

Integrated Liberal Studies 201: Western Culture: Science, Philosophy, and Technology I  
 History of Science 201: Origins of Scientific Thought  
 UW-Madison, Fall 2012

Michael H. Shank (Professor, History of Science and ILS)

TAs: Lynnette Regouby (ILS 201), James Barnes (ILS 201), Nick Jacobson (HistSci 201)

Two lectures: TTh @ 1 B130 Van Vleck; one weekly discussion section

Office hours: Shank T2-3:30 in 326 Bradley Memorial Building (262-3972); mhshank@wisc.edu

Your TAs will announce their office hours in section.

This is the first in a sequence of introductory courses that treat primarily scientific (but also related technological and medical) developments from antiquity through the twentieth century. ILS/HistSci 201 begins with early technology and Babylonian astronomy, and moves into classical Greece and the two traditions fertilized by Greek mathematics, medicine, and natural philosophy (i.e., the civilizations of medieval Islam and Latin Christendom). It concludes with the Scientific Revolution in early modern Europe, culminating in Newton's unification of physics and astronomy. As we will see, many of these developments are intertwined with the histories of philosophy, religion, and institutions. (The exciting sequels ILS 202 and HistSci 202 cover Newton to the 20<sup>th</sup> c.)

### **Announcements, course requirements and grading**

Attendance at lectures and especially sections, where active participation in discussions is crucial. The reading load is sometimes demanding but falls well within the "2 hours outside of class for every hour in class" formula. As much as possible, read in advance of lecture **and always in advance of section**. It is very important to keep up with the reading and to take notes!

Working in conjunction with the McBurney Center, the course staff will make every reasonable effort to accommodate students with disabilities.

### **Grading**

Section work: 30% (the TAs will discuss the breakdown)

Exams: two one-hour exams (in class) (10/4 and 11/8): 20% each; final exam: 30%.

The exams normally consist of several short "identification/explanation essays" and one longer essay/argument, all chosen from many options on pre-circulated review sheets.

### **Books** (available on the web and at University Bookstore)

David Lindberg, The Beginnings of Western Science: The European Scientific Tradition in Philosophical, Religious and Institutional Context, Prehistory to A. D. 1450, rev. edition (Chicago: University of Chicago Press, 2007).

Michael R. Matthews, ed., The Scientific Background to Modern Philosophy (Hackett, 1989).

Paolo Rossi, The Birth of Modern Science (Malden, Mass.: Blackwell, 2000).

The course reader is available as a pdf file at Learn@UW. This is a convenience for your own individual "fair use" as a member of this course. The file is NOT to be diffused, certainly not posted on public sites. The same goes for the electronic form of course outlines, which, besides being a lot of work, are my intellectual property. You are very strongly encouraged to get/make a hard copy of the readings for the purpose of note-taking and discussion. As an individual, you can get a reasonably priced one at Bob's Copy Shop (corner of Dayton and Charter)--almost certainly less expensive than the cost/page of printing them on your own printer).

**Plagiarism and Academic Misconduct:** All work in the course must be your own. I and my TAs do not tolerate plagiarism and will prosecute it and any other form of academic misconduct. See <http://students.wisc.edu/doso/students.html> for details.

**Honors projects:** Many types of projects are suitable for honors work, from hands-on projects with significant intellectual content (e.g., building a small telescope, programming a graphic visual aid, etc.), through the completion of a reading list/review followed by an in-depth conversation with me, to a traditional essay or research paper. I strongly encourage honors students to take some initiative, to browse the readings, and to discuss their plans and wishes with me before the end of the third week.

**Expectations:** 1) **Academic honesty:** all work submitted under your name must be your own. For plagiarism, I seek the harshest penalties available. 2) **Notification of absences:** please notify Nick and me well in advance of anticipated absences (religious observances, etc.) and ASAP in case of emergency.

Note: the \* in the syllabus readings below indicates an item in the course reader.

### Part 1: Antiquity: From the Ancient Near East to Greece

#### Week 1: Where to begin?

T 9/4: Ancient Near-Eastern technologies; myth; Babylonian mathematics & astronomy

Th 9/6: The Emergence of "Nature"/Naturalism: the Pre-Socratic Philosophers

Lindberg, Beginnings, ch. 1; \*M. Clagett, "Science in Egypt and Mesopotamia," ch. 1 of Greek Science in Antiquity, pp. 3-20; \*Thales, Anaximander, Anaximenes, Parmenides excerpts from K. Freeman, Ancilla to the Pre-Socratic Philosophers (Cambridge, Mass.: Harvard UP, 1957), 18-19, 41-46.

#### Week 2: The teacher and the student: Plato and Aristotle

T 9/11: Plato's Two Worlds and their consequences for knowledge of nature

Th 9/13: Aristotle's solution to the problem of change and his natural philosophy

Lindberg, ch. 2-3; \*Plato, selections from the Republic VII ("Myth of the Cave") and the Timaeus; Aristotle, Physics, selections in Matthews, pp. 5-26.

#### Week 3: Greek mathematics and astronomy

T 9/18: From the early Pythagoreans to Euclid and Archimedes

Th 9/20: From Eudoxus to Ptolemy

Lindberg, ch. 5; \*"Incommensurables," from Cohen and Drabkin, eds., Source Book in Greek Science (Cambridge: Harvard UP, 1948), pp. 13-14; \*Euclid, Elements, definitions,

postulates, common notions; Bk 1, Prop. 1; \*Ptolemy, Almagest, Book I, (trans. G. J. Toomer) (New York: Springer, 1980), pp. 1-9.

#### **Week 4: Medicine and technology in Greco-Roman antiquity**

T 9/25: Greek Medicine: Hippocrates to Galen

Th 9/27: Technology in Greco-Roman Antiquity

Lindberg, ch. 6; \*[Pseudo-]Hippocrates, "The Sacred Disease" from Lloyd, ed., Hippocratic Writings (London: Penguin), pp. 237-51.

#### **Week 5: From Rome to Baghdad**

T 10/2: The Puzzle of Rome

Shank and Lindberg, "Introduction," in Lindberg and Shank, eds., Cambridge History of Science, vol. 2: Medieval Science (New York: Cambridge University Press, 2013), 1-26.

Th 10/4: **HOURLY EXAM (in class)**

#### **Part 2: Medieval Islam and Christendom**

#### **Week 6: Arabic science**

T 10/9: Emergence of Islamic Civilization (622 and all that)

Th 10/11: From Baghdad to Spain

Lindberg, ch. 7-8; \*al-Kindi, Intro to Ptolemy's Almagest, in Franz Rosenthal, The Classical Heritage in Islam (New York: Routledge, 1975), pp. 216-223; \*A. I. Sabra, "The Appropriation and Subsequent Naturalization of Greek Science in Medieval Islam: A Preliminary Statement," History of Science, 25 (1987), 223-43.

#### **Week 7: Emergence of Latin medieval civilization**

T 10/16: Post-colonial Europe: Medieval agriculture and the White Thesis

Th 10/18: The rise of the universities

Lindberg, ch. 9-10; \*Jean Gimpel, "The Agricultural Revolution," ch. 2 of his The Medieval Machine (New York, 1976), pp. 29-58; \*The Condemnations of 1277" in E. Grant, Sourcebook of Medieval Science (Cambridge: Harvard UP, 1974), pp. 45-50.

#### **Week 8: The scientific enterprise in the Latin Middle Ages**

T 10/23: Towards a mathematization of natural philosophy

Th 10/25: The life sciences in the medieval Latin world

Lindberg, ch. 11-13; \*"John Buridan..." in Marshall Clagett, The Science of Mechanics in the Middle Ages (Madison: U. Wisconsin Press, 1959), pp. 557-64; \*"Twelfth-Century Bestiary," in E. Grant, A Sourcebook of Medieval Science (Cambridge: Harvard UP, 1974), pp. 644-51; \*Kenneth Kitchell and Irvén Resnick, "Hildegard as a Medieval 'Zoologist': The Animals of the Physica," in Maud Burnett McNerny, ed., Hildegard of Bingen: A Book of Essays (New York: Garland, 1999), read pp. 25-33 (skim rest); \*The Art of Falconry, being the De arte venandi of Frederick II, trans. C. A. Wood and F. M. Fyfe (Stanford UP, 1943), pp. 5-10, 39-40, 49-52, 78-79;

#### **Week 9: Old worlds and new**

T 10/30: Technologies of time and writing (13-15th c.)

Th 11/1: Aristotelianism, Platonism, and naturalism in the Renaissance

Lindberg, ch. 14; Rossi, ch. 1-4; \*Paul O. Kristeller, "The Aristotelian Tradition," in his Renaissance Thought and its Sources (New York: Columbia UP, 1979), pp. 32-49; \*Marsilio Ficino, Three Books on Life, Bk I, ch. vii-x; \*Dürer's "Melencolia I".

**Week 10: Early modern anatomy and physiology**

T 11/6: From Vesalius to Harvey: anatomy and physiology

Rossi, ch 12; \*William Harvey, excerpts from On the Movement of the Heart and Blood (1628) trans. K. J. Franklin (Oxford: Blackwell, 1963) pp. 3-4, 23-29, 57-66.

Th 11/8:  **HOUR EXAM (in class)**

**Week 11: Changing cosmological models**

T 11/13: From Regiomontanus to Copernicus and Tycho Brahe

Th 11/15: Kepler's Revolution in Astronomy

Rossi, ch 5; Copernicus selections (Commentariolus and De Revolutionibus) in Matthews, pp. 33-44.

**Week 12: Galileo Galilei (d. 1642): motion and tensions**

T 11/20: **Longer lecture:** Galileo on motion and the telescope; **start Galileo's Dialogue** (1632) and its aftermath

Th 11/22: Thanksgiving recess

Rossi, ch. 6; Matthews, pp. 53-86; \*Galileo, original manuscripts and drawing for Sidereus Nuncius and "Letter to the Grand Duchess Christina," from S. Drake, ed., Discoveries and Opinions of Galileo; \*I. B. Cohen, "Towards an Inertial Physics," ch. 5 of his The Birth of a New Physics (New York: Norton, 1985), pp. 81-126.

**Week 13: Methods and Scientific Visions: Francis Bacon and René Descartes**

T 11/27: **Longer lecture finish Galileo; start F. Bacon** (d. 1627) and the Baconian Program

Th 11/29: R. Descartes (d. 1650), Cartesian rationalism, and the "mechanical philosophy"

Rossi, ch. 7-9; Bacon and Descartes in Matthews, pp. 45-52, 87-94, 99-105.

**Week 14: Physics explains astronomy**

M 12/4: Newton: craft and theory

W 12/6: The Newtonian Synthesis of physics and astronomy, mathematics and experiment

Rossi, ch. 15, 17: Newton selections in Matthews, 133-58.

**Week 15: Academics and academies**

M 12/11: Universities and Scientific Societies

W 12/13: Looking back—and forward

Rossi, ch. 16; \*Michael Hunter, "The Significance of the Royal Society, ch. 2 of his Science and Society in Restoration England (Cambridge University Press, 1981), pp. 32-59.

**Final Exam: Saturday December 16, 2012 at 7:45 a.m. (double-check the time and especially the place, TBA)**