The Industrial Revolution, 1760-1850

The Industrial Revolution transformed human life by changing methods of manufacturing, the way people made a living, and the products available to them.

I. The Nature of the Industrial Revolution

The Industrial Revolution took place in England in the late eighteenth and nineteenth centuries. It was made up of four sets of changes: first, the introduction of new technology; second, the use of new mineral sources of energy; third, a concentration of workers in factories; and fourth, new methods of transportation.

A. The New Industrial Technology: The Industrial Revolution introduced machines to textile manufacturing, iron, printing, papermaking, and engineering industries. The most significant machines were steam engines and the machines used to make cloth.

1. Textile Machinery: Until the eighteenth century, the manufacturing of cloth was done by hand. In 1767, James Hargreaves introduced the spinning jenny, which increased the amount of cotton yarn that could be spun. In 1769, Richard Arkwright introduced the water frame, which produced stronger warp yarn. A decade later in 1779, Samuel Crompton combined the jenny and the water frame into one machine called the mule. The mule could produce 300 times as much yarn as a person on a spinning wheel. These machines produced more yarn than weavers could handle until 1787, when Edmund Cartwright invented the power loom. Because of these machines and improvements made to them, English weavers were working 200 times more cotton in 1850 than they had in 1780.

2. The Steam Engine: Another key invention of the Industrial Revolution was the steam engine, invented by James Watt in 1763, to pump water out of mines. The steam engine was used to raise minerals from mines, provide heat for smelting iron ore, and drive machines in textile mills.

B. Mineral Sources of Energy: Until the eighteenth century, transportation of goods was powered by humans or animals. Organic sources of fuel were wood, charcoal, or water power. Beginning in the eighteenth century, the Industrial Revolution began to rely on coal to produce the high temperatures needed to smelt iron. Eventually it also became a source of heat for the steam engine.

C. The Growth of Factories: One of the major developments of the Industrial Revolution was the large factory. In the sixteenth century, businessmen began employing families in the countryside to spin and weave. This was known as the domestic system, and all members of the family participated in the production. The businessman provided the materials and was responsible for the marketing. The introduction of machines in the late eighteenth century led to the development of the factory system. The large
factory was more cost effective because it allowed the concentration of machines and workers in one place. It also reduced transportation costs and allowed for greater quality control. The factory owner had greater control of the work force and enforced much stricter discipline. It also made possible what the economist Adam Smith called the "division of labor," whereby each person was responsible for one stage of production, allowing for great increase in total production. The workers needed no special skills to operate the machines.

D. **New Methods of Transportation** As industry expanded, so did the transportation network needed to move raw materials and finished products. Thousands of miles of canals and all-weather roads were built in the eighteenth century. The main innovation in transportation of the nineteenth century was the railroad. The railroads were driven by coal-burning, steam-power locomotives and provided quick, cheap transportation to places inaccessible by water. The construction of railroads created a demand for iron and for large numbers of workers and became a large industry in its own right. Unlike manufacturing, railroad networks usually involved a combination of private and public investment.

II. **Conditions Favoring Industrial Growth** The presence in England of a large population, capital, and people with scientific knowledge and entrepreneurial skills were among the social and economic factors that helped make the Industrial Revolution possible.

A. **Population Growth:** The population of England doubled between 1680 and 1820. The population increase provided the large supply of cheap labor needed by the factories. It also provided an increase in demand for manufactured goods.

B. **Agricultural Productivity:** In the eighteenth century, British agriculture experienced a revolution of its own. The process of enclosure allowed farmers and landlords to fence in their fields and control production. They introduced crop rotations that restored nutrients to the soil, allowing for greater yield. They also began scientific breeding to improve the quality of their herds. The result was an increase in productivity with fewer agricultural workers. This allowed more people to leave the farms to work in the factories while supplying them with cheap food.

C. **Capital Formation and Accumulation:** The term capital refers both to money and to fixed capital (factories and machines). The investment capital needed for the Industrial Revolution came mostly from merchants engaged in domestic and foreign trade, from landowners who profited from their estates in Britain and plantations in the colonies, and from banks.

D. **Technological Knowledge and Entrepreneurship:** England had been a leading center of the scientific revolution and consequently had plenty of people with the scientific knowledge to mechanize the industry. It also had a merchant capitalist class who organized the domestic system. The combination of these two elements is exemplified by the partnership of James Watt and Matthew Boulton. Watt had the scientific knowledge and
Boulton was a leading entrepreneur who was able to assemble the workers with the needed skills to mass produce Watt's engine.

E. Demand from Consumers and Producers: In addition to the supply of capital, labor, and knowledge, demand for goods also played an important role in fueling the Industrial Revolution. The demand for goods was created by advertising, as well as by the increasing ability of the working class to buy goods as their purchasing power increased.

III. The Spread of Industrialization
The Industrial Revolution spread to the rest of Europe and North America over the course of several decades after it developed in Britain.

A. Great Britain and the Continent: Part of the reason for the delay in the start of the Industrial Revolution in the rest of Europe was the political situation in individual countries. Germany, for example, was politically fragmented into many states, each with its own tariffs and taxes, which hindered the free passages of resources and goods across the country. Local privileges in France also hindered the free economic passage. By contrast, all of Britain was a single market. Another factor in delaying industrialization was protectionism. While it protected the local economy from competition, it also hindered the importation of necessary resources. Another factor in hindering industrialization was the aristocracy in continental Europe, who drew their wealth from land. They lacked a capitalist spirit and were more cautious about investing in the new enterprises. Finally, parts of the continent lacked the availability of the needed natural resources.

B. Features of Continental Industrialization: After 1830, Belgium, France, Switzerland, and Germany began to imitate the English industrialization process by introducing machinery into the production process, concentrating workers in factories, and beginning to build their transportation network. However, the industrialization process in the European continent differed from the British in a number of ways. First, the governments played a greater role providing capital as active partners in industrialization process. Governments built railroad systems, which facilitated the beginnings of industrialization. Second, the banks were also major partners in financing industry. Third, the development of the railroad system helped begin industrialization. It helped stimulate other industries to meet its needs by the markets it created.

C. Industrialization in the United States: The Industrial Revolution began in the United States in the 1820s with the textile industry of the northeast. It then continued with the development of heavy industry in the Pittsburgh and Cleveland regions. U.S. industrialization followed patterns borrowed from England and Europe. Most of the machinery was modeled on that of England. Like England, it also had a vast supply of raw materials. The relatively short supply of labor helped avoid the awful conditions suffered by the English working class. After 1865, U.S. industry began to expand rapidly. The major American contribution to the industrial process was the assembly line.
D. **Industrial Regionalism:** The industrialization process was regional in character. Different regions of the various countries developed different branches of industry. For example, the French textile industry developed in the northeast, near the Belgian border, and the east-central region around Lyons. In Germany, the iron industry was concentrated in the Ruhr valley. Some areas of the country remained engaged only in agriculture.

IV. **The Effects of Industrialization:** Industrialization affected every aspect of human life.

A. **Population and Economic Growth:** One of the most important changes was the continuous expansion of the population and the economy. Most observers in the eighteenth century did not believe that expansion of the population and the economy could be sustained indefinitely. Thomas Malthus (1766-1834) argued that population naturally grows faster than the food supply, and therefore malnutrition, famine, and disease will correct the imbalance. Malthus's cycle of expansion and contraction did not take place. The population had consistently expanded as the greater agricultural productivity permitted maintaining an adequate food supply. The industrial economy had been able to employ large numbers of workers. Despite economic swings, industrialized nations continued to experience an increase in the gross national product and per capita income.

B. **Standards of Living:** There has been much debate about the impact of industrialization on the working class. The optimists have pointed to the long-term effects of industrialization, which have helped avoid Malthus's predictions, such as the rise of individual income. Pessimists have emphasized the fact that improvements did not appear for several decades after the beginning of industrialization. Pessimists blame the system of industrial capitalism for the laboring population's hardships. In an effort to reduce costs and maximize profits, employers kept wages low and utilized labor-saving devices. Pessimists also point to the early decades of industrialization, when people were forced to live in decrepit housing around the factories. The monotonous, demeaning, and exhausting nature of factory work adds to the pessimists' argument against the positive effects of the Industrial Revolution.

C. **Women, Children, and Industry:** During the early Industrial Revolution, large numbers of women and children were part of the workforce. They were willing to accept lower wages and were more easily disciplined. The factory system changed family life. In the early years of the Industrial Revolution many families worked together in the factories and mines. As mothers found it impossible to care for their small children while working, they began to leave the factory. The British Factory Act of 1833 enforced restrictions against child labor. Eventually, the trend was that the man earned a living outside of the home while the woman stayed home to care for their children.

D. **Class and Class Consciousness:** Writers began to describe industrial society as divided into three classes based on the type of property they owned. The aristocracy owned land. The bourgeoisie owned capital enterprises and
gained their wealth from profits. The working class owned only their labor and received wages. There is great debate over the extent to which the people of the nineteenth century were conscious of their class status. Some historians argue that worker exploitation and conflicts between capital and labor over wages led to the formation of class identity. Others argue that workers were more conscious of their trade, ethnic, or local identity than they were of their class identity.

E. **Industrial Landscape:** The Industrial Revolution changed the landscape. Small towns grew into huge cities. In the countryside, bridges, viaducts, railroad lines, and canals were built to improve transportation. The destruction of the natural beauty of the landscape triggered a nostalgic reaction in art and literature. Some of the new industrial architecture, such as the new bridges, were romanticized and thought to be architectural marvels.

V. **Industry, Trade, and Empire:** By the middle of the nineteenth century, Britain produced 66% of the world's coal, 50% of the cotton cloth and iron, and 40% of the hardware. In the search for raw materials and markets, the interests of industry, trade, and empire worked closely together.

A. **East Asia: The Opium War, 1839-1842:** For three centuries after the arrival of the Europeans, China maintained a tight control over trade with Europeans. In the 1830s conflict broke out between China and the British over the trade of opium, which was causing severe problems in Chinese society. When the Chinese authorities began seizing and destroying chests of opium, the English declared war. The British, with their superior technology, attacked and defeated China. In the aftermath, the Chinese were forced to open several ports to English merchants and allow the ports to be governed by British consuls who were not subject to Chinese law.

B. **India: Annexation and Trade In the late eighteenth and early nineteenth centuries:** Britain gained control of India. Political control of India served British merchants' interests. British merchants controlled the trade between India and the rest of Asia. India also became a market for British textile goods, which destroyed India's own textile industry. India also became a major source of revenue for the British government.

C. **Latin America: An Empire of Trade:** In Latin America, Britain was an ardent supporter of the movements to gain independence from Spain and Portugal. Once independent, these countries became markets for British goods and capital. While these countries remained politically separate from Britain, they became economically dependent on the British in the same way India had become. Latin America's village artisan economies were destroyed and Latin America became a market for British finished goods.