

History 180

Western Science and Technology I: From the Greeks to the Scientific Revolution

University of Massachusetts Amherst
Fall Semester 2000

Lecture: Tues. & Thurs., 2:30–3:20, Tobin 304

Discussion: Friday 9:05 (Dickinson 206), 11:15 (SOM 104), or 12:20, (Dickinson 210)

Prof. Brian W. Ogilvie

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Monday (before 10 PM please)

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Office hours: TO BE ANNOUNCED

This syllabus is also available on the World Wide Web:

<<http://www-unix.oit.umass.edu/~ogilvie/courses/fall00/180/>>

(link available on the University Web-enhanced Courses page and the History Dept. website)

Brief description of course

Science and technology are important aspects of the modern world. Where did they start? In this course, we will examine ancient, medieval, and early modern science and technology, with an emphasis on scientific beliefs and the organization and purpose of scientific investigation and technological developments. Our focus will be on ancient Greece, the high and late Middle Ages, and the “Scientific Revolution” of the sixteenth and seventeenth centuries. Though the emphasis is on the Western tradition, we will also consider scientific and technological developments in other world civilizations. Readings will include classic scientific texts from the periods.

Lecture and discussion. Evaluation will be based on examinations and a take-home project.

The course has no prerequisites, though a background in western civilization is helpful. The suggested readings on the course web site include a few general histories that you might find useful if you haven't taken a western civ course.

Course goals

At the end of the semester, you should be able to:

- Explain the main developments of Western science and technology from ancient Greece through the seventeenth century.
- Explain how scientific ideas and technological developments are affected by the culture and society in which they developed.
- Explain how scientific ideas and technological developments have changed the culture and society in which they developed.
- Discuss the changing relationship between science and technology in the Western tradition.
- Understand scientific and technical ideas in their contexts, as well as how they compare with modern concepts of science and technology.
- Understand how historians approach the past and what tools and resources they use when reconstructing the history of science and technology.

Your goals for the course

You have just read my goals for the course. You should now take the time to reflect on those goals and think about any others you might have. In the space below, you can write the reasons *you* are in this course and any goals on which you wish to concentrate during it.

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Course structure

Lectures, by Prof. Ogilvie, take place on Tuesdays and Thursdays. Discussion sections, led by Mr. Dow, will be held on Fridays. Both lectures and discussions are crucial parts of the course, and attendance at both is expected (see the section on grading, below). Reading necessary to understand the lectures will be assigned in conjunction with that lecture, but all the readings for a week will be discussed on Fridays. If you fall behind in the readings during the week, you should catch up by Friday in order to be prepared for discussion.

Course requirements and grading

This course is an introductory survey. It has no prerequisites and requires no background in history or science. Some of the readings are difficult, but they will be explained so that everyone can understand them, and discussions will help you deepen your understanding. But the course is not easy. You will need to consistently do the readings and attend class regularly in order to pass. To succeed in this class, you should plan to spend four to six hours every week reading and studying. Some weeks won't require that much; other weeks may require a little more.

Requirements

1. Attendance at lectures and discussions

Attendance will be taken in discussion, and every absence beyond the second will be penalized (see below). Exceptions will be made only for religious holidays, university-approved athletic trips, and personal emergencies that have been reported to Prof. Ogilvie by the Dean of Students.

Attendance will not be taken regularly in lectures. However, see the next requirement.

2. Five-minute papers (about 10-12)

Approximately once per week, you will be asked to write a five-minute paper during the lecture period. These papers will *not* be graded; instead, they will be used to assess how well you are understanding the course material and to determine what the discussion sections should focus on. However, you must complete them. For every missed five-minute paper beyond the second, your final course grade will be penalized (see below).

3. Three examinations

There will be two in-class examinations, on **Tuesday, October 10**, and **Tuesday, November 14**, and a final examination during the exam period. The in-class examinations will be 75 minutes long and will comprise two essay questions. The comprehensive final examination will be 120 minutes long and will comprise three essay questions. You will receive study guides for each examination.

4. Take-home assignment

This assignment will be due **Tuesday, December 5**. It will be distributed well in advance. There will be several possibilities for this assignment, ranging from a traditional expository paper to recreating scientific observations made by past scientists (for instance, building and using a Galilean telescope).

Grading

The grading system for this course is simple but unusual; I hope it is more fair than the complex systems that many professors use. Each exam question will receive one of three overall marks: Weak, Satisfactory, Strong. (Essays that do not attempt to answer the question will not be marked.) The take-home assignment will receive two marks: one for content and one for presentation. In addition, each assignment and question will receive marks on a few specific aspects as well as written comments.

Each mark will receive the following points: Weak—1, Satisfactory—2, Strong—3. There are 27 possible points (6 for the first exam, 6 for the second exam, 9 for the third exam, and 6 for the take-home assignment). A student who receives a mark of “satisfactory” on all seven exam questions and both parts of the take-home assignment will receive 18 points.

One point will be deducted for every missing 5-minute paper beyond the second. One point will also be deducted for every absence from discussion beyond the second.

The final grade will be determined as follows:

Total points	Course grade
23	A
20-22	AB
17-19	B
15-16	BC
13-14	C
12	CD
11	D
10	F

As you can see, getting a “Satisfactory” on all seven exam questions and the assignment (both aspects) will result in a grade of “B.” This reflects my position that students who understand the important facts and concepts in this course have earned at least a B.

Policy on late assignments

If you must miss an exam, you should arrange beforehand with Prof. Ogilvie to take a makeup at a mutually acceptable time (within a week of the scheduled exam). If you miss an exam without permission, you will not be permitted to make it up.

The take-home assignment will be penalized one point (of a possible four) for each lecture it is late.

Five-minute papers may not be made up. Plan to attend lectures regularly! You’re paying for them!

Policy on academic honesty

Plagiarism is grounds for failure in the course. Plagiarism consists of either (a) copying the exact words of another writer without both enclosing them in quotation marks and providing a reference, or (b) using information or ideas from another writer without providing credit, in notes, to the source of the information or ideas. Submission of a paper or exam copied from another work, or which contains fictitious or falsified notes, will result in automatic failure of the course. Please refer to the *Undergraduate Rights and Responsibilities* booklet for the University’s full policy on academic honesty.

Why is plagiarism so bad? Learning depends on trust—the student trusts the teacher to know the subject and to teach about it clearly, and the teacher trusts the student to show evidence of learning through exams and other assignments. Plagiarizing a paper breaches that trust. It is also theft of someone else's intellectual property.

Books for course

The following **required** books have been ordered through Food For Thought Books (106 N. Pleasant Street, Amherst, tel. 253-5432). They are also on reserve in the DuBois Library. I have given ISBN numbers in case you want to order them yourself; I encourage you to support local businesses. Note: Bookstores begin to return unsold books around the beginning of November, so be sure to buy them while they're still available.

Suggestions for additional reading are available on the course web site.

- Aristotle. *Introductory readings*. Edited and translated by Terence Irwin and Gail Fine. Indianapolis: Hackett Publishing Co., 1996. ISBN 0-87220-339-5. \$10.
- Bacon, Francis. *New Atlantis and the Great Instauration*. Edited by Jerry Weinberger. Revised ed. Wheeling, IL: Harlan Davidson, 1989. ISBN 0-88295-126-2. \$5.
- Galilei, Galileo. *Discoveries and opinions of Galileo*. Translated by Stillman Drake. New York: Anchor Books, 1957. ISBN 0-385-09239-3. \$11.
- Grafton, Anthony. *New worlds, ancient texts: The power of tradition and the shock of discovery*. Cambridge, MA: Harvard University Press, 1992. ISBN 0-674-61876-9. \$17.
- McClellan, James E., III, and Harold Dorn. *Science and technology in world history: An introduction*. Baltimore: Johns Hopkins University Press, 1999. ISBN 0-8018-5869-0. \$19.
- White, Lynn, Jr. *Medieval technology and social change*. Oxford: Oxford University Press, 1962. ISBN 0-19-500266-0. \$13.

A note on readings

In addition to the required books, there will be a few handouts and one required reading on reserve. Most handouts are listed below, but there may be a few others over the course of the semester. They will be short.

There are several kinds of reading for this course. The textbook, McClellan and Dorn's *Science and technology in world history*, provides a basic narrative of the development of science and technology that presumes no background. Grafton's *New worlds, ancient texts* is an extended essay on the uneasy relationship between the classical Greco-Roman intellectual heritage and the new discoveries of the early modern period. White's *Medieval technology and social change* is a more focused study of the impact of technology on society. All these books are *secondary sources*: works written after the events they describe, on the basis of contemporary evidence and other secondary sources. The remaining books, by Aristotle, Bacon, and Galileo, are *primary sources*: documents written at the time which provide the evidence that historians use to reconstruct the past. They will be harder to read, because they were written for contemporaries, not for modern readers. I hope you will also find them more rewarding in the end.

Course schedule with topics, readings, and assignments

Thurs. 9/7 **Introduction to the course. What is science? What is technology?**

Fri. 9/8 **Discussion**
Read: John McPhee, How Geologists Think (**HANDOUT** from Thursday).

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- Tues. 9/12** **Handy man—and woman: Human origins, agriculture, and technology**
Read: McClellan/Dorn, pp. 1-30 (introduction, chapters 1 & 2).
- Thurs. 9/14** **Agricultural hydraulics: The foundation of civilization**
Read: McClellan/Dorn, pp. 31-54 (chapter 3).
- Fri. 9/15** **Discussion**
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- Tues. 9/19** **Greek science, technology, and society**
Read: McClellan/Dorn, pp. 55-95 (chapter 4).
- Thurs. 9/21** **Greek scientific method**
Read: Aristotle, pp. 16-30, 196-216, 275-282 (selections from Posterior Analytics, Nicomachean Ethics)
- Fri. 9/22** **Discussion**
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- Tues. 9/26** **Aristotle's physics and the Greek cosmos**
Read: Aristotle, pp. 36-75, 187-194 (selections from Physics; Generation and Corruption; Metaphysics, book 12).
- Thurs. 9/28** **Aristotle's biology and psychology**
Read: Aristotle, pp. 76-114 (selections from De Anima, Parts of Animals).
- Fri. 9/29** **Discussion**
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- Tues. 10/3** **Ancient astronomy**
Review McClellan/Dorn, pp. 65-85.
- Thurs. 10/5** **Roman science and technology**
Read: M. I. Finley, "Technical innovation and economic progress in the ancient world," in *Economy and society in ancient Greece*, ed. Brent D. Shaw and Richard P. Saller (New York: Viking Press, 1982), pp. 176-195. (Six copies on **RESERVE** in DuBois Library)
- Fri. 10/6** **Discussion**
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- Tues. 10/10** **EXAM I**
- Thurs. 10/12** **Science and technology in the Islamic world**
Read: McClellan/Dorn, pp. 97-115 (chapter 5).
- Fri. 10/13** **Discussion**
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- Tues. 10/17** **The Middle Kingdom: Chinese science and technology**
Read: McClellan/Dorn, pp. 117-140 (chapter 6)

- Thurs. 10/19 India and the Americas**
Read: McClellan/Dorn, pp. 141-174 (chapters 7-8).
- Fri. 10/20 Discussion**
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- Tues. 10/24 Knights and monks: Europe in the early Middle Ages**
Read: White, to p. 38 (preface and chapter 1).
- Thurs. 10/26 The medieval agrarian revolution**
Read: White, pp. 39-78 (chapter 2).
- Fri. 10/27 Discussion**
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- Tues. 10/31 The revitalization of Europe**
Read: McClellan/Dorn, pp. 175-201 (chapter 9).
White, pp. 79-134 (chapter 3).
- Thurs. 11/2 Medieval builders**
Prof. Ogilvie's office hours are canceled today.
- Fri. 11/3 Discussions**
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- Tues. 11/7 Medieval universities, Islam, and Greek science**
Read: Thomas Aquinas, excerpts from *Commentary on Aristotle's "On the Heavens"*; John Buridan, excerpt from *Questions on the four books "On the Heavens"* (HANDOUT).
- Thurs. 11/9 The medieval cosmos**
Read: Grafton, pp. 11-58 (chapter 1).
- Fri. 11/10 Discussion**
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- Tues. 11/14 EXAM II**
- Thurs. 11/16 Revolution in astronomy: Copernicus to Kepler**
Read: McClellan/Dorn, pp. 203-221 (chapter 10).
Copernicus, excerpts from *On the revolutions of the heavenly spheres* (HANDOUT).
- Fri. 11/17 Discussion**
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- Tues. 11/21 Galileo, astronomy, and the Church**
Read: McClellan/Dorn, pp. 223-234 (part of chapter 11).
Galileo, pp. 21-58, 173-216.
- Thurs. 11/23 NO CLASS (Thanksgiving recess)**
Fri. 11/24 NO DISCUSSION (Thanksgiving recess)
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- Tues. 11/28 Intellectual foment in the sixteenth century**
Read: Grafton, pp. 95-157 (chapter 3). Read chapter 2 if you have time.
- Thurs. 11/30 Natural history and medicine in the Renaissance**
Read: Grafton, pp. 159-193 (chapter 4).
- Fri. 12/1 Discussion**
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- Tues. 12/5 Calls for a New Science**
Read: Bacon, pp. 1-33 (The Great Instauration).

REMINDER: Take-home project due today at the beginning of class.
- Thurs. 12/7 Galileo: The New Sciences and the New Science**
Read: McClellan/Dorn, pp. 234-247 (rest of chapter 11); Galileo, *Discoveries and opinions*, pp. 229-280.
- Fri. 12/8 Discussion**
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- Tues. 12/12 The New Science: Courts, academies, circles, societies**
Read: Bacon, pp. 35-83 (The New Atlantis).
- Thurs. 12/14 Was there a Scientific Revolution? Why does it matter?**
Read: Grafton, pp. 195-256 (chapter 5 & epilogue).
McClellan/Dorn, pp. 249-273 (chapter 12). (Skim this chapter.)
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- Exam week EXAM III (comprehensive final)**