

History of Science 3013 section 2

MTWTF 12:30-1:20/Bizzell 521

Prof. Katherine Pandora

Office Hours: Mon 1:30-3:45

Wed 11:30-12:15 (and by appt.) ✓

Physical Sciences Bldg. 619

Tel.: 325.3427 email: kpandora@ou.edu



History of Science to the Age of Newton

☞ Fall 2004 ☞

This course focuses on the search for natural knowledge in antiquity, the middle ages, and the early modern era. We will look at the questions raised by those who sought to explain the structure of the heavens and the earth, the answers they gave, and the debates that were generated. We will also pay attention to the interplay between the broader culture and the scientific community. The only real prerequisites for this course are a sense of curiosity about the complex set of enterprises we place under the heading of “science,” and a willingness to think carefully and creatively about the course material.

We will be seeking to move beyond our stereotypes about what “science” is, by inquiring closely about the various ways in which people in times and places different from our own have struggled to know the physical, biological, and social worlds. The issues that we consider will help us gain a fuller sense of what it meant to know nature in the period we call the “scientific revolution,” and will also open up areas of analysis that are still under discussion today, such as the relationship between science and religion.

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 without also knowing the answers that people in other times 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?

Required texts:

The Ambitions of Curiosity: Understanding the World in Ancient Greece & China – G.E.R. Lloyd
Hypatia of Alexandria – Maria Dzielska

The Scientific Achievement of the Middle Ages -- Richard C. Dales

The Cheese and the Worms: The Cosmos of a Sixteenth-Century Miller – Carlo Ginzburg

Sidereus Nuncius – Galileo Galilei

Galileo, Science and the Church (3rd ed.) -- Jerome Langford

Revolutionizing the Sciences: European Knowledge and its Ambitions 1500-1700 – Peter Dear

Isaac Newton – James Gleick

* Course Articles (on reserve at Bizzell Library)

Overview of Course Assignments and Examinations

- 1) Warm-up Exercises 1 & 2 (Weeks 1-2) / 5% each = 10%
- 2) Take-Home Essay Exam #1 (*Due Week 5 on 9/20*): 5-6 pages in length <15%>
- 3) Take-Home Essay Exam #2 (*Due Week 8 on 10/11*): 5-6 pages in length <15%>
- 4) Response Essay to *Cheese & the Worms* (*Due Week 9 on 10/20*): approx. 3 pp. <10%>
- 5) Take-Home Essay Exam #3 (*Due Week 13 on 11/15*): 5-6 pages in length <20%>
- 6) Take-Home Essay Exam Final (*Due Tuesday, December 14th in PHSC 610 from 1:30-3:30 p.m., the final exam time assigned for this class*): 8-9 pages in length <30%>

Rules of the Road

Attendance: Attendance is required. 6 unexcused absences are allowed; missed classes beyond this will result in your grade being lowered by 5% increments. If you need to miss class for an illness serious enough to merit a trip to the doctor, a family emergency, etc., please contact the instructor.

Academic Misconduct: Cheating will not be tolerated. Cheating includes, but is not limited to, copying the work of another student, using the written work of another author without attribution, or any conduct that seeks to compromise the examination process. *Such conduct will result in an automatic F on that examination and the student may be referred to the Dean for disciplinary action.*

Due Dates: Exams will not be accepted if turned in late, and will be graded F. (This requirement will be waived only in the case of a medical or family emergency. To the extent possible, permission should be sought before the due date.)

Religious Holidays: It is the policy of the University to excuse the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required class work that may fall on religious holidays. Please see me in advance.

Students with Disabilities: Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me as soon as possible, so we can discuss accommodations necessary to ensure your full participation and to facilitate your educational opportunities.

Grading Scale: The letter grades for this course conform to a 4 point scale, as follows:

4.0-3.5 = A (A=4.0, A- = 3.7)
3.49-2.5 = B (B+ = 3.3, B = 3.0, B- = 2.7)
2.49-1.5 = C (C+ = 2.3, C = 2.0, C- = 1.7)
1.49-0.5 = D (D+ = 1.3, D= 1.0, D- = 0.7)
0.5 and below = F

↔ University of Oklahoma Writing Center ↔

For help with your pre-writing, organizing, documenting sources, or other aspects of writing assignments, make an appointment for a FREE, 45-minute conference with a consultant. The Writing Center is located in Bizzell Library, Lower Level 227; it is open during the following hours: Mon-Wed 9:00-8:00 and Thurs-Fri 9:00-5:00. For an appointment or additional information call 325-2936.

Week 1

- 8/23 Introduction
8/25 Science in Antiquity
8/27 Modern Values and Historical Investigation into Antiquity

Reading: Lloyd, *Ambitions of Curiosity*, (Chapters 1-3, pp. 1-68)
A. Stille, "Perils of the Sphinx," *New Yorker*, 2/10/97, pp. 54-66 [handout]
* Aristotle, "Metaphysics" from *The Complete Works of Aristotle* (pp.1552-6) and
"Physics" from *The Portable Greek Reader* (pp. 406-410) [handout]

Assignment: Warm-up Exercise #1 passed out 8/23; due Friday, 8/27
Warm-up Exercise #2 passed out 8/27; due Wednesday, 9/1

.....

Week 2

- 8/30 The Pre-Socratics and Plato
9/1 Aristotle on the Heavens and the Earth
9/3 Comparing Greece and China

Reading: Lloyd, *Ambitions of Curiosity* (Chapters 4-6, pp. 69-147)
* G.E.R. Lloyd, *Early Greek Science: Thales to Aristotle* (Chapters on "The Problem of Change," "Plato," and "Aristotle", pp. 36-49, 66-79, and 99-124)

Assignment: Warm-up Exercise #2 due 9/1

.....

Week 3

- 9/6 NO CLASS – LABOR DAY HOLIDAY
9/8 Aristotle, Ptolemy and the Cosmos in the Hellenistic Era
9/10 Science and the Early Christian Church

Reading: Dzielska, *Hypatia* (pp. 1-82)
* David Lindberg, "Science and the Early Church," in David C. Lindberg and Ronald L. Numbers, eds., *God and Nature: Historical Essays on the Encounter between Christianity and Science*, pp. 19-47

.....

Week 4

- 9/13 The Legend of Hypatia
9/15 Hypatia's Story as History
9/17 Modern Values and Historical Investigation into Antiquity, revisited

Reading: Dzielska, *Hypatia* (pp. 83-106)
Dales, *Scientific Achievement* (Introduction and Chapters 1-3, pp. 1-72)
* Howard R. Turner, *Science in Medieval Islam* (Chapters 4-6 on "Cosmology," "Mathematics," and "Astronomy," pp. 36-69)

Assignment: Essay Exam #1 passed out 9/13; due 9/20

.....

Week 5

- 9/20 Science in the Islamic World
9/22 The Mingling of Greek, Islamic, and European Views of Science in the Middle Ages
9/24 Standing on Aristotle's Shoulders to See the World

Reading: Dales, *Scientific Achievement* (Chapters 4-6, pp. 73-124)
* A.I. Sabra, "Islamic Science," *Dictionary of the Middle Ages*, vol. 11, pp. 81-89
* David Lindberg, "The Transmission of Greek and Arabic Learning to the West" in *Science and the Middle Ages* (pp. 52-90)

Assignment: Exam #1 Due 9/20

Week 6

9/27 The Rise of European Universities
9/29 Disputing about the Heavens and the Earth
10/1 Magical Aspects of Medieval Science: Alchemy and Nature's Powers

Reading: Dales, *Scientific Achievement* (Chapters 7-8 and Conclusion, pp. 125-176)
* Pearl Kibre and Nancy Siraisi, "The Institutional Setting: The Universities" in *Science in the Middle Ages* (pp. 120-144)
* Edward Grant, "Science and Theology in the Middle Ages" in *God and Nature* (pp. 49-75)

Week 7

10/4 The social, political, and cultural contexts of European exploration
10/6 The challenge of making sense of new worlds
10/8 NO CLASS: OU-Texas Game Holiday

Reading: * Grafton, *New Worlds, Ancient Texts* (Chapter 3, pp. 97-157)
* Paula Findlen, "Courting Nature" in *Cultures of Natural History* (pp. 57-74)

Assignment: Exam #2 Passed Out on 10/4; due on 10/11

Assignment: Cheese and the Worms Assignment Passed Out on 10/8; Due 10/20

Week 8

10/11 Humanism
10/13 Reformation and Counter-Reformation
10/15 Court Culture

Reading: Ginzburg, *The Cheese and the Worms* (pp. 1-68)
Dear, *Revolutionizing the Sciences* (Introduction and Chapters 1-2, pp. 1-48)

Assignment: Exam #2 Due on 10/11

Week 9

10/18 Copernicus' Cosmos
10/20 Menocchio's Cosmos
10/22 The Beginning of a Revolution?

Reading: * Copernicus, *Preface to De Revolutionibus*; Osiander, *Preface to the Reader*
Ginzburg, *Cheese and the Worms* (pp. 69-128)
Galilei, *Sidereus Nuncius* (pp. 1-34)
Dear, *Revolutionizing the Sciences* (Chapter 4, pp. 65-79)

Assignment: Cheese and the Worms Assignment Due 10/20

Week 10

10/25 Jesuits and the Tyconic Compromise
10/27 What is a Copernican? The Case of Johannes Kepler
10/29 What is a Copernican? The Case of Galileo Galilei

Reading: * Robert Westman, "The Copernicans and the Churches" in *God and Nature* (pp. 76-113)
Galilei, *Sidereus Nuncius* (pp. 35-113)
Langford, *Galileo, Science and the Church* (pp. 1-49)

Assignment: Exam #3 Question Passed Out on 10/25; due 11/15

Week 11

11/1 Messages from the Stars
11/3 Galileo's Cosmos and Scriptural Interpretation
11/5 The Decree Against Copernicus

Reading: Langford, *Galileo, Science and the Church* (pp. 50-136)
* Galilei, "Letter to the Grand Duchess Christina" from *The Galileo Affair* (pp. 87-118)

.....

Week 12

11/8 Galileo and Urban VIII
11/10 The Trial of Galileo
11/12 The Trial of Galileo (continued)

Reading: Langford, *Galileo, Science and the Church* (pp. 136-205)
Dear, *Revolutionizing the Sciences* (Chapters 3 and 6, pp. 49-64, 101-130)

.....

Week 13

11/15 Organizing the Pursuit of Natural Knowledge
11/17 Descartes and the Mechanists
11/19 Mechanism (con.)

Reading: Dear, *Revolutionizing the Sciences* (Chapters 5, 7, and 8 and Conclusion, pp. 80-100, 131-170)
Gleick, *Newton* (Chapters 1-3)
* Francis Bacon, "New Atlantis" from *English Science Bacon to Newton* (pp. 34-44)

Assignment: Exam #3 Due 11/15

Assignment: Final Exam Questions Passed Out on 11/17

.....

Week 14

11/22 Law and Order in Newton's Cosmos
11/24 NO CLASS - THANKSGIVING HOLIDAY
11/26 NO CLASS - THANKSGIVING HOLIDAY

Reading: Gleick, *Isaac Newton* (Chapters 4-11)

.....

Week 15

11/29 Experimentation
12/1 God's Role in Newton's Cosmos
12/3 Newton the Alchemist and Magician

Reading: Gleick, *Newton* (Chapters 12-15)
* Isaac Newton, excerpts from *Optics*

.....

Week 16

12/6 God Said "Let Newton Be!" The Authority of Natural Philosophy
12/8 Margaret Cavendish and Jonathan Swift: Strange Goings-On
12/10 Conclusions

Reading: Margaret Cavendish, *Blazing World* (pp. 132-4, 142-3, 160-1, 187-88)
Jonathan Swift, excerpt from *Gulliver's Travels* (pp. 127-139 and 152-159)

FINAL TAKE-HOME ESSAY EXAM:
DUE TUESDAY, DECEMBER 14th 1:30-3:30 IN MY OFFICE, PHSC 619