History of Thought:
5. The Victorian Age

Oct 14, 2014

Piero Scaruffi

www.scaruffi.com

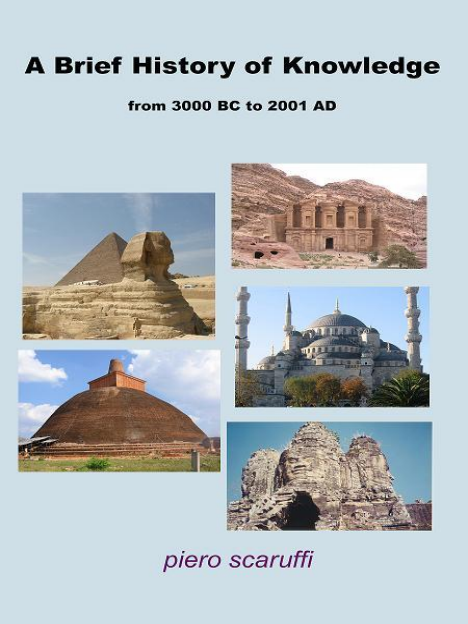
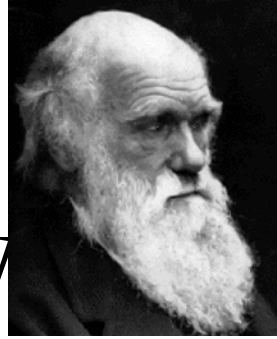


Table of Contents

1. Oldest Knowledge: The ancient Near East, Egypt, Greece
2. Oldest Knowledge: Ancient Greece, India and China
3. Classic Knowledge: Rome, Christianity, Islam, Song, European Middle Age
4. Modern Knowledge: Renaissance, Enlightenment, Scientific/Industrial Revolution
5. Modern Knowledge: The 19th century
6. Modern Knowledge: The 20th century

What the Victorian Age knew

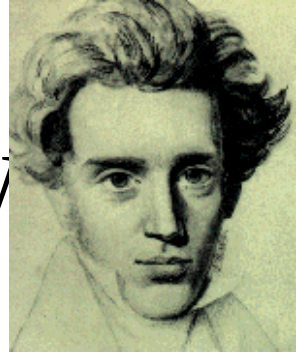


- Charles Darwin (1839 although published in 1859)
  - Evolution=variation+selection
    - Variation is ubiquitous
    - Natural selection is the driving force of evolution
    - New species are created by the action of natural selection on variation
  - Adaptation
    - New species are caused by the need to adapt to environmental changes

What the Victorian Age knew

- Gregor Mendel (1865)
  - Phenotype vs genotype
  - Units of transmission of traits

What the Victorian Age knew



- Soren Kierkegaard (1846)
  - The philosopher cannot be a detached, objective, external observer: the philosopher is someone who exists and is part of what is observed (an “existing subjective thinker”)
  - Existence is both the thinker’s object and condition
  - The truth that matters is the pathos of existing, not the truth of Logic
  - Logic is defined by necessity, but existence is dominated by possibility

What the Victorian Age knew

- Utopian socialism
  - Charles Fourier (1808)
    - Reorganization of society around phalanxes
  - Claude Rouvroy de Saint-Simon(1825)
    - Scientists to lead society (“positivism”)
  - Pierre Proudhon (1843)
    - Anarchy: elimination of government
    - Property is theft

What the Victorian Age knew

- Anarchic terrorism
  - 1881: Assassination of czar Alexander II
  - 1894: Assassination of French president Sadi Carnot
  - 1897: Assassination of Austrian empress Elizabeth and Spanish prime minister Antonio Canovas
  - 1900: Assassination of Italian king Umberto I
  - 1901: Assassination of USA president William McKinley
  - 1920: Assassination of Spanish prime minister Eduardo Dato

What the Victorian Age knew

- Karl Marx (1847)
  - The capitalist class (bourgeoisie) exploits the working class (proletariat) by keeping the "surplus value" produced by the working class
  - By reinvesting the “surplus value” the capitalist class increases its control of society

What the Victorian Age knew

- Karl Marx (1847)
  - The working class is “alienated” because producer and product are separated
  - Workers do not own the product of their work
  - The working class is further alienated because the capitalists own the production system

What the Victorian Age knew

- Karl Marx (1847)
  - All nations go through five economic stages, whose character is determined by the relations of production: slavery, feudalism, capitalism, socialism (collective ownership of property), communism (rule of the people)
  - The ultimate goal of history is a class-less society of peers (Hegelian synthesis = communism)
  - The working-class shall overthrow the capitalist class

What the Victorian Age knew

- Karl Marx (1847)
  - Socialism: all citizens own the means of production
  - Communism: full equality, class-less society

What the Victorian Age knew

- Karl Marx (1847)
  - Ironically, socialist revolutions will take place in countries with primitive capitalism and not in the countries of advanced capitalism
  - Marx did not believe that it was possible to bypass capitalism on the road to socialism: it was capitalism's mission to create the high productivity necessary to maintain a socialist state

What the Victorian Age knew

- George Boole (1854)
  - Applying algebraic methods to a variety of fields (Leibniz's project)
  - Logical propositions denoted by symbols
  - Laws of logic denoted by operators
  - "All humans are mortal" translates into "All y are some x" or y=vx, and can be further derived: y-vx=0, "Non-mortal humans do not exist"
  - Systematic use of symbols eliminates the ambiguities of natural language

What the Victorian Age knew

- Non-Euclidean geometries
  - Carl-Friedrich Gauss (1824, Germany): Euclid's postulate of the unique parallel can be replaced by the postulate that through any point there are an infinite number of parallels)
  - Nikolaj Lobachevsky (1826, Russia)
  - Janos Bolyai (1829, Hungary)

What the Victorian Age knew

- Bernhard Riemann (1854 lecture at Gottingen)
  - General class of geometries (any number of dimensions in any kind of space), that comprises the classical Euclidean geometry as a special case
  - The geometry of the surface of a sphere in which all straight lines are great circles (no parallel lines at all, unless space is flat)
  - Spaces with any number of dimensions
  - Space can be curved instead of flat
  - The curvature of space is measured by a “curvature tensor”

What the Victorian Age knew

- Charles Babbage: "Difference Engine" (1859), manufactured by Edvard Scheutz

What the Victorian Age knew

- Poetry
  - William Blake (1757, Britain): ”Jerusalem" (1820)
    - Anti-rationalist: “Science is the tree of death”
  - Friedrich Hoelderlin (1770, Germany): “Der Archipelagus” (1800)
  - William Wordsworth (1770, Britain): “Prelude” (1805)
  - Johann Wolfgang Goethe (1749, Germany): "Faust" (1832)
  - Heinrich Heine (1797, Germany): "Das Buch der Lieder" (1827)
  - Giacomo Leopardi (1798, Italy): “Canti” (1835)

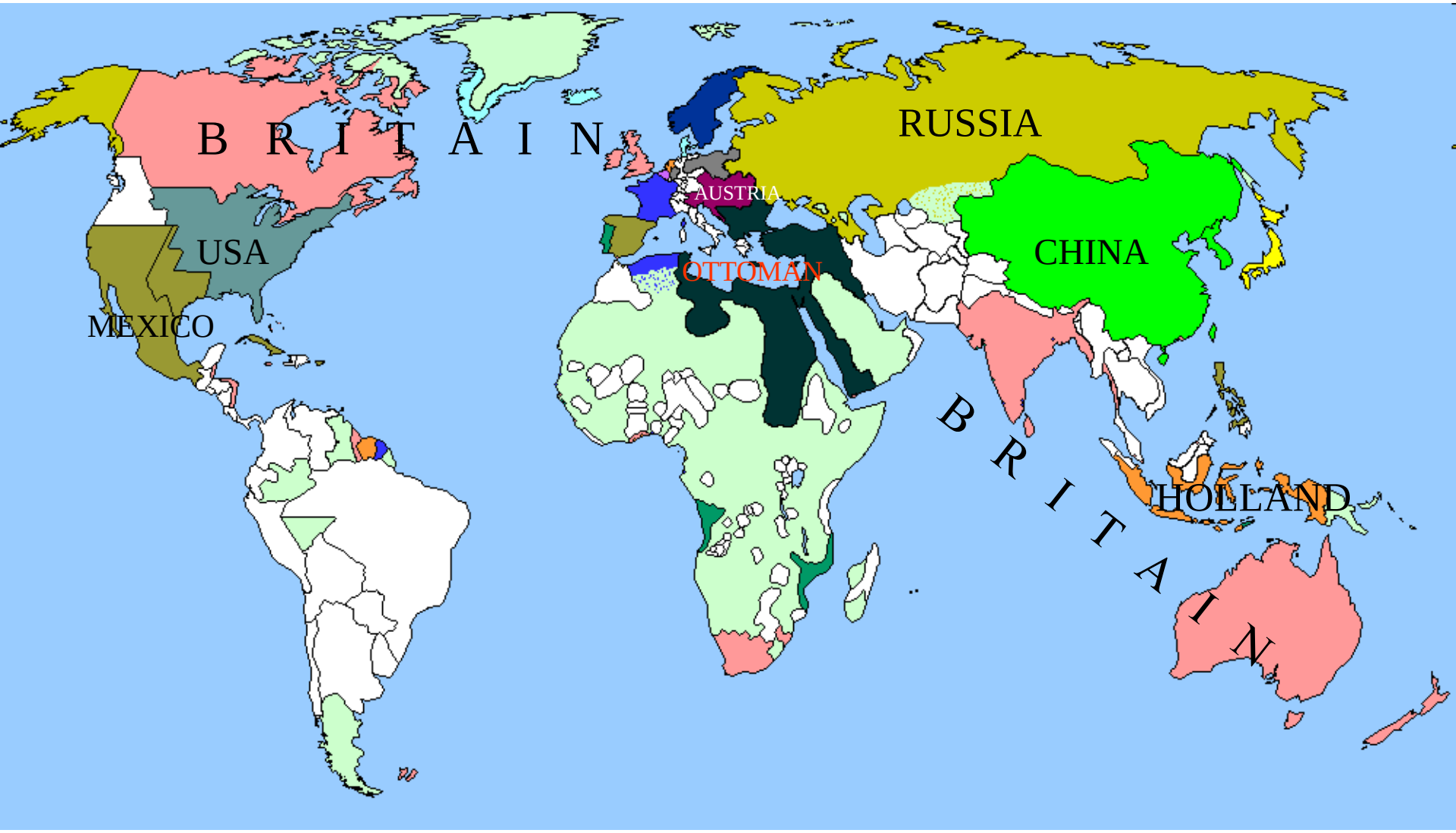
What the Victorian Age knew

- Music
  - 18th c: the symphony orchestra is born with its four sections (strings, winds, brass and percussion)
  - 1720s: a new genre emerges, the symphony, that becomes the main form in Germany, where it becomes the musical manifestation of Idealism (music = philosophy)

What the Victorian Age knew

- Music
  - Wolfgang-Amadeus Mozart (Austria, 1756): Concerto 21 in C K467 (1785)
  - Franz-Peter Schubert (Germany, 1797): “Unfinished Symphony” (1822)
  - Beethoven (Germany, 1770): “Symphony No 9” (1824)
  - Berlioz (France, 1803): “Symphonie Fantastique” (1830)

The World in 1845



The Multi-national European Wars

- 1870-71: Prussia wins against France
- 1904-05 Japanese-Russian war: Japan wins against Russia

What the Victorian Age knew

- Nations
  - After the French revolution, nationalism becomes the main factor of war
  - National aspirations by the people who don’t have a country
  - Nationalism is fed by mass education (history, geography, literature)
  - Exaltation of the past

What the Victorian Age knew

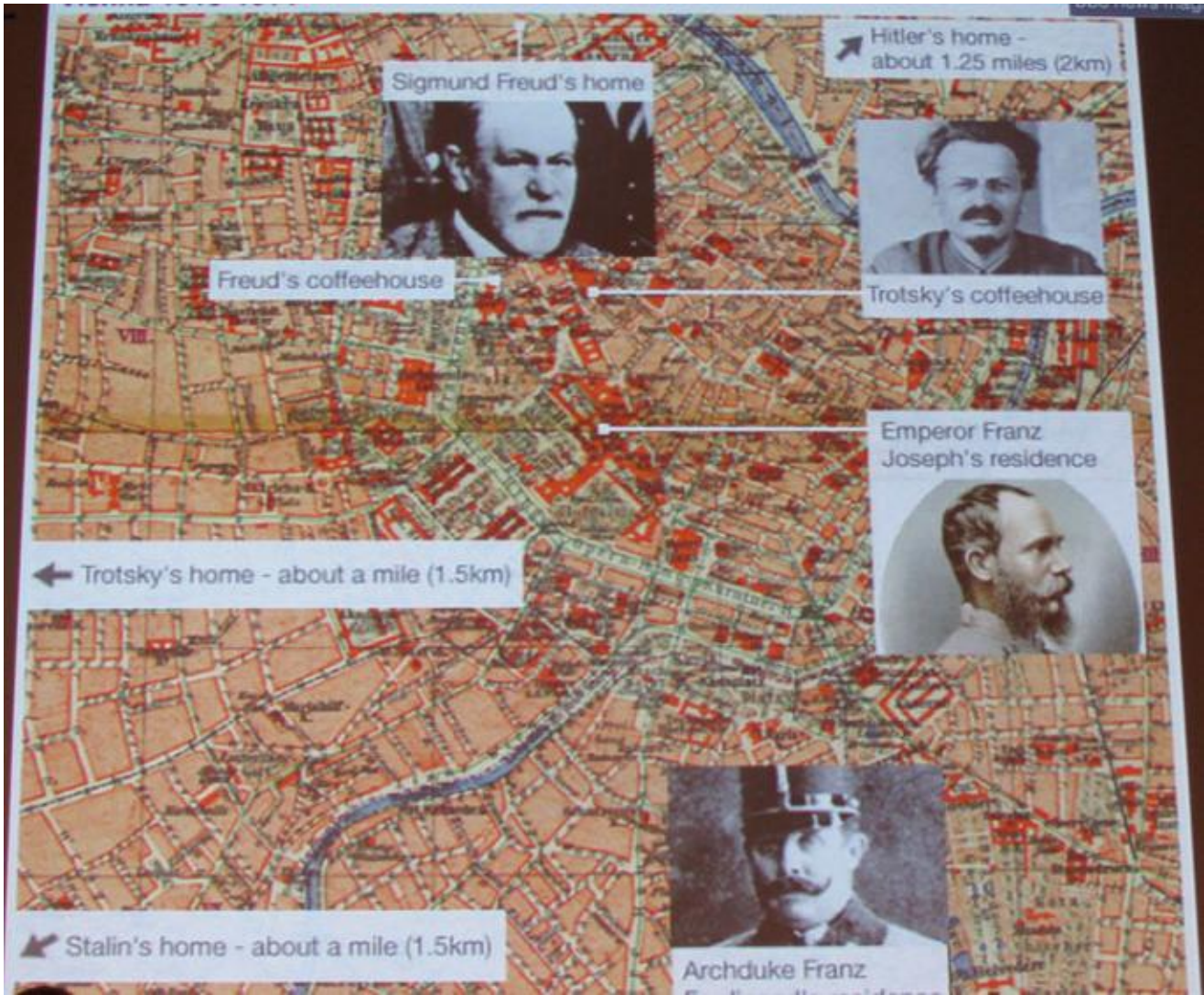
- Nations
  - Exception: Austrian empire
    - Multi-ethnic 50-million people empire (Germans, Hungarians, Czechs, Poles, Ukrainians, Italians, Slovaks, Romanians, Croatians, Serbs, Slovenes)
    - Franz Joseph’s reign from 1848 to 1916 provides stability

What the Victorian Age knew

- Austria
  - Vienna
    - Music: Richard Strauss, Gustav Mahler
    - Painting: Gustav Klimt, Egon Schiele
    - Fiction: Arthur Schnitzler, Robert Musil
    - Medicine: Sigmund Freud
    - Physics: Ludwig Boltzmann, Ernst Mach
    - Philosophy: Edmund Husserl

What the Victorian Age knew

Vienna in 1913



What the Victorian Age knew

- Nations
  - Exception: Ottoman empire
    - Multi-ethnic 24- million people empire (Turks, Arabs, Hungarians, Armenians, Kurds, Lebanese, Greeks, Bulgarians, Romanians)
  - Exception: Russian empire
    - Multi-ethnic (Russians, Caucasian peoples, Central Asian peoples, Poles, Lithuanians, Latvians, Estonians, Finns, Ukrainians, Jews)

What the Victorian Age knew

- A European world
  - National societies (in Europe)
  - Settler societies (Canada, USA, Australia, South Africa): Europeans displace the natives
  - Mixed-race societies (Latin America)
  - Subject societies (India, Africa): few Europeans rule over huge masses of natives

What the Victorian Age knew

- A European world
  - Small countries (Britain, France) control continents
  - Fewer and shorter Intra-European wars but many wars of conquest elsewhere
  - Europeans control 35% of the planet in 1800, 67% in 1878, 84% in 1914

What the Victorian Age knew

- 19th century emigration
  - 1800 - 1940: 50 Million people left Europe
  - 50% went to United States, rest to Latin America and Australia

What the Victorian Age knew

- India
  - Thin red line: less than 100,000 British control 250 million Indians
  - Suez Canal vital to British trade with India (2,250 out of 2,727 that cross the canal in 1881 are British): Britain annexes Egypt (1882)
  - The Cape vital to British naval supremacy in the Indian Ocean: Boer war (1899)

What the Victorian Age knew

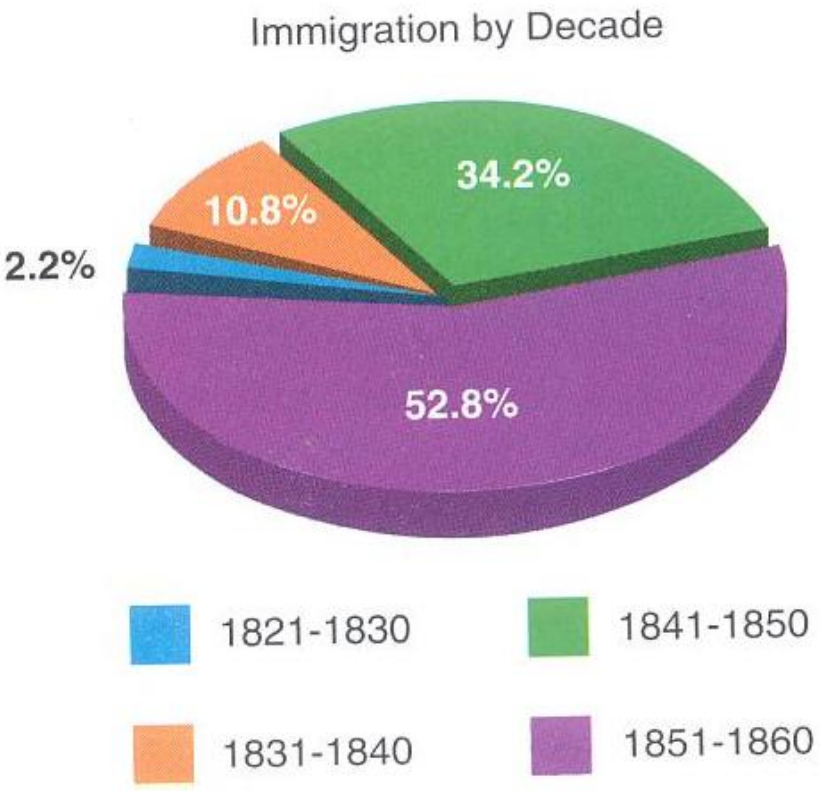
- USA

What the Victorian Age knew

- USA
  - Strong anti-aristocratic bias
  - Education, technology and initiative matter more than family heritage
  - Relentless industrialization
  - Relentless expansion
  - Most literate country in the world
  - 1860s: USA universities abandon the British system and adopt the German system (emphasis on research, PhD, etc)
  - 440,000 patents for new inventions between 1860 and 1890

What the Victorian Age knew

- USA
  - The USA depends on immigration to fuel both industrialization and expansion



(From “A People And A Nation”, Houghton Mifflin, 1998)

What the Victorian Age knew

- USA
  - Free trade within a continent that belongs to the same nation (no borders, no tarrifs)
  - State-funded expansion
  - Homestead Bill (1863): granting 0.6 square kms of public land to anyone willing to develop it for five years

What the Victorian Age knew

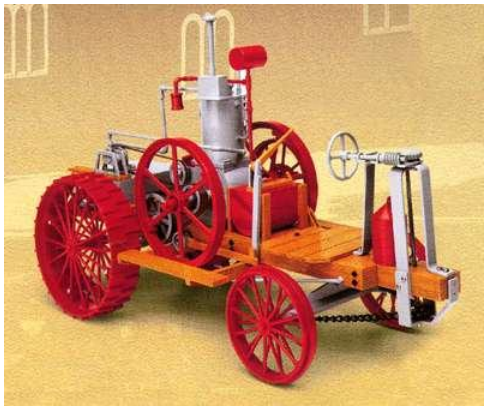
- USA
  - Just like in Britain, the inventor is mostly an everyman (not an academic or noble)
  - 1860s: invention is a normal state of mind (everyone can invent anywhere anyhow)
  - The USA is largely a rural population (85%)
  - Northern USA: Mechanization of agriculture, food processing and transportation (dearth of skilled workers)

What the Victorian Age knew

- USA
  - The Great Plains
    - Growing urban population doubles the demand for farming products
    - Machines allow families to farm large areas
    - European farmer: a member of a community (village)
    - US farmer: isolated in the Great Plains

What the Victorian Age knew

- USA
  - Mechanization of agriculture
    - 1850s: reapers and harvesters spread in the Midwest
    - 1880: John Appleby's twine binder (Wisconsin)
    - 1892: John Froelich's gasoline-powered agricultural engine, a proto-tractor (Iowa)
    - 1903: Charles Hart's and Charles Parr's name their gasoline-powered vehicle "tractor" (Iowa)



What the Victorian Age knew

- USA
  - Boom of gold
    - 1848: James Marshall's discovery of gold in California
    - US gold production increases from 1.2 tons in 1847 to 55 tons in 1849
    - Not capital intensive at all: anyone with a pan can search for gold
    - Mass migrations west
    - Mostly male population (92% of California's population in 1850)
    - Gold moves the center of mass of the USA west

What the Victorian Age knew

- USA
  - Boom of gold
    - Three ways to reach California from New York
      - » Six months by horse carriage
      - » Six months by sailship around Cape Horn
      - » Through Panama
    - 1852: Wells Fargo transcontinental express service
    - 1860: Pony Express (ten days from Missouri to Sacramento, 3000 kms): lasted only one year
    - 1869: Transcontinental railway

What the Victorian Age knew

- USA
  - Transportation
    - 1828: First railroad (Baltimore-Ohio)
    - 1869: The Union and Central Pacific railroads create the first transcontinental railroad
      - 1869: Ten days to travel from New York to San Francisco
      - In 1829 it had taken a month for newly elected president Andrew Jackson to travel by horse from Nashville to Washington
    - 1910: the USA has one third of all railroads in the world

What the Victorian Age knew

- USA
  - Transportation
    - Railroads create a new economy
      - Steel (steel rails replace iron rails from the 1880s)
      - Coal
      - Engineering (tunnels, bridges, grading)
      - Telegraph
      - Stations, depots, entire towns
      - 1883: Railroad companies standardize time (the four time zones of the USA)

What the Victorian Age knew

- USA
  - Railroads
    - Cement the nation by linking east and west
    - Create a global market for goods by linking the Atlantic to the Pacific
    - Essentially trigger the second industrial revolution
    - Railroads require huge investments, extend over thousands of kms, require a sophisticated system of planning and managing, need cost analysis to determine rates
    - Railroads pioneer managerial, financial and labor practices of large corporations as well as labor relations

What the Victorian Age knew

- USA
  - The boom of steel
    - The Bessemer System (1850s) jumpstarts the boom of steel
    - The Great Lakes region has abundant coal and iron and becomes the nations' capital of steel
    - Andrew Carnegie: steel manufacturing in Pittsburgh (1870s)
    - Vertical integration: a company controls every stage of the industrial process, from mining to distribution
    - 1900: JP Morgan's US Steel Corporation buys Carnegie and becomes the largest company in the world (3/5th of the nation's steel business)

What the Victorian Age knew

- USA
  - Communication
    - 1844: Samuel Morse's telegraph
      - Used electricity to broadcast information
      - Shared the route of the railroads
      - Cut the time to send a message from months to minutes
    - 1775: Britain learned of the revolution in the USA more than a month after it had started
    - Dec 1848: President James Polk's announcement that gold has been found in California generates an instant "gold rush"

What the Victorian Age knew

- USA
  - Communication
    - 1852: First transnational telegram (Paris to Berlin)
    - Second major revolution in information technology after the printing press
    - The virtual movement of information replaces the physical movement of people
    - Transportation and communication get decoupled

What the Victorian Age knew

- USA
  - Communication
    - Proliferation of newspapers
      - Cheaper paper
      - Steam-powered printing presses
      - Faster transportation
      - Small-town post offices
      - Subsidized printed matter

What the Victorian Age knew

- USA
  - Communication
    - 1835: James Bennett's New York Herald
      - First mass-market daily newspaper
      - Rotary press powered by steam (thousands of copies, low price)
      - Pages on business, weather, sports.
      - International correspondents (enabled by telegraph)
      - Advertising
    - 1847: Richard Hoe's rotary cylinder printing press

What the Victorian Age knew

- USA
  - Lighting
    - 1796: Philadelphia pioneers gaslight
    - 1830s: Street lighting in all major eastern cities
    - 1840s: Gaslight common in homes
    - 1840s: Central heating common in homes
    - People can stay up till late and read
    - Boom of books, magazines and newspapers

What the Victorian Age knew

- USA
  - Boom of oil
    - Population boom and industrialization increase demand for artificial illumination
    - Best fuel for lamps: whale oil
    - Decimation of whale schools and spike in the price of whale oil
    - Scarcity of whale oil for illumination drives search for alternatives

What the Victorian Age knew

- USA
  - Boom of oil
    - 1846: Abraham Gesner invents kerosene, based on from bituminous coal and oil shale
    - 1851: Sam Kier develops kerosene from crude oil
    - 1854: North American Gas Light Company in New York begins selling Gesner's kerosene for lighting
    - Kerosene used in lamps is a significant fire risk

What the Victorian Age knew

- USA
  - Boom of oil
    - 1859: First oil well in the world (Edwin Drake, Pennsylvania)
    - Lighting drives the great demand for oil until gasoline-powered cars
    - Technology of drilling for salt (Chinese invented)
    - Oil also a lubricant for machines

What the Victorian Age knew

- USA
  - Boom of oil
    - 1862: John Rockefeller founds a company to refine oil in Cleveland
    - 1882: John Rockefeller's Standard Oil pioneers the "trust" to control multiple companies (later the "holding company"), moving its headquarters to New York
    - 1890: Rockefeller has a virtual monopoly on the oil industry

What the Victorian Age knew

- USA
  - Boom of oil
    - 1908: Ford introduces the Model T, the first mass vehicle
    - 1908: A British company, Anglo-Persian, discovers oil in Iran, the first oil well in the Middle East
    - 1910: California produces 22% of the world's oil (more than any country in the world except the USA)
    - 1911: Churchill switches Britain's navy from coal to oil to counter the German build-up

What the Victorian Age knew

- USA
  - Boom of the automobile
    - Invented in Germany
    - Industrial leadership in France
    - 1908: Ford Model T, a car for the masses
    - 1908: William Durant's General Motors: Olds, Pontiac, Cadillac, Buick and later Chevrolet
    - 1913: Ford's assembly line (93' to assemble a car), inspired by meat-packing factories
    - 1913: The Lincoln Highway, the first transcontinental highway (New York to San Francisco)
    - Sloan's "planned obsolescence"

What the Victorian Age knew

- USA
  - Food/ Meat-packing
    - Chicago is the railway hub for the distribution of livestock from the Great Plains to the Eastern cities
    - 1880: Gustavus Swift's refrigerating car replace the need to ship live cattle to slaughterhouses in the cities
    - Swift's Chicago plants adopt industrial methods for meat-packing, pioneering assembly-line production techniques

What the Victorian Age knew

- USA
  - Food/ California
    - 1880s: California pioneers the adoption of new machines (gang plows, large headers, combined harvesters) not invented here
    - 1887: The railway reaches Los Angeles
    - 1889: First cooled shipment of fruit from California to the east
    - Fruit becomes California's main produce
    - 1914: Panama Canal shortens journey to California
    - 1919: California produces 57% of the oranges, 70% of the prunes/plums, over 80% of the grapes and figs, and virtually all of the apricots, almonds, walnuts, olives, and lemons grown in the USA

What the Victorian Age knew

- USA
  - Boom of California
    - 1900: California is the main producer of oil in the world
    - 1901: Henry Huntington founds the Pacific Electric Railroad to create a network of electrical trolley cars and a network of new suburbs around Los Angeles (and becomes one of the richest men in the USA thanks to land speculation)
    - 1905: Los Angeles has more cars than any other city
    - 1910: The first film is shot in Hollywood

What the Victorian Age knew

- USA
  - Boom of electricity
    - Thomas Edison
      - 1876: first industrial (non-university) research laboratory to industrialize innovation
      - 1877: phonograph
      - 1879: light bulb
      - 1880: first power plant (New York): direct current at low voltage
      - 1882: first lighting in an office building (New York)
      - 1889: Thomas Edison's business empire is consolidated in the Edison General Electrical Company

What the Victorian Age knew

- USA
  - Boom of electricity
    - 1885: George Westinghouse builds the first practical transformer
    - 1886: George Westinghouse founds the Westinghouse Electric Company
    - George Westinghouse uses alternating current at high voltage and transformers to reduce the cost of electricity distribution over long-distance

What the Victorian Age knew

- USA
  - Boom of electricity
    - Jul 1895: The Livermore company opens a 35 km hydroelectric power line to bring electricity from Folsom to Sacramento, with water powering four colossal electrical generators (dynamos), the first time that high-voltage alternating current had been successfully conducted over a long distance

Sep 1895: Grand Electrical Carnival in Sacramento

What the Victorian Age knew

- USA
  - Rise of Giant Corporations/ 1861-1899
    - Before 1861:
      - Most manufacturing businesses are small, family-owned, die with the owner
      - The cost of entering a business is very small
      - Operate locally (insularity) except for maritime merchants
      - High degree of specialization
      - Only one kind of product
      - The only bureaucracy required is bookkeeping
      - Distribution of economic power around the country
      - Still a rural world

What the Victorian Age knew

- USA
  - Rise of Giant Corporations/ 1861-1899
    - Before 1861:
      - *"What most astonishes me in the United States is not so much the marvelous grandeur of some undertakings as the innumerable multitudes of small ones"* (Tocqueville)

What the Victorian Age knew

- USA
  - Rise of Giant Corporations/ 1861-1899
    - Transformational factors:
      - Technology brings about "economies of scale" in many fields (e.g. Bessemer in steel, petroleum refining, sugar refining, cigarette-making machines)
      - 1866-1890: Falling consumer prices caused by economies of scale and fierce competition

What the Victorian Age knew

- USA
  - Rise of Giant Corporations/ 1861-1899
    - Transformational factors:
      - Transportation revolution (due to canals and railroads replacing coach and wagon travel) allows corporations to expand operations
      - Communication revolution (due to the telegraph replacing mail) allows corporations to manage remote operations

What the Victorian Age knew

- USA
  - Rise of Giant Corporations/ 1861-1899
    - Vertical integration: a corporation expands towards both raw materials and retail stores to avoid the limitations of wholesale merchants
    - Horizontal integration: a corporation expands by merging with competitors

What the Victorian Age knew

- USA
  - Rise of Giant Corporations/ 1861-1899
    - The new corporation:
      - Requires a lot of capital
      - Several owners (shareholders)
      - Separation of ownership and management
      - Operates on a large territory both in terms of factories and in terms of retailing
      - Range of products (diversification)
      - Bureaucracy: huge administrative network
      - Concentration of economic power in the hands of very few individuals
      - Urbanization and industrialization

What the Victorian Age knew

- USA
  - Rise of Giant Corporations/ 1861-1899
    - Oil: Standard Oil, Texaco
    - Rubber: Uniroyal, Goodyear
    - Metals: US Steel, Bethlehem Steel, American Smelting, Jones & Laughlin, Anaconda Copper, Phelps-Dodge, International Nickel, National Lead
    - Electrical: General Electric, Westinghouse
    - Food: American Sugar, Nabisco, United Fruit, Swift, Armour, American Tobacco
    - Chemical: DuPont
    - Electronics: Eastman Kodak

What the Victorian Age knew

- USA
  - Rise of Giant Corporations/ 1861-1899
    - 1900: 1% of USA corporations account for 33% of all manufacturing
    - 1913: 2% of USA citizens control 60% of the national product (Morgan and Rockefeller alone control 20%)

What the Victorian Age knew

- USA
  - Consolidation of information empires
  - Within a few decades of their invention:
    - the telegraph is dominated by Western Union,
    - the telephone is dominated by Bell (AT&T),
    - the radio by NBC and CBS,
    - cinema by the Hollywood studios

What the Victorian Age knew

- USA
  - Government-assisted capitalism
    - Turnpike from Maryland to Illinois (1803-1848) funded by Congress
    - Erie Canal (1825) funded by New York State
    - Transcontinental railroad (1869) subsidized by Congress
    - Homestead Acts (1862) grant lands to farmers west of the Mississippi by Congress
    - Roosevelt Dam in Phoenix (1911) funded by Congress
    - Owens Valley aqueduct to Los Angeles (1913) funded by Los Angeles
    - Panama Canal (1914) funded by Congress

What the Victorian Age knew

- USA
  - Boom of the middle class
    - Luxuries for every family
      - Isaac Singer's sewing machine (1851)
      - The washing machine (James King, 1851)
      - The carpet sweeper (1859)
      - The dishwasher (Josephine Cochrane, 1886)
      - All of them hand-powered
      - The electric kitchen (first presented at the Columbia Exhibition of 1893)

What the Victorian Age knew

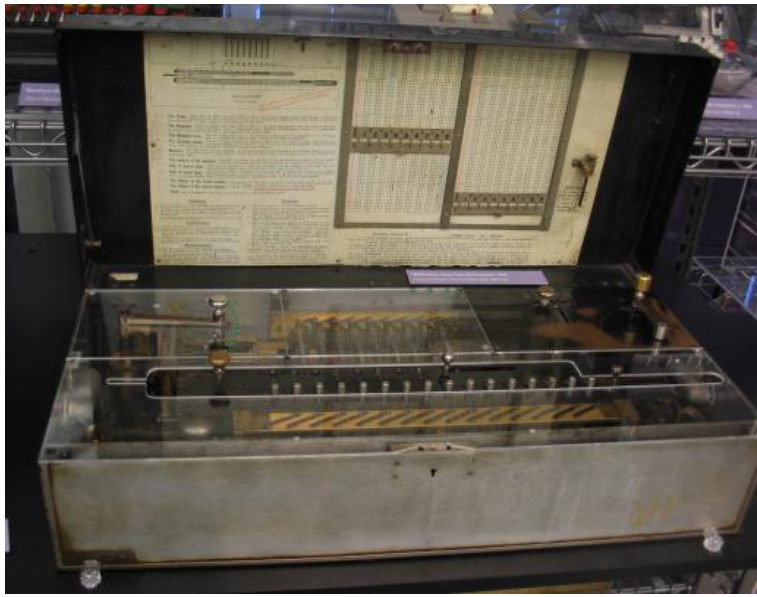
Office

- 1868: Christopher Latham Sholes invents the first practical typewriter
- 1879: James Ritty invents the cash register
- 1881: David Gestetner invents the stencil duplicator, the first office machine to duplicate documents
- 1885: William Burroughs develops an adding machine
- 1890: Herman Hollerith builds an electrical tabulating device (Hollerith's company acquired by IBM in 1911)

Burroughs' calculator (1897)
(Museum of Science, London)

What the Victorian Age knew

Herman Hollerith's Census Machine (1899)
(Computer History Museum, Mountain View)



Hans Egli's Millionaire Calculator (1899)
(Computer History Museum, Mountain View)

What the Victorian Age knew

- Rise of Japan/ Meiji Restoration
  - However Japan succeeds where China fails
    - No wars
    - No loss of territory
    - No crippling conditions
    - Commodore Perry: *Japan is "the most moral and refined of all eastern nations"*

What the Victorian Age knew

- Rise of Japan/ Meiji Restoration
  - Theoretically a nationalistic return to Japan's ancient way of life
  - Practically, a program of rapid adoption of Western manners and technology (1870s-80s)
    - Fukuzawa Yukichi's "Conditions in the West" (1869) launches the wave of Westernization
    - Students sent to the USA and Europe
    - Western teachers invited to Japan
    - Western educational system (the Confucian school of Edo becomes the Western-style "University of Tokyo" in 1869)
  - The West replaces China as Japan's main role model

What the Victorian Age knew

- Rise of Japan
  - Western-style democratic movement (1889: British-style parliamentary constitution)
  - Western-style invasion of China (1894) resulting in the annexation of Taiwan
  - Anglo-Japanese alliance (1902), first military pact between a Western power and a non-Western power
  - War against Russia (1904), first defeat of a Western power by a Far Eastern country, resulting in the annexation of Korea
  - World War I (1914) on the side of the winners, resulting in the annexation of German colonies of the Pacific

What the Victorian Age knew

- Rise of Japan
  - After exposure to Westerners, Japan followed the opposite course of China: adoption of Western manners and rise to international power, instead of decline
  - Little exaltation of Japanese past (there was nothing to exalt, as all Japanese culture was already foreign and Japan came from feudal nightmare) but a lot of assimilation of Western ideas

What the Victorian Age knew

- Rise of Japan/ Meiji Restoration
  - New generation of businessmen (zaibatsu)
    - Old merchant families (Mitsui under the management of Minomura Rizaemon, Sumitomo)
    - Samurais (Mitsubishi founded by Iwasaki Yataro
    - Peasants (banker Yasuda Zenjiro, banker Shibusawa Eiichi that founds the First National Bank and the Osaka Spinning Mill in 1880 that spearheads the industrial boom)

What the Victorian Age knew

- China/ Before WWI
  - Domestic crises
    - 1851-64: Taiping (Christian) rebellion in Nanjing
      - 30 million die
      - Loss of control by the emperor over some of the provinces
      - De-facto British control over Shanghai
    - 1856-73: Hui (Muslim) rebellion in Yunnan (south)
      - One million die
    - 1862-73: “New Teaching” Muslim rebellion in Gansu
    - 1877-78: Famine (nine million die)

What the Victorian Age knew

- China/ Before WWI
  - 1861: the new emperor, Tongzhi, is five years old (power in the hands of his mother Tsu His/ Cixi)
  - Politicians push for a “Tongzhi Restoration” similar to the “Meji Restoration” that allowed Japan to become a power
  - 1875: Tongzhi dies and is succeeded by his three-year old cousin Guangxu (power remains in the hands of Cixi)

What the Victorian Age knew

- China/ Before WWI
  - International crises
    - 1860: Opium war grants Britain political control of China
    - 1884-85: Defeat against France for control of Annam (Vietnam becomes a French protectorate)
    - 1895: Japan defeats China and ends Britain's control of China (loss of Taiwan)
    - 1900: Boxer rebellion crushed by western troops
    - China divided into spheres of influence (Britain, France, Germany, Russia, Japan)

What the Victorian Age knew

- China/ Before WWI
  - “Tongzhi Restoration” of China vs “Meji Restoration” of Japan
    - Western ideas (including Christianity) viewed with suspicion by both intellectuals and masses
    - Intellectual opposition to industrialization
    - The cities that expand rapidly are the ones founded/controlled by foreign powers: Shanghai, Canton, Hong Kong
    - Most railways built by foreign powers (the Chinese are content with water transportation)
    - Banks and communications built by foreign powers

What the Victorian Age knew

- China/ Before WWI
  - For centuries Japan has been inspired by China, but after 1905 (Japan-Russia war) it is China that is inspired by Japan
    - Students enroll in Japanese universities
    - Revolutionaries exiled to Japan
    - The revolution of 1911 is largely organized in Japan
    - The revolution of 1911 is organized by young people (students), who replace the scholar class as political leaders

What the Victorian Age knew

- China/ Before WWI
  - 1912: First elections won by Sun Yatsen's Kuomintang (KMT) party
  - 1913: Military coup and Sun Yatsen's exile
  - Sun Yatsen's legacy: China is even weaker and undemocratic than it was under the Manchus

What the Victorian Age knew

- China/ Before WWI
  - Japan
    - Nationalism leads to industrial and financial boom
    - Anti-imperialist sentiment yields capitalist sentiment, and eventually to own empire
  - China
    - Nationalism leads to intellectual debate, and eventually to Marxism
    - Anti-imperialist sentiment yields anti-capitalist sentiment, and eventually to civil war

What the Victorian Age knew

- Germany
  - A federal state dominated by Prussia (30 million people)
  - Bismarck fearful of British-style parliamentary system
  - Long economic boom makes Germany the second industrial power of Europe

What the Victorian Age knew

- Berlin/ Electricity
  - 1866: Siemens develops the first practical dynamo
  - 1879: Siemens demonstrates the first electric railway
  - 1880: Siemens builds the first electric elevator
  - 1881: Siemens demonstrates the first electric tram system
  - 1887: Emil Rathenau founds the Allgemeine Elektrizitats Gesellschaft (AEG), specializing in electrical engineering, whereas Siemens specializes in communication and information
  - 1890: AEG develops the AC motor and generator (first power plants) and alternating current makes it easy to transmit electricity over long distances
  - 1910s: Greatest center of electrical production in the world (“Elektropolis”)

What the Victorian Age knew

- Germany
  - Preeminence of German universities
  - Physics, Chemistry and Geology regarded as equal to humanities
  - The factory laboratory: Siemens, AEG, Bayer
  - Chemistry and engineering spawn a boom in dyes, pharmaceuticals and electrical devices

What the Victorian Age knew

Second industrial revolution

- Steel replaces iron
- Electricity replaces steam
- Machines replace humans
- Scientific laboratories at the service of industry
- Global business based on fast transportation and communication
- Imperialism

What the Victorian Age knew

Biology

- Louis Pasteur (1865): diseases are caused by germs
- Robert Koch (1875): isolates the cause of anthrax
- Robert Koch (1882): discovers the tuberculosis bacillus
- Robert Koch (1883): discovers the cholera bacillus
- Jaime Ferran's cholera vaccine (1885)
- Paul Ehrlich (1909): syphilis (de facto discovers the principles of antibiotics and the immune system)
- Enabler: a new generation of German microscopes (Carl Zeiss' microscopes of the 1870s, the 1906 ultramicroscope of Richard Zsigmondy)

What the Victorian Age knew

Chemistry

- 1832: Faraday identifies benzene - birth of organic chemistry
- 1856: William Perkin invents the first synthetic dye, mauve
- Industrial chemicals multiply, mostly derived from benzene (dyes, soap, mothballs…)
- 1860s: Chemistry becomes a popular subject to study in universities
- 1869: John Hyatt’s celluloid, the first industrial plastic
- 1897: Bayer’s aspirin (first discovered by either Arthur Eichengrün or Felix Hoffman)
- 1907: Leo Baekeland invents "bakelite", the first entirely synthetic plastic

What the Victorian Age knew

Organic chemistry/ Agricultural revolution

- Justus von Liebig’s nitrogen-based fertilizer (plants get their food from the atmosphere and one can add it directly to the soil to increase production)
- 1913: Fritz Haber's and Carl Bosch's process for the manufacture of ammonia
- Ammonia replaces depleted nitrogen in the soil with nitrogen from the air
- Ammonia becomes the #1 fertilizer in the world
- Ammonia drives population explosion

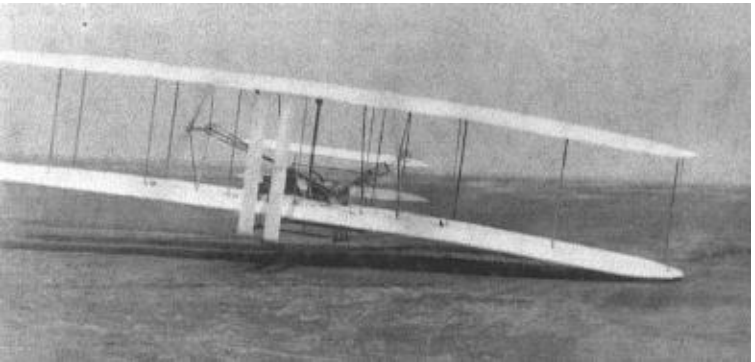
What the Victorian Age knew

- Transportation
  - 1886: Karl Benz builds a gasoline-powered car
  - 1888: The Orient Express train connects Paris and Istanbul
  - 1890: The first electrical subway (London)
  - 1903: Wilbur and Orville Wright fly the first airplane

What the Victorian age knew

- Transportation
  - The Airplane
    - 1903: Wilbur and Orville Wright fly the first airplane
    - 1909: Louis Bleriot crosses the English Channel in a monoplane
    - 1914: Robert Goddard invents the liquid-fuel rocket
    - 1915: German zeppelins bomb Britain (first air raid)
    - 1915-18: France builds 67987 planes, Britain 58144, Germany 48537, Italy 20000 and the USA 15,000

Wright brothers, 1903



Germany's Fokker combat aircraft (1918)

What the Victorian age knew

- Communication
  - The telephone
  - 1861: Johann Reis invents the telephone
  - 1876: Alexander Bell demonstrates his telephone

First commercial telephone, 1877
(Bell installs the world's first commercial telephone service)

Telephones 1900s

What the Victorian age knew

- Communication
  - The radio
    - 1887: German physicist Heinrich Hertz discovers Radio Waves
    - 1901: Guglielmo Marconi conducts the first transatlantic radio transmission
    - 1906: The vacuum tube (Robert von Lieben 1906) enables long-distance phone lines and radio transmissions

What the Victorian Age knew

Media

- 1876: Alexander Bell demonstrates his telephone
- 1877: Thomas Edison invents the phonograph
- 1888: Kodak's consumer camera
- 1892: popular music becomes big business
- 1895: the Lumiere brothers invent cinema
- 1898: Valdemar Poulsen demonstrates magnetic recording


THE KODAK CAMERA.

"You press the button, - - - - - we do the rest."

The only camera that anybody can use without instructions. Send for the Primer, free.

The Kodak is for sale by all Photo stock dealers.

The Eastman Dry Plate and Film Co.,

Price $25.00—Loaded for 100 Pictures. ROCHESTER, N. Y.

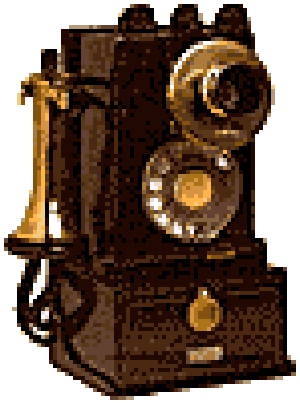
A full line Eastman's goods always in stock at LOEBER BROS., 131 Nassau Street, New York.

"You press the button,
We do the rest"

What the Victorian Age knew

Media

Queen Victoria (1854)
Photograph by Roger Fenton



Public telephone, 1909

In 1908 people in the USA mailed 677,777,798 postcards out of a population of 88,700,000 (the postcard had been invented only in 1900)

What the Victorian Age knew

Speed

- Airplanes, trains, steamships and cars transport people faster than ever
- Telegraph, telephone and radio transmit messages faster than ever
- Electricity transmits power faster than ever

What the Victorian Age knew

- Thanks to trains, cars and airplanes, the individual can quickly travel anywhere
- Thanks to the radio and the telephone, the individual can simultaneously be anywhere

What the Victorian Age knew

- Thermodynamics
  - Classical Physics: the world as a static and reversible system that undergoes no evolution, whose information is constant in time
  - Classical physics is the science of being
  - Thermodynamics describes an evolving world in which irreversible processes occurs
  - Thermodynamics is the science of becoming
  - The science of being and the science of becoming describe dual aspects of nature
  - Entropy and irreversibility

What the Victorian Age knew

- Thermodynamics
  - Rudolf “Clausius” Gottlieb’s entropy (1850): any transformation of energy has an energetic cost
  - Natural processes generate entropy
  - Heat flows spontaneously from hot to cold bodies, but the opposite never occurs

What the Victorian Age knew

- Thermodynamics
  - The second law of thermodynamics : entropy (of an isolated system) can never decrease
  - Some processes are not symmetric in time
  - Change cannot always be bi-directional
  - We cannot always replay the history of the universe backwards
  - Some things are irreversible

What the Victorian Age knew

- Ludwig Boltzmann (1877)
  - Statistical Mechanics: statistical description of ensembles of discrete molecules (spheres) obeying classical mechanics and subject to perfectly elastic collisions)
  - Boltzmann's eternal doom: the universe must evolve in the direction of higher and higher entropy
  - The universe is proceeding towards the state of maximum entropy

What the Victorian Age knew

- James Maxwell (1873)
  - Maxwell's equations showed that the electromagnetic phenomenon "oscillates" like a wave and all such waves travel at 300 thousand kms/hour (in the vacuum).
  - Light is one particular electromagnetic wave
  - The interaction between distant bodies does not happen instantaneously as Newton thought but is mediated by a "field".
  - An electric phenomenon in one inertial frame is a magnetic phenomenon in another

What the Victorian Age knew

- James Maxwell (1873)
  - Electricity and magnetism are the same phenomenon
  - Electric bodies radiate invisible waves of energy through space (fields)
  - Mathematical relation between electric and magnetic fields (field equations)

What the Victorian Age knew

- James Maxwell (1873)
  - E = Electric field
  - p = charge density
  - i = electric current
  - B = Magnetic field
  - E0= permittivity
  - J = current density
  - u0 = permeability
  - c = speed of light

I. Gauss' law for electricity $\nabla \cdot E = \frac{\rho}{\varepsilon_0} = 4\pi k \rho$

II. Gauss' law for magnetism $\nabla \cdot B = 0$

III. Faraday's law of induction $\nabla x\, E = -\frac{\partial B}{\partial t}$

IV. Ampere's law

$$\nabla\, x\, B = \frac{4\pi k}{c^2} J + \frac{1}{c^2}\frac{\partial E}{\partial t}$$

$$= \frac{J}{\varepsilon_0 c^2} + \frac{1}{c^2}\frac{\partial E}{\partial t}$$

$$k = \frac{1}{4\pi\varepsilon_0} = \text{Coulomb's constant} \qquad c^2 = \frac{1}{\mu_0 \varepsilon_0}$$

What the Victorian Age knew

- Friedrich Nietzsche (1886)
  - Human behavior is caused by the will to power (urge to order the course of one’s experiences)
  - Will to power: an extension of Schopenhauer's will to live

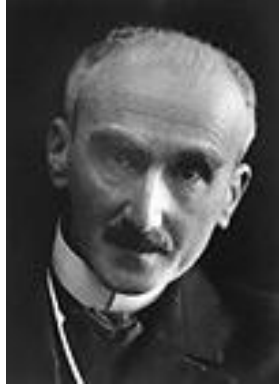
What the Victorian Age knew

- Friedrich Nietzsche (1886)
  - Morality is a device invented by the weak to assert their will to power over the strong
  - Christian values are a "slave morality", a morality of the weak ones
  - Christian values are obsolete (”God is dead")
  - Christianity is an expression of the will the power, but only the will to power of the weak who are full of resentment

What the Victorian Age knew

- Friedrich Nietzsche (1886)
  - The new morality is the morality of the “uebermensch” ("superman”), who is above the masses and is interested in solving the problems of this world, not of the otherworld

What the Victorian Age knew



- Henri Bergson (1889)
  - Reality is an endless flow of change of the whole
  - The upward flow is life, the downward flow is inert matter
  - There is an “elan vital” (vital force) that causes life despite the opposition of inert matter

What the Victorian Age knew

- Neurology
  - 1891: Santiago Ramon y Cajal discovers the fundamental unit of brain processing, the neuron
  - 1903: Alfred Binet's "intelligent quotient" (IQ) test
  - 1906: Charles Sherrington argues that the cerebral cortex is the center of integration for cognitive life
  - 1911: Edward Thorndike's connectionism (the mind is a network of connections and learning occurs when elements are connected)

What the Victorian Age knew

- Psychology
  - Wilhelm-Max Wundt (1874): experimental psychology

What the Victorian Age knew

- William James (1890)
  - The function of mind is to help the body live in an environment
  - The brain is an organ that evolved because of its usefulness for survival
  - Consciousness is a sequence of conscious mental states, each state being the experience of some content
  - Consciousness is not a substance, it is a process (“the stream of consciousness")

What the Victorian Age knew

- William James (1890)
  - The brain is organized as an associative network, and associations are governed by a rule of reinforcement
  - Long-term and short-term memory

What the Victorian Age knew

- The subconscious
  - Schopenhauer's will
  - Nietzsche's covert instinct
  - Johann Herbart's "Textbook of Psychology" (1816): the mind arises from the dialogue between conscious and unconscious processes
  - Pierre Janet's "psychological analysis" (hypnosis + automatic writing)

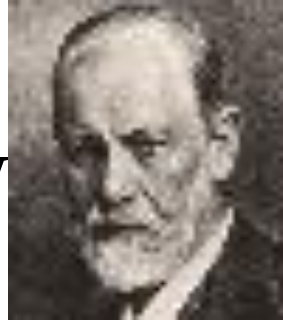
What the Victorian Age knew

- The subconscious
  - Eduard von Hartmann's "Philosophy of the Unconscious" (1868)
    - The absolute subconscious permeates the universe
    - The physiological subconscious is inherited biologically by each individual
    - A study that mixed biology, anthropology, linguistics, art, poetry
  - Max Dessoir's "Double Ego" (1890)

What the Victorian Age knew

- Classical world of psychology (Wilhelm-Max Wundt, 1874)
  - Actions have a motive
  - Motives are mental states, hosted in our minds and controlled by our minds
  - Motives express an imbalance in the mind, between desire and reality
  - Action is an attempt to regenerate balance by changing the reality to match our desire
  - Assumption: human action is rational
  - Dreams? (Human action, yet irrational)
- Classical view of dreams
  - Dreams are about the future (oracles)

What the Victorian Age knew



- Sigmund Freud (1900)
  - The mind is divided in conscious (rational motives) and unconscious mind (reservoir of unconscious motives)
  - There is a repertory of motives that our mind, independent of our will, has created over the years, and they participate daily in determining our actions
  - Separation of motive and awareness

What the Victorian Age knew

- Freud (1900)
  - Libido (sexual desires)
    - A child is a sexual being
    - Parents repress the child's sexuality
    - The child undergoes oral, anal and phallic stages before entering the latency stage
    - Boys desire sex with their mother and are afraid their father wants to castrate them
    - Girls envy the penis and are attracted to their father

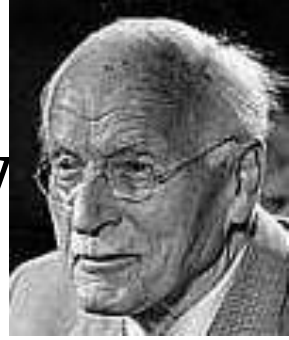
What the Victorian Age knew

- Freud (1900)
  - A dream is only apparently meaningless: it is meaningless if interpreted within the context of conscious motives.
  - The dream is perfectly logical if one considers also the unconscious motives
  - Meaning of dreams are hidden and reflect memories of emotionally meaningful experience
  - “Latent content” of the subconscious yields “manifest content” of the dream
  - Dreams rely on memories and are assembled by the brain to deliver a meaning
  - Dreams are not prophecies but memories

What the Victorian Age knew

- Edward Thorndike (1911)
  - Animals learn based on the outcome of their actions ("law of effect")
  - The mind as a network
  - Learning occurs when elements are connected
  - Behavior is due to the association of stimuli with responses that are generated through those connections
  - A habit is a chain of “stimulus-response” pairs

What the Victorian Age knew



- Carl Jung (1912)
  - Motives are not in the history of the individual but in the history of the entire human race
  - Unconscious as a repertory of symbols
  - Collective unconscious: a shared repertory of archaic experience represented by "archetypes" which spontaneously emerge in all minds

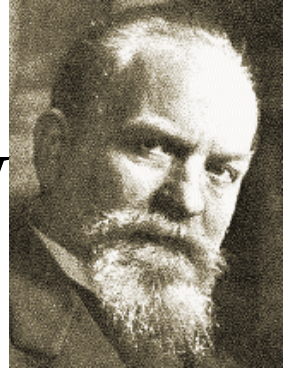
What the Victorian Age knew

- Carl Jung (1912)
  - Mythology is the key to understanding the human mind
  - Predispositions by all human brains to create some myths rather than others
  - Humans are born with an extensive knowledge of the world.
  - Dreams reflect the collective unconscious

What the Victorian Age knew

- Logic
  - Georg Cantor (1879): set theory
  - Gottlob Frege (1884): “predicate calculus”
  - Charles Peirce (1883): abduction. deduction and induction
- David Hilbert (1900)
  - Entscheidungsproblem: does a general algorithmic procedure for resolving all mathematical problems exist?

What the Victorian Age knew



- Edmund Husserl (1901)
  - The essence of something is not its physical constituents or physical laws, but the way we experience it
  - ”Phenomenology” is the science of phenomena
  - Science caused a crisis by denying humans the truth of the reality that they experience (by proving that phenomenon and being are not identical)
  - Advocates a return to the primary experience of the world

What the Victorian Age knew

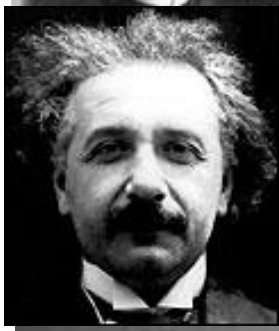
- Edmund Husserl (1901)
  - The phenomenon is intuitively known to the subject
  - The essence (eidos) of the phenomenon is the sum of all possible “intuitive” ways of knowing the phenomenon
  - This has to be achieve after “bracketing out” (“einklammerung”) the physical description of the phenomenon (the description given by the natural sciences)
  - Subject and object are not separated

What the Victorian Age knew

- Physics
  - Albert Michelson (1879): the speed of light in a vacuum is 299,792,458 meters per second and it is the same in all directions
  - Hendrik Lorentz (1892): the atom is not elementary but is made of smaller units that are electrical in nature (theory of the electron)
  - Ernest Rutherford (1911): the atom is made of a nucleus and orbiting electrons (a mini-solar system)
  - Robert Millikan (1913): the charge of the electron

What the Modern Age knew

- Quantum Mechanics
  - Energy quanta (1900): atoms can emit energy only in discrete amounts (Max Planck)
  - Energy-frequency equivalence (1903): the energy of a photon is proportional to the frequency of the radiation, i.e. light itself exists only in discrete units, and it is both particle and wave $hv=E=mc^2$ (Albert Einstein)
  - Structure of the atom (1913): electrons are permitted to occupy only some orbits (Niels Bohr)
  - Dualism (1923): waves and particles are dual aspects (Louis de Broglie)

What the Victorian Age knew

- Albert Einstein (1905)
  - Axioms:
    - The laws of nature must be the same (invariant) in all frames of reference that are inertial (Galileo's old principle of relativity)
    - The speed of light is the same in all directions
  - Then space and time cannot be absolute

What the Victorian Age knew

- Albert Einstein (1905)
  - Consequences:
    - Lorentz transformations to preserve relativity (invariance)
    - The length of an object and the duration of an event are relative to the observer
    - All quantities must have four dimensions, a time component and a space component (e.g., energy-momentum)
    - Equivalence of mass and energy (E=mc2)

What the Victorian Age knew

- Albert Einstein (1905)
  - Space and time are not absolute
  - "Now" is a meaningless concept
  - The past determines the future
  - Nothing can travel faster than light
  - Time does not flow (no more than space does), it is just a dimension

What the Victorian Age knew

- Hermann Minkowski (1908)
  - Space and time are different dimensions of the same space-time continuum
  - Each observer has a different perspective on the events in the space-time continuum (e.g., length or duration)
  - Past and future are segments of space-time continuum
  - Each observer's history is constrained by a cone of light within the space-time continuum

What the Victorian Age knew

- Albert Einstein (1915)
  - Gravitation
    - Finite speed of light is incompatible with Newton's instantaneous gravitational attraction
    - Need for a theory of gravitation that is consistent with Relativity

What the Victorian Age knew

- Albert Einstein (1915)
  - The effect of a gravitational field is just like the effect of an acceleration (of an “accelerating reference frame”)
  - Principle of Equivalence: Forces produced by gravity are in every way equivalent to forces produced by acceleration
  - All forces (gravitational or not) are due to acceleration
  - Free-fall motion is natural motion
  - If space-time is curved, free fall is a straight line
  - No need for gravitational forces

What the Victorian Age knew

- Albert Einstein (1915)
  - If all accelerated systems are equivalent, then Euclidean geometry cannot hold in all of them
  - Masses do not attract each other: they curve spacetime

What the Victorian Age knew

- Albert Einstein (1915)
  - Masses curve spacetime
  - Spacetime's curvature determines the motion of masses
  - Einstein's equivalent of the law of gravity: Every object, which is not subject to external forces, moves along a geodesic of spacetime (the shortest route between two points on a warped surface), its “world line” (the equivalent of a straight line in flat space)
  - Spacetime “is” the gravitational field

What the Victorian Age knew

- Albert Einstein (1915)
  - Gravitation is not a force
  - Physics = Geometry of space-time
  - Gravitation = space-time curvature
  - Relativity theory is ultimately about the nature of gravitation
  - Relativity explains gravitation in terms of curved space-time, i.e. Geometry
  - ”Gravitational force" becomes an effect of the geometry of space-time

What the Victorian Age knew

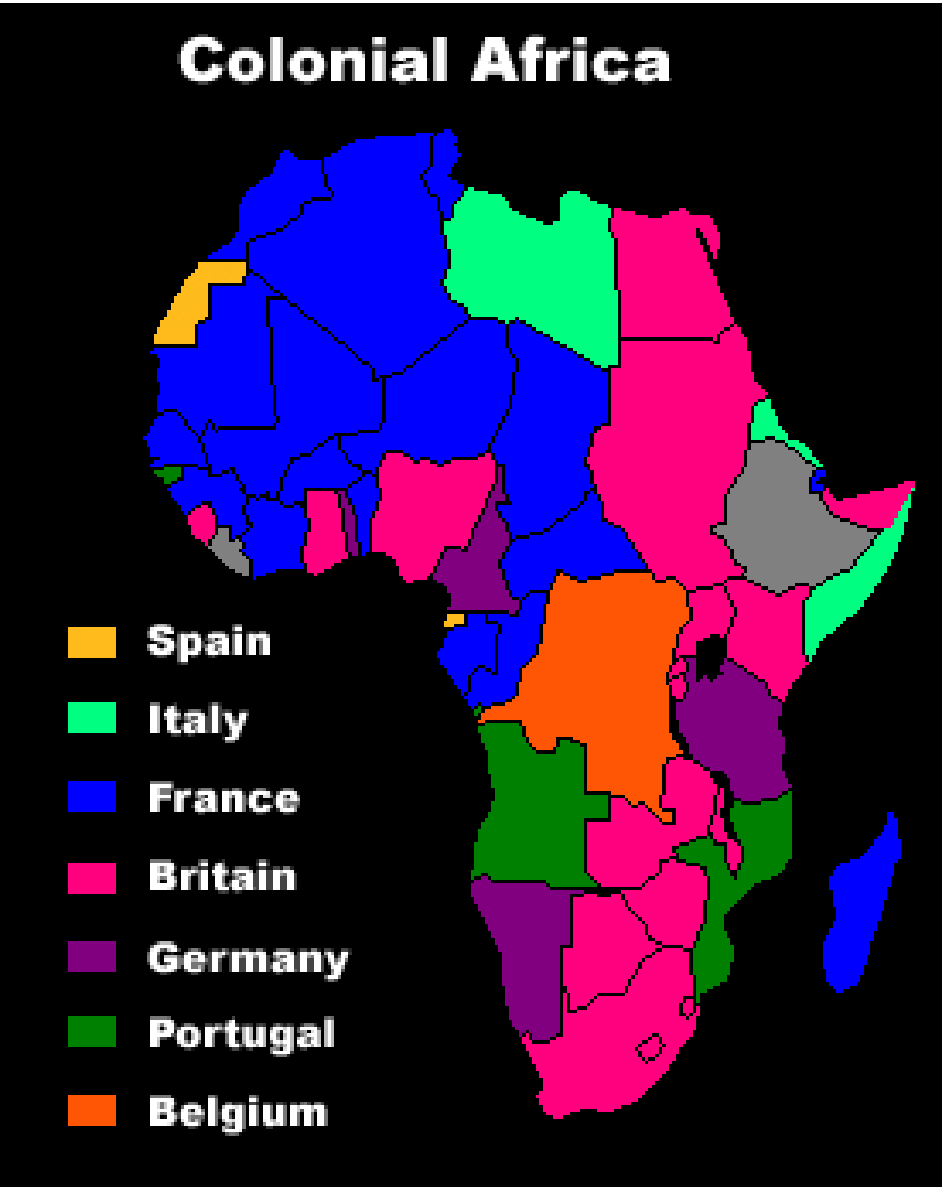
- Albert Einstein (1915)
  - The curvature of space-time is measured by a "curvature tensor" (Riemann's geometry)
  - What causes the "warps" is energy-mass
  - Clocks slow down in a gravitational field
  - Light is deflected in a gravitational field

What the Victorian Age knew

Age of European Imperialism

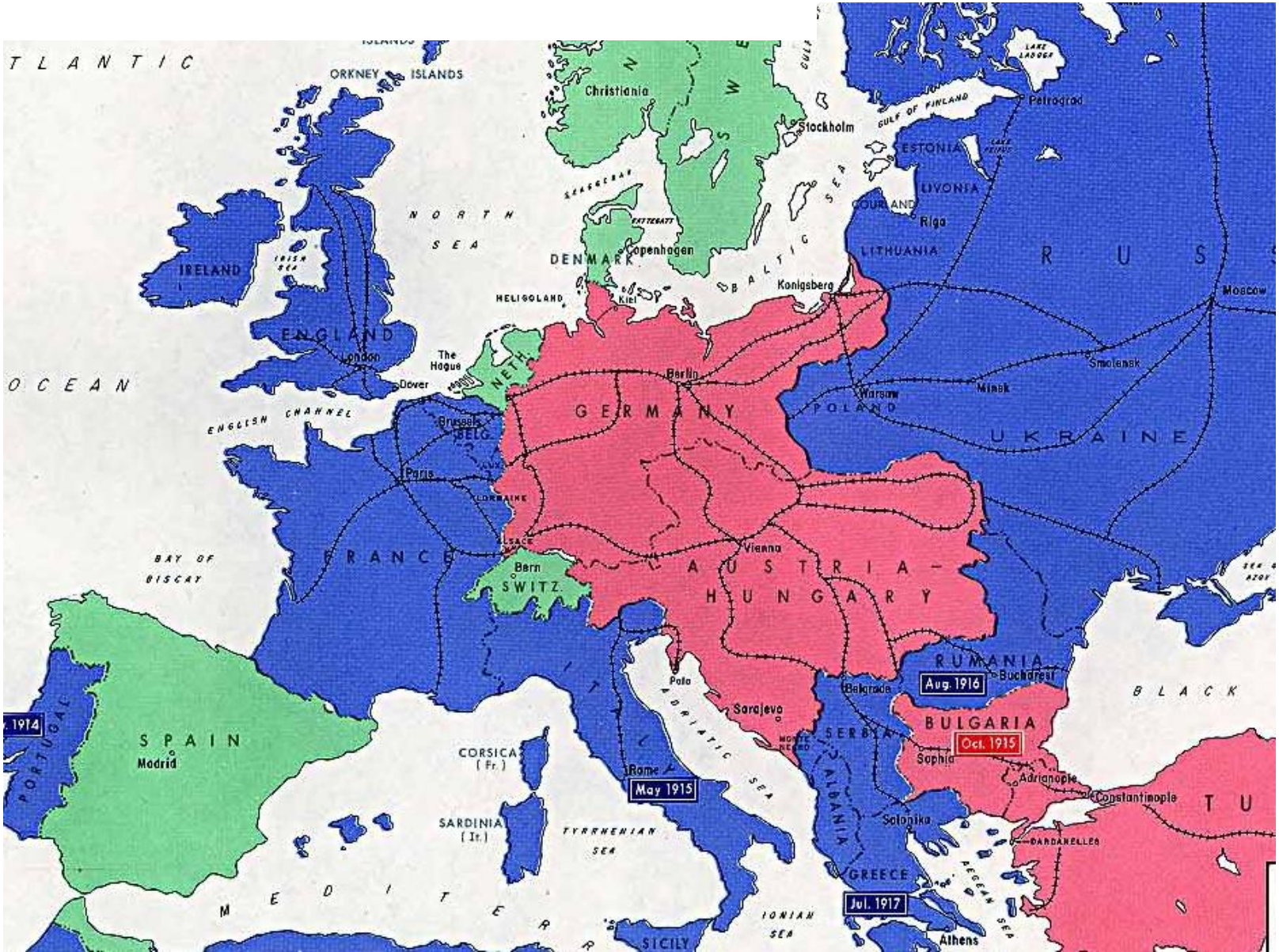
- Territory is annexed for reasons of prestige not for economic reasons
- Race by European powers to annex still free nations in Africa, Far East, Oceania

What the Victorian Age knew



Africa in 1914

Europe 1914


ORKNEY ISLANDS
Christiania
Stockholm
Petrograd
GULF OF FINLAND
ESTONIA
LIVONIA
COURLAND
Riga
LITHUANIA
Konigsberg
Moscow
Smolensk
Minsk
Warsaw
POLAND
UKRAINE
NORTH SEA
DENMARK
Copenhagen
BALTIC SEA
HELIGOLAND
Kiel
IRELAND
ENGLAND
London
Dover
The Hague
NETH.
Berlin
GERMANY
ENGLISH CHANNEL
Brussels
BELG.
Paris
LORRAINE
ALSACE
FRANCE
BAY OF BISCAY
Bern
SWITZ.
Vienna
AUSTRIA-HUNGARY
RUMANIA
Bucharest
Aug. 1916
Belgrade
Sarajevo
SERBIA
BULGARIA
Oct. 1915
Sophia
Adrianople
Constantinople
TU
BLACK
Pola
ADRIATIC SEA
ALBANIA
Salonika
DARDANELLES
GREECE
Jul. 1917
Athens
AEGEAN SEA
IONIAN SEA
SICILY
Rome
May 1915
CORSICA (Fr.)
SARDINIA (It.)
TYRRHENIAN SEA
SPAIN
Madrid
PORTUGAL
MEDITERR

What the Victorian Age knew

- World War I
  - 1914-18: Serbia, Russia, France, Britain, Japan, Italy, China, USA win against Austria, Germany and Turkey

What the Victorian Age knew

- World War I
  - War machine (“all arms” battles)
    - Firepower (200 divisions)
    - Grenades, cannons, machine guns, torpedoes, bombs
    - Transportation: battleships, submarines, zeppelins, air bombs (pioneered by Italy in 1911) and air fighters, trains, cars, trucks, tanks (battle of Cambrai, 1917)
    - Lack of adequate communication (no radio or telephone)
    - Demise of the horse as the main assault vehicle

What the Victorian Age knew

- World War I
  - War machine
    - Oil and the internal combustion engine change the very meaning of the word “war”
    - At the end of the war Britain had more than 100,000 gasoline-powered vehicles (the USA had 50,000)

What the Victorian Age knew

- World War I
  - Psychological war
    - Propaganda (press, cinema)
    - Criminalization of the enemy
    - The masses enthusiastically support the war and volunteer to die

The Victorian Age

- World War I
  - 60 million men mobilized
  - Casualties: 8 million in battle
    - Russia 2m
    - Germany 1.8m
    - France 1.3m
    - Austria 1.2m
    - Britain 900,000
    - Turkey 600,000
    - Italy 500,000
    - USA 116,000

The Victorian Age

- World War I
  - Winners and Losers
    - Triumph of the nation state (Britain, France, Italy, Japan)
    - Defeat of the multi-ethnic multi-national empires (Austria, Ottoman)
    - Demise of a monarch ruling over a collection of nations

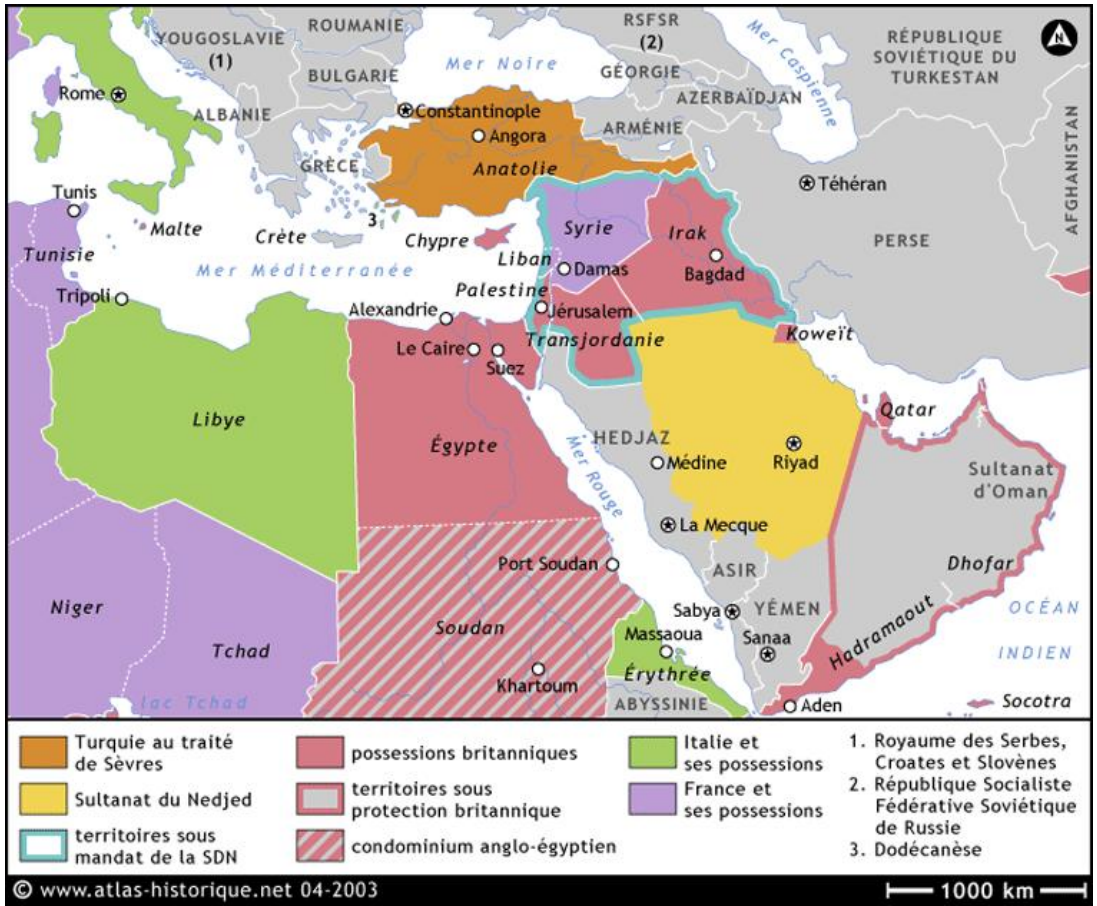
The Victorian Age

- World War I
  - New countries:
    - Poland (part of Austria and Germany)
    - Czechoslovakia
    - Yugoslavia
    - Hungary
    - Romania doubles in size
    - Iraq (multi-ethnic), Palestine (multi-ethnic), Transjordan, Yemen, Syria, Lebanon (multi-ethnic), Saudi Arabia
    - Finland, Estonia, Latvia, Lithuania, Ukraine


POLAND
GERMANY
U.S.S.R.
Bohemia
(To Czechoslovakia)
Moravia
(To Poland)
Galicia (To Poland)
(To Czechoslovakia)
Slovakia
Ruthenia
Burgenland
(To Austria)
Bucovina
(To Romania)
AUSTRIA
HUNGARY
South Tyrol
(To Italy)
Gorizia
(To Italy)
Carniola
(To Yugoslavia)
Transylvania (To Romania)
Istria
(To Yugoslavia)
Croatia
Slavonia
ROMANIA
Zara
(To Italy)
Bosnia-Hercegovina
(To Yugoslavia)
ITALY
Adriatic Sea
Dalmatia
SERBIA
MONTE-NEGRO
ALBANIA
BULGARIA
0 100 200
MILES
Austrian territory prior to division.
Hungarian territory prior to division.
TERRITORIAL DIVISION
of the
AUSTRO-HUNGARIAN EMPIRE
after the First World War
In addition, Fiume and its immediate environs, formerly Hungarian, became a free city in 1920; it was ceded to Italy in 1924.
Based on Saucerman, International Transfers of Territory in Europe, U.S. Government Printing Office, 1937.

The Victorian Age

- World War I
  - New countries:
    - Several regions of the Ottoman empire



What the Victorian Age knew

- Painting/ From Realism to Impressionism
  - Eduard Manet (1832, France):
    - “Le Dernier Dejouner” (1863) - four disconnected characters, violation of the law of perspective, shadows oriented in opposite directions

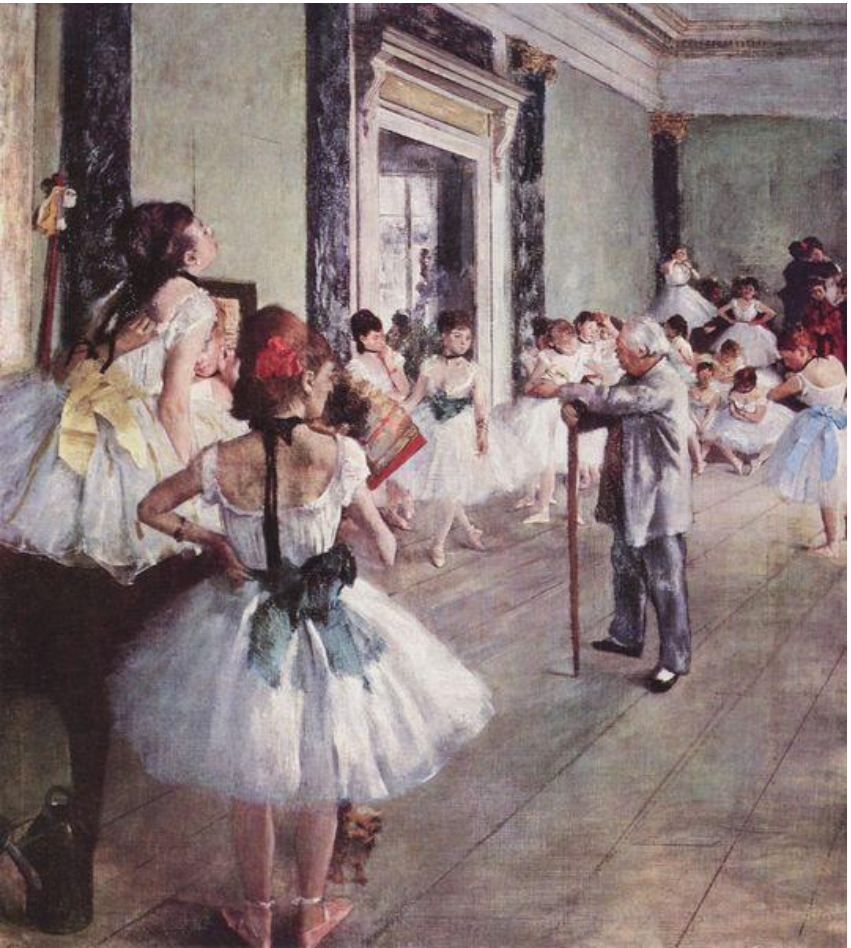
What the Victorian Age knew

- Painting/ From Realism to Impressionism
  - Eduard Manet (1832, France):
    - “Music in the Tuileries” (1862) - chaotic scene without a focus, no hierarchy, curved trees

What the Victorian Age knew

- Painting/ From Realism to Impressionism
  - Edgar Degas (1834, France): Movement

"La Classe de Danse" (1876)



"La La At the Cirque Fernando" (1879)

What the Victorian Age knew

- Painting/ From Realism to Impressionism
  - First impressionist exhibition in Paris (1874)
  - Ordinary life in motion
  - Light effects
  - The real subject is the brush stroke itself

What the Victorian Age knew

- Painting/ From Realism to Impressionism
  - Pierre Renoir (1841, France)

"Ball at the Moulin de la Galette" (1876)

What the Victorian Age knew

- Impressionism
  - Claude Monet

"The Artist's Garden at Giverny" (1900)

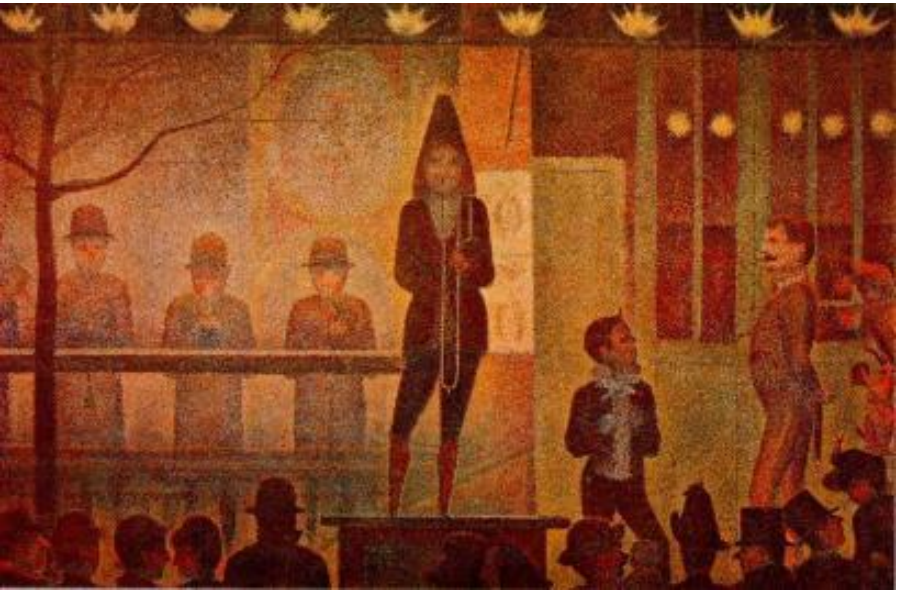
"Bridge Over a Pond of Water Lilies" (1899)

“Nimphee” (1926)

What the Victorian Age knew

- Pointillism
  - Georges-Pierre Seurat (1859, France)
    - Sense of tranquillity and civility
    - Idealized civilized life

"La Parade du Cirque" (1888)

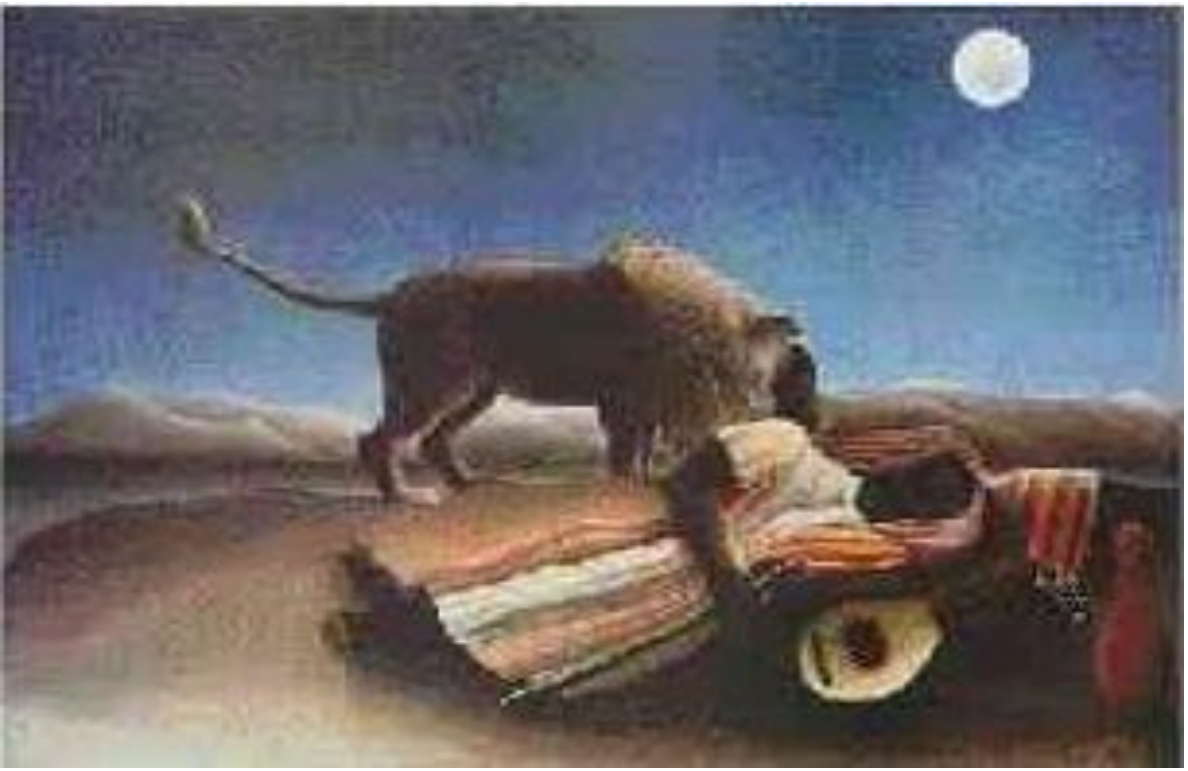


"La Grande Jatte" (1884)

What the Victorian Age knew

- Naïve/Primitive style
  - Henry Rousseau (1844, France)
    - Beauty and terror

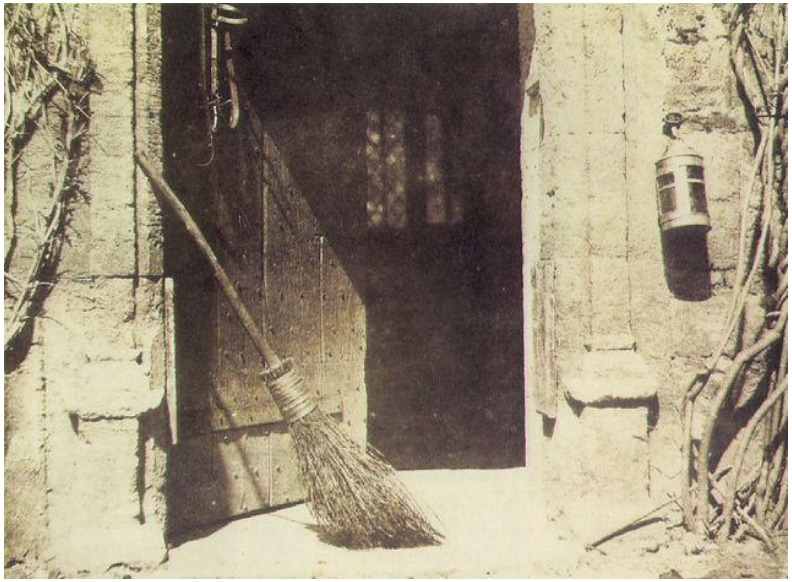
“Carnival Evening” (1886)



“Sleeping Gypsy” (1897)

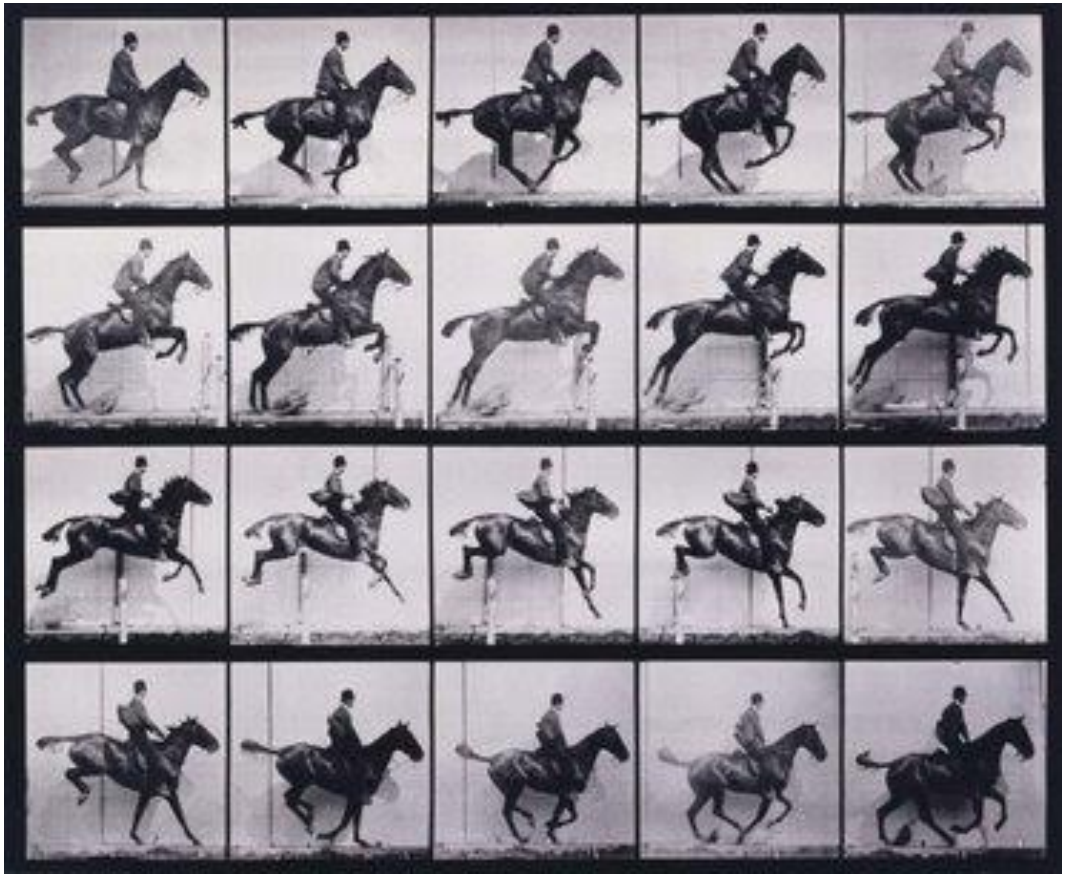
What the Victorian Age knew

- Photography in the USA
  - William Talbot publishes the first book eentirely illustrated by photography: “Pencil of Nature” (1844)



What the Victorian Age knew

- Photography
  - Eadweard Muybridge (1830, San Francisco): “Galloping Horse” (1878)



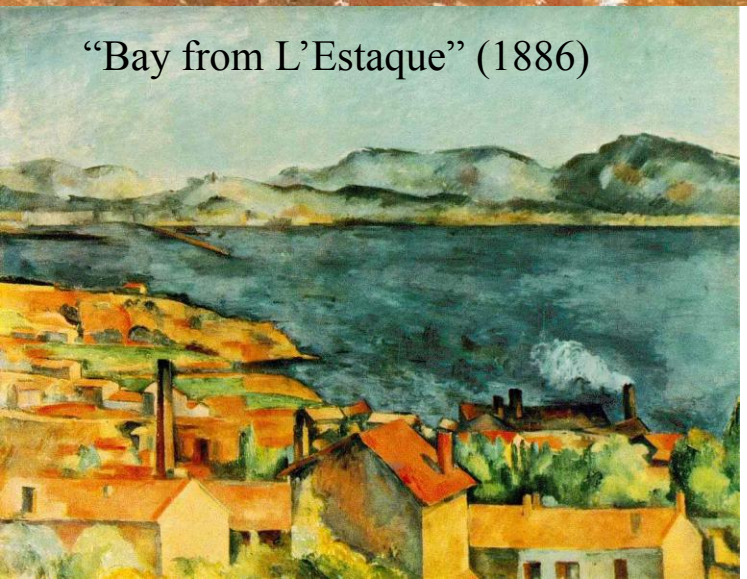
What the Victorian Age knew

- Paul Cezanne (1839, France)
  - Still life and landscape: absence of change, movement, time
  - Timelessness
  - Multiple perspectives in the same painting (“Still Life With Fruit Basket” in which each object is painted from a different perspective)
  - Color instead of line, shading, perspective
  - Color to create a sense of depth
  - Cezanne abstracts form the way Van Gogh abstracts color
  - Reducing objects to the fundamental forms (cones, cylinders, spheres)

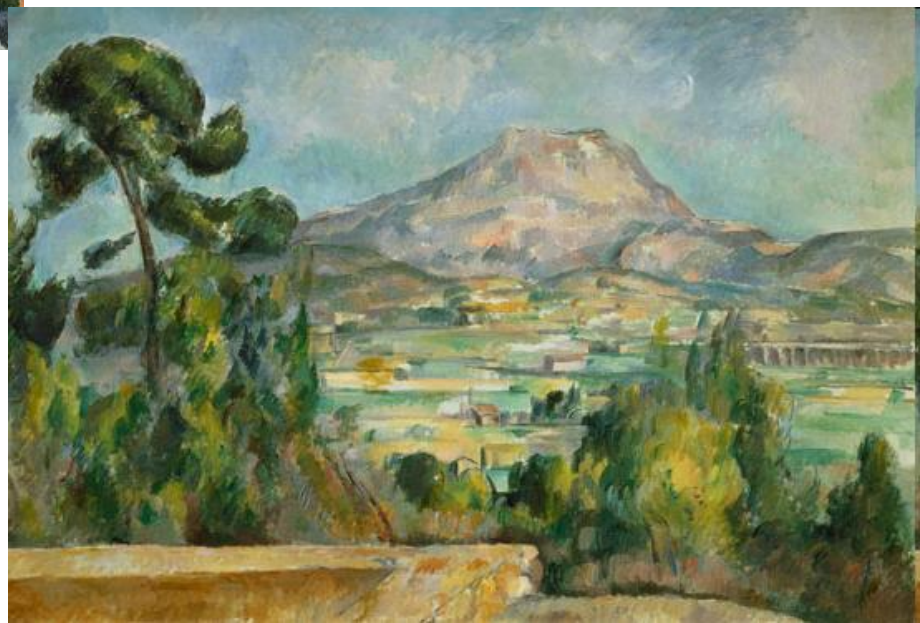
"Still Life With Fruit Basket"

"Large Bathers" (1905)

"Montagne Sainte-Victoire" (1906)



"Bay from L'Estaque" (1886)



What the Victorian Age knew

- Van Gogh (1853, Holland)
  - Emotional use of color

Wheatfield with Crows (1890)

Night Café (1888)

"Starry Night" (1889)

What the Victorian Age knew

- Painting
  - Paul Guaguin (1848, France)
    - Color to cause emotion
    - “Color expresses something by itself”
    - The grass is red in “Vision After the Sermon”
    - Non-Western traditions
    - Allegorical quality
    - Musical quality

“Vision After the Sermon” (1888)

What the Victorian Age knew

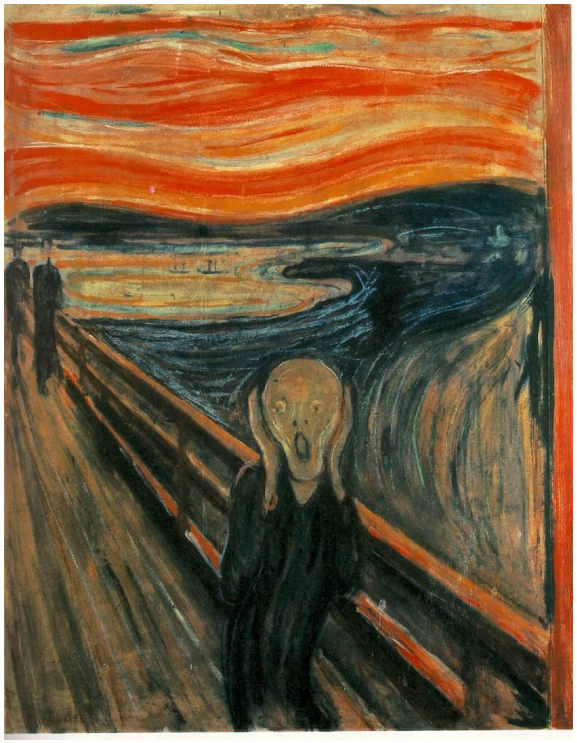
- Painting
  - Paul Guaguin

"La Orana Maria" (1891)

What the Victorian Age knew

- Painting/ Symbolism
  - Edvard Munch (1863, Norway)
    - Human suffering
    - The age of anxiety

"Dance of Life" (1900)



"The Scream" (1893)

What the Victorian Age knew

- Art Nouveau/ Sezessionstil
  - Gustav Klimt (1862, Austria)
    - Art Deco ante-litteram
    - The female body and experience

“Beethovenfries” (1902)

What the Victorian Age knew

- **Gustav Klimt**

"Adele Bloch-Bauer" (1907)

"The Kiss" (1908)

What the Victorian Age knew

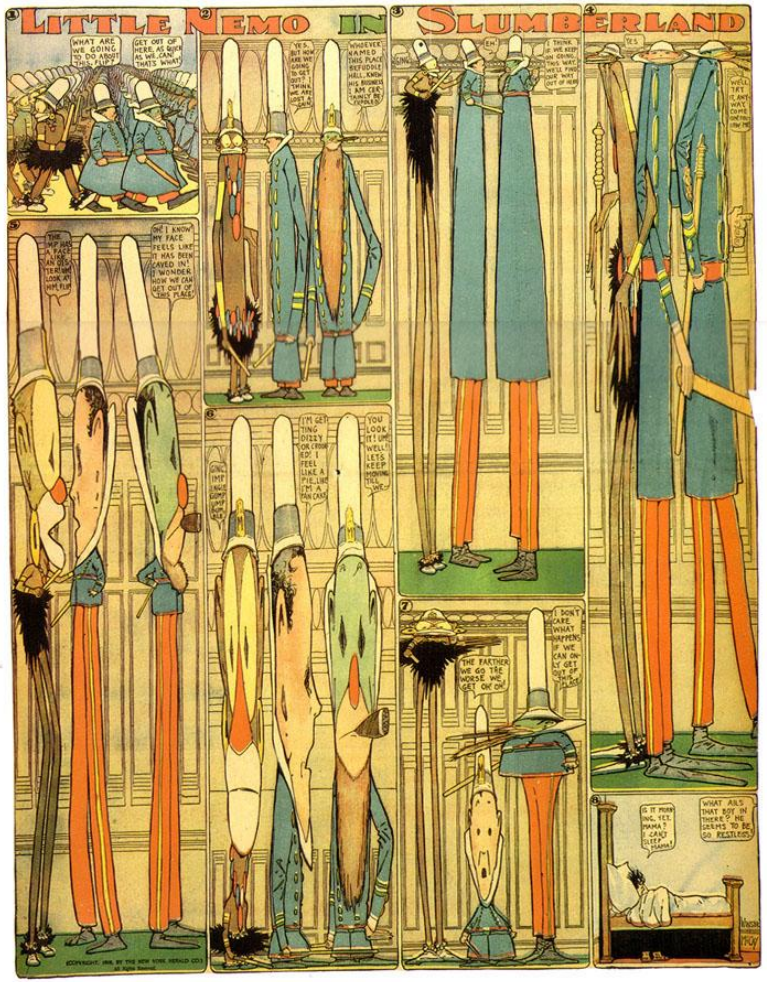
- Gustav Klimt

"Death and Life" (1910)

"The Virgin" (1913)

What the Victorian Age knew

- Art Nouveau/ Comics
  - Winsor McCay (1869): “Little Nemo” (1905-14)



What the Victorian Age knew

- Expressionism
  - Oskar Kokoschka (1886, Germany):
    - “Die Windsbraut/ Bride of the Wind” (1914)
    - “The Prometheus Triptych” (1950)

What the Victorian Age knew

- Expressionism
  - Vasilij Kandinskij (1866, Russia):
    - First abstract watercolor (1910)
    - Art with no subject

"Study for Composition 7" (1913)

"Gelb-Rot-Blau" (1925)

- Vasilij Kandinskij

“Composition IX” (1936)

“Composition X” (1939)

What the Victorian Age knew

- Painting
  - Fauve/ Wild Beast (1905)
    - Exaggerated colors and shapes
    - Henri Matisse (1869, France)

"Le bonheur de vivre" (1905)

"Le chambre rouge" (1908)

What the Victorian Age knew

- Painting/ Fauve
  - Matisse

"The Dance" (1909)

What the Victorian Age knew

- Painting/ Before cubism
  - Pablo Picasso (1881): “Les Demoiselles d'Avignon” (1907)
    - Influenced by Gauguin and Cezanne
    - Influenced by African sculpture

Not yet cubist (too erotic and too colorful)

Optical synthesis of perspectives. Simultaneous vision.

What the Victorian Age knew

- Painting
  - Cubism
    - For the first time since the Renaissance the goal is not an accurate representation of reality
    - Disposal of perspective (paintings with no depth)
    - Simultaneous views of an object (different perspectives can coexist)
    - New conception of space
    - New process of visual composition
    - Formalistic (about the pictorial technique itself)
    - Mostly monochrome, mostly linear (not curve)
    - Very few external influences (Cezanne)

What the Victorian Age knew

- Cubism
  - Georges Braque (1882, France)
    - Cezanne's strategy of turning 3D into 2D via form disassembly and multiple perspectives

"Violin and Candlestick" (1910)

"Violin and Palette" (1910)

What the Victorian Age knew

- Cubism
  - Pablo Picasso (1881, Spain)

"Female Nude" (1910)

"Ma Jolie" (1911)

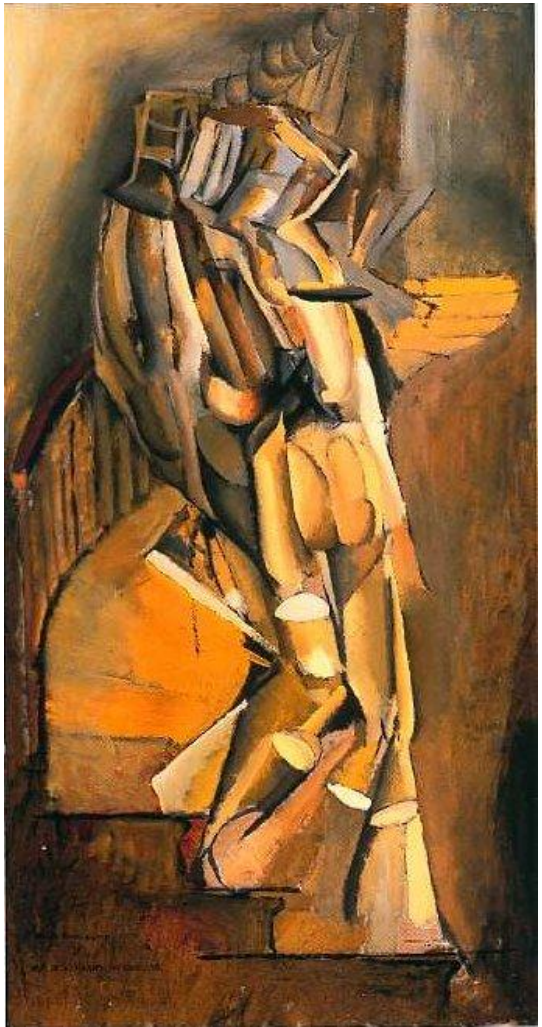
"L'Accordeoniste" (1911)

What the Victorian Age knew

- Cubism
  - Pablo Picasso
    - “Three Musicians” (1921)
    - “Ambroise Vollard” (1910)

What the Victorian Age knew

- Cubism
  - Marcel Duchamp (1887)



"Nu descendant un escalier n° 1" (1911)

"Nu descendant un escalier n° 2" (1912)

What the Victorian Age knew

- Cubism
  - Marcel Duchamp (1887)

"Passage of the Virgin to the Bride" (1912)

"The Bride" (1912)

What the Victorian Age knew

- Futurism
  - Futurist manifesto (1910)
  - Glorifying the future, not the past
  - Industrial and urban romanticism
  - Worship of machines
  - Representation of motion (multiple overlapped images of the same object as it moves)
  - Concerned with the time dimension (whereas cubism was concerned with space and impressionism with light)

What the Victorian Age knew

- Dada
  - 1916: Cabaret Voltaire in Zurich
  - International: German (Jean/Hans Arp, Hugo Ball, Max Ernst), Romanians (Tristan Tzara), French (Andre Breton, Marcel Duchamp, Francis Picabia), US (Man Ray/ Emmanuel Radnitzky) but mostly expatriates
  - Nihilistic
  - Sardonic
  - Provocative

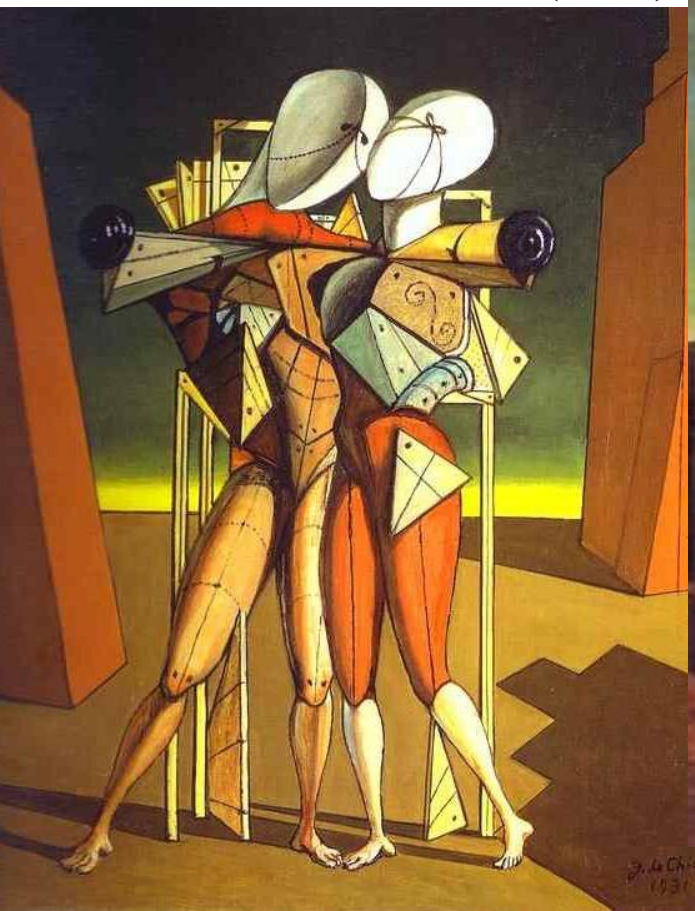
What the Victorian Age knew

- Painting
  - Surrealism
    - 1924: Breton’s manifesto
    - Mainly literature
    - Spontaneous creativity
    - Automatism
    - 1939: World War II ends Surrealism and some migrate to the USA

What the Victorian Age knew

- Giorgio De Chirico

“Hector and Andromache” (1917)



“Il grande metafisico” (1917)

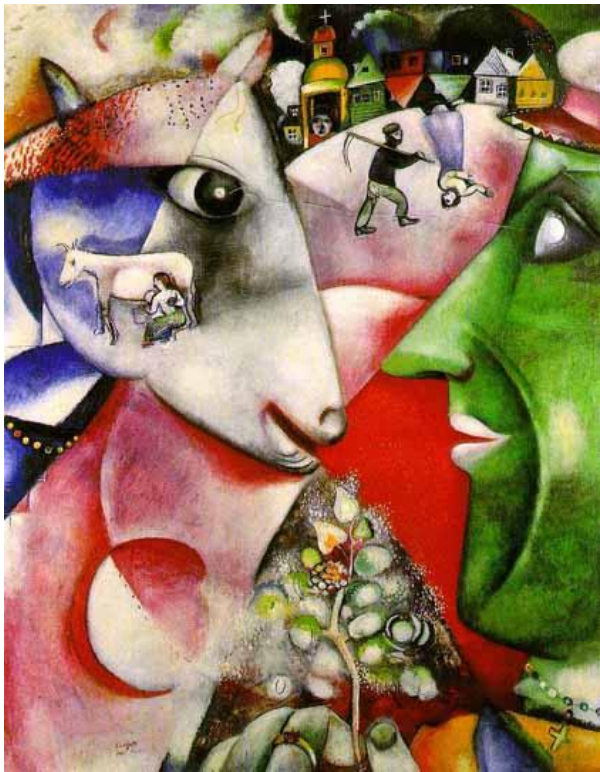
“Nostalgia dell’Infinito” (191

What the Victorian Age knew

- Painting
  - Marc Chagall (1887, Russia)
    - Russian and Jewish folklore
    - Childish cartoonish fantastic imagery
    - Cubism and surrealism
    - Collapse of the laws of Physics

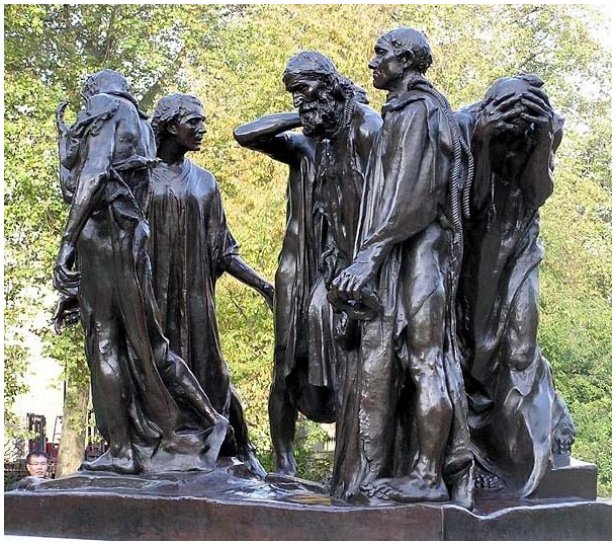
"Au Dessus de la Ville" (1924)

"I and the Village" (1911)



What the Victorian Age knew

- Sculpture
  - Auguste Rodin (1840, France)
    - Graeco-Roman and Renaissance art



The Burghers of Calais (1889)

The Thinker (1902)

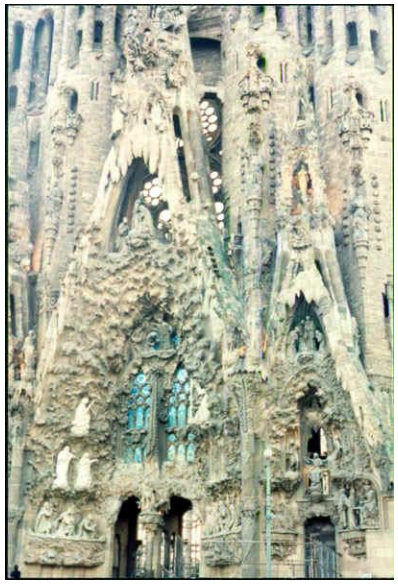
The Three Shades (1886)

What the Victorian Age knew

- Art Noveau
  - Antoni Gaudi (1852)
    - Sagrada Familia, Barcelona (1883-..)
    - Casa Batllo, Barcelona (1905)

What the Victorian Age knew

- Art Noveau



Sagrada Familia

Casa Batllo

What the Victorian Age knew

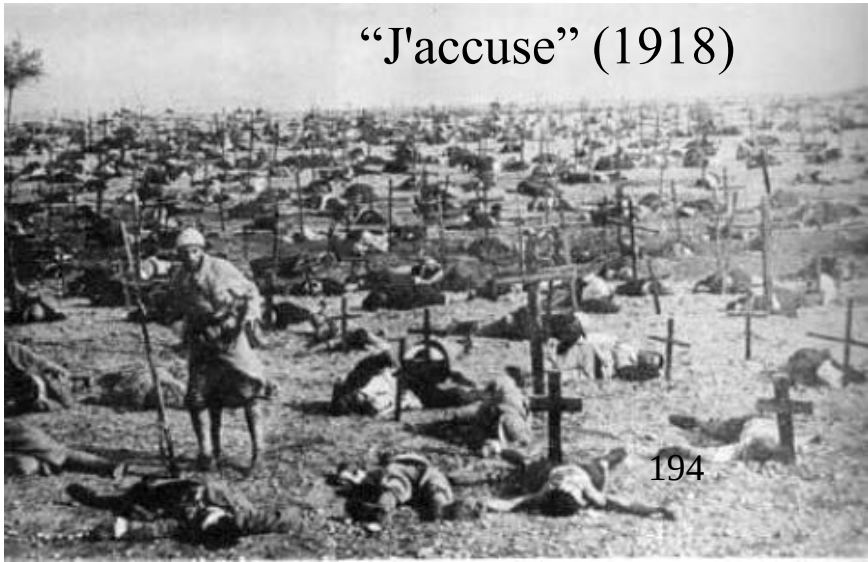
- Skyscrapers
  - Steel frame and electricity (elevators and lighting) make high-rise buildings feasible for rebuilding Chicago after the great fire (1871)
  - William LeBaron-Jenney's "Home Insurance Company Building" (1885)
  - Paul Sullivan publishes the article "The Tall Office Building Artistically Considered" (1896)

What the Victorian Age knew

- Cinema
  - Auguste and Louis Lumière
  - Stellan Rye/ Paul Wegener
  - Abel Gance

"The Student from Prague" (1913)

"The Arrival of a Train at La Ciotat Station" (1896)



"J'accuse" (1918)

What the Victorian Age knew

- Cinema
  - Georges Melies (1861, France)

"A Trip to the Moon" (1902)

"Tunneling the English Channel" (1907)

"The Kingdom of Fairies" (1903)

What the Victorian Age knew

- Cinema
  - Louis Feuillade (1873, France)

"The Vampyres" (1915)

"Fantomas" (1913)

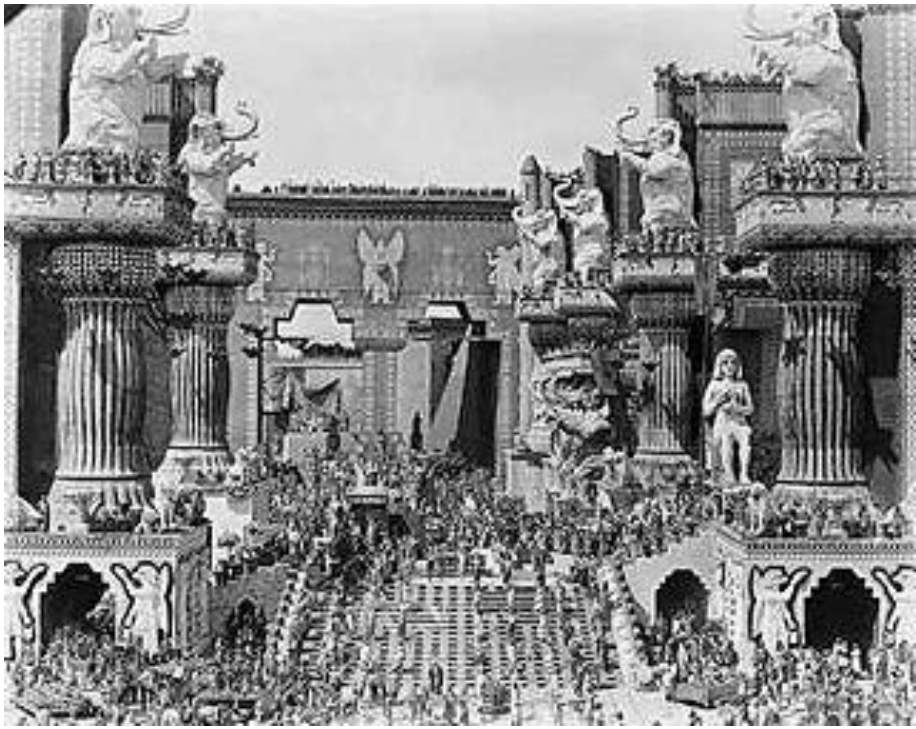
"Judex" (1916)

What the Victorian Age knew

- Cinema
  - David Wark Griffith (1875)

"The Birth of a Nation" (1915)

"Intolerance" (1916)



What the Victorian Age knew

- Fiction
  - Leo Tolstoj (1828, Russia): “War and Peace” (1869)
  - George Eliot (1819, Britain): “Middlemarch” (1872)
  - Emile Zola (1840, France): “L’Assommoir” (1877)
  - Fodor Dostoevsky (1821, Russia): “Brothers Karamazov” (1880)
    - Attack against Western values (materialism, logic, science)
    - Russian nationalism and Christian spirituality
    - Transforming theology into human tragedy
  - Joaquim-Maria Machado de Assis (1835, Brazil): “Memorias Postumas” (1881)
  - Joris Huysmans (1848): "A Rebours" (1884)

What the Victorian Age knew

- Fiction
  - Perez Galdos (1843, Spain): "Tristana" (1892)
  - Jose-Maria Eca de Queiros (1845, Portugal): "Casa de Ramires" (1897)
  - Thomas Mann (1875, Germany): "Buddenbrooks" (1901)
  - Henry James (1843, USA):"Golden Bowl (1904)
  - Joseph Conrad (1857, Britain): "Nostromo" (1904)
  - Maksim Gorkij (1868, Russia): "The Mother" (1907)
  - Franz Kafka (1883, Germany): "Der Prozess" (1915)
    - The individual lives in a rational society driven by forces that he not understand and cannot control

What the Victorian Age knew

- Theatre
  - Henrik Ibsen (1828, Norway): “Wild Duck” (1884)
  - Alfred Jarry (1873): "Ubu Roi" (1894)
  - August Strindberg (1849, Sweden): "The Dream" (1902)
  - Anton Chekhov (1860, Russia): ”The Cherries Garden" (1904)
  - Gerhart Hauptmann (1862): "Die Weber" (1892)
  - Arthur Schnitzler (1862): "Reigen/ La Ronde" (1896)
  - Frank Wedekind (1864, Germany): "Die Buchse der Pandora" (1904)
  - Bernard Shaw (1856, Britain): "Pygmalion" (1914)

What the Victorian Age knew

- Poetry
  - Charles Baudelaire (1821, France): “Les Fleurs du Mal” (1857)
  - Robert Browning (1812): “The Ring And The Book” (1869)
  - Isidore de Lautreamont (1846): "Les Chants de Maldoror" (1868)
  - Arthur Rimbaud (1854, France): "Une Saison En Enfer" (1873)
  - Stephane Mallarme` (1842, France): "L'Apres-Midi d'un Faune" (1876)
  - Gerald-Manley Hopkins (1844, Britain): "The Wreck Of The Deutschland” (1876)

What the Victorian Age knew

- Poetry
  - Ruben Dario (1867, Nicaragua): “Prosas Profanas” (1896)
  - Antonio Machado (1875, Spain): "Campos de Castilla" (1912)
  - Rabindranath Tagore (1861, India): "Gitanjali" (1913)
  - Guillaume Apollinaire (1880): "Alcools" (1913)
  - Paul Valery (1871, France): "La Jeune Parque" (1917)

What the Victorian Age knew

- Music
  - Richard Wagner (Germany, 1813):
    - Der Ring des Nibelungen: 12 hours of opera
    - He writes the words for his own music
    - Gesamtkunstwerk (total art, inspired by pre-Christian myth), formulated in 1849
    - “Tristan”: an opera made of discords
    - Influence of Schopenhauer
  - Modest Moussorgsky (Russia, 1839): Boris Godunov (1874)
  - Giuseppe Verdi (Italy, 1813):
    - La Traviata: real-life contemporary subject
    - Aida (1871): grand opera
    - Requiem (1874)

What the Victorian Age knew

- Music
  - Johannes Brahms (Germany, 1833): Symphony 4 (1885)
  - Giuseppe Verdi (Italy, 1813): “Otello” (1887)
  - Antonin Dvorak (Czech, 1841): Symphony 9 (1893)
  - Richard Strauss:
    - Also Sprach Zarathustra (1896)
    - Elektra: a dissonant expressionist opera
  - Fryderyk Chopin (Poland, 1810)
  - Ferencz Liszt (Hungary, 1811)

What the Victorian Age knew

- Music
  - Aleksandr Skrjabin (Russia, 1872): Divine Poem (1905)
  - Gustav Mahler (Austria, 1860): Symphony 9 (1910)
  - Arnold Schoenberg (Austria, 1874):
    - Second String Quartet (1908): atonal
    - Erwartung (1909): atonal opera
    - Pierrot Lunaire (1912): decadence and “degeneration” (first sprechgesang)
    - “Piano Suite” (1923): serial music (no note prevails)
  - Claude Debussy (France, 1862): Jeux (1912)
  - Igor Stravinskij (Russia, 1882): Le Sacre du Printemps (1913)