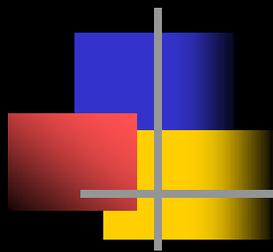


# The Early Industrial Revolution

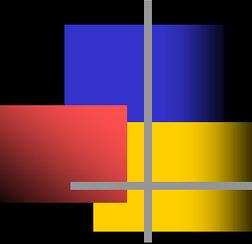
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1760–1851



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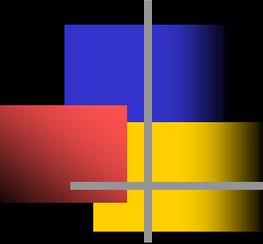
# Causes of the Industrial Revolution

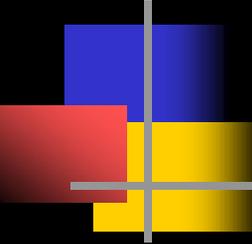


# Population Growth

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- In the eighteenth century more reliable food supplies, earlier marriage, high birth rates, and more widespread resistance to disease contributed to significant population growth in Europe.
- ***England and Wales*** experienced particularly rapid population growth

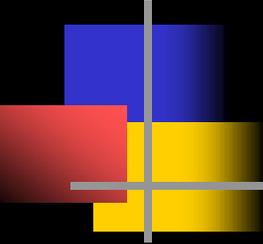
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- Rapid population growth meant that children accounted for a relatively high proportion of the total population.
  - Population growth also contributed to migration of people from the countryside to the cities, from Ireland to England, and from Europe to the Americas

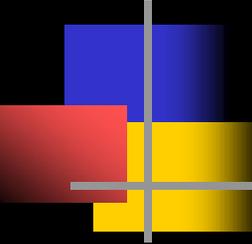


# The Agricultural Revolution

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- The agricultural revolution began long before the eighteenth century.
- New food crops, many of them from the Americas, and new forage crops produced more food per acre and allowed farmers to raise more cattle for meat and milk

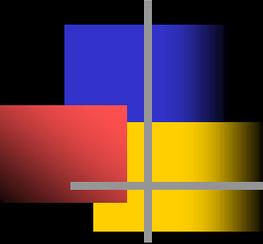
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- Only wealthy landowners could afford to invest in new crops and new farming methods.
  - Rich landowners fenced off (*enclosed*) their own land and common land to apply new scientific farming methods
  - As a result they did so, they forced their former tenants to become sharecroppers or landless laborers, or to *migrate to the cities*

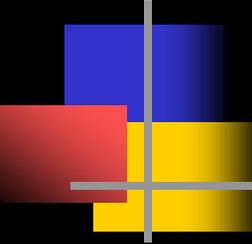


# Trade and Inventiveness

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- In most of Europe, increasing demand for goods was met with increasing production in traditional ways
- This happened through the addition of new craftsmen to existing workshops

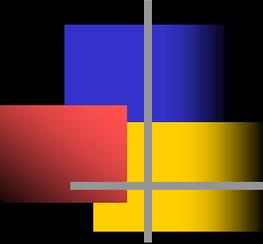
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- Population growth and increased agricultural productivity were accompanied by a growth in trade and a fascination with technology and innovation



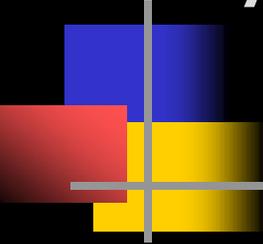
# Britain and Continental Europe

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- Eighteenth-century Britain had a number of characteristics that help to explain its peculiar role in the Industrial Revolution.
- These characteristics include economic growth, population growth, people who were willing to put new ideas into practice, strong mining and metal industries, the world's largest merchant marine, and a relatively fluid social structure.

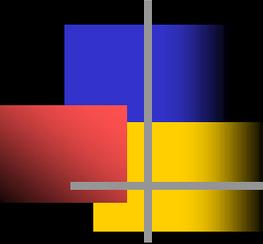
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- Britain also had a good water transportation system, a unified market, and a highly developed commercial sector

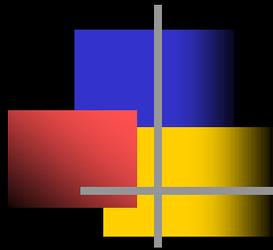
# Why Britain led the Industrial Revolution



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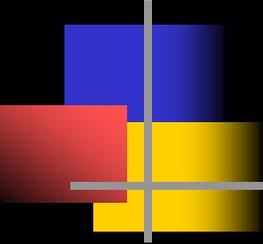
- **Geography**
  - **Climate good for textile production**
  - **Plenty of natural resources such as iron & coal**
  - **Separation from the European continent kept them out of wars**
- **Government**
  - **Internal trade encouraged**
  - **Population allowed to relocate**
  - **Helped build canals & roads (public works)**
- **Social Factors**
  - **British society less rigid than the rest of Europe**
- **Colonial Empire**
  - **Supplied raw materials for manufactured goods**
  - **Provided markets for goods**
- **Advantages of industrializing 1<sup>st</sup>**
  - **No other countries competing for manufactured goods**
  - **Monopoly on technology**

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- The economies of continental Europe experienced a similar dynamic expansion in the eighteenth century
  - ***However***, lack of markets and management skills and the constant warfare from 1789–1815 interrupted trade and weakened the incentive to invest in new technologies.
  - Industrialization took hold in Europe after 1815, first in Belgium and France. European governments played a significant role in fostering industrialization



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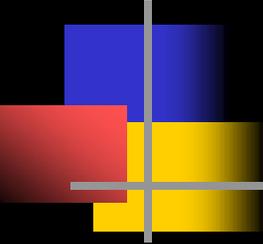
# The Technological Revolution

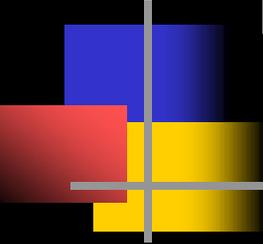


# Mass Production: Pottery

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- Pottery was either imported or handmade for the aristocracy; in either event, ordinary people could not afford it.
- But the growing taste for tea, cocoa, and coffee created a demand for porcelain that would not spoil the flavor of these beverages

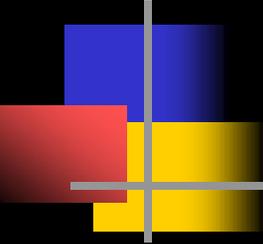
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- In 1759 Josiah Wedgwood opened a pottery business that used division of labor and molds (rather than the potters wheel) in order to mass-produce high quality porcelain at a low cost that made it affordable for everyday use

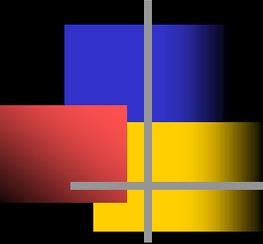


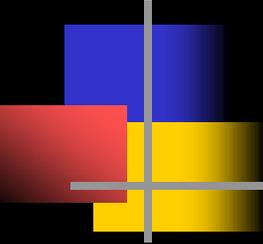
# Mechanization: the Cotton Industry

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- There was a strong market for cotton cloth, but the cotton plant did not grow in Europe.
- Restrictions on the import of cotton cloth led inventors and entrepreneurs to devise cheap mechanical methods for spinning cotton thread and weaving cotton cloth in England.

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- Beginning in the 1760s a series of inventions revolutionized the spinning of cotton thread.
  - These included the spinning jenny (1764), the water frame (1769), and the mule (1785).
  - The increased supply of cotton thread and the demand for cotton cloth led to the invention of power looms and other machinery and processes for cotton textile production

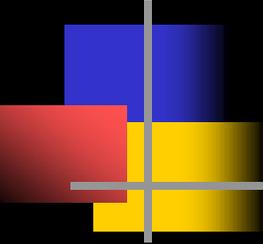
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- Mechanization of cotton textile production led to much greater efficiency and lower prices.
  - Cotton became America's most valuable crop, produced for export to England and, from the 1820s, for America's own cotton textile industry

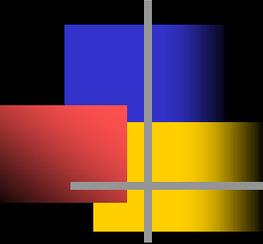


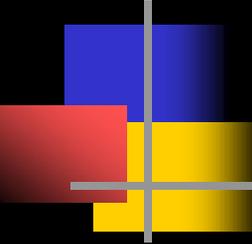
# The Iron Industry

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- Iron had been in use in Eurasia and Africa for thousands of years
- However iron production was associated with deforestation that increased the price of charcoal and thus reduced the output of iron.
- Limited wood supplies and the high cost of skilled labor made iron a rare and valuable metal outside of China before the eighteenth century

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- In the eighteenth century a series of inventions made it possible for the British to produce large amounts of cheap iron.
  - Increased production and lower cost led people to use iron for numerous applications including bridge building and the construction of the Crystal Palace

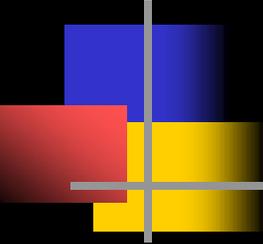
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- The idea of interchangeable parts originated in the eighteenth century, but it was widely adopted in the firearms, farm equipment, and sewing machine industries in the nineteenth century.
  - The use of machinery to mass-produce consumer goods with identical parts was known as “the American system of manufactures”

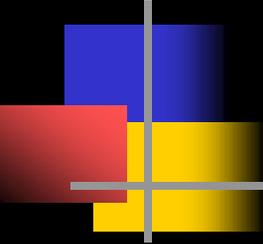


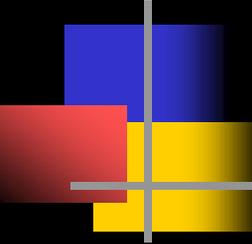
# The Steam Engine

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- The steam engine was the most revolutionary invention of the Industrial Revolution.
- Between 1702 and 1712 Thomas Newcomen developed a crude, inefficient steam engine that was used to pump water out of coal mines

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- In 1769 James Watt improved the Newcomen engine and began to manufacture engines for sale to manufacturers.
  - Watt's engine provided a source of power that allowed factories to be located where animal, wind, and water power were lacking

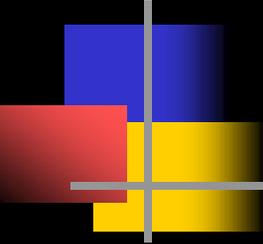
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- In the 1780s the steam engine was used to power riverboats in France and America.
  - In the 1830s the development of more efficient engines made it possible to build ocean-going steamships

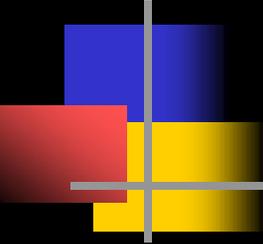


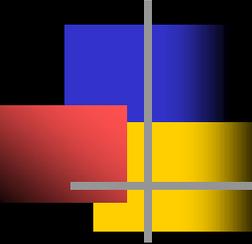
# Railroads

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- After 1800 inventors including Richard Trevithick and George Stephenson built lighter, more powerful high-pressure steam engines and used them to power steam locomotives that soon replaced the horses on horse-power railways

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- Railway-building mania swept Britain from 1825 to 1845 as the major cities, and then small towns, were linked by a network of railroads.
  - In the United States, railway booms in the 1840s and 1850s linked the country together and opened the Midwest to agricultural development

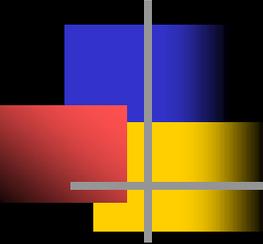
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- In Europe, railways triggered industrialization.
  - Europe's industrial areas were concentrated in the iron and coal-rich areas of northern France, Belgium, the Ruhr, and Silesia

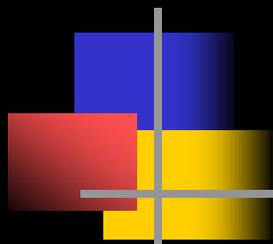


# Communication Over Wires

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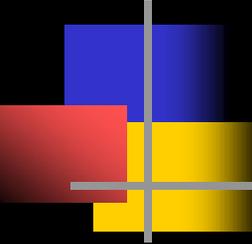
- The construction of railroads was accompanied by the development of the electric telegraph.
- Two systems of telegraphy were invented in 1837: Wheatstone and Cook's five-needle telegraph in England, and Morse's dots and dashes system in the United States

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- In the 1840s and 1850s Americans and Europeans had built the beginnings of what would become a global communications network.
  - Europeans and Americans regarded this rapid communications system as a clear measure of progress.



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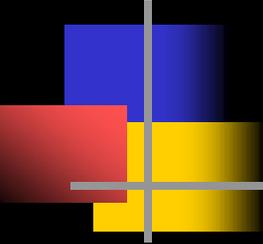
# The Impact of the Industrial Revolution

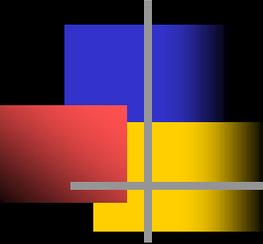


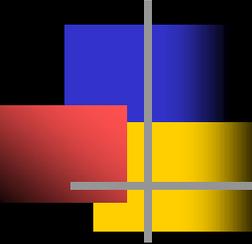
# The New Industrial Cities

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- Industrialization brought about the rapid growth of towns and the development of megalopolises such as Greater London.
- The wealthy built fine homes, churches, and public buildings; the poor crowded into cheap, shoddy row houses

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- Sudden population growth, crowding, and lack of municipal services made urban problems more serious than they had been in the past.
  - Inadequate facilities for sewage disposal, air and water pollution, and diseases made urban life unhealthy and contributed to high infant mortality and short life expectancy

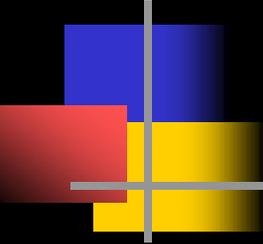
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- Reports of the horrors of slum life led to municipal reforms that began to alleviate the ills of urban life after the mid-nineteenth century

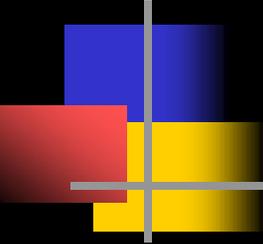


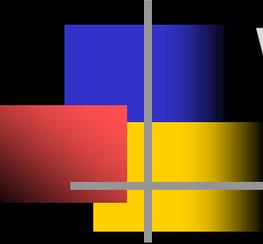
# Rural Environments

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- Almost all the land in Europe had been transformed by human activity before the Industrial Revolution, but deforestation was an ongoing problem.
- Americans transformed their environment even faster than Europeans, clearing land, using it until the soil was depleted, and then moving on

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- Industrialization relieved pressure on the English environment in some ways; agricultural raw materials were replaced by industrial materials or by imports, while the use of coke and the availability of cheap iron reduced the demand for wood

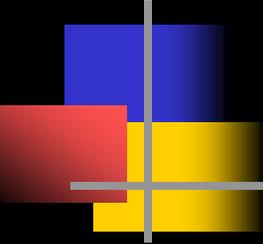
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- New transportation systems greatly changed rural life.
  - Toll roads, canals, and then railroads linked isolated districts to the great centers of commerce, industry, and population

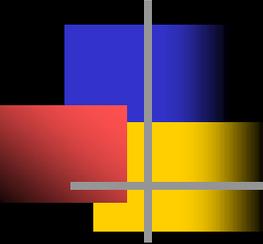


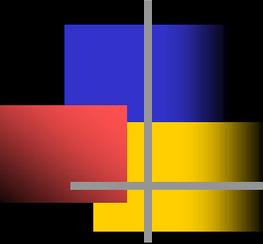
# Working Conditions

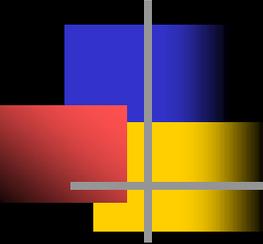
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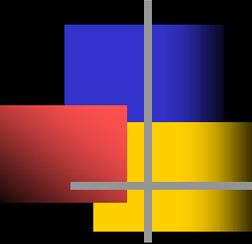
- Industrialization offered new, highly-paid opportunities for a small number of skilled carpenters, metalworkers, and machinists; but most industrial jobs were unskilled, repetitive, boring, badly paid, and came with poor working conditions
- The separation of work from home had a major impact on women and on family life

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- Women workers were concentrated in the textile mills and earned much less than men.
  - Husbands and wives worked in separate places.
  - Most of the female work force consisted of young women who took low-paid jobs as domestic servants

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- Poverty and employers' preference for child workers led to high rates of child labor.
  - In the mid-nineteenth century the British government restricted child labor, so mill owners recruited Irish immigrants instead

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- In America, the first industrialists offered good wages and decent working conditions to their women workers, but harsh working conditions, long hours and low pay soon became standard.
  - Protests by American women workers led factory owners to replace them with Irish women, who were willing to accept lower pay and worse conditions

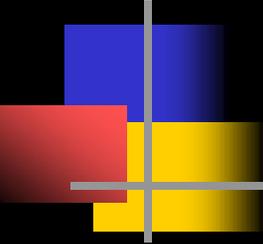
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- The Industrial Revolution increased the demand for cotton, sugar, and coffee.
  - In doing so, industrialization helped to prolong slavery in the United States and the Caribbean and to extend slavery to the coffee-growing regions of Brazil

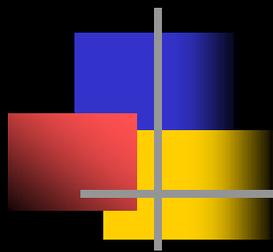


# Changes in Society

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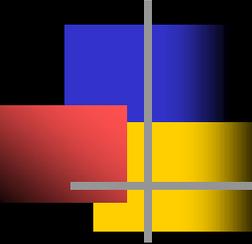
- Industrialization increased disparities in income.
- The wages and standards of living of the workers varied with the fluctuations of the business cycle, but overall, workers' standards of living did not improve until the 1850s

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- The real beneficiaries of the Industrial Revolution were the middle classes.
  - Rising incomes allowed the middle class to build their own businesses, to keep their women at home, and to develop a moral code that stood in contrast to the squalor and drunkenness of the working class



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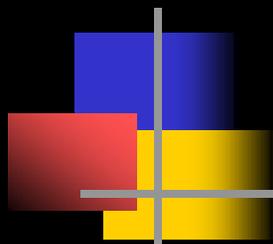
# New Economic and Political Ideas



# Laissez Faire and Its Critics

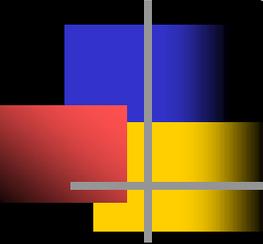
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- Adam Smith was the most famous proponent of the laissez-faire doctrine that government should refrain from interfering in business.
- Thomas Malthus and David Ricardo argued that the poverty of the working class was the result of over-population and that it could best be addressed, not by government action, but by delayed marriage and sexual restraint.
- Business people welcomed the idea of laissez faire.



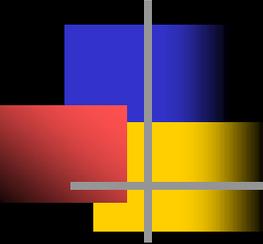
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- Critics of laissez faire, such as Jeremy Bentham in England and Friedrich List in Germany, argued that the state should take action to manage the economy and to address social problems.

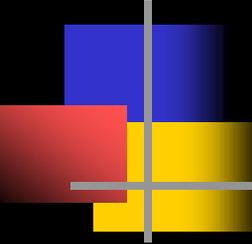
# Positivists and Utopian Socialists



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- In France, the count of Saint-Simon developed a philosophy called positivism, which argued that the scientific method could solve social as well as technical problems.

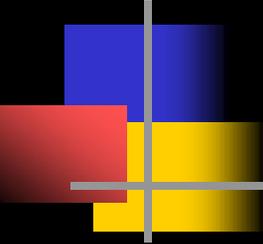
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- The utopian socialists include Charles Fourier, who imagined an ideal society without capitalists, and Robert Owen, who believed that industry could provide prosperity for all.
  - Owen tried to put his ideas into practice by carrying out reforms in his own textile mill and by encouraging Parliament to pass child labor laws and establish government inspection of working conditions.

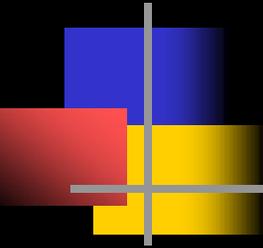


# Protests and Reforms

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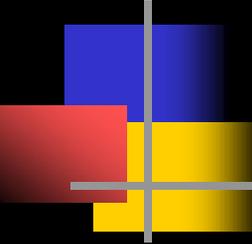
- Workers initially responded to the harsh working conditions by changing jobs frequently, not reporting for work, doing poor quality work when not closely watched, and by engaging in riots or strikes.
- Workers gradually moved beyond the stage of individual, unorganized resistance to create organizations for collective action: benevolent societies and trade unions.

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- Mass movements persuaded the British government to investigate the abuses of industrial life and to offer ameliorative legislation that included the Factory Act of 1833, the Mines Act of 1842, and the repeal of the Corn Laws in 1846.
  - In Europe, the revolutions of 1848 revealed widespread discontent, but European governments did not seek reform through accommodation.



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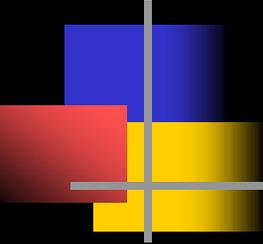
# Industrialization and the Non-Industrial World

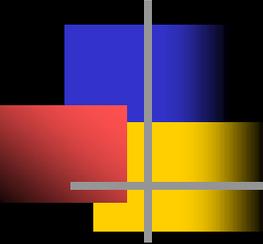


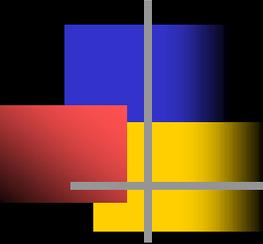
# China, Egypt, and India

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- New military technologies changed the balance of power between Europe and China, allowing Britain to defeat the Chinese quickly and easily.
- In the early nineteenth century Egypt's ruler Muhammad Ali undertook a program of industrialization that was funded by the export of wheat and cotton and protected by high tariffs on imported goods.

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- The prospect of a powerful modern Egypt posed a threat to the British, so in 1839 Britain forced Muhammad Ali to eliminate all import duties.
  - Without tariff protection, Egypt's industries could not compete with cheap British products; Egypt became an economic dependency of Britain.

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- Cheap machine-made British textiles forced Indian spinners and hand weavers out of work.
  - Most became landless peasants, and India became an exporter of raw materials and an importer of British industrial goods.



# Here comes *IMPERIALISM!*

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- Railroads, coal mining, and telegraph lines were introduced to India in the mid-nineteenth century.
- Some Indian entrepreneurs were able to establish their own textile mills, but overall, India's industrialization proceeded at a very slow pace because the British administration did nothing to encourage Indian industry.