



**Big Era Seven**  
**Industrialization and its Consequences**  
**1750 – 1914 CE**



**Landscape Teaching Unit 7.1**  
**The Industrial Revolution as a World Event**  
**1715 – 1840 CE**

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## Why this unit?

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In 1750, China's share of world manufacturing output was 32.8 percent, while Europe's was 23.2 percent. Together, India and China accounted for 57.3 percent of world manufacturing output, and if the rest of Asia is included, the total jumps to 70 percent. Most of the manufacturing was in cotton and silk textiles, which became the basis for industrialization in Britain. Once started, Britain's adoption of steam-powered mechanical manufacturing changed the production capacity globally. It enormously increased the capacity of some groups, mostly the British at first, to produce goods and services. It greatly altered the distribution of wealth and poverty around the world and engendered new attitudes towards nature and society. The [fossil fuel revolution](#) was a revolution in the use of coal, which transformed the world's energy regime from one based on biomass (wood) and animal muscle to one increasingly dependent on fossil fuels. Early in the era, the steam engine harnessed coal power, which vastly expanded the amount of energy per capita available to humans. Steam-powered industry first became established in Britain, but the Industrial Revolution was a global event. It happened to the whole world in the eighteenth and nineteenth centuries, though in different ways and at different moments.

## Unit objectives

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*Upon completing this unit, students will be able to:*

1. Identify the "engine science" culture that developed in Great Britain.
2. Compare manufacturing in Great Britain, Qing China, and Mughal India.
3. Compare the sugar and cotton plantation system with the early textile factories in Great Britain.
4. Analyze how and why the Industrial Revolution got started.
5. Explain in what sense the Industrial Revolution was a global event in its origins and development, not just a British or European event.

## Time and materials

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This unit will take about four days of 45-minute class periods.

Students may need access to statistics on the current economy, including the power company operations in their area, as well as the cost and source of cotton clothing that students wear.

## Author

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founding member of the editorial board of World History Connected. She joined the World History for Us All development team in 2002.

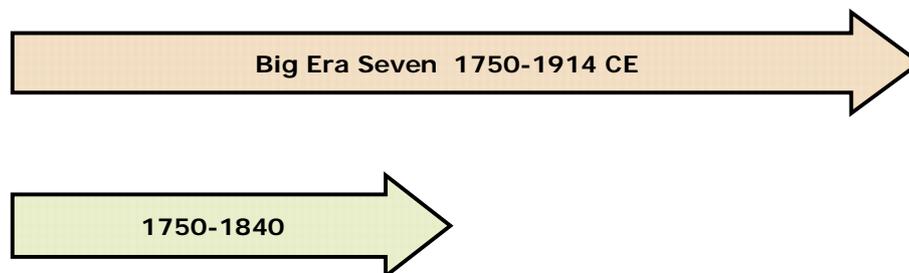
## The historical context

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In the first phase of the Industrial Revolution (1750-1840), [entrepreneurs](#) and workers, mainly in Britain, harnessed coal and steam power to drive industrial machinery. This technology vastly increased production. Railroad construction propelled coal and steel industries and facilitated the expansion of domestic and international markets that helped form the modern world economy. Colonies of European powers and many other rural regions of the world produced raw materials for export to manufacturing centers, which sold them finished goods. Thus, the societies that produced “primary materials” participated in the Industrial Revolution by supplying commodities, including food, that the industrializing regions had to have. At the beginning of the era, sugar was the world’s most important commercial crop, but in the 1830s cotton replaced it, owing to the mechanization of production and establishment of a global cotton market. Britain did not produce any raw cotton but rather imported it at advantageous prices from India, Egypt, and the southern United States. British manufacturers then mass-produced cotton textiles using machines, and they inundated the world market with cotton products. For British business people, this was good liberal practice because the market was allowed to determine whether Indians bought local or European cotton textiles. The market, however, drove down prices in India and thereby destroyed the livelihood of local spinners and weavers there during the first phase of the [industrialization](#) process.

## This unit in the Big Era Timeline

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## *Lesson 1*

### *What was so Steamy about Industrialization in Britain?*

#### **Preparation**

Discuss where the electricity is generated for the lights in your classroom. Does the power come from nuclear power plants, solar panels on the roof of your school, windmills, or coal-fired plants? Why does electricity cost more if the source of power is expensive? Is electricity cheaper in your area because of the way electricity is generated?

#### **Introduction**

In 1800, British miners produced about 10 million tons of coal, which was 90 percent of the world's output. In this lesson, students will learn why British miners were working so hard to get coal out of the ground. The lesson also will focus on the reasons for the British development of steam power. It will also ask students to compare the use of coal for manufacturing in Great Britain with the types of energy used in China and India in 1800, when those regions continued to dominate manufacturing globally. Finally, the lesson will explore the connection between steam power for manufacturing and steam power for railroads and ships.

Since ancient times, peoples of [Afroeurasia](#) have created a variety of designs and uses of water and steam power for grinding grain, mechanically moving objects, and manufacturing. The “engine science” developments in England and Scotland in the seventeenth through the nineteenth centuries dramatically changed the use of steam power by simultaneously applying it to manufacturing and transportation.

#### **Activities**

1. Analyze the timeline in Student Handout 1.1 on the development of steam power in Great Britain. Annotate the timeline with your interpretation of the importance of each step in the use of steam power for expanding the British economy.
2. Distribute copies of Student Handout 1.2. Have students study the table to analyze changes in iron production in China, India, and Europe. What historical inferences might be made from the data presented?
3. Distribute copies of Student Handout 1.3 and have students compare textile production in India and Great Britain in the eighteenth and nineteenth centuries.

#### **Assessment**

1. Create a political cartoon comparing British, Chinese, and Indian views on steam power in 1840.

2. Write a summary about your interpretations of the effects of steam power on the British economy by 1830.

**Lesson 1*****Student Handout 1.1—The Evolution and Effect of Steam Engines***

<b>Dates and Facts about Key Inventions</b>	<b>Student Interpretation of and Questions on the Invention's Importance for Expanding the British Economy</b>
1698 - English engineer Thomas Savery gained a royal patent for an apparatus that was able to draw water up by suction to a height of approximately 26-28 feet owing to the action of atmospheric pressure and the condensation of steam, which was created by heating water with coal within the closed vessel. He successfully advertised his water pumping steam engine to owners of coal mines in his region of England where deepening mines kept filling with water.	
1700 - 2.7 million tons of coal were mined in Britain	
1712 - English blacksmiths Thomas Newcomen and John Calley improved Savery's steam engine by combining a cylinder with a water pump powered by a rocking piston.	
1736 - British inventor Jonathan Hull gained a royal patent for his steam tugboat design.	
1750 - 4.7 million tons of coal were mined in Britain.	

1763 - Scottish instrument-maker and engineer James Watt improved a Newcomen steam engine by cooling the used steam in a condenser separate from the main cylinder. John Roebuck, the owner of a Scottish ironworks, provided financial backing for Watt's project. By 1769, 2,500 steam engines were being used to pump water out of coal mines in Britain.	
1785 - English Anglican minister and inventor Edmund Cartwright patented the first steam power loom and set up a factory in Doncaster, England to manufacture cotton cloth.	
1788 - Englishmen William Symmington and Patrick Miller built a paddle steamboat using the Watt steam engine.	
1797 - 900 cotton mills were operating across Britain.	
1800 - 10 million tons of coal were mined in Britain.	

1814 - 5 steam-powered ships operated in British waters.	
1820 - 34 steam-powered ships operated in British waters.	
1825 - First steam engine railway used to transport passengers, iron, and other goods in Britain.	
1830 - A few dozen miles of railroad track existed in Britain	
1835 - 106,000 power looms operated in England.	

1840 - Britain was exporting 200 million yards of cotton textiles to other European countries and 529 million yards of cotton textiles elsewhere in the world.	
1840 - 4,500 miles of railroad track existed in Britain.	
1840 - 1,325 steam vessels operated in Britain	
1850 - 50 million tons of coal were mined in Britain.	
1850 - 23,000 miles of railroad track existed in Britain	

**Lesson 1*****Student Handout 1.2—Iron Production***

<b>Date CE</b>	<b>Country or Region</b>	<b>Total Iron Production (tons per year)</b>
1078	China	125,000
1500	Europe (excluding Russia)	60,000
1740	Britain	17,000
1750	China	200,000
1750	India	200,000
1750	Europe (including Britain, excluding Russia)	200,000
1793	Russia	202,000
1806	Europe (including Britain, excluding Russia)	700,000
1806	Britain	248,000
1806	France	200,000

Source: Arnold Pacey, *Technology in World Civilization* (Cambridge, MA: MIT Press, 1990), 115.

**Lesson 1*****Student Handout 1.3—Textile Production and Trade in India and Great Britain, 1760-1830***

<b>Date CE</b>	<b>Raw cotton consumption in Great Britain</b> (millions of pounds)	<b>Exports of cotton textiles from Great Britain</b> (British pounds sterling)
1760-69	3.5	227
1820-29	166.5	25,605

<b>Date CE</b>	<b>British imports of cotton piece goods from India</b> (in British pounds sterling)	<b>British exports of cotton textiles</b> (in British pounds sterling)
1772-74	697	221
1824-26	363	17,375

Source: Stephen Broadberry and Bishnupriya Gupta, "Cotton Textiles and the Great Divergence: Lancashire, India, and Shifting Competitive Advantage, 1600-1850," paper presented at "The Rise, Organization, and Institutional Framework of Factor Markets," Utrecht, Netherlands, June 23-25, 2005, 32-3. Available at: <http://www.iisg.nl/hpw/intro.php>

## *Lesson 2*

### *What was so Hot about Industrialization in Britain?*

#### **Preparation**

Ask students to discuss which of their pieces of clothing are made of cotton. In what area of the world with tropical climates do students think that cotton was grown? Ask students to check the labels in their cotton or cotton-blend shirts or tops to identify where they were made. Ask students if they ever eat sugar or foods with sugar added in it. Where do they think that sugar is grown? How does that sugar get to them? What makes growing and harvesting of cotton and sugar difficult?

#### **Introduction**

The British Industrial Revolution depended on cotton grown in other places because the climate in England could not support cotton plants. In this lesson, students will learn where the British purchased the cotton and how cotton was harvested in those other places. They will also learn about the links between sugar and cotton plantations over time and their influence on the cotton factories that made the British Industrial Revolution so successful.

#### **Activities**

1. Distribute copies of Student Handout 2.1. (Spread of the Sugar Industry). Have students map the spread of sugar plantations run by Europeans.
2. Referring to the information in Student Handout 2.2, ask students to analyze similarities and differences between production on a Caribbean or Brazilian sugar mill and cotton production in an English textile factory in the late eighteenth century. Students may design a diagram or chart to document these similarities and differences.

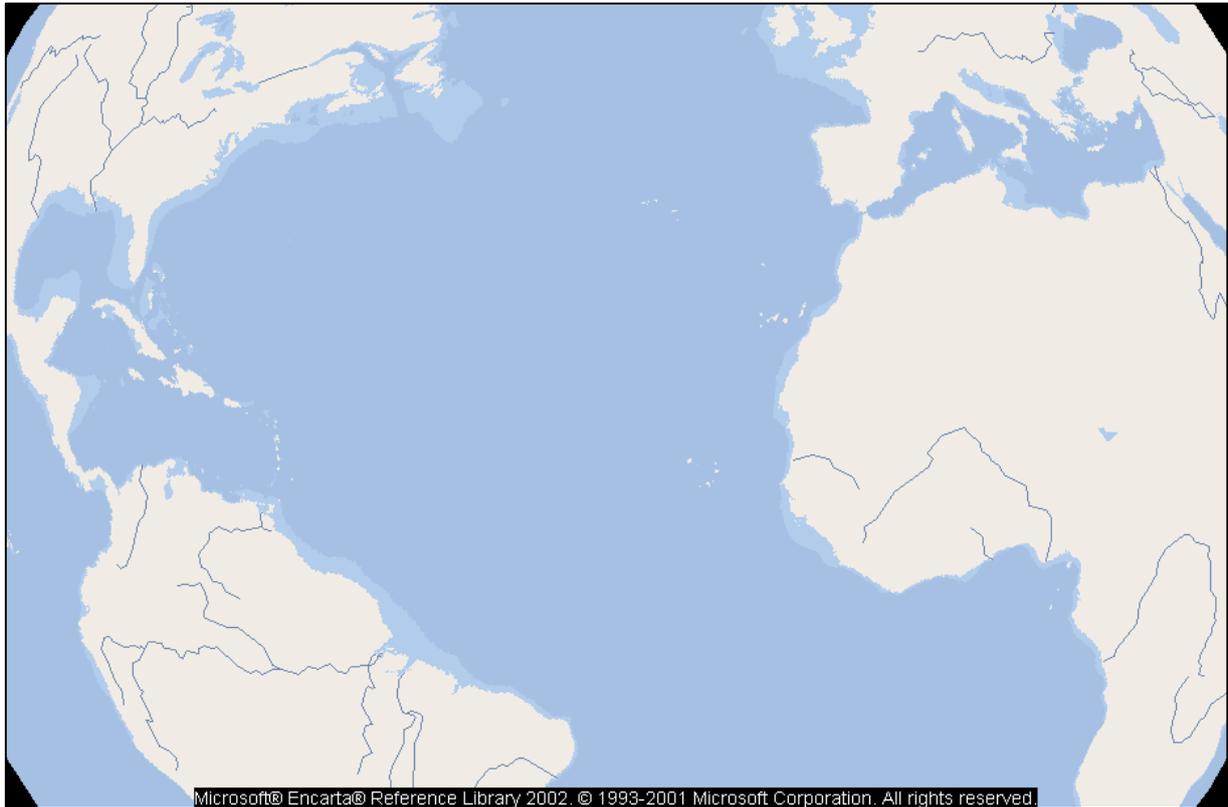
## Lesson 2

### *Student Handout 2.1—Spread of the Sugar Industry*

Use the following facts to map the spread of sugar plantations from the Mediterranean to the Atlantic islands to the Western Hemisphere.

- European demand for sugar continually increased from the Crusades up to the fifteenth century as profits from revived regional trade and increased connections to Afroeurasian trade routes encouraged more participation from European merchants.
- During the thirteenth century, sugar plantation owners on Cyprus, which was then under European Crusader control, purchased slaves from the Caucasus and prisoners of war to plant, harvest, and process the sugar cane. The creation of the Ottoman empire ended that source of slaves in the fifteenth century.
- Sugar plantations in the islands of the eastern Atlantic (Madeira and Canary Islands) used prisoners from the Iberian peninsula, indigenous people of the Canaries (the Guanches), and then slaves imported from West Africa for their supply of coerced labor.
- In the fifteenth century, Christopher Columbus brought sugar cane plants from a Madeira plantation to the Caribbean region.
- By 1540, the Spanish and Portuguese established sugar plantations in the Caribbean and Brazil, and depended on West African slaves to plant, harvest, and produce crystallized sugar for export to European markets.

**Draw lines, arrows, and dots to map the spread of sugar plantations from Afroeurasia to the Americas.**



## Lesson 2

### *Student Handout 2.2—Were Sugar Plantations Early Factories?*

#### **SUGAR**

Production of sugar required plentiful rain or irrigation, supervision and organization of planting and cutting, cutting and gathering of wood to boil sugar juice, and directed production to get crushing, boiling, and crystallization done before the cut cane spoiled. There was clear division of specialized jobs to maximize the production of crystallized sugar in a strictly disciplined environment.

#### **TEXTILES**

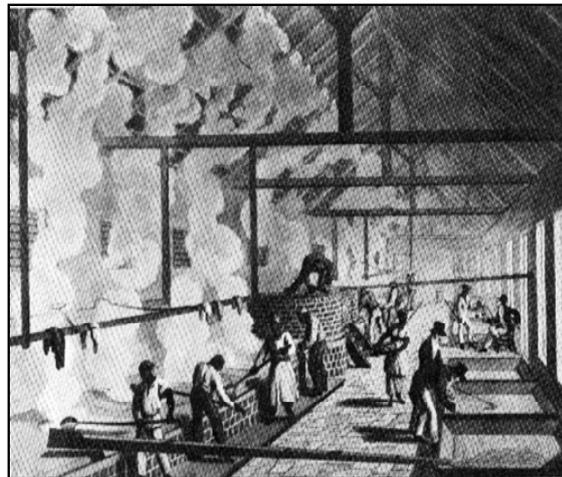
Production of textiles required the purchase of raw cotton from overseas, the spinning of the raw cotton into thread, the weaving of the thread into cloth, the supply of tools and steam power to make machines run, simple and repetitive sequences of tasks, semi-skilled labor, large buildings to accommodate large-size machines, the location of factories near coal supply, and a strictly disciplined environment to keep the flow of production going.

Much has been made of the impact of textile machinery inventions in the eighteenth century, but it will be apparent that up to the 1760s the machines actually used in the textile industry—like the cane-crushing mills ... on Caribbean sugar plantations—were of a very traditional kind with several centuries of history behind them. What was really new was the approach to work discipline and organization, which had parallels on plantations also. ...

Source: Arnold Pacey, *Technology in World Civilization* (Cambridge, MA: MIT Press, 1990), 107.

## Aspects of work on a Caribbean or Brazilian sugar plantation

- **Sugar cane field and sugar mill both essential elements of the plantation.**
- **Slave laborers regarded as interchangeable units.**
- **Labor divided by age and sex.**
- **Labor organized into crews, gangs, and shifts.**
- **Planting, harvesting, and milling scheduled in a time-conscious way.**
- **Rigorous discipline and punctuality maintained.**
- **Fields and mills places of heat, danger, and noise.**



Caribbean Sugar Mill

### *Lesson 3*

## *How did Industrialization of Textile Production Change British Policies toward Trade?*

### **Preparation**

Discuss the typical price for a tee-shirt in an American chain store. Who do students think determined the price of their clothing? How much might the government affect the price of the tee-shirt?

### **Introduction**

By the seventeenth century, Europeans in the Americas began opening plantations to export raw cotton to European markets for production of textiles, but the high quality and competitive price of imported, colorfully designed Indian cotton textiles made it difficult for European producers to compete.

One solution to the problem of economic competition was [mercantilism](#). European mercantilist policymakers sought a favorable balance of trade for their governments, with exports exceeding imports, since this would increase how much gold or silver they held in their treasuries. They attempted to limit the import of foreign goods through laws and high customs duties. Domestic manufacturers also wanted protection for their goods. For example, in 1701, the English woolen industry won protection against Indian textile imports when English importers of Indian cottons and Chinese and Persian silk textiles had to pay extra taxes for those goods as ordered by the “Calico Act.” One exception to the import tax requirement was made for textiles reshipped by the British East India Company for export to Europe or the American colonies. While the British government and domestic manufacturers felt protected, English importers and the customers of imported goods felt cheated.

Another solution to the problem of economic competition was the Navigation Acts. In 1651, the first British Navigation Act declared that no goods grown or manufactured in Asia, Africa, or America should be transported to England except in English ships, and that the goods of any European country imported into England must be brought in British ships, or in ships of the country producing them. The law was first directed against the more successful Dutch merchants and ship owners. In 1660, the British Parliament passed a wider law that forbade the importing into or the exporting from the British colonies of any goods except in English or colonial ships. The expanded law also required that the colonial tobacco, sugar, and cotton be shipped only to England or other English colonies. These Navigation Acts could scarcely be enforced, however, owing to widespread smuggling.

In 1813, Parliament removed the East India Company’s monopoly in India, thus opening up the subcontinent to the large-scale importation of Lancashire cottons.

### **Activities**

Distribute copies of Student Handout 3 (Adam Smith on Mercantilism), and have students do the following:

1. List Adam Smith's criticisms of mercantilism.
2. Match his criticisms to changes in British government actions toward trade as outlined in the "Introduction."

### Lesson 3

#### *Student Handout 3—Adam Smith on Mercantilism*

In 1776, the British philosopher, Adam Smith, wrote *An Inquiry into the Nature and Causes of the Wealth of Nations*. According to him, the government should stop interfering in business matters and let the laws of supply and demand regulate the market.

By restraining, either by high duties, or by absolute prohibitions, the importation of such goods from foreign countries as can be produced at home, the monopoly of the home market is more or less secured to the domestic industry employed in producing them. ... In the system of laws which has been established for the management of our American and West Indian colonies the interest of the home-consumer has been sacrificed to that of the producer with a more extravagant profusion than in all our other commercial regulations. A great empire has been established for the sole purpose of raising up a nation of customers who should be obliged to buy from the shops of our different producers, all the goods with which these could supply them. For the sake of that little enhancement of price which this monopoly might afford our producers, the home-consumers have been burdened with the whole expense of maintaining and defending that empire. ... It cannot be very difficult to determine who have been the contrivers of this whole mercantile system; not the consumers, we may believe, whose interest has been entirely neglected; but the producers, whose interest has been so carefully attended to; and among this latter class our merchants and manufacturers have been by far the principal architects.

Source: Adam Smith, *The Wealth of Nations* (London: Penguin Books, 1999), 6-7.



**Adam Smith**

Library of Congress, Prints and Photographs Division, engraving published in 1805,

Reproduction Number: LC-USZ62-17407

## Assessment

In small groups, ask students to create an illustrated history of the shift from Asian dominance of manufacturing to British dominance between 1750 and 1830.

## This unit and the Three Essential Questions

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 <p>HUMANS &amp; the ENVIRONMENT</p>	<p>Research ways in which an industry in your city or region may have affected the local natural and physical environment. Consider such factors as changes of the landscape, air pollution (from the industry or traffic), water and power usage, and the company's adoption of "green" policies. How might the environmental impact of this modern industry compare with the impact of a mechanized English textile factory in the late eighteenth or early nineteenth centuries?</p>
 <p>HUMANS &amp; other HUMANS</p>	<p>Stage a debate on the social benefits and costs of mechanized industrialization in Britain in the late nineteenth and early twentieth centuries. The debate should assess the positive and negative aspects of industrialization in its impact on people of different classes.</p>
 <p>HUMANS &amp; IDEAS</p>	<p>How did early industrialization in Britain change ideas about the role of government in the economy? What was liberalism as defined in the early nineteenth century? How did liberal ideology differ from mercantilist ideology? How do nineteenth-century liberal ideas differ from the principles of political liberalism in the United States today?</p>

## This unit and the Seven Key Themes

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This unit emphasizes:

Key Theme 2: Economic Networks and Exchange

Key Theme 4: Haves and Have-Nots

Key Theme 7: Science, Technology, and the Environment

## This unit and the Standards in Historical Thinking

### Historical Thinking Standard 1: Chronological Thinking

The student is able to (E) interpret data presented in timelines and create timelines by designating appropriate equidistant intervals of time and recording events according to the temporal order in which they occurred.

### Historical Thinking Standard 2: Historical Comprehension

The student is able to (C) Identify the central question(s) the historical narrative addresses and the purpose, perspective, or point of view from which it has been constructed.

### Historical Thinking Standard 3: Historical Analysis and Interpretation

The student is able to (C) analyze cause-and-effect relationships bearing in mind multiple causation including (a) the importance of the individual in history; (b) the influence of ideas, human interests, and beliefs; and (c) the role of chance, the accidental, and the irrational.

### Historical Thinking Standard 4: Historical Research Capabilities

The student is able to (C) interrogate historical data by uncovering the social, political, and economic context in which it was created; testing the data source for its credibility, authority, authenticity, internal consistency, and completeness; and detecting and evaluating bias, distortion, and propaganda by omission, suppression, or invention of facts.

### Historical Thinking Standard 5: Historical Issues-Analysis and Decision-Making

The student is able to (B) marshal evidence of antecedent circumstances and current factors contributing to contemporary problems and alternative courses of action.

## Resources

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### *Resources for teachers*

Goldstone, Jack. "Efflorescences and Economic Growth in World History: Rethinking the 'Rise of the West' and the Industrial Revolution." *Journal of World History*, 13:2 (2002): 323-89.

Hobsbawm, Eric. *Industry and Empire: The Birth of the Industrial Revolution*. New York: New Press, 1999. A revised version of a classic account of the Industrial Revolution in Britain.

Marks, Robert B. *The Origins of the Modern World: A Global and Ecological Narrative from the Fifteenth to the Twenty-first Century*. 2<sup>nd</sup> ed. Lanham, MD: Rowman and Littlefield, 2007. A concise and lucid account of the development of the global economy. Accessible to high school students, especially AP world history classes.

Pacey, Arnold. *Technology in World Civilization: A Thousand-Year History*. Cambridge, MA: MIT Press, 1998. An insightful and well-illustrated survey with a strong global perspective.

Stearns, Peter N. *The Industrial Revolution in World History*. Boulder, CO: Westview Press, 1993. Synthesizes and integrates in one volume most of the key issues and topics relating to the worldwide rise and spread of the Industrial Revolution.

Williams, Eric. *Capitalism and Slavery*. Chapel Hill, N.C.: University of North Carolina Press, 1944. A classic thesis arguing that slave labor agriculture in the Americas jumpstarted the Industrial Revolution.

Wolf, Eric R. *Europe and the People without History*. Berkeley, CA: University of California Press, 1982. A dense and eclectically Marxist interpretation of the development of the world economy

### ***Resources for students***

Briggs, Asa. *Iron Bridges to Crystal Palace: Impact and Images of the Industrial Revolution*. London: Thames and Hudson, 1979. Well and profusely illustrated; wonderful pictures about places, machinery, and people involved in the Industrial Revolution in Britain.

“Rethinking the Industrial Revolution,” with Ken Pomeranz and Bin Wong, Asian Topics in World History, Asia for Educators, Columbia University, China and Europe, 1500-2000 and Beyond: What is “Modern?”  
<http://afe.easia.columbia.edu/chinawh/web/s3/index.html>.

## **Correlations to National and State Standards**

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### ***National Standards for World History***

Era 7: An Age of Revolutions, 1750-1914. 2A: The student understands the early industrialization and the importance of developments in England. 3C: The student understands the consequences of political and military encounters between Europeans and peoples of South and Southeast Asia. Therefore, the student is able to: Describe patterns of British trade linking India with both China and Europe and assess ways in which Indian farmers and manufacturers responded to world trade.

***California: History-Social Science Content Standard***

Grade Ten, 10.3: Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.

***Virginia History and Social Science Standards of Learning***

WHII.8: The student will demonstrate knowledge of the effects of the Industrial Revolution during the nineteenth century by a) citing scientific, technological, and industrial developments and explaining how they brought about urbanization and social and environmental changes; d) explaining the rise of industrial economies and their link to imperialism and nationalism.

**Conceptual links to other teaching units**

The well-known historian Eric J. Hobsbawm wrote in 1962 that a “dual revolution” occurred in the later eighteenth century. The French Revolution, which began in 1789, and the industrialization that got underway in Britain about the same time were the two elements of this dual revolution. This unit has explored the beginnings of industrialization. Landscape Teaching Unit 7.2 turns to the political side of the dual revolution, emphasizing the ideas that shaped it. Study of the two units in succession raises questions about the intermeshing of the industrial and political revolutions with each other.