

ACCELERATING POWER OF SCIENCE & TECHNOLOGY OVERTURNS MODERNISM: 19th to 20th Cs.
Lecture Guide # 22

- I. IMPACT OF MACHINES = DEEP & WIDE
 - A. Effects on Business/Industry, Labor, Government
 - 1. Urbanization & Standardization of Society
 - 3. Stimulated Development of: Big business, Big labor, Big gov't
 - B. Effects on Culture & Society
 - 1. Division between RICH & POOR
 - 2. Alienated Intellectuals who see its Ills
 - 3. New Ideologies & Forces Opposing Capitalism
 - 4. Negative Products & Consequences (unforeseen)
 - C. Yet, Industrialism Progressed at Accelerating Pace
- II. SURGE of NEW TECHNOLOGIES & INVENTIONS
 - A. "Tinkerers" vs. "Professional Scientists:" Edison's Light Bulb
 - B. Taken Together: Altered Traditional Views of
 - 1. World: Night & Day
 - 2. Work & Leisure
 - 3. Personal & Social Habits
 - C. ACROSS SOCIETY: Industry, Communication, Entertainment, Transportation, Medicine, PHYSICS
 - 1. Industry: Already covered
 - 2. Communication: e.g., Morse (Telegraph); A.G. Bell (Telephone)
 - 3. Entertainment: e.g., Edison (Vitaphone movie; Light Bulb; gramophone record player)
 - 4. Transportation: Ford's Assembly Line -> cheap cars -> 1st sexual revolution
 - D. Inventions & Technological Development Had Social Effect
- III. ADVANCES IN MEDICAL SCIENCES = DEMOGRAPHICALLY IMPORTANT --> LONGER LIVES
 - A. Theodore Schwann, Cell Theory, 1835
 - B. GERM THEORY ---> Antisepsis = Germ Theory Chief Factor in Increased Longevity
 - 1. L. Pasteur: Vaccine for Sheep Anthrax
 - 2. J. Lister: Carbolic Acid
 - C. Western Demographic now rises (Has not dropped yet!)
- IV. Advances IN PHYSICAL SCIENCES: Attack on Newtonian Paradigm
 - A. Classical Newtonian Physics
 - 1. based on ABSOLUTES / LAWS
 - 2. Time, Space (Ether wind), Substance (Matter), Motion, Causality
 - B. MATTER / SUBSTANCE Now Under Attack
 - 1. John Dalton, Chemical Elements = of ATOMS
 - 2. W. K. Roentgen: Unknown Rays = X-rays
 - 3. Later: ATOMIC Structure of All Substances
 - a. Ernst Rutherford & Niels Bohr
 - b. Atomic Structure, 1910 = Small Solar System
 - C. 1st REAL MODIFICATION OF NEWTON: EINSTEIN!;, THEN QUANTAM PHYSICS
 - 1. EINSTEIN's Theory of Relativity:
 - a. Newton = OK for earth mechanics; NOT for Space or Atoms
 - b. Special Relativity, 1905 & General Relativity, 1916
 - 2. Significance:
 - a. Matter, Space, Motion not Absolute
 - b. Relative to Point of Observer in Time & Space
 - c. MATTER = ENERGY (NO unchangeable matter)
 - d. Did NOT Say: EVERYTHING IS RELATIVE
 - 3. $E = MC^2$: Energy = Mass X Speed of Light squared
 - a. E & M = relative AND (worst of all) Matter = (can turn into) Energy
 - b. C = *celeritas* = SPEED of light = ABSOLUTE for Einstein
 - c. Explodes Newtonian Scientific Assumptions about absolute nature of Mass etc.
 - 4. QUANTAM THEORY: Attacked Causality
 - a. Max PLANCK - QUANTUM THEORY, 1900ff:
 - 1) Energy radiates QUANTA / packets (?? Waves??)
 - 2) CONSTANT (h) relationship between frequency & energy of quanta
 - 3) PLANCK'S CONSTANT: $h = 6.626 \times 10^{-34}$
 - b. W. HEISENBERG - Principle of UNCERTAINTY, 1925ff: Attacked Causality
 - 1) Micro-world of sub-atomic particles
 - 2) Cannot know *both* speed and location of particles
 - 3) Measuring speed changes location; determining location changes speed
 - 4) Uncertainty of particle location X uncertainty of speed = WHAT!!!
 - a) Yep! You guessed it: 6.626×10^{-34}
 - b) so, what . . . UN-certainty is a Constant !!!
 - c. So Quantum Theory attacked Causality (Einstein: "God does not play dice with the Universe")
 - D. ASTOUNDING EFFECT on Physics & Philosophy
 - 1. Newtonian World of UNIVERSALS destroyed
 - 2. ENTER: Einsteinian World of Physical RELATIVITY
- V. CULTURAL EFFECT
 - A. EINSTEINIAN RELATIVISM APPLIED BROADLY LIKE NEWTONIAN ABSOLUTISM
 - B. "EVERYTHING IS RELATIVE"
 - C. BEGINNING OF END FOR MODERNIST CERTAINTIES!