to invest in industry.

Some companies had been in business since the 1600s. But new companies sprang up too. Among them was the Mitsubishi company, founded in 1870 and still in business.

The industrializing of Japan produced sustained economic growth for the country. But it also led to strengthening the military and to Japanese imperialism in Asia.

Beginnings in Belgium Belgium led Europe in adopting Britain's new technology. It had rich deposits of iron ore and coal as well as fine waterways for transportation. As in the United States, British skilled workers played a key role in industrializing Belgium.

Samuel Slater had smuggled the design of a spinning machine to the United States. Much like him, a Lancashire carpenter named William Cockerill illegally made his way to Belgium in 1799. He carried secret plans for building spinning machinery. His son John eventually built an enormous industrial enterprise in eastern Belgium. It produced a variety of mechanical equipment, including steam engines and railway locomotives. Carrying the latest British advances, more British workers came to work with Cockerill. Several then founded their own companies in Europe.

Germany Industrializes Germany was politically divided in the early 1800s. Economic isolation and scattered resources hampered countrywide industrialization. Instead, pockets of industrialization appeared, as in the coal-rich Ruhr Valley of west central Germany. Beginning around 1835, Germany began to copy the British model. Germany imported British equipment and engineers. German manufacturers also sent their children to England to learn industrial management.

MAIN IDEA

Analyzing Causes What factors slowed industrialization in Germany?

B. Answer Germany was politically divided, economically isolated, and its resources were scattered.

Most important, Germany built railroads that linked its growing manufacturing cities, such as Frankfurt, with the Ruhr Valley's coal and iron ore deposits. In 1858, a German economist wrote, "Railroads and machine shops, coal mines and iron foundries, spinneries and rolling mills seem to spring up out of the ground, and smokestacks sprout from the earth like mushrooms." Germany's economic strength spurred its ability to develop as a military power. By the late 1800s, a unified, imperial Germany had become both an industrial and a military giant.

Expansion Elsewhere in Europe In the rest of Europe, as in Germany, industrialization during the early 1800s proceeded by region rather than by country. Even in countries where agriculture dominated, pockets of industrialization arose. For example, Bohemia developed a spinning industry. Spain's Catalonia processed more cotton than Belgium. Northern Italy mechanized its textile production, specializing in silk spinning. Serf labor ran factories in regions around Moscow and St. Petersburg.

In France, sustained industrial growth occurred after 1830. French industrialization was more measured and controlled than in other countries because the agricultural economy remained strong. As a result, France avoided the great social and economic problems caused by industrialization. A thriving national market for new French products was created after 1850, when the government began railroad construction.

For a variety of reasons, many European countries did not industrialize. In some nations, the social structure delayed the adoption of new methods of production. The accidents of geography held back others. In Austria-Hungary and Spain, transportation posed great obstacles. Austria-Hungary's mountains defeated railroad builders. Spain lacked both good roads and waterways for canals.

The Impact of Industrialization

The Industrial Revolution shifted the world balance of power. It increased competition between industrialized nations and poverty in less-developed nations.

Rise of Global Inequality Industrialization widened the wealth gap between industrialized and nonindustrialized countries, even while it strengthened their economic ties. To keep factories running and workers fed, industrialized countries required a steady supply of raw materials from less-developed lands. In turn, industrialized countries viewed poor countries as markets for their manufactured products.

Britain led in exploiting its overseas colonies for resources and markets. Soon other European countries, the United States, Russia, and Japan followed Britain's lead, seizing colonies for their economic resources. Imperialism, the policy of extending one country's rule over many other lands, gave even more power and wealth to these already wealthy nations. Imperialism was born out of the cycle of industrialization, the need for resources to supply the factories of Europe, and the development of new markets around the world. (See Chapter 27.)

MAIN IDEA

Clarifying

Why did imperialism grow out of industrialization?

C. Answer

Industrialized countries seized colonies for raw materials and as markets.

Transformation of Society Between 1700 and 1900, revolutions in agriculture, production, transportation, and communication changed the lives of people in Western Europe and the United States. Industrialization gave Europe tremendous economic power. In contrast, the economies of Asia and Africa were still based on agriculture and small workshops. Industrialization revolutionized every aspect of society, from daily life to life expectancy. Despite the hardships early urban workers suffered, population, health, and wealth eventually rose dramatically in all industrialized countries. The development of a middle class created great opportunities for education and democratic participation. Greater democratic participation, in turn, fueled a powerful movement for social reform.

▲ The Crystal Palace Exposition in London in 1851 (shown above) celebrated the "works of industry of all nations."

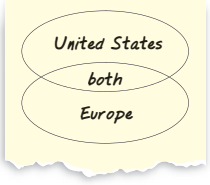
SECTION 3 ASSESSMENT

TERMS & NAMES **1.** For each term or name, write a sentence explaining its significance.

• stock • corporation

USING YOUR NOTES

2. Which development had the most impact in the United States? in continental Europe?



MAIN IDEAS

3. What early industries mechanized in the United States?

4. Why did Belgium lead Europe in adopting industrialization?

5. How did the Industrial Revolution shift the world balance of power?

CRITICAL THINKING & WRITING

6. RECOGNIZING BIAS Go back to the quote from Lucy Larcom on page 730. Do you think her feelings about working in the mill are typical? Why or why not?

7. MAKING INFERENCES Why was Britain unable to keep industrial secrets away from other nations?

8. FORMING AND SUPPORTING OPINIONS What was the most significant effect of the Industrial Revolution?

9. WRITING ACTIVITY EMPIRE BUILDING Draw a **political cartoon** that could have been used by the British government to show their sense of their own superiority over nonindustrialized nations that they planned to colonize.

INTEGRATED TECHNOLOGY **INTERNET ACTIVITY**

Use the Internet to research the economy of a less-developed nation in either Asia, Africa, or South America. Create a **database** of economic statistics for that country.

INTERNET KEYWORD
country profiles

Steam train on the Nancha Bank, China

Power plant in West Virginia, United States

4

Reforming the Industrial World

MAIN IDEA	WHY IT MATTERS NOW	TERMS & NAMES
ECONOMICS The Industrial Revolution led to economic, social, and political reforms.	Many modern social welfare programs developed during this period of reform.	• laissez faire • Adam Smith • capitalism • utilitarianism • socialism • Karl Marx • communism • union • strike

SETTING THE STAGE In industrialized countries in the 19th century, the Industrial Revolution opened a wide gap between the rich and the poor. Business leaders believed that governments should stay out of business and economic affairs. Reformers, however, felt that governments needed to play an active role to improve conditions for the poor. Workers also demanded more rights and protection. They formed labor unions to increase their influence.

TAKING NOTES

Summarizing Use a chart to summarize the characteristics of capitalism and socialism.

Capitalism	Socialism
1.	1.
2.	2.
3.	3.

The Philosophers of Industrialization

The term **laissez faire** (LEHS•ay•FAIR) refers to the economic policy of letting owners of industry and business set working conditions without interference. This policy favors a free market unregulated by the government. The term is French for "let do," and by extension, "let people do as they please."

Laissez-faire Economics Laissez-faire economics stemmed from French economic philosophers of the Enlightenment. They criticized the idea that nations grow wealthy by placing heavy tariffs on foreign goods. In fact, they argued, government regulations only interfered with the production of wealth. These philosophers believed that if government allowed free trade—the flow of commerce in the world market without government regulation—the economy would prosper.

Adam Smith, a professor at the University of Glasgow, Scotland, defended the idea of a free economy, or free markets, in his 1776 book *The Wealth of Nations*. According to Smith, economic liberty guaranteed economic progress. As a result, government should not interfere. Smith's arguments rested on what he called the three natural laws of economics:

- the law of self-interest—People work for their own good.
- the law of competition—Competition forces people to make a better product.
- the law of supply and demand—Enough goods would be produced at the lowest possible price to meet demand in a market economy.

The Economists of Capitalism Smith's basic ideas were supported by British economists Thomas Malthus and David Ricardo. Like Smith, they believed that natural laws governed economic life. Their important ideas were the foundation of laissez-faire capitalism. **Capitalism** is an economic system in which the factors of production are privately owned and money is invested in business ventures to make a profit. These ideas also helped bring about the Industrial Revolution.

In *An Essay on the Principle of Population*, written in 1798, Thomas Malthus argued that population tended to increase more rapidly than the food supply. Without wars and epidemics to kill off the extra people, most were destined to be poor and miserable. The predictions of Malthus seemed to be coming true in the 1840s.

David Ricardo, a wealthy stockbroker, took Malthus's theory one step further in his book, *Principles of Political Economy and Taxation* (1817). Like Malthus, Ricardo believed that a permanent underclass would always be poor. In a market system, if there are many workers and abundant resources, then labor and resources are cheap. If there are few workers and scarce resources, then they are expensive. Ricardo believed that wages would be forced down as population increased.

A. **Answer** Malthus said population growth could lead to starvation. Ricardo said it caused low wages.

MAIN IDEA

Summarizing What did Malthus and Ricardo say about the effects of population growth?

Laissez-faire thinkers such as Smith, Malthus, and Ricardo opposed government efforts to help poor workers. They thought that creating minimum wage laws and better working conditions would upset the free market system, lower profits, and undermine the production of wealth in society.

The Rise of Socialism

In contrast to laissez-faire philosophy, which advised governments to leave business alone, other theorists believed that governments should intervene. These thinkers believed that wealthy people or the government must take action to improve people's lives. The French writer Alexis de Tocqueville gave a warning:

PRIMARY SOURCE

Consider what is happening among the working classes. . . . Do you not see spreading among them, little by little, opinions and ideas that aim not to overturn such and such a ministry, or such laws, or such a government, but society itself, to shake it to the foundations upon which it now rests?

ALEXIS DE TOCQUEVILLE, 1848 speech

Utilitarianism English philosopher Jeremy Bentham modified the ideas of Adam Smith. In the late 1700s, Bentham introduced the philosoophy of **utilitarianism**. Bentham wrote his most influential works in the late 1700s. According to Bentham's theory, people should judge ideas, institutions, and actions on the basis of their utility, or usefulness. He argued that the government should try to promote the greatest good for the greatest number of people. A government policy was only useful if it promoted this goal. Bentham believed that in general the individual should be free to pursue his or her own advantage without interference from the state.

B. **Answer** He wanted to equalize the distribution of wealth and give the poor a break; he favored a cooperative system of agriculture.

MAIN IDEA

Clarifying How did Mill want to change the economic system?

John Stuart Mill, a philosopher and economist, led the utilitarian movement in the 1800s. Mill came to question unregulated capitalism. He believed it was wrong that workers should lead deprived lives that sometimes bordered on starvation. Mill wished to help ordinary working people with policies that would lead to a more equal division of profits. He also favored a cooperative system of agriculture and women's rights, including the right to vote. Mill called for the government to do away with great differences in wealth. Utilitarians also pushed for reforms in the legal and prison systems and in education.

History Makers

Adam Smith
1723–1790

In his book *The Wealth of Nations*, Smith argued that if individuals freely followed their own self-interest, the world would be an orderly and progressive place. Social harmony would result without any government direction, "as if by an invisible hand."

Smith applied an invisible hand of his own. After his death, people discovered that he had secretly donated large sums of his income to charities.

INTEGRATED TECHNOLOGY

RESEARCH LINKS For more on Adam Smith, go to **classzone.com**

Utopian Ideas Other reformers took an even more active approach. Shocked by the misery and poverty of the working class, a British factory owner named Robert Owen improved working conditions for his employees. Near his cotton mill in New Lanark, Scotland, Owen built houses, which he rented at low rates. He prohibited children under ten from working in the mills and provided free schooling.

Then, in 1824, he traveled to the United States. He founded a cooperative community called New Harmony in Indiana, in 1825. He intended this community to be a utopia, or perfect living place. New Harmony lasted only three years but inspired the founding of other communities.

Socialism French reformers such as Charles Fourier (FUR•ee•AY), Saint-Simon (san see•MOHN), and others sought to offset the ill effects of industrialization with a new economic system called socialism. In **socialism**, the factors of production are owned by the public and operate for the welfare of all.

Socialism grew out of an optimistic view of human nature, a belief in progress, and a concern for social justice. Socialists argued that the government should plan the economy rather than depend on free-market capitalism to do the job. They argued that government control of factories, mines, railroads, and other key industries would end poverty and promote equality. Public ownership, they believed, would help workers, who were at the mercy of their employers. Some socialists—such as Louis Blanc—advocated change through extension of the right to vote.

History Makers

Karl Marx
1818–1883

Karl Marx studied philosophy at the University of Berlin before he turned to journalism and economics. In 1849, Marx joined the flood of radicals who fled continental Europe for England. He had declared in *The Communist Manifesto* that "the working men have no country."

Marx's theories of socialism and the inevitable revolt of the working class made him little money. He earned a meager living as a journalist. His wealthy coauthor and fellow German, Friedrich Engels, gave Marx financial aid.

INTEGRATED TECHNOLOGY

RESEARCH LINKS For more on Karl Marx, go to **classzone.com**

Marxism: Radical Socialism

The writings of a German journalist named **Karl Marx** introduced the world to a radical type of socialism called Marxism. Marx and Friedrich Engels, a German whose father owned a textile mill in Manchester, outlined their ideas in a 23-page pamphlet called *The Communist Manifesto*.

The Communist Manifesto In their manifesto, Marx and Engels argued that human societies have always been divided into warring classes. In their own time, these were the middle class "haves" or employers, called the bourgeoisie (BUR•zhwah•ZEE), and the "have-nots" or workers, called the proletariat (PROH•lih•TAIR•ee•iht). While the wealthy controlled the means of producing goods, the poor performed backbreaking labor under terrible conditions. This situation resulted in conflict:

PRIMARY SOURCE

Freeman and slave, patrician and plebeian, lord and serf, guild-master and journeyman, in a word, oppressor and oppressed, stood in constant opposition to one another, carried on an uninterrupted, now hidden, now open fight, a fight that each time ended, either in a revolutionary reconstitution of society at large, or in the common ruin of the contending classes.

KARL MARX and **FRIEDRICH ENGELS**, *The Communist Manifesto* (1848)

According to Marx and Engels, the Industrial Revolution had enriched the wealthy and impoverished the poor. The two writers predicted that the workers would overthrow the owners: "The proletarians have nothing to lose but their chains. They have a world to win. Workingmen of all countries, unite."

C. Possible Answer Marx and Engels believed the working class and the owners were natural enemies.

MAIN IDEA

Summarizing
What were the ideas of Marx and Engels concerning relations between the owners and the working class?

Capitalism vs. Socialism

The economic system called capitalism developed gradually over centuries, beginning in the late Middle Ages. Because of the ways industrialization changed society, some people began to think that capitalism led to certain problems, such as the abuse of workers. They responded by developing a new system of economic ideas called socialism.

Capitalism	Socialism
• Individuals and businesses own property and the means of production.	• The community or the state should own property and the means of production.
• Progress results when individuals follow their own self-interest.	• Progress results when a community of producers cooperate for the good of all.
• Businesses follow their own self-interest by competing for the consumer's money. Each business tries to produce goods or services that are better and less expensive than those of competitors.	• Socialists believe that capitalist employers take advantage of workers. The community or state must act to protect workers.
• Consumers compete to buy the best goods at the lowest prices. This competition shapes the market by affecting what businesses are able to sell.	• Capitalism creates unequal distribution of wealth and material goods. A better system is to distribute goods according to each person's need.
• Government should not interfere in the economy because competition creates efficiency in business.	• An unequal distribution of wealth and material goods is unfair. A better system is to distribute goods according to each person's need.

SKILLBUILDER: Interpreting Charts

1. **Developing Historical Perspective** *Consider the following people from 19th-century Britain: factory worker, shop owner, factory owner, unemployed artisan. Which of them would be most likely to prefer capitalism and which would prefer socialism? Why?*
2. **Forming and Supporting Opinions** *Which system of economic ideas seems most widespread today? Support your opinion.*

The Future According to Marx Marx believed that the capitalist system, which produced the Industrial Revolution, would eventually destroy itself in the following way. Factories would drive small artisans out of business, leaving a small number of manufacturers to control all the wealth. The large proletariat would revolt, seize the factories and mills from the capitalists, and produce what society needed. Workers, sharing in the profits, would bring about economic equality for all people. The workers would control the government in a "dictatorship of the proletariat." After a period of cooperative living and education, the state or government would wither away as a classless society developed.

Marx called this final phase pure communism. Marx described **communism** as a form of complete socialism in which the means of production—all land, mines, factories, railroads, and businesses—would be owned by the people. Private property would in effect cease to exist. All goods and services would be shared equally.

Published in 1848, *The Communist Manifesto* produced few short-term results. Though widespread revolts shook Europe during 1848 and 1849, Europe's leaders eventually put down the uprisings. Only after the turn of the century did the fiery Marxist pamphlet produce explosive results. In the 1900s, Marxism inspired revolutionaries such as Russia's Lenin, China's Mao Zedong, and Cuba's Fidel Castro. These leaders adapted Marx's beliefs to their own specific situations and needs.

Connect *to* Today

Communism Today

Communism expanded to all parts of the world during the Cold War that followed the end of World War II. (See map on page 963.) At the peak of Communist expansion in the 1980s, about 20 nations were Communist-controlled, including two of the world's largest—China and the Soviet Union. However, dissatisfaction with the theories of Karl Marx had been developing.

Eventually, most Communist governments were replaced. Today, there are only five Communist countries—China, North Korea, Vietnam, and Laos in Asia and Cuba in the Caribbean. (See map above.)

In *The Communist Manifesto*, Marx and Engels stated their belief that economic forces alone dominated society. Time has shown, however, that religion, nationalism, ethnic loyalties, and a desire for democratic reforms may be as strong influences on history as economic forces. In addition, the gap between the rich and the poor within the industrialized countries failed to widen in the way that Marx and Engels predicted, mostly because of the various reforms enacted by governments.

Labor Unions and Reform Laws

Factory workers faced long hours, dirty and dangerous working conditions, and the threat of being laid off. By the 1800s, working people became more active in politics. To press for reforms, workers joined together in voluntary labor associations called **unions**.

Unionization A union spoke for all the workers in a particular trade. Unions engaged in collective bargaining, negotiations between workers and their employers. They bargained for better working conditions and higher pay. If factory owners refused these demands, union members could **strike**, or refuse to work.

Skilled workers led the way in forming unions because their special skills gave them extra bargaining power. Management would have trouble replacing such skilled workers as carpenters, printers, and spinners. Thus, the earliest unions helped the lower middle class more than they helped the poorest workers.

The union movement underwent slow, painful growth in both Great Britain and the United States. For years, the British government denied workers the right to form unions. The government saw unions as a threat to social order and stability. Indeed, the Combination Acts of 1799 and 1800 outlawed unions and strikes. Ignoring the threat of jail or job loss, factory workers joined unions anyway. Parliament finally repealed the Combination Acts in 1824. After 1825, the British government unhappily tolerated unions.

British unions had shared goals of raising wages for their members and improving working conditions. By 1875, British trade unions had won the right to strike and picket peacefully. They had also built up a membership of about 1 million people.

In the United States, skilled workers had belonged to unions since the early 1800s. In 1886, several unions joined together to form the organization that would become the American Federation of Labor (AFL). A series of successful strikes won AFL members higher wages and shorter hours.

Reform Laws Eventually, reformers and unions forced political leaders to look into the abuses caused by industrialization. In both Great Britain and the United States, new laws reformed some of the worst abuses of industrialization. In the 1820s and 1830s, for example, Parliament began investigating child labor and working conditions in factories and mines. As a result of its findings, Parliament passed the Factory Act of 1833. The new law made it illegal to hire children under 9 years old. Children from the ages of 9 to 12 could not work more than 8 hours a day. Young people from 13 to 17 could not work more than 12 hours. In 1842, the Mines Act prevented women and children from working underground.

MAIN IDEA

Summarizing

What were some of the important reform bills passed in Britain during this period?

D. Answer Factory Act of 1833; Mines Act of 1842; Ten Hours Act of 1847

In 1847, the Parliament passed a bill that helped working women as well as their children. The Ten Hours Act of 1847 limited the workday to ten hours for women and children who worked in factories.

Reformers in the United States also passed laws to protect child workers. In 1904, a group of progressive reformers organized the National Child Labor Committee to end child labor. Arguing that child labor lowered wages for all workers, union members joined the reformers. Together they pressured national and state politicians to ban child labor and set maximum working hours.

In 1919, the U.S. Supreme Court objected to a federal child labor law, ruling that it interfered with states' rights to regulate labor. However, individual states were allowed to limit the working hours of women and, later, of men.

▲ Hungarian workers meet to plan their strategy before a strike.

The Reform Movement Spreads

Almost from the beginning, reform movements rose in response to the negative impact of industrialization. These reforms included improving the workplace and extending the right to vote to working-class men. The same impulse toward reform, along with the ideals of the French Revolution, also helped to end slavery and promote new rights for women and children.

The Abolition of Slavery William Wilberforce, a highly religious man, was a member of Parliament who led the fight for abolition—the end of the slave trade and slavery in the British Empire. Parliament passed a bill to end the slave trade in the British West Indies in 1807. After he retired from Parliament in 1825, Wilberforce continued his fight to free the slaves. Britain finally abolished slavery in its empire in 1833.

British antislavery activists had mixed motives. Some, such as the abolitionist Wilberforce, were morally against slavery. Others viewed slave labor as an economic threat. Furthermore, a new class of industrialists developed who supported cheap labor rather than slave labor. They soon gained power in Parliament.

In the United States the movement to fulfill the promise of the Declaration of Independence by ending slavery grew in the early 1800s. The enslavement of African people finally ended in the United States when the Union won the Civil War in 1865. Then, enslavement persisted in the Americas only in Puerto Rico, Cuba, and Brazil. In Puerto Rico, slavery was ended in 1873. Spain finally abolished slavery in its Cuban colony in 1886. Not until 1888 did Brazil's huge enslaved population win freedom.

The Fight for Women's Rights The Industrial Revolution proved a mixed blessing for women. On the one hand, factory work offered higher wages than work done at home. Women spinners in Manchester, for example, earned much more money than women who stayed home to spin cotton thread. On the other hand, women factory workers usually made only one-third as much money as men did.

Women led reform movements to address this and other pressing social issues. During the mid-1800s, for example, women formed unions in the trades where they dominated. In Britain, some women served as safety inspectors in factories where other women worked. In the United States, college-educated women like Jane Addams ran settlement houses. These community centers served the poor residents of slum neighborhoods.

History Makers

Jane Addams
1860–1935

After graduating from college, Jane Addams wondered what to do with her life.

> *I gradually became convinced that it would be a good thing to rent a house in a part of the city where many primitive and actual needs are found, in which young women who had been given over too exclusively to study, might . . . learn of life from life itself.*

Addams and her friend Ellen Starr set up Hull House in a working-class district in Chicago. Eventually the facilities included a nursery, a gym, a kitchen, and a boarding house for working women. Hull House not only served the immigrant population of the neighborhood, it also trained social workers.

In both the United States and Britain, women who had rallied for the abolition of slavery began to wonder why their own rights should be denied on the basis of gender. The movement for women's rights began in the United States as early as 1848. Women activists around the world joined to found the International Council for Women in 1888. Delegates and observers from 27 countries attended the council's 1899 meeting.

Reforms Spread to Many Areas of Life In the United States and Western Europe, reformers tried to correct the problems troubling the newly industrialized nations. Public education and prison reform ranked high on the reformers' lists.

One of the most prominent U.S. reformers, Horace Mann of Massachusetts, favored free public education for all children. Mann, who spent his own childhood working at hard labor, warned, "If we do not prepare children to become good citizens . . . if we do not enrich their minds with knowledge, then our republic must go down to destruction." By the 1850s, many states were starting public school systems. In Western Europe, free public schooling became available in the late 1800s.

In 1831, French writer Alexis de Tocqueville had contrasted the brutal conditions in American prisons to the "extended liberty" of American society. Those who sought to reform prisons emphasized the goal of providing prisoners with the means to lead to useful lives upon release.

During the 1800s, democracy grew in industrialized countries even as foreign expansion increased. The industrialized democracies faced new challenges both at home and abroad. You will learn about these challenges in Chapter 26.

MAIN IDEA

Making Inferences
Why might women abolitionists have headed the movement for women's rights?

E. Possible Answer Their work to gain rights for African Americans may have led them to try to gain equal rights for themselves.

SECTION 4 ASSESSMENT

TERMS & NAMES **1.** For each term or name, write a sentence explaining its significance.

• laissez faire • Adam Smith • capitalism • utilitarianism • socialism • Karl Marx • communism • union • strike

USING YOUR NOTES

2. What characteristics do capitalism and socialism share?

Capitalism	Socialism
1.	1.
2.	2.
3.	3.

MAIN IDEAS

3. What were Adam Smith's three natural laws of economics?

4. What kind of society did early socialists want?

5. Why did workers join together in unions?

CRITICAL THINKING & WRITING

6. IDENTIFYING PROBLEMS What were the main problems faced by the unions during the 1800s and how did they overcome them?

7. DRAWING CONCLUSIONS Why do you think that Marx's "dictatorship of the proletariat" did not happen?

8. MAKING INFERENCES Why did the labor reform movement spread to other areas of life?

9. WRITING ACTIVITY ECONOMICS Write a two-paragraph **persuasive essay** on how important economic forces are in society. Support your opinion using evidence from this and previous chapters.

CONNECT TO TODAY **PREPARING AN ECONOMIC REPORT**

Research a present-day corporation. Prepare an **economic report** that includes the corporation's structure, products or services, number of employees, and any other relevant economic information you are able to find.

INTERACTIVE

Industrialization

Industrialization eventually raised the standard of living for many people in Europe and North America in the 1800s. Yet the process also brought suffering to countless workers who crowded into filthy cities to toil for starvation wages. The following excerpts reveal a variety of perspectives on this major historical event.

A PRIMARY SOURCE

Mary Paul

Mary Paul worked in a textile factory in Lowell, Massachusetts. In an 1846 letter to her father in New Hampshire, the 16-year-old expressed her satisfaction with her situation at Lowell.

I am at work in a spinning room tending four sides of warp which is one girl's work. The overseer tells me that he never had a girl get along better than I do. . . . I have a very good boarding place, have enough to eat. . . . The girls are all kind and obliging. . . . I think that the factory is the best place for me and if any girl wants employment, I advise them to come to Lowell.

B PRIMARY SOURCE

Andrew Carnegie

In his autobiography, published in 1920, the multimillionaire industrialist views with optimism the growth of American industry.

One great advantage which America will have in competing in the markets of the world is that her manufacturers will have the best home market. Upon this they can depend for a return upon capital, and the surplus product can be exported with advantage, even when the prices received for it do no more than cover actual cost, provided the exports be charged with their proportion of all expenses. The nation that has the best home market, especially if products are standardized, as ours are, can soon outsell the foreign producer.

C PRIMARY SOURCE

Friedrich Engels

Friedrich Engels, who coauthored *The Communist Manifesto* and also managed a textile factory in Manchester, England, spent his nights wandering the city's slums.

Nobody troubles about the poor as they struggle helplessly in the whirlpool of modern industrial life. The working man may be lucky enough to find employment, if by his labor he can enrich some member of the middle classes. But his wages are so low that they hardly keep body and soul together. If he cannot find work, he can steal, unless he is afraid of the police; or he can go hungry and then the police will see to it that he will die of hunger in such a way as not to disturb the equanimity of the middle classes.

D PRIMARY SOURCE

Walter Crane

This political cartoon was published in *Cartoons for the Cause* in Britain in 1886. It shows the vampire bat of Capitalism attacking a laborer. Socialism is pictured as an angel who is coming to the rescue.

Document-Based QUESTIONS

1. Why would Andrew Carnegie (Source B) and Friedrich Engels (Source C) disagree about the effects of industrialization?
2. What might be reasons for 16-year-old Mary Paul's (Source A) satisfaction with her job and life in Lowell?
3. Why might the political cartoon by Walter Crane (Source D) be useful in getting workers to rally to the cause of socialism?

Activists for woman suffrage in London

Thomas Edison with phonograph

1

Democratic Reform and Activism

MAIN IDEA	WHY IT MATTERS NOW	TERMS & NAMES
POWER AND AUTHORITY Spurred by the demands of the people, Great Britain and France underwent democratic reforms.	During this period, Britain and France were transformed into the democracies they are today.	• suffrage • Chartist movement • Queen Victoria • Third Republic • Dreyfus affair • anti-Semitism • Zionism

SETTING THE STAGE Urbanization and industrialization brought sweeping changes to Western nations. People looking for solutions to the problems created by these developments began to demand reforms. They wanted to improve conditions for workers and the poor. Many people also began to call for political reforms. They demanded that more people be given a greater voice in government. Many different groups, including the middle class, workers, and women, argued that the right to vote be extended to groups that were excluded.

Britain Enacts Reforms

TAKING NOTES

Evaluating Courses of Action Use a chart to list and evaluate events in this section according to whether they expanded (+) or impeded (-) democracy.

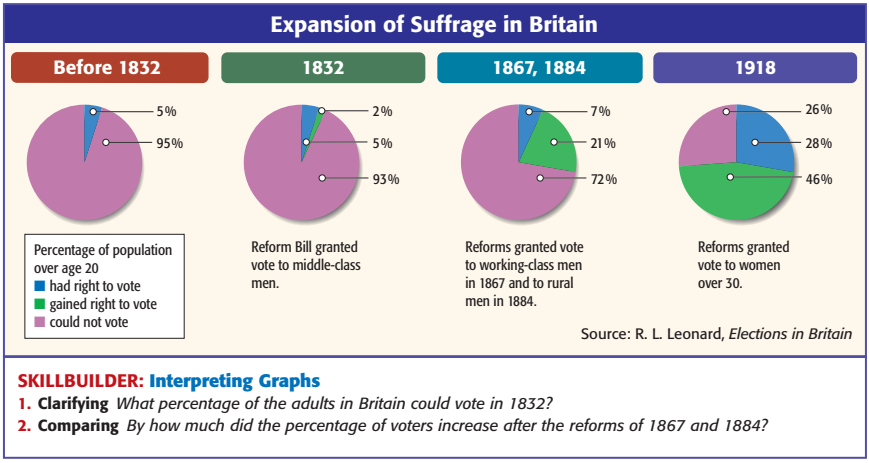
Event	Evaluation

As Chapter 21 explained, Britain became a constitutional monarchy in the late 1600s. Under this system of government, the monarch serves as the head of state, but Parliament holds the real power. The British Parliament consists of a House of Lords and a House of Commons. Traditionally, members of the House of Lords either inherited their seats or were appointed. However, this changed in 1999, when legislation was passed that abolished the right of hereditary peers to inherit a seat in the House of Lords. Members of the House of Commons are elected by the British people.

In the early 1800s, the method of selecting the British government was not a true democracy. Only about five percent of the population had the right to elect the members of the House of Commons. Voting was limited to men who owned a substantial amount of land. Women could not vote at all. As a result, the upper classes ran the government.

The Reform Bill of 1832 The first group to demand a greater voice in politics was the wealthy middle class—factory owners, bankers, and merchants. Beginning in 1830, protests took place around England in favor of a bill in Parliament that would extend **suffrage**, or the right to vote. The Revolution of 1830 in France frightened parliamentary leaders. They feared that revolutionary violence would spread to Britain. Thus, Parliament passed the Reform Bill of 1832. This law eased the property requirements so that well-to-do men in the middle class could vote. The Reform Bill also modernized the districts for electing members of Parliament and gave the thriving new industrial cities more representation.

Chartist Movement Although the Reform Bill increased the number of British voters, only a small percentage of men were eligible to vote. A popular movement



SKILLBUILDER: Interpreting Graphs

1. **Clarifying** *What percentage of the adults in Britain could vote in 1832?*
2. **Comparing** *By how much did the percentage of voters increase after the reforms of 1867 and 1884?*

arose among the workers and other groups who still could not vote to press for more rights. It was called the **Chartist movement** because the group first presented its demands to Parliament in a petition called The People's Charter of 1838.

The People's Charter called for suffrage for all men and annual Parliamentary elections. It also proposed to reform Parliament in other ways. In Britain at the time, eligible men voted openly. Since their vote was not secret, they could feel pressure to vote in a certain way. Members of Parliament had to own land and received no salary, so they needed to be wealthy. The Chartists wanted to make Parliament responsive to the lower classes. To do this, they demanded a secret ballot, an end to property requirements for serving in Parliament, and pay for members of Parliament.

Parliament rejected the Chartists' demands. However, their protests convinced many people that the workers had valid complaints. Over the years, workers continued to press for political reform, and Parliament responded. It gave the vote to working-class men in 1867 and to male rural workers in 1884. After 1884, most adult males in Britain had the right to vote. By the early 1900s, all the demands of the Chartists, except for annual elections, became law.

The Victorian Age The figure who presided over all this historic change was **Queen Victoria**. Victoria came to the throne in 1837 at the age of 18. She was queen for nearly 64 years. During the Victorian Age, the British Empire reached the height of its wealth and power. Victoria was popular with her subjects, and she performed her duties capably. However, she was forced to accept a less powerful role for the monarchy.

The kings who preceded Victoria in the 1700s and 1800s had exercised great influence over Parliament. The spread of democracy in the 1800s shifted political power almost completely to Parliament, and especially to the elected House of Commons. Now the government was completely run by the prime minister and the cabinet.

History Makers

Queen Victoria and Prince Albert

About two years after her coronation, Queen Victoria (1819–1901) fell in love with her cousin Albert (1819–1861), a German prince. She proposed to him and they were married in 1840. Together they had nine children. Prince Albert established a tone of politeness and correct behavior at court, and the royal couple presented a picture of loving family life that became a British ideal.

After Albert died in 1861, the queen wore black silk for the rest of her life in mourning. She once said of Albert, "Without him everything loses its interest."

MAIN IDEA

Making Inferences

Why do you think the Chartists demanded a secret ballot rather than public voting?

A. Possible Answers allowed people to vote their conscience, made voters less subject to intimidation, reduced power of bribery

Women Get the Vote

By 1890, several industrial countries had universal male suffrage (the right of all men to vote). No country, however, allowed women to vote. As more men gained suffrage, more women demanded the same.

Organization and Resistance During the 1800s, women in both Great Britain and the United States worked to gain the right to vote. British women organized reform societies and protested unfair laws and customs. As women became more vocal, however, resistance to their demands grew. Many people, both men and women, thought that woman suffrage was too radical a break with tradition. Some claimed that women lacked the ability to take part in politics.

Militant Protests After decades of peaceful efforts to win the right to vote, some women took more drastic steps. In Britain, Emmeline Pankhurst formed the Women's Social and Political Union (WSPU) in 1903. The WSPU became the most militant organization for women's rights. Its goal was to draw attention to the cause of woman suffrage. When asked about why her group chose militant means to gain women's rights, Pankhurst replied:

PRIMARY SOURCE

I want to say here and now that the only justification for violence, the only justification for damage to property, the only justification for risk to the comfort of other human beings is the fact that you have tried all other available means and have failed to secure justice.

EMMELINE PANKHURST, *Why We Are Militant*

B. Answer The success of the militant group was not achieved until the end of World War I but it did call attention to their goals.

MAIN IDEA

Analyzing Motives Was the use of militant action effective in achieving the goal of woman suffrage? Explain.

Emmeline Pankhurst, her daughters Christabel and Sylvia, and other WSPU members were arrested and imprisoned many times. When they were jailed, the Pankhursts led hunger strikes to keep their cause in the public eye. British officials force-fed Sylvia and other activists to keep them alive.

Though the woman suffrage movement gained attention between 1880 and 1914, its successes were gradual. Women did not gain the right to vote in national elections in Great Britain and the United States until after World War I.

Global Impact

The Women's Movement

By the 1880s, women were working internationally to win more rights. In 1888, women activists from the United States, Canada, and Europe met in Washington, D.C., for the International Council of Women. In 1893, delegates and observers from many countries attended a large congress of women in Chicago. They came from lands as far apart as New Zealand, Argentina, Iceland, Persia, and China.

The first countries to grant suffrage to women were New Zealand (1893) and Australia (1902). Only in two European countries—Finland (1906, then part of the Russian Empire) and Norway (1913)—did women gain voting rights before World War I. In the United States, the territory of Wyoming allowed women to vote in 1869. Several other Western states followed suit.

France and Democracy

While Great Britain moved toward greater democracy in the late 1800s, democracy finally took hold in France.

The Third Republic In the aftermath of the Franco-Prussian War, France went through a series of crises. Between 1871 and 1914, France averaged a change of government almost yearly. A dozen political parties competed for power. Not until 1875 could the National Assembly agree on a new government. Eventually, the members voted to set up a republic. The **Third Republic** lasted over 60 years. However, France remained divided.

The Dreyfus Affair During the 1880s and 1890s, the Third Republic was threatened by monarchists, aristocrats, clergy, and army leaders. These groups wanted a monarchy or military rule. A controversy known as the **Dreyfus affair** became a battleground for these opposing forces. Widespread feelings of **anti-Semitism**, or prejudice against Jews, also played a role in this scandal.

▲ *Zola Under Attack,* painted in 1898 by Henry de Groux, shows Émile Zola surrounded by an anti-Semitic mob.

In 1894, Captain Alfred Dreyfus, one of the few Jewish officers in the French army, was accused of selling military secrets to Germany. A court found him guilty, based on false evidence, and sentenced him to life in prison. In a few years, new evidence showed that Dreyfus had been framed by other army officers.

Public opinion was sharply divided over the scandal. Many army leaders, nationalists, leaders in the clergy, and anti-Jewish groups refused to let the case be reopened. They feared sudden action would cast doubt on the honor of the army. Dreyfus's defenders insisted that justice was more important. In 1898, the writer Émile Zola published an open letter titled *J'accuse!* (I accuse) in a popular French newspaper. In the letter, Zola denounced the army for covering up a scandal. Zola was sentenced to a year in prison for his views, but his letter gave strength to Dreyfus's cause. Eventually, the French government declared his innocence.

The Rise of Zionism The Dreyfus case showed the strength of anti-Semitism in France and other parts of Western Europe. However, persecution of Jews was even more severe in Eastern Europe. Russian officials permitted pogroms (puh•GRAHMS), organized campaigns of violence against Jews. From the late 1880s on, thousands of Jews fled Eastern Europe. Many headed for the United States.

For many Jews, the long history of exile and persecution convinced them to work for a homeland in Palestine. In the 1890s, a movement known as **Zionism** developed to pursue this goal. Its leader was Theodor Herzl (HEHRT•suhl), a writer in Vienna. It took many years, however, before the state of Israel was established.

SECTION 1 ASSESSMENT

TERMS & NAMES **1.** For each term or name, write a sentence explaining its significance.

• suffrage • Chartist movement • Queen Victoria • Third Republic • Dreyfus affair • anti-Semitism • Zionism

USING YOUR NOTES

2. Which of these events most expanded democracy, and why?

Event	Evaluation

MAIN IDEAS

3. What were some effects of the Reform Bill of 1832?

4. What was the goal of the WSPU in Britain?

5. What was the Dreyfus affair?

CRITICAL THINKING & WRITING

6. COMPARING Why was the road to democracy more difficult for France than for England?

7. SYNTHESIZING Look again at the primary source on page 749. What is Pankhurst demanding?

8. RECOGNIZING EFFECTS What was the connection between anti-Semitism and Zionism?

9. WRITING ACTIVITY POWER AND AUTHORITY Among the Chartists' demands was pay for members of Parliament. Write a **letter to the editor** that supports or criticizes a pay raise for your legislators.

CONNECT TO TODAY **CREATING A POSTER**

Find information on issues in today's world that involve a call for social justice. Then make a **poster** in which you illustrate what you regard as the most compelling example of a current social injustice.

Activists for woman suffrage in London

Thomas Edison with phonograph

4

Nineteenth-Century Progress

MAIN IDEA	WHY IT MATTERS NOW	TERMS & NAMES
SCIENCE AND TECHNOLOGY Breakthroughs in science and technology transformed daily life and entertainment.	Electric lights, telephones, cars, and many other conveniences of modern life were invented during this period.	• assembly line • Charles Darwin • theory of evolution • radioactivity • psychology • mass culture

SETTING THE STAGE The Industrial Revolution happened because of inventions such as the spinning jenny and the steam engine. By the late 1800s, advances in both industry and technology were occurring faster than ever before. In turn, the demands of growing industries spurred even greater advances in technology. A surge of scientific discovery pushed the frontiers of knowledge forward. At the same time, in industrialized countries, economic growth produced many social changes.

TAKING NOTES

Summarizing Use a web diagram to connect people with their ideas and inventions.

Inventions Make Life Easier

In the early 1800s, coal and steam drove the machines of industry. By the late 1800s, new kinds of energy were coming into use. One was gasoline (made from oil), which powered the internal combustion engine. This engine would make the automobile possible. Another kind of energy was electricity. In the 1870s, the electric generator was developed, which produced a current that could power machines.

Edison the Inventor During his career, Thomas Edison patented more than 1,000 inventions, including the light bulb and the phonograph. Early in his career, Edison started a research laboratory in Menlo Park, New Jersey. Most of his important inventions were developed there, with help from the researchers he employed, such as Lewis H. Latimer, an African-American inventor. Indeed, the idea of a research laboratory may have been Edison's most important invention.

Bell and Marconi Revolutionize Communication Other inventors helped harness electricity to transmit sounds over great distances. Alexander Graham Bell was a teacher of deaf students who invented the telephone in his spare time. He displayed his device at the Philadelphia Centennial Exposition of 1876.

The Italian inventor Guglielmo Marconi used theoretical discoveries about electromagnetic waves to create the first radio in 1895. This device was important because it sent messages (using Morse Code) through the air, without the use of wires. Primitive radios soon became standard equipment for ships at sea.

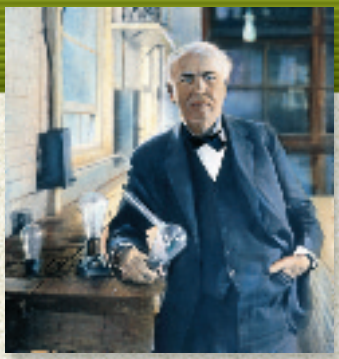
Ford Sparks the Automobile Industry In the 1880s, German inventors used a gasoline engine to power a vehicle—the automobile. Automobile technology developed quickly, but since early cars were built by hand, they were expensive.

An American mechanic named Henry Ford decided to make cars that were affordable for most people. Ford used standardized, interchangeable parts. He

Edison's Inventions

Thomas Alva Edison was one of the greatest inventors in history. He held thousands of patents for his inventions in over 30 countries. The United States Patent Office alone issued Edison 1,093 patents. Among his inventions was an electric light bulb, the phonograph, and motion pictures, all shown on this page.

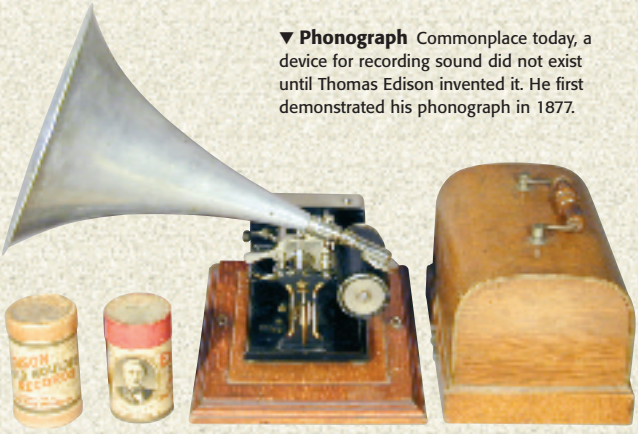
Some scientists and historians, however, believe that Edison's greatest achievement was his development of the research laboratory. Edison worked with a team of different specialists to produce his creations. His precise manner is illustrated by his famous quote: "Genius is 1 percent inspiration and 99 percent perspiration."



▲ Thomas Edison in his West Orange, New Jersey, laboratory, 1915

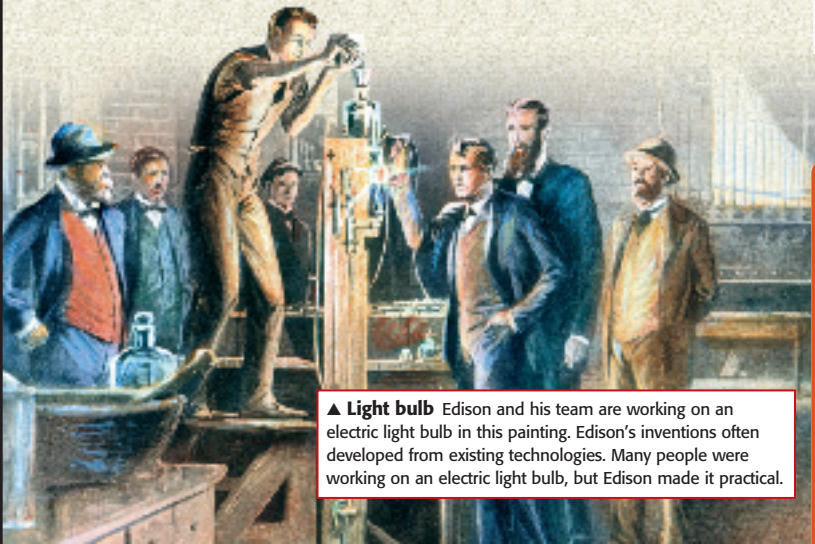
INTEGRATED TECHNOLOGY

RESEARCH LINKS For more on Thomas Alva Edison, go to **classzone.com**



▼ **Phonograph** Commonplace today, a device for recording sound did not exist until Thomas Edison invented it. He first demonstrated his phonograph in 1877.

▼ **Motion pictures** The idea of "moving pictures" was not Edison's, but his "Kinetoscope," shown below, made movies practical.



▲ **Light bulb** Edison and his team are working on an electric light bulb in this painting. Edison's inventions often developed from existing technologies. Many people were working on an electric light bulb, but Edison made it practical.

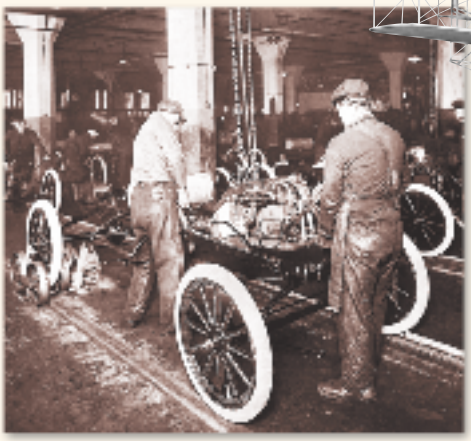
Connect *to* Today

1. **Clarifying** What did Edison mean when he said, "Genius is 1 percent inspiration and 99 percent perspiration"?

See Skillbuilder Handbook, page R4.

2. **Forming and Supporting Opinions** Which of Edison's inventions shown on this page do you think has had the most influence?

▲ **Telephone**
Alexander Graham Bell demonstrated the first telephone in 1876. It quickly became an essential of modern life. By 1900, there were 1.4 million telephones in the United States. By 1912, there were 8.7 million.



◀ **Automobile Assembly Line**
Ford's major innovation was to improve efficiency in his factory. By introducing the assembly line, he reduced the time it took to build a car from 12.5 to 1.5 worker-hours.

▲ **Airplane**
Through trial and error, the Wright brothers designed wings that provided lift and balance in flight. Their design is based on principles that are still used in every aircraft.

also built them on an **assembly line**, a line of workers who each put a single piece on unfinished cars as they passed on a moving belt.

Assembly line workers could put together an entire Model T Ford in less than two hours. When Ford introduced this plain, black, reliable car in 1908, it sold for $850. As his production costs fell, Ford lowered the price. Eventually it dropped to less than $300. Other factories adopted Ford's ideas. By 1916, more than 3.5 million cars were traveling around on America's roads.

MAIN IDEA

Making Inferences
Why do you think Ford reduced the price of the Model T?

A. Answer so that more people could afford to buy a car and he could sell more

The Wright Brothers Fly Two bicycle mechanics from Dayton, Ohio, named Wilbur and Orville Wright, solved the age-old riddle of flight. On December 17, 1903, they flew a gasoline-powered flying machine at Kitty Hawk, North Carolina. The longest flight lasted only 59 seconds, but it started the aircraft industry.

New Ideas in Medicine

As you learned in Chapter 22, earlier centuries had established the scientific method. Now this method brought new insights into nature as well as practical results.

The Germ Theory of Disease An important breakthrough in the history of medicine was the germ theory of disease. It was developed by French chemist Louis Pasteur in the mid-1800s. While examining the fermentation process of alcohol, Pasteur discovered that it was caused by microscopic organisms he called bacteria. He also learned that heat killed bacteria. This led him to develop the process of pasteurization to kill germs in liquids such as milk. Soon, it became clear to Pasteur and others that bacteria also caused diseases.

Joseph Lister, a British surgeon, read about Pasteur's work. He thought germs might explain why half of surgical patients died of infections. In 1865, he ordered that his surgical wards be kept spotlessly clean. He insisted that wounds be washed in antiseptics, or germ-killing liquids. As a result, 85 percent of Lister's patients survived. Other hospitals adopted Lister's methods.

Public officials, too, began to understand that cleanliness helped prevent the spread of disease. Cities built plumbing and sewer systems and took other steps to improve public health. Meanwhile, medical researchers developed vaccines or cures for such deadly diseases as typhus, typhoid fever, diphtheria, and yellow fever. These advances helped people live longer, healthier lives.

New Ideas in Science

No scientific idea of modern times aroused more controversy than the work of English naturalist **Charles Darwin**. The cause of the controversy was Darwin's answer to the question that faced biologists: How can we explain the tremendous variety of plants and animals on earth? A widely accepted answer in the 1800s was the idea of special creation—every kind of plant and animal had been created by God at the beginning of the world and had remained the same since then.

Darwin's Theory of Evolution Darwin challenged the idea of special creation. Based on his research as a naturalist on the voyage of the *H.M.S. Beagle,* he developed a theory that all forms of life, including human beings, evolved from earlier living forms that had existed millions of years ago.

In 1859, Darwin published his thinking in a book titled *On the Origin of Species by Means of Natural Selection.* According to the idea of natural selection, populations tend to grow faster than the food supply and so must compete for food. The members of a species that survive are those that are fittest, or best adapted to their environment. These surviving members of a species produce offspring that share their advantages. Gradually, over many generations, the species may change. In this way, new species evolve. Darwin's idea of change through natural selection came to be called the **theory of evolution**.

MAIN IDEA

Clarifying

According to Darwin, how does natural selection affect evolution?

B. Answer Because of competition for food, only the fittest members of a species survive to reproduce; these members pass their advantages on to their offspring, and gradually the species evolves.

Mendel and Genetics Although Darwin said that living things passed on their variations from one generation to the next, he did not know how they did so. In the 1850s and 1860s, an Austrian monk named Gregor Mendel discovered that there is a pattern to the way that certain traits are inherited. Although his work was not widely known until 1900, Mendel's work began the science of genetics.

Advances in Chemistry and Physics In 1803, the British chemist John Dalton theorized that all matter is made of tiny particles called atoms. Dalton showed that elements contain only one kind of atom, which has a specific weight. Compounds, on the other hand, contain more than one kind of atom.

In 1869, Dmitri Mendeleev (MEHN•duh•LAY•uhf), a Russian chemist, organized a chart on which all the known elements were arranged in order of weight, from lightest to heaviest. He left gaps where he predicted that new elements would be discovered. Later, his predictions proved correct. Mendeleev's chart, the Periodic Table, is still used today.

A husband and wife team working in Paris, Marie and Pierre Curie, discovered two of the missing elements, which they named radium and polonium. The elements were found in a mineral called pitchblende that released a powerful form of energy. In 1898, Marie Curie gave this energy the name **radioactivity**. In 1903, the Curies shared the Nobel Prize for physics for their work on radioactivity. In 1911, Marie Curie won the Nobel Prize for chemistry for the discovery of radium and polonium.

Physicists around 1900 continued to unravel the secrets of the atom. Earlier scientists believed that the atom was the smallest particle that existed. A British physicist named

History Makers

Marie Curie
1867–1934

Marie Curie's original name was Marya Sklodowska. Born in Warsaw, Poland, she emigrated to Paris to study, where she changed her name to Marie.

She achieved a number of firsts in her career. She was the first woman to teach in the Sorbonne, a world-famous college that was part of the University of Paris. She was the first woman to win a Nobel Prize—two, in fact.

In 1911, she won the Nobel prize for chemistry. In 1921, she made a journey to the U.S. In 1934, she died from leukemia caused by the radiation she had been exposed to in her work.

INTEGRATED TECHNOLOGY

RESEARCH LINKS For more on Marie Curie, go to **classzone.com.**

Ernest Rutherford suggested that atoms were made up of yet smaller particles. Each atom, he said, had a nucleus surrounded by one or more particles called electrons. Soon other physicists such as Max Planck, Neils Bohr, and Albert Einstein were studying the structure and energy of atoms.

Social Sciences Explore Behavior

The scientific theories of the 1800s prompted scholars to study human society and behavior in a scientific way. Interest in these fields grew enormously during that century, as global expeditions produced a flood of new discoveries about ancient civilizations and world cultures. This led to the development of modern social sciences such as archaeology, anthropology, and sociology.

An important new social science was **psychology**, the study of the human mind and behavior. The Russian physiologist Ivan Pavlov believed that human actions were often unconscious reactions to experiences and could be changed by training.

Another pioneer in psychology, the Austrian doctor Sigmund Freud, also believed that the unconscious mind drives how people think and act. In Freud's view, unconscious forces such as suppressed memories, desires, and impulses shape behavior. He founded a type of therapy called psychoanalysis to deal with psychological conflicts created by these forces.

Freud's theories became very influential. However, his idea that the mind was beyond conscious control also shocked many people. The theories of Freud and Pavlov challenged the fundamental idea of the Enlightenment—that reason was supreme. The new ideas about psychology began to shake the 19th-century faith that humans could perfect themselves and society through reason.

C. Possible Answer because it explored how a part of the mind that people were not aware of—the unconscious—influences people's thoughts and behavior

MAIN IDEA

Clarifying

Why was the work of Pavlov and Freud groundbreaking?

The Rise of Mass Culture

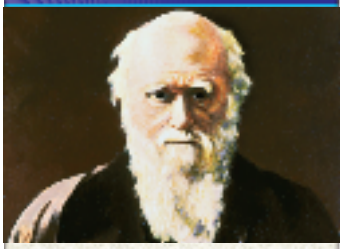
In earlier periods, art, music, and theater were enjoyed by the wealthy. This group had the money, leisure time, and education to appreciate high culture. It was not until about 1900 that people could speak of **mass culture**—the appeal of art, writing, music, and other forms of entertainment to a larger audience.

Changes Produce Mass Culture There were several causes for the rise of mass culture. Their effects changed life in Europe and North America. Notice in the chart on the next page how working class people's lives were changed by mass culture. The demand for leisure activities resulted in a variety of new pursuits for people to enjoy. People went to music performances, movies, and sporting events.

Music Halls, Vaudeville, and Movies A popular leisure activity was a trip to the local music hall. On a typical evening, a music hall might offer a dozen or more different acts. It might feature singers, dancers, comedians, jugglers, magicians, and acrobats. In the United States, musical variety shows were called vaudeville. Vaudeville acts traveled from town to town, appearing at theaters.

During the 1880s, several inventors worked at trying to project moving images. One successful design came from France. Another came from Thomas Edison's laboratory. The earliest motion pictures were black and white and lasted less than a minute.

History in Depth



Social Darwinism

Charles Darwin (above) was a naturalist, but a number of 19th-century thinkers tried to apply his ideas to economics and politics. The leader in this movement was Herbert Spencer, an English philosopher.

Free economic competition, Spencer argued, was natural selection in action. The best companies make profits, while inefficient ones go bankrupt. Spencer applied the same rules to individuals. Those who were fittest for survival enjoyed wealth and success, while the poor remained poor because they were unfit. This idea became known as Social Darwinism. It also provided a rationalization for imperialism and colonialism.

Rise of Mass Culture		
Cause	**Effect/Cause**	**Effect**
• Public education	• Increase in literacy	• Mass market for books and newspapers
• Improvement in communications	• Publications cheaper and more accessible	• Mass market for books and newspapers
• Invention of phonograph and records	• More music directly in people's homes	• Greater demand for musical entertainment
• Shorter workday—10 hours shorter workweek—5-1/2 days	• More leisure time	• Greater demand for mass entertainment activities

SKILLBUILDER: Interpreting Charts

1. **Analyzing Causes** *What was the immediate cause for the increased demand for mass entertainment activities?*
2. **Recognizing Effects** *What was the ultimate effect of public education and improved communications?*

By the early 1900s, filmmakers were producing the first feature films. Movies quickly became big business. By 1910, five million Americans attended some 10,000 theaters each day. The European movie industry experienced similar growth.

Sports Entertain Millions With time at their disposal, more people began to enjoy sports and outdoor activities. Spectator sports now became entertainment. In the United States, football and baseball soared in popularity. In Europe, the first professional soccer clubs formed and drew big crowds. Favorite English sports such as cricket spread to the British colonies of Australia, India, and South Africa.

As a result of the growing interest in sports, the International Olympic Games began in 1896. They revived the ancient Greek tradition of holding an athletic competition every four years. Fittingly, the first modern Olympics took place in Athens, Greece, the country where the games had originated.

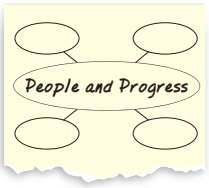
SECTION 4 ASSESSMENT

TERMS & NAMES 1. For each term or name, write a sentence explaining its significance.

• assembly line • Charles Darwin • theory of evolution • radioactivity • psychology • mass culture

USING YOUR NOTES

2. Which breakthrough helped people the most? Why?



MAIN IDEAS

3. What effect did the assembly line have on production costs?
4. How did Joseph Lister improve the survival rate of his patients?
5. What effect did the spread of public education have on culture?

CRITICAL THINKING & WRITING

6. **COMPARING AND CONTRASTING** How is the mass culture that rose at the end of the 19th century similar to mass culture today? How is it different? Explain your response.
7. **RECOGNIZING EFFECTS** How did the germ theory change living conditions in Europe and the United States?
8. **ANALYZING CAUSES** What changes led to the rise of mass culture around 1900?
9. **WRITING ACTIVITY** SCIENCE AND TECHNOLOGY Write a two-paragraph **expository essay** in which you discuss whether advances in science and technology have had a largely positive or negative impact on society.

CONNECT TO TODAY **MAKING A POSTER**

Find information on the current state of medicines such as antibiotics and problems with their use and overuse. Create a **poster** that shows examples of current antibiotics, their benefits, and their potential negative long-term impact.