

HI 322: The Rise of Modern Science

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Fall 2009 SYLLABUS

HI 322 surveys the development of modern science from the beginnings of the scientific revolution of the 17th century up to the early 1900s. The course places the history of important scientific ideas within their changing cultural and intellectual context. Major scientific innovations that we'll consider include the development of Newtonian science, the chemical revolution in the 18th century, scientific syntheses in the 19th century in physics, chemistry, geology, and biology, and new challenges in the early 20th century. To understand the development of modern practices of science, we will examine the changing nature of investigation and scientific methods, new social supports and institutions for scientists, and the growing cultural importance of science.

Given how central in our society science and technology have become, the educated citizen ought to have an understanding of how their place in society has evolved. One goal of the course is to help you to develop an understanding of scientific theories, methods, institutions, and individuals of the past. With that knowledge, you also gain a skill in basic historical reasoning, which enriches the analysis of current issues of scientific development. Overall, I hope to foster your understanding of the cultural dimension of science and the forces that shape its development.

ASSIGNMENTS & GRADING

Attendance at lectures is essential. You are responsible for the material covered in class, the expanded coverage of those issues in the text, and the material outlined on the course website. The Outlines contain links to further scholarship. In general, you need to read the linked material written by Dr. Kimler; it will always be within the NC State domain. Other links to off-campus sources provide such things as extra biographical coverage, expanded historical treatment, or material of general interest. These are for your own curiosity or further pursuit.

See the online <http://legacy.ncsu.edu/classes/hi322001/322topics.html> sequence of topics and assignments for the lecture and exam schedule, links to review Outlines, and links to reading assignments. This schedule may change, as announced in class. Reading assignments will come from on-line articles and from the required texts:

- Jacob, James R. 1998. *The Scientific Revolution: Aspirations and Achievements, 1500-1700*. Amherst, NY: Humanity Books.
- Jacob, Margaret C. and Larry Stewart. 2004. *Practical Matter: Newton's Science in the Service of Industry and Empire, 1687-1851*. Cambridge, MA: Harvard University Press.
- Ruse, Michael. 1999. *The Darwinian Revolution: Science Red in Tooth and Claw* (2nd edition). Chicago: University of Chicago Press.

There will be 3 Exams and 2 Essay Papers, with your grade to be determined as follows:

- **20 %** : Essay 1 due between August 31 and November 16, depending on which question you choose from the posted list <<http://legacy.ncsu.edu/classes/hi322001/322essay1.html>>, with final approval by Dr. Kimler. The sign-up list will be circulated in class, with approved choices posted on-line at <<http://legacy.ncsu.edu/classes/hi322001/essayassign1.html>>.
- **20 %** : Exam 1 on September 25.
- **20 %** : Essay 2 due on October 5 or November 2 or November 23, depending on which question you choose from the posted list <<http://legacy.ncsu.edu/classes/hi322001/322essay2.html>>, with final approval by Dr. Kimler. The sign-up list will be circulated in class, with approved choices posted on-line at <<http://legacy.ncsu.edu/classes/hi322001/essayassign2.html>>.
- **20 %** : Exam 2 on October 23.
- **20 %** : Final Exam on Wednesday, December 16, 8:00-11:00 a.m.

Make-up work for excused absences must be arranged with me before exam dates.

I assume that you are familiar with NC State Academic Regulations, in particular the policy on Academic Integrity found in the Code of Student Conduct.

See <http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php>.

Students requiring special assistance because of visual, hearing, or motor disabilities should contact and register with Disability Services for Students (DSS), 1900 Student Health Center, (919) 515-7653. Reasonable accommodations will be made for students with verifiable disabilities. DSS can initiate direct services for all learning disabled students, such as educational counseling and arrangements for appropriate academic support. Interpreter, tutorial, note taker and/or reader services are available by contacting the center.

See <http://www.ncsu.edu/provost/offices/affirm_action/dss/>.

OFFICE HOURS & CONTACT INFO

Monday 11:15 - 12:15; Wednesday 1:00 - 2:45; and by appointment
474 Withers Hall
513-2238
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Lecture Topics & Reading Assignments

This schedule may change as announced in class.

Week 1: August 19, 21

The Setting of the "Scientific Revolution" of the 17th Century

READ: J. R. Jacob, Ch. 1

Outline #1 and Timeline

Week 2: August 24, 26, 28

New Interests, Questions, and Philosophies

READ: J. R. Jacob, Ch. 2

course webpages on Ptolemaic and Copernican models

Copernicus's "Preface" to *On the Revolutions of the Heavenly Spheres*

Outline #2

Week 3: August 31, September 2, 4

Galileo, Natural Philosophy, and Society

READ: J. R. Jacob, Ch. 3

Galileo's "Letter to the Grand Duchess Christina"

Outline #2

Week 4: September –, 9, 11

Mechanical Philosophy: Method and Research

READ: Selections from Harvey's *Motion of the Heart and Blood*

Selections from Redi's *Experiments on the Generation of Insects*

Outline #3

Week 5: September 14, 16, 18

Mechanical Philosophy: Method and Research

READ: J. R. Jacob, Ch. 4

webpages on Pascal's and Boyle's Air Pressure Experiments

Selections from Descartes's *Discourse on Method*

Outline #3

Week 6: September 21, 23, 25

Exam 1 on September 25

Mechanical Philosophy: Public Interest

READ: J. R. Jacob, Ch. 5

Extract from *Philosophical Transactions of the Royal Society*, Number 1

Outline #3

Week 7: September 28, 30, October 2

Newton and the Problems of Natural Philosophy

READ: Biographical articles by A.R. Hall, and Robert Hatch, and R.S. Westfall

Outline #4

Week 8: October 5, 7, –

The Newtonian Synthesis

READ: M. C. Jacob & L. Stewart, Ch. 1

Newton's "Rules of Philosophy" and "Query 31" from *Opticks*

Outline #4

Week 9: October 12, 14, 16

The Appeal and Spread of Newtonianism in the 18th Century

READ: M. C. Jacob & L. Stewart, Ch. 2 - 4

webpages on Electrical and Chemical Experiments

Outline #5

Week 10: October 19, 21, 23

Exam 2 on October 23

Scientific Naturalism in the Enlightenment

READ: M. C. Jacob & L. Stewart, Ch. 5

webpages on Natural Theology and Natural Philosophy vs. Anglican Theology?

Natural Religion in the Age of Newton: Paley and Hume

Natural Philosophy and the "Atheist's Bible"

Outline #5

Week 11: October 26, 28, 30

Natural History in Enlightenment Culture

READ: Ruse, Ch. 1

webpages on taxonomy, implications of fossils, theory of Special Creation

Outline #6

Week 12: November 2, 4, 6

Darwin and the Practices of Natural History

READ: Ruse, Ch. 2 - 4

webpages on naturalistic explanation, the principle of uniformity, and consilience

Outline #7

Week 13: November 9, 11, 13

Evolution: The Darwinian Synthesis

READ: Ruse, Ch. 6 - 7

Selections from Darwin's *Origin of Species*

Outline #7

Week 14: November 16, 18, 20

Evolution: The Darwinian Synthesis

READ: Ruse, Ch. 8 - 9

Outline #7

Week 15: November 23, --, --

The 19th Century Success of the Sciences

READ: Outline #8

Week 16: November 30, December 2, 4

Science and Technology in Society

READ: Outline #8

Final Exam: December 16 (8:00 - 11:00)
