A History of Knowledge

Oldest Knowledge
What the Sumerians knew
What the Babylonians knew
What the Hittites knew
What the Persians knew
What the Egyptians knew
What the Indians knew
What the Chinese knew
What the Greeks knew
What the Phoenicians knew
What the Romans knew
What the Barbarians knew

What the Jews knew
What the Christians knew
Tang & Sung China
What the Japanese knew
What the Muslims knew
The Middle Ages
Ming & Manchu China
The Renaissance
The Industrial Age
The Victorian Age
The Modern World
What the Victorian Age knew

- European immigrants and their descendants occupy a large share of the planet, despite the fact that Europe is the smallest continent
- Between 1820 and 1930 more than 50 million Europeans emigrated to the Americas and to Oceania, certainly helped by the introduction of steamships
What the Victorian Age knew

• Paris
  – Belle Epoque (40 years of peace 1871-1914)
  – Cafes (middle-class) replace salons (aristocracy)
  – Montmartre
    • Cafe-concert (Moulin de la Galette)
    • Dance halls (Moulin Rouge)
    • Brothels
    • Students
  – 1881: the Chat Noir cabaret opens in Paris
  – 1889: Moulin Rouge
  – 1894: the first strip-tease show
  – Chansonniers
  – Convergence of sex, art and politics
What the Victorian Age knew

- Paris
  - Impressionism
    - Prodromes: Corot, Manet's "Olympia" (1865)
    - Claude Monet: "Impression: Sunrise" (1872)
  - Symbolism
    - Prodromes: Charles Baudelaire's "Les Fleurs du Mal" (1857)
    - Arthur Rimbaud: "Le Bateau Ivre" (1871)
    - Paul Verlaine: "Romances sans Paroles" (1874)
    - Stephane Mallarme`: "L'apres-midi d'un Faune" (1876)
    - Vincent van Gogh: "Sunflowers" (1888)
    - Paul Gauguin: "Vision after the Sermon" (1888)
  - Fauvism: Henri Matisse (1905)
What the Victorian Age knew

- Paris
  - Cubism
    - Pablo Picasso: "Les Demoiselles d'Avignon" (1907)
  - Futurism
    - Filippo Tommaso Marinetti's "Futurist Manifesto" (1909)
  - Dadaism
    - Tristan Tzara ("Dada") performs at the Cabaret Voltaire in Zurich (1916)
    - Anarchic
  - Surrealism
    - Andre Breton's "Surrealist Manifesto" (1924)
    - Sigmund Freud's influence: the unconscious, dreams
    - Automatism
What the Victorian Age knew

• Berlin/ Physics
  – Germany had only one world-class university (Gottingen) until 1810
  – 1810: Founding of the University of Berlin
  – Wilhelm von Humboldt’s school reforms: teachers must have a university degree, priority to research, doctorate
  – Specialist academic literature separate from general readership
  – Scientific renaissance in Germany
  – Hermann Helmholtz
  – Rudolph Clausius
  – Max Planck
What the Victorian Age knew

• Berlin/ Physics
  – In 1909 Max Planck delivers a lecture in German at Columbia Univ: every physicist in the world was expected to understand German
What the Victorian Age knew

• Berlin/ Electricity
  – 1847: Werner Siemens founds a company to exploit the telegraph
  – 1866: Siemens develops the first practical dynamo
  – 1873: Zénobe Gramme discovers how to use a dynamo as a direct current motor (Belgium)
  – 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 Elektrizitäts Gesellschaft (AEG), specializing in electrical engineering, whereas Siemens specializes in communication and information
What the Victorian Age knew

• Berlin/ Electricity
  – 1888: Nikola Tesla invents the alternating-current motor (USA)
  – 1890: AEG develops the AC motor and generator (first power plants) and alternating current makes it easy to transmit electricity over long distances
  – 1897: Karl Ferdinand Braun builds the first oscilloscope and invents the cathode-ray tube
  – 1910s: Greatest center of electrical production in the world ("Elektropolis")
What the Victorian Age knew

- Germany
  - 1910: Berlin third largest city in Europe
  - 1910: 60% of Germans live in cities
  - 1875: Germany’s industrial output surpasses France’s
  - 1900: Germany’s industrial output surpasses Britain’s
  - 1870: Britain has 32% of the world's industrial production
  - 1910: The USA has 35.3% of the world's industrial production, Germany has 15.9% and Britain 14.7%
  - 1912: The “Kongo”, the largest battleship in the world
What the Victorian Age knew

• Germany
  – Preeminence of German universities
  – Physics, Chemistry and Geology regarded as equal to humanities
  – The industrial research lab: Siemens, AEG, Bayer
  – Chemistry and engineering spawn a boom in dyes, pharmaceuticals and electrical devices
What the Victorian Age knew

• Germany
  – 1827: Georg Ohm's electrical laws
  – 1845: Gustav Kirchhoff's electrical laws
  – 1847: Hermann Helmholtz's conservation of energy
  – 1850: Rudolf Clausius discovers entropy
  – 1866: Werner Siemens' dynamo
  – 1875-83: Robert Koch isolates the cause of anthrax, tuberculosis and cholera
  – 1876: Ferdinand Braun discovers semiconductors
  – 1886: Karl Benz's gasoline-powered car
  – 1890: AEG's alternate-current motor
  – 1897: Felix Hoffman's aspirin
  – 1897: Karl Braun's oscilloscope
  – 1900: Ferdinand von Zeppelin's dirigible
  – 1900: Max Planck's Quantum Theory
  – 1905: Albert Einstein's Relativity
What the Victorian Age knew

- Berlin/ Expressionism
  - Prodromes: Victor von Falk's best-selling gore novel "The Executioner of Berlin"
  - Berlin's megalopolis: population grew from 1.9 million in 1890 to 3 million in 1910
  - 1918: Dada exported to Berlin
  - 1919: the Bauhaus opens in Weimar
  - 1919: "Das Kabinett von Dr Caligari" brings expressionism to cinema
  - 1924: Neue Sachlichkeit
  - 1925: Erwin Piscator produces "Trotz Alledem", a multi-stage multi-media event
  - 1926: Walter Gropius opens the new Bauhaus in Dessau
  - 1927: Bertold Brecht writes the manifesto of the "epic theatre"
What the Victorian Age knew

- Berlin/ Great Depression
  - 1929: unemployment in Germany is 1 million
  - 1930: unemployment in Germany is 3 million
  - 1932: unemployment in Germany is 6 million
What the Victorian Age knew

• Vienna
  – Music: Richard Strauss, Gustav Mahler
  – Painting: Gustav Klimt, Egon Schiele
  – Fiction: Arthur Schnitzler, Robert Musil
  – Psychology: Sigmund Freud
  – Physics: Ludwig Boltzmann, Ernst Mach
  – Philosophy: Edmund Husserl
What the Victorian Age knew

- Alexandria
What the Victorian Age knew

Democracy

- USA: 1865
- France: 1875
- Britain: 1918
- but not for women
What the Victorian Age knew

Second industrial revolution

- Bessemer converter for mass-producing steel (1856)
- Edwin Drake drills oil in Pennsylvania (1858)
- First practical dynamo (1866)
- Thomas Edison’s first power plant (1882)
- Almamian Decker’s alternate-current power plant (1893)
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

Second industrial revolution/ The power plant
• Water wheels and steam engines did not allow for long-distance power distribution (they needed to be near the factory that used them)
• Electricity can be distributed over long distances
• The electrical power plant produces energy for multiple factories
• The factory does not need to take care of its own power production anymore
• Electricity allows factories to be located far from the production of energy
• Electricity enables the assembly line
What the Victorian Age knew

Second industrial revolution/ The power plant
• The electrical power plant produces energy for the entire city
• Energy production becomes centralized the way food production became centralized 5000 years earlier
• Power plants cause the price of electricity to fall
• Cheap and plentiful energy
• Democratization of electricity (homes can afford the energy that only factories used to have)
• Birth of “utility” companies that charge a fee for energy
• The same companies start selling electrical appliances to homes
What the Victorian Age knew

Second industrial revolution/ The power plant

• Cheap and ubiquitous electricity enables the shift from public entertainment (theater, cinema, amusement park) to private entertainment (radio, phonograph and later television)
What the Victorian Age knew

• Second industrial revolution/ Lighting
  – Traditional methods: whale oil, candles, Etruscan lamps and gas lamps
  – Electric lighting:
    • Healthy (no fumes)
    • Cheap
    • Controllable
    • Less flammable
  – Tungsten filament (1904)
What the Victorian Age knew

The Great Monopolies of the USA

• Scientific organization of the corporation leads to economies of scale that change the world more than wars do
• Privately held monopolies pledge commitment to the public good
• Corporate titans reinvent capitalism as a quasi-divine mission to reform the world via technology, the monopoly as an agent of good for the whole society
  – Theodore Vail (AT&T, 1885-1919)
  – Henry Ford (Ford, 1899-1945)
  – John Rockefeller (Standard Oil Company, 1862-1897)
What the Victorian Age knew

The Great Monopolies of the USA

• Goal: to create the industrial equivalent of the British Empire, that brings "civilization" to the entire world.

• Adam Smith's "invisible hand" is destructive, competition leads to waste not efficiency:
  – "The public as a whole has never benefited by destructive competition" (Theodore Vail)
  – "There can be no greater absurdity and no greater disservice to humanity in general than to insist that all men are equal" (Henry Ford)

• The government’s reaction: the Sherman Antitrust Act (1890), prosecution of Standard Oil (1909)
What the Victorian Age knew

Physics

- 1842: Julius Mayer discovers that heat can be converted into work (before Joule)
- 1843: James Joule establishes the equivalence of work and heat (energy can be transformed)
- 1847: Helmholtz popularizes Mayer’s and Joule’s proofs of the conservation of energy: electric, magnetic, heat and light energy are equivalent to mechanical work
- 1850: Rudolf Clausius discovers entropy
- 1851: Hippolyte Fizeau measures the speed of light
- 1859: Le Verrier discovers that the perihelion of the planet Mercury advances by 38" per century more than Newton’s equations predict
What the Victorian Age knew

Physics

• 1859: Gaston Plante invents the lead-acid cell, the first rechargeable battery
• 1864: James Clerk-Maxwell formulates the laws of electricity and magnetism
• 1867: Georges Leclanché invents the zinc-manganese battery (forerunner of the alkaline battery)
• 1868: William Huggins discovers that galaxies are receding
• 1869: Dmitri Mendeleev's periodic table of elements (56 known elements and a law for discovering the next ones)
• 1878: Willard Gibbs’ principles of thermodynamics
What the Victorian Age knew

Physics

• 1876: Ferdinand Braun discovers semiconductors
• 1886: Heinrich Hertz discovers that radio waves can be broadcast and received
• 1892: Hendrik Lorentz outlines the theory of the electron (the atom is not elementary but is made of smaller units that are electrical in nature)
• 1895: Wilhelm Roentgen discovers the X rays, light rays that are invisible to the human eye
• 1896: Antoine Henri Becquerel observes the radioactive decay of atomic nuclei (discovery of radioactivity)
• 1897: Joseph-John Thompson discovers that electricity is due to the flow of tiny negatively charged particles (discovery of the electron)
What the Victorian Age knew

Physics

• 1895: The X rays
  – Camille Flammarion: “The Unknown” (1900)
  – Marie Curie (1904): “The discovery of the phenomena of radioactivity adds a new group to the great number of invisible radiations now known, and once more we are forced to recognize how limited is our direct perception of the world which surrounds us, and how numerous and varied may be the phenomena which we pass without a suspicion of their existence until the day when a fortunate hazard reveals them”.
  – Note: after 1895 painters start painting things that don’t exist (futurists, cubists, surrealists…)
What the Victorian Age knew

Physics

• 1898: Pierre Curie and Marie Curie isolate the radioactive elements polonium and radium (and coin the word “radioactivity”)

• William "Lord Kelvin" Thompson (1900): there are two small clouds on Physics
  – The speed of light is the same in all directions, i.e. no experiment reveals the existence of the ether (Michelson-Morley, 1887)
  – Decrease in energy emitted at short wavelengths by a "black" body (a body that does not reflect light)
What the Victorian Age knew

Physics

• 1900: Max Planck discovers that atoms can emit energy only in discrete amounts (first explanation of why chemical substances are made of discrete units, the elements)

• 1902: Ernest Rutherford discovers the radioactive decay law (the that every radioactive isotope has a specific “half life”)

• 1903: Konstantin Tsiolkovsky's "The Exploration of Cosmic Space by Means of Reaction Devices"
What the Victorian Age knew

Physics

• 1905: Albert Einstein explains the photoelectric effect as being the result of light being made of “photons”, their energy being proportional to frequency
• 1905: Albert Einstein explains Brownian motion, and proves the existence of John Dalton’s atoms
• 1905: Albert Einstein publishes "Special Theory of Relativity"
What the Victorian Age knew

Physics
- 1910: Heike Kamerlingh Onnes discovers superconductivity
- 1911: Ernest Rutherford discovers that the atom is made of a nucleus and orbiting electrons (a mini-solar system)
- 1913: Robert Millikan measures the charge of the electron
- 1913: Niels Bohr proves that electrons are permitted to occupy only some orbits around the nucleus of the atom
What the Victorian Age knew

Institutes for theoretical physics
- University of Berlin (first director Gustav Kirchhoff in 1875, led by Max Planck in 1900)
- Bonn (Heinrich Hertz until 1894)
- Königsberg (first director Franz Neumann)
- Leipzig
- Göttingen (led by Woldemar Voigt in 1900)
- Munich (first director Arnold Sommerfeld in 1906)
- Vienna (Ludwig Boltzmann since 1894)
- Leiden (first director Hendrik Lorentz in 1877)
- Cambridge (Joseph John Thomson since 1884)
- University of Manchester (Ernest Rutherford since 1907)
- University of Paris (Pierre Curie & Maria Sklodowska)
What the Victorian Age knew

Non-Euclidean Geometry

• Nikolai Lobachevsky's non-Euclidean geometry (1829)
• Janos Bolyai's "Absolute Science of Space" (1829)
• Arthur Cayley's "Analytical Geometry of n Dimensions" (1843)
• Bernhard Riemann's lecture "On the Hypotheses which lie at the Foundation of Geometry" (1854)
• Hermann von Helmholtz's lecture "On the Origin and Significance of Geometrical Axioms" (1870)
• Henri Poincaré's article "Non-Euclidean Geometries" (1891)
What the Victorian Age knew

Logic

- John Stuart Mill's "System of Logic" (1843)
- George Boole's "Mathematical Analysis of Logic" (1847)
- Charles Babbage's "difference engine" (1859)
- Gottlob Frege's "Begriffsschrift" (1879)
- John Venn's set diagrams (1880)
- Giuseppe Peano's "The principles of Arithmetic" (1889)
- David Hilbert's "23 Problems" (1900)
- Ernst Zermelo's set theory (1908)
- Alfred Whitehead's and Bertrand Russell's "Principia Mathematica" (1913)
- Thoralf Skolem's "Some Remarks on Axiomatized Set Theory" (1922)
What the Industrial 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
  – Logic becomes as rigorous as Mathematics
What the Industrial 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)
  – All of them: the sum of the angles of a triangle is less than 180 degrees
What the Industrial 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”
  – The sum of the angles of a triangle is greater than 180 degrees
What the Industrial Age knew

- Charles Babbage (1832)
  - Economic principles that regulate automation
  - Mass production implies a society of manufacturers not makers
  - Mass production requires division of labor
  - Progress will increasingly depend on the ability to calculate
What the Industrial Age knew

• Charles Babbage: "Difference Engine" (1859), manufactured by Edvard Scheutz
What the Industrial Age knew

- Charles Babbage: the probability of miracles

The probability of the witnesses speaking truth, and the event occurring, is therefore,

\[
\frac{(1 - \frac{1}{p})^n \cdot \frac{1}{m+2}}{(1 - \frac{1}{p})^n - \frac{1}{m+2} + \left(\frac{1}{p}\right)^n \frac{m+1}{m+2}} = \frac{(p - 1)^n}{(p - 1)^n + m + 1}; \quad (A)
\]

and the probability of their falsehood is,

\[
\frac{\left(\frac{1}{p}\right)^n \frac{m+1}{m+2}}{(1 - \frac{1}{p})^n - \frac{1}{m+2} + \left(\frac{1}{p}\right)^n \frac{m+1}{m+2}} = \frac{m+1}{(p - 1)^n + m + 1}; \quad (B)
\]
What the Industrial Age knew

• Charles Babbage: “On the Economy of Machinery and Manufactures” (1832) predating the assembly line
  – “The economy of human time is the next advantage of machinery in manufactures”
What the Victorian Age knew

• Electricity
  – Gustav Kirchhoff (1845): laws for the distribution of current in electric circuits (e.g., the sum of the currents into a given node equals the sum of the currents out of that node)
  – William Weber (1855): the ratio between the electrodynamic and electrostatic units of charge is the same number as the speed of light
  – Gustav Robert Kirchhoff (1862) coins the term "black body radiation"
  – Thomas Edison (1879) invents the light bulb with carbon filaments, replacing the old expensive inefficient electric lamps
What the Victorian Age knew

• Electricity
  – Valdemar Poulsen (1898) invents the telegraphophone
What the Victorian Age knew

• Electricity: power generation
  – 1832: Benoit Fourneyron invents the turbine water wheel (50 horsepower)
  – 1849: James Francis (Lowell, USA) improves the water turbine
  – 1879: Lester Pelton (Gold Country, California) improves the impulse water turbine
  – Water turbines replace waterwheels to harness waterpower
  – Water turbines generate electricity
  – The world's first hydroelectric power plant uses water turbines (Niagara Falls, 1886)
  – Steam turbines (propelled by fossil fuels) generate electricity (Charles Parsons, 1885, Newcastle)
What the Victorian Age knew

- Electricity: power generation
  - Electricity is a form of energy that is easily stored and transmitted
  - Electricity creates new industrial sectors
What the Victorian Age knew

- Electricity: power generation

(From Electropædia)
What the Victorian Age knew

Biology/ Medicine

- Matthias Schleiden discovers that all living beings are made of cells (1839)
- 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

Sanitary revolution/ milk

• 1858: Frank Leslie in New York publishes an essay about people killed by milk
• 1865: Louis Pasteur invents pasteurization
• 1892: Nathan Straus opens the Pasteurized Milk Laboratory in New York to produce pasteurized milk at scale
• 1909: Chicago becomes the first city of the USA to require pasteurization of milk
• 1935: Infant-mortality rate in the USA is half what it was in 1915
What the Victorian Age knew

Sanitary revolution / water

• 1908: Typhoid is responsible for 30 deaths per 100,000 people in the USA
• 1908: John Leal adds chlorine to the public reservoirs in Jersey City
• 1912: Chicago chlorinates public reservoirs
• 1938: Typhoid is responsible for 3 deaths per 100,000 people
What the Victorian Age knew

Sanitary revolution / cholera

• 1906: intravenous hypertonic solutions reduces cholera's mortality rate to 40%
What the Victorian Age knew

Chemistry

• 1825: Michael Faraday identifies benzene - birth of organic chemistry
• 1842: Crawford Long demonstrates that ether can be used as an anesthetic
• 1847: Ascanio Sobrero invents nitroglycerin
• 1848: Charles Mansfield isolates benzene from coal tar (Britain)
• Industrial chemicals multiply, mostly derived from benzene (dyes, soap, mothballs…)
• 1855: Alexander Parkes invents celluloid (Britain)
• 1856: William Perkin, still a teenager, accidentally invents the first synthetic dye, mauve (Britain)
• 1860s: Chemistry becomes a popular subject to study in universities
What the Victorian Age knew

Chemistry

• 1897: Felix Hoffman discovers acetylsalicylic acid (introduced by Bayer in the form of water-soluble tablets as “aspirin”)
• 1898: Bayer introduces commercially a drug made from opium, diacetylmorphine, under the name "heroin"
• 1901: Frederick Kipping names “silicones” (Britain)
• 1908: Jacques Brandenberger invents cellophane (Switzerland)
• 1909: Sahachiro Hata and Paul Ehrlich discover arsphenamine, the first scientific treatment for syphilis (marketed by Hoechst as Salvarsan)
What the Victorian Age knew

Chemistry/ Germany

• 1870s: the German chemical industry pioneers the industrial research lab
• 1890: Germany’s chemical industry focuses on synthetic products (including gasoline) based on coal
• 1900: the German chemical industry (BASF, Bayer, Hoechst) dominates the world market for synthetic dyes (90% of the world supply of dyestuffs in 1913)
• 1913: Fritz Haber's and Carl Bosch's process for the manufacture of ammonia
• 1925: the German chemical industry consolidated in IG-Farben, which remains the world's largest chemical company until World War II
• 1939: German scientists have won 15 of the 30 Nobel Prizes awarded in Chemistry
What the Victorian Age knew

Organic chemistry/ Agricultural revolution

• Justus von Liebig’s nitrogen-based fertilizers (19th c): plants feed on nitrogen and ammonia is a source of nitrogen (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 (at BASF), kept secret until World War II

• IG-Farben is the world's largest chemical company until World War II

• After World War II: Ammonia replaces depleted nitrogen in the soil with nitrogen from the air

• Ammonia becomes the #1 fertilizer in the world

• Food production has no limit

• Ammonia drives population explosion
What the Victorian Age knew

Psychology

• Spencer, Herbert: "Principles of Psychology" (1855)
• Helmholtz, Hermann: "Handbuch der Physiologischen Optik" (1867)
• Brentano, Franz: PSYCHOLOGY FROM AN EMPIRICAL STANDPOINT (1874)
• Wundt, Wilhelm: "Principles of Physiological Psychology" (1874)
• Ebbinghaus, Hermann: "Memory" (1885)
• James, William: PRINCIPLES OF PSYCHOLOGY (1890)
• Dewey, John: "The Reflex Arc Concept in Psychology" (1896)
• Titchener, Edward: "Outline of Psychology." (1896)
• Freud, Sigmund: The Interpretation of Dreams (1900)
• Shaler, Nathaniel: "The Individual - A Study of Life and Death" (1901)
What the Victorian Age knew

Psychology

- Rank, Otto: "The Myth of the Birth of the Hero" (1909)
- Thorndike, Edward: ANIMAL INTELLIGENCE (1911)
- Adler, Alfred: "Individual Psychology" (1911)
- Jung, Carl: "Psychology of the Unconscious" (1912)
- Selz, Otto: "On the Laws of the Orderly Thought Process" (1913)
What the Victorian Age knew

Private Life

Board games of the 1880s
What the Victorian Age knew

Moving panoramas: before cinema and before virtual reality

John Banvard: moving panorama of 1848

Albert Smith’s panorama of the Mont Blanc, showed more than 2000 times (1852-58)

Moses Gompertz and the Poole brothers’ Myriorama (1890s)
What the Victorian Age knew

• 1838: Charles Wheatstone invents the stereoscope
• 1851: David Brewster demonstrates his stereoscopes at the Great Exhibition of 1851
• 1850: Frederick Langenheim’s stereopticon
• 1862: Oliver Holmes starts selling stereoscopes
What the Victorian Age knew

- 1900: cineorama at the Paris World Exhibition (ten films projected simultaneously to form a 360 degree image)
- 1922: Laurens Hammond’s teleview for projecting stereoscopic films
What the Victorian Age knew

• Urbanization
  – 1800: 12% of Europeans live in towns
  – 1910: 41% of Europeans live in towns
What the Victorian Age knew

• Gas
  – 1867: Paris is lit by 20,000 gas lamps
  – 1890: Liverpool introduces the slot meter, a meter that provides a fixed amount of gas when a coin is inserted
  – 1892: London installs the first slot meters
  – The consumption of gas by the working class increases rapidly after the invention of the slot meter
  – Gas-lighting enters the homes of ordinary people

• Water
  – 1870: London introduces high-pressure water supply to homes (water around the clock, on demand)
What the Victorian Age knew

• Furniture
  – Michael Thonet (1796, Austria) : elegant, lightweight and comfortable furniture
What the Victorian Age knew

Beauty

– 1840: Guerlain introduces the first lipstick
– 1846: David Hough invents a hoop skirt supported by a dome-shaped crinoline
– 1852: The first public bathhouse opens in New York
– 1856: W.S. Thompson invents the steel-frame cage crinoline
– 1869: Steam molding enables stiffer corsets
– 1872: The bustle becomes more popular than the crinoline
– 1875: Charles Michel uses electrolysis for removal of facial hair
– 1875: The long-waisted corset is introduced
– 1888: Mum introduces the first deodorant
– 1889: Teresa Dean publishes "How to be Beautiful"
– 1890: Charles Gibson's illustrations of the "Gibson Girl" promote the S-shaped tall and slender woman as fashionable, and therefore the swan-bill corset
What the Victorian Age knew

Beauty

– 1892: The fashion magazine Vogue debuts
– 1892: Burroughs Wellcome introduces the first vanishing cream, "Hazeline Snow"
– 1894: Paul Unna discovers the relationship between sun exposure and skin aging,
– 1896: Colgate introduces toothpaste in tubes
– 1903: Helena Rubinstein begins selling her Valaze anti-aging cream
– 1907: Pond begins to sell a day beauty cream and a night beauty cream
– 1907: Australian swimmer Annette Kellerman is arrested on a Boston beach for wearing a one-piece swimsuit
– 1907: Eugene Schueller (founder of L'Oreal) invents the first synthetic hair dye
– 1909: Diaghilev's ballets in Paris popularizes mascara
– 1910: Paul Poiret introduces his girdle
What the Victorian Age knew

Beauty

- 1911: Oskar Troplowitz's Beiersdorf introduces the Nivea anti-aging cream, the first stable water-in-oil emulsifier
- 1912: Suzanne Noel performs the first "face-lift" cosmetic surgery
- 1912: Coco Chanel proclaims that women should dress for themselves and not only for men
- 1914: Mary Phelps-Jacobs files the first patent for a bra
- 1914: Cutex introduces liquid nail polish
- 1915: A portable lipstick container is marketed by Scovill
- 1915: Gillette introduces the Milady razor for women to remove underarm hair
- 1915: Elizabeth Arden introduces the Ardena Skin Tonic lotion and the Venetian Cream Amoretta beauty cream
- 1917: Maybelline mascara makes mascara affordable for everybody
- 1918: By the end of World War I the popularity of the corset has dramatically declined, replaced by the girdle
What the Victorian Age knew

• Transportation
  – 1830: The world’s first commercial railroad opens
    (George Stephenson’s Liverpool-Manchester)
  – 1840s: Boom of railways in Britain
  – 1857: Steamships take only 9 days to cross the Atlantic (1857)
  – 1866: Robert Whitehead invents the torpedo
  – 1869: The Union and Central Pacific railroads create the first transcontinental railroad (USA)
  – 1869: The Suez canal (impassable by sail boats) boosts sales of steamboats
What the Victorian Age knew

• Transportation
  – 1876: Nikolaus Otto’s four-cycle internal combustion engine
  – 1879: The first steel steamboat crosses the Atlantic
  – 1882: Britain invades Egypt and takes control of Suez
  – 1914: The USA inaugurates the Panama Canal
What the Victorian Age knew

• Transportation

Transcontinental railway

Steamship routes
What the Victorian Age knew

• Transportation
  – Between 1830 and 1920 more than 60 million Europeans emigrate to the Americas
  – Emigrants help colonize the Americas
  – Emigrants reduce unemployment in Europe
  – The Suez Canal links Britain and India
  – Steamships and railroads allow Britain to unite the entire Indian subcontinent
  – Steamships allow Britain to link India and China (e.g. opium)
  – The British navy (steam + steel + torpedo) is virtually invincible
What the Victorian Age knew

• Transportation
  – 1885: Gottlieb Daimler and Wilhelm Maybach invent the motorcycle
  – 1885: John Kemp Starley’s bicycle
  – 1886: Karl Benz builds a gasoline-powered car
  – 1888: The Orient Express train connects Paris and Istanbul
  – 1888: John Dunlop’s pneumatic tire
  – 1890: The first electrical subway (London)
  – 1892: Britain tonnage and seatrade exceeds the rest of the world together
  – 1900: Ferdinand von Zeppelin builds the first rigid dirigible
  – 1903: Wilbur and Orville Wright fly the first airplane
  – 1913: Henry Ford installs the first assembly line
What the Victorian Age knew

- Transportation/ car
  - The car inherits technology invented for the bicycle (steel tubes, differential gearing, chain drive)
  - Initially a French-dominated industry (garage, chaffeur, chassis, automobile) because of a good network of “paved” roads and a poor railway network
  - Gasoline, electric and steam vehicles compete (the electric engine is silent, clean and it is smell-free; the steam engine has a lot of power and doesn’t require the transmission)
  - The car is a toy for wealthy sportsmen
  - Michigan is the center for carriage and wagon manufacturing thanks to its forests
What the Victorian Age knew

- Transportation/ car
  - Gasoline-power cars win because of
    - Charles Kettering’s electric starter (1912) that makes car easy to operate by women
  - Boom of oil
- Consequences
  - The assembly line (soon applied to farm machinery too)
  - The rubber industry moves to Ohio
  - Gas stations
  - Repair shops
  - Highways (also boosted by WWI)
What the Victorian Age knew

Transportation

Benz’s car of 1886 (a carriage without horses)

The USA’s first commercial automobile (Duryea, 1893)

Henry Ford’s first automobile (1896)
What the Victorian age knew

• Transportation
  – The Railway
    • Conductors, drivers, engine fireman
    • Railway stations
    • Signalmen
    • Maintenance crews
    • Telegraph
    • Engineers

Coal locomotive of 1893 ("Engine 999" for the "Empire State Express") that reached 181 km/h (Museum of Science, Chicago)
What the Victorian age knew

- Transportation
  - Railway companies are the first modern corporations
  - Railways stimulate the internationalization of financial markets
  - 1869: Transcontinental railroad in the USA
  - 1903: The Trans-Siberian railway from Moscow to Vladivostok
What the Victorian age knew

- Transportation
  - Horse streetcar of 1870
    (Museum of Science, Chicago)
  - Conestoga wagon
    (Museum of Science, Chicago)
  - Stagecoach
    (Museum of Science, Chicago)
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

• Transportation
  – The Aerospace Industry
    • 1909: The Wright Brothers found their own company in New York (but with a factory in Ohio)
    • 1909: Glenn Curtiss and Augustus Herring found in New York state the Herring-Curtiss Company (later Curtiss Aeroplane Company)
    • 1912: Glenn Martin founds Martin in the Los Angeles area
    • 1915: The USA establishes the National Advisory Committee on Aeronautics (NACA)
What the Victorian age knew

• Transportation
  – The Aerospace Industry
    • 1916, the Wright Company merges with Glenn Martin's company to form the Wright-Martin Aircraft Corporation (later Wright Aeronautical)
    • During WWI most airplane engines are built by the car industry
    • 1918: The Curtiss Aeroplane Company has become the largest aircraft manufacturer in the world
    • 1929: Curtiss is absorbed into Curtiss-Wright
What the Victorian Age knew

Telegraph
- 1830: John Henry uses a battery and an electromagnet to send an electrical signal over a long wire
- 1837: William Cooke and Charles Wheatstone demonstrate an electric telegraph
- 1838: Cooke and Wheatstone install the first commercial telegraph (London)
What the Victorian Age knew

Electric Telegraph

- 1844: Samuel Morse sends the first message in the USA
- 1846: First use in the US-Mexico war
- 1851: First undersea cable (Dover to Calais)
- 1852: First transnational telegram (Paris to Berlin)
- 1852: John Brett’s underwater cable connects London and Paris
- 1854: Josiah Clark’s pneumatic tube to send telegrams around London
- 1858: Charles Wheatstone’s automatic telegraph (that doesn’t require knowledge of the Morse code)
- British hegemony until WWI
What the Victorian Age knew

Telegraph
- 1861: Telegraph line between Washington and California
- 1864: Telegraph line to India (Britain)
- 1866: Cyrus Field’s transatlantic telegraph cable
- 1868: Telegraph line from Malta to Egypt (Britain)
- 1869: Japan’s first telegraph line (Tokyo-Yokohama)
- 1870: Telegraph line to Japan (Britain)
- 1871: Telegraph line to Australia (Britain)
- 1900: Telegraph line Germany-New York (Germany)
- 1902: British transpacific cable
- 1903: US transpacific cable from San Francisco to Manila via Honolulu
What the Victorian Age knew

Telegraph

• 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
• Information travels faster than transportation
What the Industrial Age knew

• USA revolution
  – 1833: Benjamin Day starts the New York Sun, the first “penny paper”, that mainly makes money out of advertising and is sold by hawkers in the streets (readers can buy individual copies instead of having to subscribe), with stories that ordinary people can identify with (crime, trials and fake news)
  – 1835: The Sun installs a steam press
  – 1838: The Sun is the #1 newspaper in the world (38,000 copies)
What the Industrial Age knew

- USA revolution
  - 1835: James Bennett’s New York Herald
    - First mass-market daily newspaper: thousands of copies, low price (early adopter of the steam-powered rotary press)
    - Pages on business, weather, sports.
    - International correspondents (early adopter of the telegraph)
    - Advertising
    - Capital intensive (private investors)
What the Industrial Age knew

• USA revolution
  – The rotary press
• 1814: Friedrich Koenig's steam-powered stop-cylinder printing machine at The Times of London (1,000 copies an hour)
What the Industrial Age knew

- USA revolution
  - The rotary press

- 1828: Augustus Applegath and Edward Cowper’s four-cylinder press for the New York Times (4,000 copies an hour)
What the Industrial Age knew

- USA revolution
  - The rotary press
    - 1847: Richard Hoe’s horizontal rotary press (New York)

Hoe’s rotary press printing the Baltimore Sun

Hoe’s six-feeder

Hoe’s ten-feeder
What the Industrial Age knew

• USA revolution
  – The rotary press
    • 1848: Augustus Applegath’s vertical-drum rotary press (London)
What the Industrial Age knew

- USA revolution
  - The rotary press
    - 1868: “Walter” rotary press at The Times of London (12,000 copies per hour)
What the Industrial Age knew

• USA revolution
  – The rotary press
    • 1863: William Bullock of Philadelphia invents the web press
    • Duncan & Wilson of Liverpool makes the “Victory”, the first web press that also incorporates a paper folding mechanism (9,000 complete, folding 8-page newspapers per hour)
What the Industrial Age knew

• USA revolution
  – Newspapers
    • The penny paper intensifies competition for last-minute news from other cities
      – 1838: The New York Herald has correspondents in six European cities
    • Birth of the profession of the reporter (previously, newspapers had mostly rephrased documents)
      – 1834: The Sun employs four reporters
      – 1854: The New York Tribune (1841) employs 14 reporters
  • Advertisers become more important than readers (readership is used to attract advertising)
What the Victorian Age knew

The news agency

• 1835 Agence France-Press (French empire, Mediterranean countries, Latin America)

• 1846: Five daily newspapers in New York City create the Associated Press to share the cost of transmitting news of the Mexican-American War by boat, horse express, and telegraph

• 1851 Reuters (British and Dutch empires)
What the Victorian Age knew

- The industrialization of printing
  - New York newspapers offer a rich reward for mechanizing the composition process (1880)
  - Ottmar Mergenthaler (German clockmaker): the linotype machine to compose type at the New York Tribune (1886), i.e. the first "keyboard"
What the Victorian Age knew

• The industrialization of printing
  – Louis Prang (German printer in Boston): mass-market color lithography (adverts, Christmas cards, artistic cards to collect in “scrap” albums, etc)

The Christmas card in 1873
What the Victorian Age knew

• Mass Media
  – 1903: Alfred Harmsworth creates the first "tabloid" newspaper, the Daily Mirror, in London
What the Victorian Age knew

• The invention of childhood
  – Industrial revolution: children work in factories (instead of farms)
  – 1763: Prussia introduces a compulsory system of education
  – 1779: Johann Oberlin and Louise Scheppler found a kindergarten in Strassbourg (France)
  – Automation and wealth reduce the need for child labor
  – Mid 19th century: kindergarten and orphanages spread in Germany and England
  – Infant Life Protection Act (Britain, 1872)
  – Second half of the 19th century: Mandatory education for children in USA, France, Britain
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

Electronics

- Albert Michelson (1879): the speed of light in a vacuum is 299,792,458 meters per second
- Hendrik Lorentz (1892): the atom is not elementary but is made of smaller units that are electrical in nature (theory of the electron)
- Robert von Lieben (1906): creates the first triode amplifier by adding a third electrode to the diode (birth of electronics)
- 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 Victorian Age knew

Electronics

• Mystery: why the electrons don’t fall into the nucleus of the atom (as required by Maxwell’s equations)?
• Mystery: why the “black body radiation” is not infinite?
• Mystery: why the speed of light is the same for all directions of motion?
What the Victorian Age knew

Appliances

1886: Josephine Cochrane invents the dishwasher
1893: The first electric kitchen is exhibited at the Chicago World Fair (1893)
1902: Willis Carrier invents the air conditioner
1907: The washing powder Persil
1908: Hurley Machine introduces the first washing machine
What the Victorian Age knew

Appliances

1911: General Electric introduces the first commercial refrigerator

1913: Fred Wolf builds an electric refrigerator for the home, the Domestic Electric Refrigerator or Domelre

1914: Nathaniel Wales founds Electro-Automatic Refrigerating Company (later Kelvinator) in Detroit to produce electric refrigerators for the home

1916: Alfred Mellowes founds the Guardian Frigerator Company (later Frigidaire) in Indiana to produce the self-contained refrigerator
What the Victorian Age knew

Sport

1824: first sporting journal (Pierce Egan, London)
Hunting
Boxing
1896: the French philanthropist Pierre DeCoubertin revives the Olympic Games
1903: the first Tour de France of cycling
1930: the first World Cup of football is held in Uruguay
What the Victorian Age knew

Media

The music industry
1877 Edison invents the phonograph (that plays cylinders)
1887 Emile Berliner invents the gramophone (that plays records)
1889 Columbia (USA)
1892 Tin Pan Alley and the boom of popular music
1894 Billboard magazine
1898 Deutsche Gramophon (Germany)
1898 The Gramophone Company (Britain)
1901 Emile Berliner’s Victor (USA)
1904: A recording of Enrico Caruso is the first record to sell a million copies
What the Victorian Age knew

Media

Thomas Edison and his phonograph (1877, Bettmann archive)
What the Victorian Age knew

Media

1861: Johann Reis invents the telephone
1876: Alexander Bell demonstrates his telephone
1877: Thomas Edison invents the phonograph
1890: Telephone line Paris-London
1888: the first consumer camera is introduced by Kodak
1892: popular music becomes big business
1895: the Lumiere brothers invent cinema
1898: Valdemar Poulsen demonstrates magnetic recording
What the Victorian Age knew

• Telephone

Bell on the phone

The first telephone directory (1878)
What the Victorian Age knew

• Telephone
  – Until 1956 transatlantic telephone service is radio-based
  – 1956: Britain’s TAT-1 (Transatlantic No. 1) the first transatlantic telephone cable (between Scotland and Canada’s Newfoundland)
What the Victorian Age knew

Media

1895: Guglielmo Marconi invents a device to broadcast radio signals at long distances

1901: Guglielmo Marconi conducts the first transatlantic radio transmission

Unlike the telegraph, no need for a code: radio can transmit voice

Unlike the telegraph (that requires a station and knowledge of the Morse code), the radio can be owned and used by anybody to receive and send messages

Specialized magazines and clubs create a geographically-dispersed community
What the Victorian Age knew

Media

1906: The vacuum tube (Robert von Lieben 1906) enables long-distance phone lines and radio transmissions
What the Victorian Age knew

Photography
1824: Nicéphore Niépce invents photography
1838: Louis Daguerre invents the daguerreotype
1841: William Talbot’s calotype, the first negative-positive process
1869: Louis Ducos makes the first color photograph
1884: George Eastman’s practical film in roll form
1892: George Eastman founds Eastman Kodak
1935: Mannes and Godowsky invent the process later marketed by Kodak as Kodachrome
1936: Agfa introduces Agfacolor films
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

Photography: first photographed wars
Crimean War (1853 – 56)
“American” Civil War (1861 – 65)

Roger Fenton: Crimean war

Timothy O’Sulliva: A Harvest of Death, Gettysburg
What the Victorian Age knew

Photography:

Gaspard-Félix Tournachon "Nadar" (1820, France)

- 1855: photographic studio in Paris
- 1858: the aerial photographer (on a balloon)
- 1870 (during the German Siege of Paris): the world's first air-mail service
- 1874: the first exhibition of the Impressionists takes place at his studio
What the Victorian Age knew

Photography:
Félix Nadar (1820, France)
What the Victorian Age knew

Telephone

First commercial telephone, 1877
(Bell installs the world's first commercial telephone service)
What the Victorian Age knew

Media

(Stanford Archive of Recordings)
What the Victorian Age knew

Media

Grammophone:
– The appearance reveals the workings
– The design reveals the engineering
  • A round piece of vinyl encodes the sound
  • A handle makes the platter turn
  • A needle picks up undulations in the grooves
  • A horn amplifies the sound

Camera:
– The design hides the engineering
– “You press the button, We do the rest”
What the Victorian Age knew

The radio

– Initially used just to bring people together (one to one communication)
– Radio creates a virtual community that is geographically distributed
– Radio becomes family entertainment
– Also a worldwide community of ham-radio hobbyists (600,000 in the USA in 1922)
– Later used for one-to-many communications (e.g., news)
– Later used for control and propaganda
– The same evolutionary path of writing: from the personal sphere to the public sphere
What the Victorian Age knew

The radio

– Theodor Adorno criticizes the “atomized” listening of the radio listener
– Radio Physiognomics: democratizing media like the radio produce passive, obedient, mindless citizens
– Marx’s opiate of the masses is not religion but popular culture
– "On Jazz" (1936), "On Popular Music" (1941) vs "serious music"
– The standardization of the cultural product leads to the standardization of the audience.
What the Victorian Age knew

• Radio

First commercial radio, 1920
What the Victorian Age knew

• Video
What the Victorian Age knew

• Victorian revolutions
  – 1829: The Age of the Railway is born with the "Rocket" steam engine for the Liverpool-Manchester railway
  – 1838: The Age of Image is born when Louis Daguerre take a picture of the Boulevard du Temple from a window of the Diorama
  – 1859: The Age of Oil is born when Drake strikes oil in Pennsylvania
  – 1866: The Age of Electricity is born with Werner von Siemens’ dynamo
  – 1875: The Age of Steel is born with the opening of the Carnegie Bessemer steel plant in Pittsburgh
  – 1877: the Age of Sound is born with Thomas Edison’s phonograph
  – 1901: The age of Radio is born when Marconi sends a message from Canada to England across the Atlantic Ocean
  – 1908: The Age of Mass Production begins with the production of the first Ford Model-T in Detroit
What the Victorian Age knew

• Entertainment creates new public spaces
  – The music hall
  – The cinema
  – The amusement park: Tivoli Garden in Copenhagen (1843), Coney Island in New York, Blackpool
  – The stadium
  – The velodrome
  – The dance hall
What the Victorian Age knew

- Consumerism
  - 1815: After Napoleon's defeat, Britain creates a large free-trade zone extending over all continents.
  - Britain has a very large middle class
  - High wages encouraged consumerism
  - High wages encouraged automation
  - And automation enabled mass production to satisfy mass consumption
  - The first consumeristic empire
What the Victorian Age knew

• Consumerism
  – Transition from "collecting" to "consuming": the aristocracy used to collect (especially ancient and exotic items), the middle class consumes (especially novelties)
  – 1846: Britain repeals the Corn Laws that protect its agriculture from imports and becomes a free-trade country
  – The steamship and the railroad make it easier and cheaper to import goods from distant regions
  – Slavery makes it cheap to mass produce crop
  – Late 19th century: prices plummet for wheat, sugar, clothes, etc
What the Victorian Age knew

• Department Store
  – Harrods in London (1849),
  – Le Bon Marche' in Paris (1852), Marshall Field's in Chicago (1852)
What the Victorian Age knew

- Department Store
  - The department store pioneers new technologies: electric lighting, elevator, escalator, conveyor belt, mail-order catalog
  - The department store is a museum of objects
  - Street vendors are forced into market halls
  - Shopping creates new public spaces

Bon Marche’
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

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

International standards
1874 Universal Postal Union
1875 International Commission for Weight and Measures adopts the metric system
1879 International Regulation of Sea Routes
1881 International Electricity Show (to decide the universal units of measurement for electrical quantities like voltage)
1884 International time zones
1890 International Rail Transport
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

Coin-operated machines

Mills Novelty of Chicago: Whiffs of Fragrance (1916)

Automatic Clerk (New Haven, 1901)
What the Victorian Age knew

Coin-operated machines

Western Weighing (Cincinnati, 1894): Improved Nickel Tickler

Pulver (Rochester, 1903): Too Choos

Caille Bros (Detroit, 1905)
What the Victorian Age knew

Coin-operated machines

Caille Bros: Log Cabin (1902)

Midland (Chicago, 1899): Electricity is Life

Jackson Vending (Chicago, 1906): Safety matches
What the Victorian Age knew

Coin-operated machines

Watling (Chicago, 1902): Brownie
What the Victorian Age knew

• The Invention
  – Invention of the concept of invention and of the figure of the inventor
What the Victorian Age knew

• The Press
  – Luis Senarens’ imaginary inventions of imaginary inventor Frank Reade

(1887)

(1892)
What the Victorian Age knew

• Sensationalist pulp
  – The penny dreadfuls
  – Serialized novels about psychokillers ("The Man Eater of Scotland" about Sawney Beane, 1825;
    – "The String of Pearls" about Sweeney Todd, 1846)
  – Marie Tussard's was museum (1833)
  – Weekly tabloids specializing in murders and executions (Illustrated Police News, 1864)
  – Public executions are a popular attraction for both the aristocracy and the masses
What the Victorian Age knew

Consumerism

1872: First mail order catalog (Aaron Montgomery Ward)
1886: Kodak camera
1888: Chewing gum
1892: Coca Cola
1893: First shopping center (Cleveland)
1897: First movies to advertise products
1901: King Camp Gillette invents the razor
1917: 40% of American households have a telephone
1920: eight million Americans own a car
What the Victorian Age knew

Customs

Gentleman/lady not by birth but by good manners
The dandy (modeled after Bryan “Beau” Brummell of the 1800s)
What the Victorian Age knew

Jean-Marc Côté paints how the world will be in the year 2000 (1900-10)
What the Victorian Age knew

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What the Victorian Age knew

- World War I
  - Europe in 1900
What the Victorian Age knew

• World War I
  – Austria
What the Victorian Age knew

• World War I
  – Causes
    • Rapid mass mobilization
    • Population explosion
    • Decline of the Papacy
    • Colonialism
    • Nations (nationalist spirit)
What the Victorian Age knew

• World War I
  – Causes
    • Assassination of Alexander I of Serbia (1903)
    • Moroccan crisis (1905)
    • Bosnian crisis (1908)
    • Agadir crisis (1911)
    • Balkan wars (1912-13) - Serbia doubles in size
What the Victorian Age knew

• World War I
  – Causes
  • Alliances

  AUSTRIA
  ➔
  SERBIA
  ➔
  RUSSIA
  ➔
  FRANCE
  ➔
  BRITAIN

attacks

alliance 1879

1914

1894

1904

Pan-Slavic movement

OTTOMANS

GERMANY

ITALY 1915

USA 1917
What the Victorian Age knew

• World War I
  – Causes – a false era of peace
    • Concert of Europe: 1815-1914 No major wars in the European continent
    • Bulgaria, Serbia and Greece fight Ottoman rule
    • Austria supports independence movements but then replaces the Ottomans with itself
    • Slavs (led by Serbia and supported by Russia) resent rule of Austria-Hungary
    • Russia aims for Istanbul and a sphere of influence in the Slavic world (e.g., Balkans)
    • Italy and Turkey fight a war (1912)
    • British alliances with former enemies: Japan 1902, France 1904, Russia 1907
What the Victorian Age knew

- World War I
  - Causes
  - the Middle East
What the Victorian Age knew

- World War I
  - Whose war?
    - The war was started by an accident
    - Its precursors were ethnic and nationalism wars in the Balkans
  - But it quickly becomes an ideological war
    - Britain fights to uphold international law
    - France fights to defend “Liberté, Égalité, Fraternité” (political rights)
    - Germany fights the mediocrity of democracy and the materialism of capitalism
    - Germany fights for progress against Britain and France who fight for the status quo
What the Victorian Age knew

• World War I
  – Whose war?
    • The diplomats mourn the end of an era of peace and mutual respect
    • The masses celebrate ecstatically
    • The diplomats find the slaughter senseless
    • The masses find the slaughter exciting
What the Victorian Age knew

• World War I
  – War machine ("all arms" battles)
    • Firepower (200 divisions)
    • Grenades, cannons, machine guns, torpedoes, bombs
      – Battle of the Frontiers: first time that French, British and German soldiers experienced modern firepower
      – Within four months Austria has lost one million soldiers
What the Victorian Age knew

• World War I
  – War machine (“all arms” battles)
    • 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)
  • 1917: The USA accounts for 67% of the world’s oil output
What the Victorian Age knew

• World War I
  – Business opportunity
    • The USA, Holland, Switzerland and Scandinavia profit from the war
    • The Dow Jones index rises 80% between Dec 1914 and Dec 1915
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
    - USA: the sinking of the Lusitania (1201 passengers die)
What the Victorian Age knew

• World War I
  – Information war
    • Radio
    • Telegraph
    • Telephone
What the Victorian Age knew

• World War I
  – Information war
    • Germany relies on wireless transmissions for its navy
    • Britain’s “Room 40” (staffed with academics by Reginald Hall) captures German secret code for wireless transmission within four months of the start of the war
    • Room 40 helps the USA prevent German propaganda in the USA and exposes German plans in the USA (1916: Germany supports Pancho Villa and invites Mexico to enter the war)
The Victorian Age

• World War I
  – Serbia, Russia, France, Britain, Japan, Canada, Australia, Italy (1915), China (1917), USA (1917), Romania win against Austria, Germany, Turkey, Bulgaria
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
  – British economic blockade of Germany causes more than 700,000 civilian deaths
The Victorian Age

• World War I
  – 10,000 soldiers died in the last six hours of war, after Germany and Austria had already surrendered
The Victorian Age

• World War I
  – Winners and Losers
    • Britain
    • France
    • Germany
    • Austria
    • Russia
    • Japan
    • USA
    • Italy
    • Turkey
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
  – Winners
    • Gavrilo Princip achieves his goals: destruction of the Austro-Hungarian empire and independence of Yugoslavia
    • But Serbia pays a huge price: highest casualties as % of the population
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
    • Soviet Union
The Victorian Age

• World War I
  – New countries:

![Map of Europe, 1922](image)
The Victorian Age

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

• World War I
  – New countries:
    • Wilson's principle of self-determination dissolves the multi-ethnic empires…
    • … but 30 million people find themselves on the wrong side of a border, especially in the Balkans
The Victorian Age

• World War I
  – New powers:
    • In 1917, provoked by Germany, the USA enters the war
    • In 1917, supported by Germany, the Bolsheviks seize power in Russia
The Victorian Age

• World War I
  – WW1: End of the multi-ethnic empires within Europe (notable exception: Soviet Union)
  – WW2: End of the European empires outside Europe
  – Cold War: End of the Soviet Union (last multi-ethnic empire run by Europeans)
The Victorian Age

• World War I
  – Creation of chronic instability
    • Miniature empires run by one ethnic group:
      – Yugoslavia (run by Serbs over Croats, Slovenes, Muslims)
      – Poland (run by Poles over Germans, Ukrainians, Lithuanians, Belorussians, Jews)
      – Czechoslovakia (run by Czechs over Germans, Slovaks, Ukrainians and Hungarians)
      – Romania (run by Romanians over Hungarians)
The Victorian Age

• World War I
  – Creation of chronic instability
    • Miniature empires run by one ethnic group:
      – Poland makes enemies by its wars of expansion of 1919-1923 that double its size (Ukraine, Czechoslovakia, Lithuania, Russia)
      – Balkan wars
The Victorian Age

• World War I
  – Creation of chronic instability
    • Decentralization of control from empires to small independent nations
    • Shift from wars among great powers towards regional violence
    • Economic crises caused by partitioning of ethnic groups (especially in former Austria-Hungary)
    • First era of hyper-inflation since the 16th century
The Victorian Age

• World War I
  – Grievances of the Versailles Treaty
    • Russia loses Finland, Baltic states, Poland, Ukraine, Georgia, Crimea
      – Lenin’s communism
    • Hungary loses a lot of territory
      – Bela Kun’s communism
    • Germany morally wins the war it was fighting (against expansionist Tsarist Russia) but is declared the main loser (and Germans were forced to live under Slavs)
      – Hitler’s nazism
  • Turkey loses its Arab satellites
    – Ataturk’s revolution
The Victorian Age

• World War I
  – Grievances of the Versailles Treaty
    • Italy: does not obtain Dalmatia
      – Mussolini’s fascism
    • France: 1.4 million men killed
      – Raymond Poincare, determined to get reparations from Germany
The Victorian Age

- World War I
  - Peak of the British Empire
    - Obtains Tanzania and Namibia from Germany, Jordan and Iraq from Ottomans
    - One fourth of the Earth
    - Largest navy
    - Largest air force
    - Dominant power in the Middle East (besides India and West Africa)
    - The Indian Ocean becomes a British “lake” (naval bases from South Africa to Kenya to Aden to India to Singapore to Australia)
The Victorian Age

- World War I
  - British Empire: Population: 400 million (65 million whites of which 20 live in Canada, Australia, New Zealand, South Africa)
The Victorian Age

• World War I
  – British Empire: Population: 400 million (65 million whites of which 20 live in Canada, Australia, New Zealand, South Africa)
  – At the end of the war the British army has 8.5 people, of which 5.7 are from Britain, 1.4 from India, 630,000 from Canada, 420,000 from Australia, 136,000 from South Africa and 129,000 from New Zealand plus about 300,000 Egyptian, black African and Chinese laborers
The Victorian Age

- World War I
  - Peak of the British Empire

- Most of Africa’s mineral wealth + most of Africa’s agricultural land + most of Middle Eastern oil + India’s unlimited supply of labor
The Victorian Age

• World War I
  – Britain: the only remaining military power
    • France: political instability
    • Germany: war-reparation debt
    • Russia: civil war
    • Austria: dismantled
    • Turkey: dismantled
    • USA: isolationist
The Victorian Age

• World War I
  – Self-determination spreads to the British Empire
  • The League of Nations (Wilson) and the Versailles Treaty spread the idea of self-determination to the British Empire
  • 1917: Edwin-Samuel Montagu is appointed secretary of state for India and champions India’s independence
  • April 1919: British massacre of Hindus at Amritsar, the beginning of large-scale riots in India (against the British, among different sects, against the Indian political class, etc)
  • 1921: Ireland becomes independent having won an independence war, the first time since the USA
The Victorian Age

• World War I
  – Futility of the French Empire
    • African colonies acquired for prestige not economic interests
    • Indochina a forced-labor system
    • Most French investment goes to Algeria
The Victorian Age

• World War I
  – Death of God
    • Marx, Freud, Nietzsche and Einstein (all Germans) create a world in which God is no longer the prime mover of human history.
    • World War I creates a world in which God-appointed monarchs are no longer in control
    • Secular ideology (fascism, nazism, communism, capitalism) replaces religion
The Victorian Age

• World War I
  – Social effects
    • US cinema invades Europe (in 1919 90% of films in Europe are made in the USA)
    • US popular music (blues, jazz) invades Europe
The Victorian Age
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