INDUSTRIAL REVOLUTION

- Industrialization
  - Manufactured goods had traditionally been made in home by guilds
  - specialization - process by which people pick one task or trade
  - machines begin to replace human labor
    - more efficient and cost effective
  - combination will eventually lead to world wide economy
- Agriculture improvements
  - enclosure
    - population growth eliminates available land
    - farmers begin to fence off land
    - must find new ways to increase production
  - crop rotation
    - three field system brings more land into production
    - 1721 - Jethro Tull invents the seed drill
      - makes planting more successful
  - improved livestock
    - breeding is used to increase the size of livestock
    - 1700 -1786
      - cows - 370 to 840 lbs.
      - sheep - 28 to 100 lbs.
  - allows more money for families to purchase manufactured goods
  - population continues to grow dramatically
    - provides labor needed for factory system
- Factory System
  - manufacturing will move out of the cottage industry
  - access to running water for power for machines
    - very little land available
  - development of iron ore industry makes metal for machines available
  - work moves out of homes into independent structures
  - workers now traveled to get to work
    - new transportation makes this possible
    - dramatically changes nature of family relationships
  - Captains of Industry(capitalists) will provide money for factories
    - AKA Robber Barons
      - ruled over workforce with brutal efficiency
- Great Britain leads the way into the Industrial Revolution
  - Natural resources
    - Britain has an abundance of waterpower and coal
  - geography
    - island with few resources has to trade
    - harbors provide access raw materials and markets
  - interested in technology
    - British had natural inclination to work for change
    - Royal Society’s financed many inventors

- strong finance
  - Bank of England - 1694
    - provided sound financial system
  - will lead to the development of the factory system
- political stability
  - few wars and favorable business laws
- Obstacles to Industrialization
  - Britain passes many laws forbidding exportation of ideas
    - keeps them ahead of the continent for some time
  - Guild systems tended to be stronger
  - transportation was more difficult
  - Napoleonic wars were also disruptive

Textile Inventions

- initially, spinners and weavers worked in the home(cottage industry)
- rapidly increasing population increase demand for clothes
- flying shuttle
  - doubled the speed of weaving
- spinning jenny
  - invented by James Hargreaves
  - hand operated machine doubled speed of spinning
- water-frame
  - invented by Richard Arkwright
  - used running water to power machines
    - more efficient that human power
- spinning mule
  - invented by Samuel Crompton
  - combined water frame and spinning jenny
  - built into factories
- power loom
  - invented by Edmund Cartwright
  - dramatically increased the speed of weaving
- Raw materials came into great demand
  - increased value of colonies
    - most British cotton produced in American South
- cotton gin
  - invented by Eli Whitney
  - quickly separated seeds from raw cotton
  - encouraged slavery in the colonies

Steam engines

- first invented by Thomas Newcomen
  - needed to find mechanical method to remove water from mines
  - Britain was dangerously short of lumber for fuel
- James Watt perfects the steam engine in 1765
  - allowed for factory production anywhere
    - factories moved out of mountains into cities
  - Watt becomes rich through licensing agreements

- Transportation Revolution
  - Railroads
    - invented by Richard Trevithick, perfected by George Stephenson
      - utilize steam for propulsion
    - Railways boom
      - 1850-80 worldwide
        - 23,600 to 228,400 miles
          - transcontinental RR is built in US
  - Railroads had multiple effects
    - industrial transport - move goods for sale to markets
    - jobs - massive 2nd order effects
    - agriculture - populations could be fed from large areas
    - travel - people had means to visit more areas
  - railways crisscross England, Europe, and US
  - telegraph - revolutionizes communication
    - invented by Samuel Morse
      - Morse Code
- Steamships
  - could move without relying on wind or oars
  - Suez Canal
    - links Mediterranean Sea with Indian Ocean
      - no longer necessary to sail around Africa
- Cities grew
  - population growth and enclosure forced thousands into cities
    - sought work in the factories
  - social problems followed
    - Row or Tenement houses
      - people crowded into extremely small apartments
      - little air, light, electricity, plumbing
        - no social services
      - disease was more likely to spread
        - cholera
    - many uneducated workers were taken advantage of
      - poor food, organized crime, confidence schemes
    - Working conditions
      - people worked 14 -16 hour days, six days a week
        - many also worked on Sundays
          - few breaks and holidays
      - equipment was often cheap and dangerous
        - many workers lost limbs and lives
        - it was more cost effective to replace labor
        - no worker's compensation or unemployment
    - Child labor was horrible
      - children were used to get into small spaces
        - cheaper source of labor
      - often worked in textiles and mines

- stunted their growth in many ways
- middle class expands
  - growing demands for educated professionals
  - business owners also added to the industrial middle class
  - money available to give middle class children educations
    - many will become social reformers
      - reformers bring sewer and trash to cities
      - city planning also became a serious profession
- Workers attempt to reform the system
  - Trade Unions
    - workers organized by industry
      - demanded higher wages, better conditions
    - strikes were used to achieve goals
      - government and police sided with capitalists
    - Unions also limited by industry and exclusion
      - will eventually begin to work together
    - German Social Democrats work for political influence
      - run candidates for Reichstag
    - Jean Jaures led the French socialists
      - advocated spending wealth on social programs
      - helped to unify socialists of Europe
    - Anarchists provided an alternative for some workers
      - believed in the destruction of state
      - paint all revolutionaries in poor light

Marxism

- By 1870, much of the European continent was industrialized
  - brought difficulties to all as well
  - governments almost always supported business over labor
- Karl Marx
  - German philosopher and historian
  - 1848 - publishes Communist Manifesto w/ Friedrich Engels
    - argued that history constantly evolves
    - Middle Ages - Feudalism - Capitalism
    - believed class struggle was more important than nationalism
      - bourgeoisie v. proletariat
    - workers of the world will eventually overthrow capitalists
    - they will then establish classless egalitarian society
- world - wide influence to present day

New Products and Inventions will continue the Industrial Revolution

- Steel
  - iron blasted through with carbon
  - blast furnace invented by Henry Bessemer
  - lasts 15 times longer than iron
    - hold sharper edge, stronger
  - skyscrapers are built using steel as base
    - elevators are invented to move up buildings

- electricity(1890's) provides new power and inspiration
- Thomas Edison
  - "Wizard of Menlo Park"
  - more than 1000 patented inventions
    - stock ticker, electric light, phonograph
  - first to utilize a team of inventors
- Alexander Graham Bell
  - invents telephone to revolutionize communication
- Guglielmo Marconi
  - invents radio and revolutionizes mass media
- internal combustion engine
  - perfected by Gottlieb Daimler
  - replaced steam with petroleum
    - smaller and provided more power

Henry Ford

- brought new strength to industry by perfecting factory process
  - mass production - making a large number of something
  - assembly line - highly specialized conveyor for production
  - interchangeable parts - all cars will be the same
    - easily constructed and repaired
  - Model T Ford - AKA "Tin Lizzie"
    - cost just $500 and could be bought by anyone
  - spurns entire new industries

Wright Brothers

- successfully complete first airplane flight in 1908 at Kitty Hawk, NC

Women had severely limited economic opportunity

- Jobs
  - House servant
  - teachers
  - Factory worker
    - garment industry
    - lower paying
    - "protection" laws made it more difficult to find work
    - unions didn't allow female members
  - Nursing
    - Florence Nightingale
    - Nightingale school for nurses
      - opens a whole new career for women
  - clerks and offices
- Business laws severely discriminated against women
  - Couldn't own property
  - could not make contracts or sue
  - could not get divorced
  - 1900 - no voting