Ether, Atoms, Particles and Politics: The Physical Sciences in Modern Society
History of Science 129v, Fall 2014

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Course Description

This course surveys the history of the physical sciences from the late eighteenth century to the present. The course will cover major events and themes in the history of the physical sciences, placing particular emphasis on the interaction between the physical sciences and social and political changes. Students will work with primary sources and will also gain familiarity with some of the most important secondary sources in the history of physics, chemistry, and the earth sciences. Topics include the Chemical Revolution, thermodynamics, the Industrial Revolution, quantum mechanics, the atomic and hydrogen bombs, plate tectonics, and cold fusion.

Course Objectives

1) Learn about the major events in the history of the physical sciences.
2) Think about how the physical sciences affected society, and how society affected the physical sciences.
3) Practice evaluating primary sources, secondary sources, and competing historical accounts.
4) Become familiar with some major books and articles in the history of the physical sciences.

Required books


All other reading will be available as PDF downloads on the course iSite (available through my.harvard.edu, login required) or through Harvard's library resources (links on the course iSite).
Schedule of Lectures and Readings

Week 1 – Introduction

September 2: Introduction/Course expectations

September 4: The Physical Sciences during the Scientific Revolution
  • Levere, Chapter 1: “First Steps: From Alchemy to Chemistry?” and Chapter 2, “Robert Boyle: Chemistry and Experiment”

Week 2 – Chemical and political revolutions in the eighteenth century

September 9: Chemical Revolution 1 – Lavoisier vs. Priestley
  • Levere, Chapter 5: “Different Kinds of Air” and Chapter 6, “Theory and Practice: The Tools of Revolution”

September 11: Chemical Revolution 2 – Atomism
  • Levere, Chapter 7: “Atoms and Elements”
  • Nye, Chapter 2: “Dalton’s Atom and Two Paths for the Study of Matter”

Week 3 – Chemical and social revolutions in the nineteenth century

September 16: Industrial Revolution
  • Lee T. Wyatt, *The Industrial Revolution* (Westport, Conn: Greenwood Press, 2009), Chapter 4, “The Industrial Revolution in Great Britain.”

September 18: Organic chemistry, classroom space, and the Revolutions of 1848
  • Levere, Chapter 8: “The Rise of Organic Chemistry”
Week 4 – Science and society in Victorian Britain

September 23: Victorian Physics and Victorian Religion

*Paper 1 is due today!*

- Selected primary sources on the prayer gauge debate

September 25: The Age of the Earth – physics vs. biology?


Week 5 – The periodic table and radioactivity

September 30: Textbooks, Russian imperialism, and the periodic table of the elements


October 2: X Rays and Radioactivity: the new alchemy?


Week 6 – A new worldview

October 7: Ether theory and Einstein’s relativity

- Nye, Chapter 3: “The Electromagnetic View of Nature and a World of Ether”
- Albert Einstein, “On the Electrodynamics of Moving Bodies,” pages 1-6 – Read to get a sense of what Einstein is arguing; don’t worry if you find the details confusing.

October 9: Quantum mechanics and the new atom

- Nye, Chapter 6, “A New Chemistry, a New Physics,” pages 171-188
Week 7 – Nuclear fission

October 14: MIDTERM

October 16: The atom splits
- Nye, Chapter 7: “Nationalism, Internationalism, and the Creation of Nuclear Science, 1914-1940”

Week 8 – The Manhattan Project and Hiroshima

October 21: The Manhattan Project and opportunity in science

October 23: The aftermath of Hiroshima

Week 9 – Chemistry and physics meet biology

October 28: Chemistry and molecular biology
- Selections from James Watson, *The Double Helix*

October 30: Radioisotopes and medicine
Week 10 – The Nuclear Age

November 4: The Nuclear World
- Selections from Herman Kahn, *On Thermonuclear War*
- Ray Bradbury, “There Will Come Soft Rains”

November 6: The USSR, Britain, France, China and India build a bomb

Week 11 – Cold War physical sciences

November 11: Big Science and the Cold War physics bubble

November 13: Plate tectonics
- Selections from Thomas Kuhn, *The Structure of Scientific Revolutions*
- Marie Tharp’s autobiographical essay, available online at http://www.whoi.edu/sbl/liteSite.do?litesiteid=9092&articleId=13407

Week 12 – Physical science and physical pseudoscience

November 18: Aryan physics

November 20: Catastrophists and hippies

*Paper 2 is due today!*
Week 13 – Fusion, fraud, or faulty experiment?

November 25: Cold Fusion

Week 14 – Into the twenty-first century

December 2: The Higgs Boson and scientific discovery in the twenty-first century

Your final examination will be held during the exam period.
Good luck and enjoy the break!