History of Science since the 17th Century

Spring 2013

In this course we will be exploring some of the major conceptual achievements of science in the modern period, as well as examining the interplay between the wider culture and the scientific community. We will be seeking to move beyond our stereotypes about what science is by inquiring closely about how people in times and places different than our own have struggled to know the physical, biological, and social worlds. We will also use the analytical skills we sharpen this term to gain a fuller understanding of the nature of science in our own era. In this course you will learn about the past, other cultures, and ideas about nature, but you will also learn some philosophy as well. We cannot begin to understand the scientific patterns of thought and practice in different historical periods – or in our own – without also knowing the answers that people have given to such questions as: How should we expect nature to behave? How is truth defined? What is a human being? What relationships make society possible? What is our place in the universe?

The work for this course consists of a mixture of reading, lectures, video presentations, online investigations, discussion, and writing. Lectures will help provide background and highlight focal points for the reading but are NOT a substitute for the assigned reading. Discussions will expand on the reading you have done and topics we cover in lecture, as well as present new material. All exams will be take-home essays.

required books (in order of use):
- The Invention of Air: A Story of Science, Faith, Revolution and the Birth of America – Steven Johnson
- Evolutionary Theory and Victorian Culture – Martin Fichman
- Uncertainty: Einstein, Heisenberg, Bohr and the Struggle for the Soul of Science – David Lindley
- The Madame Curie Complex – Julie Des Jardins

And choose one of the following four options for your last book:
- *Fly: The Unsung Hero of Twentieth Century Science* – Martin Brookes
  or
  or
- *Polio: An American Story* – David Oshinsky
  or
- *Sputnik: The Shock of the Century* – Paul Dickson

* plus course articles on e-reserve at http://libraries.ou.edu/eresources/reserves/
* plus selected online sites and sources as listed in the syllabus

Note: copies of the books are on 2-hr reserve at the Bizzell Library Circulation Desk
schedule of readings with weblinks

Week 1
1/14 Introduction: Where We’re Going and How We’ll Get There
1/16 How Isaac Newton Brought Law and Order Back to the Wild West
1/18 Experimenting with a Mechanical Universe: Film Excerpt: Benjamin Franklin (PBS)

Reading:
Jones, The Invention of Air (Prologue and chapters 1-2)

Websites:
Demonstration of Franklin's Electrical Experimentation
http://www.pbs.org/benfranklin/exp_shocking.html

Benjamin Franklin and Electrical Fire

Reproduction of Benjamin West's painting, "Benjamin Franklin Drawing Electricity from the Sky" c. 1816)
http://www.flickr.com/photos/zoom_gne/397606283/size=m [note that there is also a larger version]

Week 2
1/21 No Class–Martin Luther King, Jr. Holiday
1/23 Enlightenment Natural Philosophy: Transatlantic Disturbances
1/25 The Circulation of Knowledge: Following Priestley

Take-Home Essay Question #1 passed out: due 2/6

Reading:
Jones, The Invention of Air (chapters 3-5)

Websites:
Frontispiece to the Encyclopédie
http://artflx.uchicago.edu/images/encyclopedia/web_images/frontispice.jpg

The Encyclopedia of Diderot and d’Alembert
http://quod.lib.umich.edu/d/did/index.html

The Great Lisbon Earthquake of 1755

Week 3
1/28 "One of the few lives precious to mankind": Priestley's Travels to New Worlds
1/30 The light of reason and the missing scientific revolution regarding race and sex
2/1 Penny universities and stimulating conversation: coffee-house philosophy then and now

Reading:
Podcast from BBC Radio 4 on the discovery of oxygen
http://www.bbc.co.uk/programmes/b0088nql (45 minutes)

"The Internet in a Cup: The Information Exchanges of the 17th and 18th centuries"
http://www.economist.com/node/2281736
Excerpts of discussions of the nature of women and Africans by Enlightenment thinkers [Handout]

Fichman, Evolutionary Theory and Victorian Culture (chapter 1)
Websites:
"2 is for Squared" from Einstein's Big Idea (on Emilie du Chatelet)
http://www.youtube.com/watch?v=gT9BAWOpQ7Q [15 minutes]

Week 4
2/4 The Problem of Life in a Mechanical Universe
2/6 The Terraqueous Globe
  Take-Home Essay Question #1 due
2/8 Picturing the Prehistoric Past: Bringing Dinosaurs to Life

Reading:
Fichman, Evolutionary Theory and Victorian Culture ( chapters 2-5)
Trembley's Polyp http://uh.edu/engines/epi364.htm

Websites:
Romantic Natural History
http://blogs.dickinson.edu/romnat/

The Thomas Jefferson Fossil Collection
"Fossils in the White House" http://192.204.19.100/museum/jefferson/mastodon/history-08.php

Week 5
2/11 Vestiges of the Natural History of Creation by Anonymous: Evolutionary Theory becomes a Public Sensation, 15 Years before Origin of Species
2/13 Voyaging: Darwin and Wallace
2/15 1859: Darwin's Origin of Species -- Themes and Reception
  Take-Home Essay Question #2 passed out: due 2/27

Reading:
Fichman, Evolutionary Theory and Victorian Culture ( chapters 6-8)

Robert Chambers, excerpt from Vestiges of the Natural History of Creation [handout]

"Missing Link: Alfred Russel Wallace, Charles Darwin's Neglected Double"
http://www.newyorker.com/arts/critics/atlarge/2007/02/12/070212crat_atlarge_rosen

*e-reserve, Darwin, excerpt from Origin of Species

Websites:
"What Albert Read to Victoria" (short review of a book about the publication of Vestiges):
http://www.telegraph.co.uk/culture/4721864/What-Albert-read-to-Victoria.html

The Darwin Correspondence Project
http://www.darwinproject.ac.uk/

Week 6
2/18 Evolutionist Variations
2/20 Humans: Evolution and De-evolution: Perplexities
2/22 19th- and 20th-century Cavemen and the Ecologies of Modern Life

Reading:
Fichman, Evolutionary Theory and Victorian Culture ( chapters 6-8)
*e-reserve, Abbott, The Spirit on the Waters (1897)
Websites:
Darwin Behind the Scenes
https://darwinbehindthescenes.omeka.net/

Darwin Exhibit -- American Museum of Natural History
http://www.amnh.org/exhibitions/darwin/

Week 7
2/25 No class meeting: individual lab sessions previewing online investigation mini-projects
2/27 The Unknown Detected: The Discovery of X-Rays and Radioactivity
  Take-Home Essay Question #2 due
3/1 The Changing Culture of Space and Time

Reading:
Lindley, Uncertainty (Introduction, Chapters 1-5)

Websites:
The Radium Girls (3 parts):
1) http://blogs.plos.org/speakeasyscience/2011/03/24/the-radium-girls/

Week 8
3/4 The Secret Life of Atoms and the Emergence of Quantum Theory
3/6 Physics and Philosophy: Why Couldn’t they Just Run the Numbers?
3/8 Einstein vs. “the Bohr-Heisenberg Tranquilizing Philosophy”

Reading:
Lindley, Uncertainty (Chapters 6-15)

Website:
Niels Bohr: Wikiquote
http://en.wikiquote.org/wiki/Niels_Bohr

Albert Einstein: Image and Impact
http://www.aip.org/history/einstein/

Heisenberg and the Uncertainty Principle
http://www.aip.org/history/heisenberg/p08.htm

Week 9
3/11 Splitting the Atom / Living with the Bomb
3/13 Film: Copenhagen [excerpt]
  Take-Home Essay Question #3 passed out; due 4/3
3/15 Online Investigation mini-project #1 due

Reading:
Lindley, Uncertainty (Chapters 16-18, and Postscript)

Websites:
The Atomic Archive http://www.atomicarchive.com/index.shtml

CONELRAD: All Things Atomic and the Popular Culture Fallout
http://www.conelrad.com/index.php
Week 10
3/18 No class – spring break
3/20 No class – spring break
3/22 No class – spring break

Week 11
3/25 Hitting the Rewind Button: Revisiting Radioactivity and Madame Curie
3/27 Beyond the Great Men: Other Histories of Science
3/29 Nobel Dreams: The Case of Lise Meitner

Reading:
Des Jardins, *The Madame Curie Complex* (part 1)

Websites:
xkcd, “Marie Curie” http://xkcd.com/896/
  Marie Curie’s life as told by artist Lauren Redniss in an illustrated biography
Lise Meitner, ‘Our Madam Curie’
http://www.wired.com/thisdayintech/2010/02/0211lise-meitner-publishes-nuclear-fission/all/

Week 12
4/1 The Problem of Life in a Mechanical Universe (revisited)
4/3 Laboratory Life vs. Field Life
  Take-Home Essay Question #3 due
4/5 Nobel Dreams: The Case of Rosalind Franklin

Reading:
Des Jardins, *The Madame Curie Complex* (part 2; part 3 optional)

Websites:
*The Secret of Photo 51* [55 minutes] http://www.youtube.com/watch?v=0tmNf6ec2kU

Week 13
4/8 Women in Science in the 21st Century: What has Changed?
4/10 The Road to Big Science: From Sputnik to the Race to the Moon
4/12 Excerpt from Disney, *Man and the Moon* (1955)
  Assignment: Pass out Final Take-Home Essay Exam; Due May 8th

Reading:
Begin your final book: Brookes, *Fly* or Blum, *Love at Goon Park*; or Oshinsky, *Polio*; or Dickson, *Sputnik*

Websites:
Sputnik 1, *CBS News Special Report* October 6, 1957 http://www.youtube.com/watch?v=KMFvr1VwSSo
Anthropologist Margaret Mead and Children’s *Sputnik* Drawings:
http://www.loc.gov/exhibits/mead/oneworld-learn.html

PBS Website for *The Polio Crusade* http://www.pbs.org/wgbh/amERICANExperience/films/polio/


“How We’ll Stop for Polio for Good” | Bruce Aylward (TED talk, 2011)
Week 14
4/15 The Road to Big Science, part 2: The Polio Crusade
4/17 Model Organisms and Animal Experimentation: Experimental Ethics Considered
4/19 Online Investigation mini-project #2 due

Reading:
Finish your final book: Brookes, Fly; or Blum, Love at Goon Park; or Oshinsky, Polio; or Dickson, Sputnik

Websites:
Model Organisms in Research http://www.exploratorium.edu/origins/coldspring/tools/index.html

Thomas Hunt Morgan and pictures of "The Fly Room" http://www.dnaftb.org/10/gallery.html

Extract Your Own DNA http://www.pbs.org/wgbh/nova/education/activities/2809_genome.html

DIY scientists: “Biopunks Tinker with the Building Blocks of Life”


The Harlow experiments and the issue of adoption:
http://darkwing.uoregon.edu/~adoption/studies/HarlowMLE.htm

Harry Harlow videos on youtube.com (put in “Harry Harlow” as your search term)

Week 15
4/22 Experimental Science and the Question of Love
4/24 Project Nim and the Question of Interspecies Communication
4/26 Collections Visit: Individual Choices and Special Items

Week 16
4/29 Conclusions: A Sense of History and the Present and Future
5/1 Final Assignment Consultations
5/3 Final Assignment Consultations

The Final Examination Time for this Course is Wed., May 8th, 8:00-10:00 a.m.

Your Final Take-Home Essay is Thus Due in the d2l Dropbox by 10:00 a.m. on May 8th.