

History 251. History of Western Science: A Survey (CRN 10793)

(Tu & Th 9:30-10:45, Graham 423)

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Office hours: Tu & Th 11:00-12:00 or by appointment; I am potentially available many other times!

This course examines some of the major episodes in the historical development of Western science through the Scientific Revolution, which marked the effective founding of the modern scientific worldview. Primary attention will be devoted to developments in physics, cosmology, and astronomy as the fields then most determinative of the character of Western science. (Other fields, such as medicine and technology, are also important, but choices must be made in the interest of time and coherence.) Some of the principal questions we'll be looking at are:

- (1) How did people's conceptions of the structure of the cosmos and the nature of the material world change from antiquity to the Scientific Revolution?
- (2) What kinds of questions did scientists try to answer? What did they rule out of bounds? How did "science" come to be defined?
- (3) How was science shaped through its relationship to religious traditions?

The one required book for the course is Stephen Toulmin and June Goodfield, *The Fabric of the Heavens: The Development of Astronomy and Dynamics* (designated "FH" in the readings). Additional required readings are accessible as e-Reserves via Blackboard, as described below. Note that Blackboard alphabetizes by title, including initial "a" and "the." You should print out these readings for easier use. *You will get the most out of this class if you do the assigned readings before the scheduled class period, and then review them afterwards!* If you don't do the readings, you cannot expect to do well in this course.

Although this is primarily a lecture class, students are encouraged to ask whatever kinds of questions they might have--from the readings, from the lectures, or from anywhere else. Feel free to interrupt the lectures with your *relevant* questions!

There will be two exams and a cumulative final, each a third of the raw final grade, consisting of both short-answer and essay questions. Attendance and class participation will also be taken into account in determining the final grade (by up to a full letter grade, though usually much less, as will be explained in class). *Students who miss the first two classes will be dropped from the role.* I reserve the right to drop students who have more than three absences.

It has traditionally been reckoned that students should expect to spend around three hours outside of class for each hour of class time. Hence in this class if you're *not* devoting around eight hours a week to reading and studying, you're probably not going to do as well as you should.

A few words about **Blackboard**, UNCG's online course management system. You can access it from the UNCG homepage by clicking "Current Students" on the horizontal yellow bar, then "Blackboard" on the horizontal grey line just below it. Most of you will already have been exposed to Blackboard at one or another orientation session for incoming students. If not, you can familiarize yourself with it via the Blackboard Online Student Orientation at <http://www.uncg.edu/aas/itc/bborient/>. If you have specific problems—say with logging in or printing—you should call the Help Desk at 6-TECH (*i.e.*, 68324) on a University phone. *In order to gain access to Blackboard you will first need to have activated your student account.* If you haven't, go to <https://blackboard.uncg.edu/webapps/login>. Scroll to the bottom of the page, and click on "Haven't activated your UNCG computer account?" and follow the instructions from there. What you need to know for this course is relatively simple. "Course Information" contains the syllabus and the handout "Most of the Foreign and a Few of the More Obscure Words from the Readings"—nothing new here. "e-Reserves" is a list of all the readings, arranged alphabetically by title. That's the principal feature you'll need for this course. "Announcements" will alert you to things like cancellation of a class--unlikely, but you should check it regularly just in case.

I expect students to have read and understood the section of the *Policies for Students* handbook (or the equivalent on-line version at <http://studentconduct.uncg.edu/policy/academicintegrity/>) relating to the UNCG Academic Integrity Policy. Submission of written work implies your acceptance of its provisions.

Student Learning Goals

- Basic knowledge of some of the principal episodes and developments in the history of Western science from its beginnings through the Scientific Revolution.
- Understanding of the changes in people's conception of the structure of the cosmos and the nature of the material world.
- Appreciation of the nature of scientific enquiry, in particular the relationship between phenomena and their explanation.

Syllabus of Topics and Readings

Introduction (Jan. 10): FH, 15-22

What is science? (Jan. 12): Lindberg, *The Beginnings of Western Science*, 1-13

Mesopotamian culture, mathematics, and astronomy (Jan. 17): FH, 23-48 (optional: 48-50)

Greek culture and early science; atomism (Jan. 19, 24): FH, 52-79

Plato and Platonism (Jan. 26): FH, 79-89

Aristotle and Aristotelianism; physics (Jan. 31): FH, 90-105; Lloyd, *Early Greek Science*, 99-109, 112-115

Aristotle: cosmology (Feb. 2): FH, 105-114; Lloyd, *Early Greek Science*, 109-112, 121-124

Astronomy (Feb. 7): FH, 119-127, 131-137

Ptolemy: astronomy and astrology (Feb. 9): FH, 137-149

buffer day (Feb. 14): no new reading; *try to get a head start on the reading for February 16*

Greek science in its social context (Feb. 16): Lloyd, *Magic, Reason, and Experience*, 226-267
(for the bibliography, consult the book on reserve) [*handout*]

Review for first exam (Feb. 21)

FIRST EXAM (Feb. 23)

Significance of Medieval science (Feb. 28): Grant, "When Did Modern Science Begin?"

Science in the Middle Ages (Mar. 2): FH, 158-169, 210-218, 221-223; Alioto, *A History of Western Science*, 147-159 (but don't get bogged down in the details on 152-153)

SPRING BREAK (Mar. 7, 9): you might want to do the readings for the next two classes, as they're long and will repay rereading

Meaning in the natural world (Mar. 14): Toulmin & Goodfield, *The Discovery of Time*, Pt. A, 65-70; Ashworth, "Natural History and the Emblematic World View"

[March 15: last day to drop a course without penalty]

New Ideals of Knowledge (Mar. 16): Eamon, "From the Secrets of Nature to Public Knowledge"

Copernicus and Copernicanism (Mar. 21): FH, 169-180; Cohen, *Revolution in Science*, Pt. A, 105-125 (to see the bibliography for this and the other selections from Cohen, consult the book on reserve)

Brahe and Kepler (Mar. 23): FH, 184-190, 198-208; Cohen, *Revolution in Science*, Pt. B, 126-133

Galileo: physics (Mar. 28): FH, 218-221, 223-225; Cohen, *Revolution in Science*, Pt. B, 135-142

Galileo: astronomy (Mar. 30): FH, 189-198; Cohen, *Revolution in Science*, Pt. B, 143-145

Galileo and the Church (Apr. 4): Shea, "Galileo and the Church"

Review for second exam (Apr. 6)

SECOND EXAM (Apr. 11)

Descartes, Cartesianism, and the mechanical worldview; laws of nature (Apr. 13): FH, 225-227; Toulmin & Goodfield, *The Discovery of Time*, Pt. B, 77-87; Cohen, *Revolution in Science*, Pt. C, 151-160; Toulmin & Goodfield, *The Architecture of Matter*, Pt. A, 156-169

Bacon and Baconianism (Apr. 18): Hall and Hall, *A Brief History of Science*, 170-173; Cohen, *Revolution in Science*, Pt. C, 146-151; review Eamon, "From the Secrets of Nature," 349-357

Newton: astronomy and mechanics (Apr. 20): FH, 228-249; Cohen, *Revolution in Science*, Pt. D, 161-175

Newtonianism (Apr. 25): FH, 250-271; Toulmin & Goodfield, *The Architecture of Matter*, Pt. B, 186-198

Retrospect and review; course evaluation (Apr. 27): strongly recommended reading: Roszak, *Where the Wasteland Ends*, Pts. A & B, 118-134 & 163-174

[Tuesday, May 2: last day of classes; *follows Friday schedule*]

Reading Day (Wednesday, May 3)

FINAL EXAM (Thursday, May 4, 12:00-3:00)