

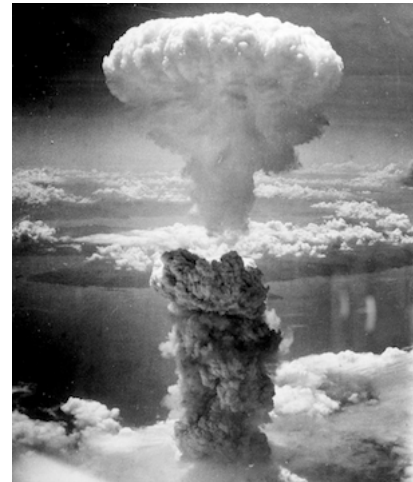
STSC/HSOC 001
Emergence of Modern Science
Summer Session II, 2012

July 2 to August 10
MTWR 10:40–12:15
Williams 23

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Schema huius præmissæ diuisionis Sphærarum .



Overview

In this course, we will explore the lives, ideas, and influence of those who created modern science from the Renaissance to today. We will think about what problems scientific ideas solved, what made them controversial and exciting, and how they were related to contemporary art, religion, and politics. Our focus will be on the spaces in which science was done, the tools and techniques used, and the media through which it was communicated. Topics will range widely, from Newtonian mechanics to atomic weapons, from Darwin to DNA sequencing, and from an eighteenth-century defecating mechanical duck to the first twentieth-century computer game.

The course has no prerequisites, and is designed to be accessible to all students. It can serve science students by providing a historical context for scientific knowledge, and students in other fields by providing some knowledge of how science works and has worked in the past. The course fulfills sector requirements in humanities and social science (sector IV) and natural sciences and mathematics (sector VII).

Course Structure

Most meetings will include both a lecture by one of the instructors and a discussion period. Some days we will have a demonstration in place of a discussion, and other days we will have a field trip.

Reading

The lectures will compliment the required reading, which include both writings by scientists and other participants in the history we'll be studying (or *primary sources* in historical jargon) and analysis by historians (or *secondary sources*). You will probably find some of these readings challenging, so it is important that you complete those assigned for each class on time and use discussions as an opportunity to understand them better.

Our two textbooks for the course are *Revolutionizing the Sciences: European Knowledge and Its Ambitions, 1500–1700* by Peter Dear (second edition: Princeton University Press, 2009) and *Making Modern Science: A Historical Survey* by Peter J. Bowler and Iwan Rhys Morus (University of Chicago Press, 2005). Both are available at the Penn Book Center at 130 South 34th Street. Other readings are posted on Blackboard.

Assignments

There are three written assignments required:

- a contextual analysis based on any one of our field trips due a week after the trip
- a take-home midterm exam due Monday, July 23
- an in-class final exam on Thursday, August 9

Your final grade will derive 25% from each of these assignments and 25% from discussion participation.

Office Hours

Both instructors will be available on Tuesdays from 1–2 pm, and by appointment.

Schedule

- July 2 **Ways of Knowing**
 Making Modern Science, introduction (1–19)
- July 3 **Scholasticism and the University**
 Revolutionizing the Sciences, introduction and “‘What Was Worth Knowing’
 in 1500” sections I–III (1–23)
 Aristotle, excerpt from *Physics* (29–33)
 Averroes, excerpt from commentary on Aristotle (67–72)
- July 5 **Scientific Renaissance**
 Revolutionizing the Sciences, “‘What Was Worth Knowing’ in 1500” sections IV
 and V, “Humanism and Ancient Wisdom,” and “The Alchemist, the Craftsman,
 and the Scholar” section I and II (23–55)
 Paracelsus, excerpt from *Iatrochemistry* (150–153)

- July 9 **New Cosmos**
Revolutionizing the Sciences, “Mathematics Challenges Natural Philosophy” (64–78)
 Andreas Osiander, foreword to *De Revolutionibus Orbium Coelestium* (3–4)
 Johannes Kepler, excerpt from *Harmonices Mundi* (144–150)
- July 10 **The Trial of Galileo**
Revolutionizing the Sciences, “Extra-Curricular Activities” sections I and II (99–106)
Making Modern Science, “Science and Religion” (341–365)
- July 11 **Scientific Methods: Bacon and Descartes**
Revolutionizing the Sciences, “The Alchemist, the Craftsman, and the Scholar”
 sections III and VI (55–63) and “Mechanism and Corpuscles” (79–98)
 Carolyn Merchant, *The Death of Nature*, “Dominion over Nature” (164–191)
 Francis Bacon, excerpt from “The New Atlantis” (157–162)
 René Descartes, excerpt from *Discourse on Method* (167–172)
- July 12 **Scientific Society**
Revolutionizing the Sciences, “Extra-Curricular Activities” sections III–V
 and “Experiment” (106–144)
Making Modern Science, “The Organization of Science” (319–339)
- July 16 **Field Trip: Van Pelt Library**
 We’ll be visiting a collection of rare books from the Scientific Revolution, the
 Rittenhouse Orrery, and an exhibit on *Wonders of the Microscope!*
- July 17 **Last of the Magicians**
Revolutionizing the Sciences, “Cartesians and Newtonians” & conclusion (145–166)
 Isaac Newton, “New Theory about Light and Colors” (3075-3087)
- July 18 **Enlightenment and Revolution**
Making Modern Science, “The Chemical Revolution” (55–77)
 Denis Diderot, “The Arts” (198–201)
 Nicolas de Condorcet, excerpt from *Selected Writings* (204–208)
- July 19 **Empire, Collecting, and Classification**
 Patricia Fara, *Sex, Botany and Empire*, “The Scientific Swede”
 and “The British Botanist” (19–69)
 Carl Linnaeus, *Systema Naturae* first edition (18–30)
- July 23 **Romantic Science (and midterm due)**
 John Tresch, *The Romantic Machine*, introduction (1–6, 11–12)
Making Modern Science, “Science and Technology” (391–413)
- July 24 **Catastrophe or Uniformity**
Making Modern Science, “The Age of the Earth” (103–126)
 Georges Cuvier, excerpt from *Essay on the Theory of the Earth* (237–241)
 Charles Lyell, excerpt from *Principle of Geology* (251–252)

- July 25 **The Evolution of Evolution**
Making Modern Science, “The Darwinian Revolution” (129–162)
 and “Biology and Ideology” (415–436)
 Charles Darwin, *The Origin of Species*, “Recapitulation and Conclusion” (459–490)
- July 26 **Explaining Everything: Classical Physics**
Making Modern Science, “The Conservation of Energy” (79–101)
 Michael Faraday, excerpt from *Experimental Researches in Electricity* (299–304)
- July 30 **New Atomism: Elements, Cells, and Germs**
Making Modern Science, “The New Biology” (165–186)
 and “Science and Medicine” (439–460)
- July 31 **Field Trip: Wagner Free Institute of Science**
Making Modern Science, “Popular Science” (367–389)
 Class will be held at 1700 West Montgomery Avenue, near Temple University. If you would like to take SEPTA from Penn with us, meet at 9:55 at the 34th and Market subway station.
- August 1 **Genetics and Heredity**
Making Modern Science, “Genetics” (189–211)
 Thomas Hunt Morgan, excerpt from *The Scientific Basis of Evolution* (356–362)
 James Watson and Francis Crick, “Molecular Structure of Nucleic Acids” (737–738)
- August 2 **Uncertainty and Relativity**
Making Modern Science, “Twentieth-Century Physics” (253–275)
 Albert Einstein, “What Is the Theory of Relativity?” (342–344)
 Erwin Schrödinger, “The Present Situation in Quantum Mechanics” (362–368)
- August 6 **Destroyer of Worlds**
Making Modern Science, “Science and War” (463–484)
 Excerpt from the Franck Report (371–375)
 Robert Oppenheimer, “Atomic Explosives” (375–380)
- August 7 **The Information Age**
 Lily Kay, “Cybernetics, Information, Life” (23–91)
- August 8 **Global Science**
Making Modern Science, “Ecology and Environmentalism” (213–234)
 Paul Edwards, “The World in a Machine,” introduction (221–223)
 Ron Hipschman, “How SETI@home Works,” <http://is.gd/setiathome>
 “The Science behind Folding@home,” <http://folding.stanford.edu/English/Science>
- August 9 **Final Exam**