

## ILS 202: Western Culture: Science, Technology, Philosophy II Fall 2009

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Lectures: MW 11-11:50, 1227 Engineering Hall. Discussions: R 2:25, 3:30 in CompSci&St 1289; F 9:55, 11:00 in Meiklejohn 103 (living room). Please attend the section you signed up for!

**Welcome** to ILS 202! This course offers an introduction to the history of the sciences between the late seventeenth century and the early twentieth century, with the aim of understanding the varied ways of knowing that have come to be known as “science.” In pursuing this question, we will treat such pivotal intellectual developments as Newtonianism, the conservation of energy, and Darwin's theory of evolution. At the same time, we will seek to understand the relationship between these ideas and the broader cultural context in which they took place, paying particular attention to the ways it was possible to “do science” in different times and places. We will see how scientific ideas have developed in relation to religious belief systems, on the one hand, and technology and medicine, on the other. These big, messy, important relationships are among the most important in our culture's history and remain central to understanding the condition of modern Western and global culture today.

### **Grading:**

- 30 %: Attendance at lecture and participation in weekly discussion sections, including two exercises (5% each): herbarium exercise, to be completed in discussion sections **October 1-2**; and Darwin letters exercise, due **Monday, Nov. 23**
- 20% Unit I take-home essay (1200 words), due at lecture **Wednesday, October 14**;
- 20% Unit II take-home essay (1200 words), due at lecture **Wednesday, November 11**
- 30% Final take-home essay (1500 words), due in the ILS 202 L@UW Dropbox by **NOON on Monday, December 21**. The final essay will ask you to draw on the course as a whole, with emphasis on the third unit.

All formal writings should be **word-processed and double-spaced**. It is a good idea to keep both an electronic and a hard copy for yourself. See “Introductory Study Materials” on Learn@UW for details on policies concerning late papers, plagiarism, learning accommodations, and academic performance.

### **Books available for Purchase:** (University Book Store):

- Peter Bowler and Iwan Morus, *Making Modern Science* (“B&M” in course schedule)
- Paul Lawrence Farber, *Finding Order in Nature: The Naturalist Tradition from Linnaeus to E. O. Wilson* (“Farber” in course schedule)
- Mary Shelley, *Frankenstein* (Broadview edition only)
- H. G. Wells, *The Time Machine* (Broadview edition only)

*Course Reader*: available for purchase (cash or check, payable to “History of Science”) at the Department of History of Science, Bradley Memorial Building, 1225 Linden Drive. Readers are **nonrefundable**; once you’ve bought one, it’s yours.

*Study Materials* are online at on the course Learn@UW website. You’ll need to print them up (and use them!) before the class at which the work is due. These will be collected from time to time to make sure you are filling them out.

\*A copy of all readings (but not the study materials) is on reserve at College Library.\*

**Course Website.** We will be using Learn@UW, an interactive course website, for distributing writing assignments and handouts and for important website links and other information. To access the Learn@UW site for ILS 202, follow these two steps:

1. Go to <http://learnuw.wisc.edu>, or access it from the UW home page. Type in your WiscWorld username and password to get to the next screen, which is your “portal page.” Notice that on this page there is a red “Help” button to click on if you have any trouble navigating to the site or getting any of the information. The Help Desk is available to assist you around the clock, so please contact this number: 264-HELP (and not Lynnette or me!).
2. Once on your Learn @UW portal page, you will see a column in the middle called “**My Courses,**” which will list all your UW courses that have a Learn@UW website. Click on the link under this heading for “ILS 202” and you’ll arrive next at the course website.

**Course Objectives:**

This course is designed to help you achieve a variety of goals. In terms of content, the basic goals are:

- to learn in some detail how reliable knowledge of nature has been constituted over time (issues of scientific method);
- to learn to view science as a living, changing enterprise made by people responding both to nature and also to their own material needs and belief systems;
- to learn some basic scientific concepts, how they came into being, and how they have mattered in Western culture; and
- to understand how past science—even long-past science—has shaped the world we live in today.

But this course also serves a larger purpose: to improve your ability to think historically and critically about science. This involves developing several skills:

- how to ask good questions about information you encounter;
- how to break down a big question into manageable pieces;
- how to think synthetically, to piece together patterns from diverse pieces of evidence
- how to make and defend critical/analytical arguments.

While the content goals will help you gain greater scientific and cultural literacy, the historical thinking goals will help you develop and cement skills that you can transfer to many other realms. This course is designed to challenge you on both fronts, while also stimulating you to think in new ways about science and its place in Western culture.

## Course Schedule

Readings are listed beneath lecture titles for each lecture date. Those marked with \* are in your course reader.

### **Week 1: Introductions**

9/2: *Course Introduction: Science, Knowledge, and Power*

\*\*Be sure to go to discussion sections this week!\*\*

Print up and read “Introductory Course Materials” (on Learn@UW) for section.

## **Unit I: Understanding Nature, 1665-1805**

### **Week 2: Legacies of the Scientific Revolution**

9/9: *Experimental Knowledge and the Mechanical Philosophy*

B&M, 23-25, 33-52, 322-326

\*Robert Crease, “*Experimentum Crucis*: Newton’s Decomposition of Sunlight with Prisms,” chapter 4 in *The Prism and the Pendulum*, 59-76.

\*Newton, “A New Theory about Light and Colours” (1672), as excerpted by William Francis Magie, ed., *A Source Book in Physics* (Cambridge: Harvard U. Press, 1963), 298-305

### **Week 3: From Newton to Newtonianism**

9/14: *Newton’s Syntheses*

\*Isaac Newton, *Principia* (1729), Definitions; Laws; Book III: The System of the World: “Rules of Reasoning;” General Scholium.

9/16: *Popularizing Newtonian Science*

B&M, 367-371 (bottom)

\*Dobbs and Jacob, *Newton and the Culture of Newtonianism* (1995), 71-95, 123-4. (Reader 33-46)

\*John T. Desaguliers, *Course of Experimental Philosophy* (1734), Introduction and selection from Lecture III

\*I. Bernard Cohen, “Franklin’s Scientific Style,” in idem, *Benjamin Franklin’s Science* (Cambridge, MA: Harvard University Press, 1990), 14-20 only

THEN AND NOW Activity (optional): Popular astronomy: Check out the Space Place’s “Planet Trek,” a correctly scaled model of the solar system, on bike paths between Monona Terrace and Mt. Horeb. To learn more, go to: <http://www.spaceplace.wisc.edu/planettrek.htm>. Or just get on your bike and look for the signs on the Southwest bikeway from Monona Terrace (Earth is near the Brittingham Boathouse on Monona Bay). Go while the weather is good—the signs will be removed come October!

\*Discussion sections meet this week at Memorial Library Special Collections

### **Week 4: Expanding the Framework: Electricity and Living Matter**

9/21: *The Nature of Matter, from Atomic Attraction to Subtle Fluids*

\*J. T. Desaguliers, “Some Thoughts and Experiments concerning Electricity” (1739-41).

\*I. Bernard Cohen, “Franklin’s Scientific Style,” 20-30 (Reader 71-74)

\*Letter 3 from Benjamin Franklin to Peter Collinson, Sept. 1, 1747, as reprinted in *Benjamin Franklin’s Experiments: A New Edition of Franklin’s Experiments and Observations on Electricity*, ed. I. B. Cohen (Cambridge, MA: Harvard University Press, 1941), 179-186.

9/23: *Explaining Living Matter* (guest lecture by Lynnette Regouby!)

\*Abraham Trembley, *Memoirs concerning the Natural History of the Polyp* (1744). Translated and edited by Sylvia G. Lenhoff and Howard M. Lenhoff, in *Hydra and the Birth of*

*Experimental Biology–1744*. (Pacific Grove, CA: Boxwood Press, 1986). Excerpts from the First and Fourth Memoirs, pp. 1-11, 182-188, Plates 11-13.

\*Anton Mesmer, “Dissertation on the Discovery of Animal Magnetism” (selections) in *Mesmerism: A Translation of the Original Scientific and Medical Writings of F. A. Mesmer*, translated and compiled by George Bloch (Los Altos, Calif: William Kaufmann, Inc., 1980), 43-48, 67-70.

\*Robert Darnton, *Mesmerism and the End of the Enlightenment in France* (Cambridge: Harvard University Press, 1968), 3-11.

### **Week 5: Science and Global Adventuring**

9/28: *Global Positioning*

\*Terrall, Mary, “Heroic Narratives of Quest and Discovery,” *Configurations: A Journal of Literature, Science, and Technology* 1998, 6: 223-242

\*Mary Shelley, *Frankenstein*, 39-117 (introductory notes + vol. 1)

9/30: *Enlightenment Natural History*

Farber, pp. 6-36.

Herbarium exercise preparation (information to be sent via L@UW)

\*10/1 and 10/2: **Discussion sections meet at UW Herbarium**, 160 Birge Hall\*

### **Week 6: The End of the Enlightenment Paradigm(s)?**

10/5: *Alexander von Humboldt and Global Physics*

\*Michael Dettelbach, “Humboldtian Science,” In *Cultures of Natural History*, ed. N. Jardine, J. A. Secord and E. C. Spary (Cambridge, England: Cambridge University Press, 1996), 287-304.

Shelley, *Frankenstein*, 117-174 (vol. 2)

\*Receive first essay assignment at lecture\* (material covered through 10/7)

10/7: *Romanticism and the Value of Subjectivity*

Shelley, *Frankenstein*, 175-244 (vol. 3)

THEN AND NOW Reading (optional): Science heroes, villains, and popular culture:

[www.salon.com/env/feature/2009/07/13/science\\_illiteracy/](http://www.salon.com/env/feature/2009/07/13/science_illiteracy/)

THEN AND NOW Reading (optional): “Scientists create a form of pre-life”:

<http://www.wired.com/wiredscience/2009/06/tpna/>

## **Unit II: Improving on Nature**

### **Week 7: The Scientist as Technical “Improver” and Entrepreneur**

10/12: *The Culture of Improvement*

\*Robert Friedel, *A Culture of Improvement*, ch. 13, “Artisans, Philosophes, and Entrepreneurs,” 235-254

B&M, 391-398

10/14: *The Science and Technology of Power*

B&M, 398-403

\*Friedel, *A Culture of Improvement*, ch. 11, “Raising Fire,” 191-209

\***Essay 1 due at lecture**\*

### **Week 8: Energy and Empire in Britain**

10/19: *The Conservation of Energy in Britain*

B&M, 79-95

10/21: *Electricity and Empire*

B&M, 403-407

\*Bruce J. Hunt, "Doing Science in a Global Empire: Cable Telegraphy and Electrical Physics in Victorian Britain"(1997).

THEN AND NOW Reading (optional): Global Communication, Past and Future:

<<http://www.elon.edu/e-web/predictions/150/>>

### **Week 9: Chemistry at the Intersections of Science and Industry**

10/26: *The "New" Chemistry and the Method of Analysis*

B&M, 55-78

\*William H. Brock, *The Norton History of Chemistry* (NY: Norton, 1992), 173-75, 177-182, 194-209.

10/28: *"Nature, Aided by Chemistry": Light, Color, and Coal*

\*Robert Friedel, *A Culture of Improvement*, ch.18: "Stuff, Reality, and Dreams" (selection), 341-354

THEN AND NOW Reading (optional): Plastics:

<[www.motherjones.com/environment/2009/05/plastic-fantastic](http://www.motherjones.com/environment/2009/05/plastic-fantastic)>

### **Week 10: Improving Life**

11/2: *Pasteur and the Agricultural Origins of "Germs"*

\*David V. Cohn, "The Life and Times of Louis Pasteur," <http://www.foundersofscience.net>. (Go to this website, click on "Pasteur," and scroll down to see the illustrations in color.)

\*Louis Pasteur, *Studies on Fermentation: The Diseases of Beer, Their Causes, and the Means of Preventing Them*, tr. Frank Faulkner and D. Constable Robb (1879)

11/4: *"Scientific" Medicine and Public Health*

B&M, 439-441, 446-450

\*Bert Hansen, "America's First Medical Breakthrough: How Popular Excitement about a French Rabies Cure in 1885 Raised New Expectations for Medical Progress" (1998)

THEN AND NOW Reading (optional): Germs

<<http://protomag.com/assets/the-war-on-superbugs>>

## **Unit III: Sciences of History and Progress**

### **Week 11: Progress and the Sciences of the Past**

11/9 : *The Earth Acquires a History*

B&M, 103-115, 341-3, 347-354

\*Mott. T. Greene, "Genesis and Geology Revisited: The Order of Nature and the Nature of Order in Nineteenth-century Britain" (2003)

11/11: *Change, Progress, and the History of Life*

B&M, 115-124, 132-143

\*Charles Lyell, *Principles of Geology*, vol. 1 (1830) (selections)

**\*Essay 2 due at lecture\***

THEN AND NOW Reading (optional): Extinction

<<http://www.actionbioscience.org/newfrontiers/eldredge2.html>>

### **Week 12: Darwinian Evolution**

11/16: *The Evolution of Darwin's Theory*

B&M, 143-149

Farber 37-42; 56-63

Erasmus Darwin, *The Temple of Nature*, "Additional Note I.1-3," in Shelley, *Frankenstein*, 267-269

\*receive Darwin letters exercise\*

11/18: *Darwin's Theory and Its Consequences: The Great Gestalt Shift*

\*Charles Darwin, *On the Origin of Species* (1859) chapter 4, "Natural Selection"

Farber, 63-71

B&M 149-57, 161-162, 354-62

**Week 13: Evolutionary Naturalism: More Consequences**

11/23: *The Significance of Darwinian Evolution for Science and Society*

THEN AND NOW Reading (optional): Intelligent Design:

<<http://www.actionbioscience.org/evolution/nhmag.html>>

\*Darwin letters exercise due **in class**\*

11/25: *Evolution, Art, and Religion*

Film: *Proteus* (to be shown during class)

Thanksgiving: No discussion sections

**Week 14: Progress and its Problems**

11/30: *Evolution, Race, and Intelligence*

B&M, 420-431

\*John Carson, *The Measure of Merit: Talents, Intelligence, and Inequality in the French and American Republics, 1750-1940* (Princeton: Princeton University Press, 2007), 75-97, 308-316

\*"Sir Francis Galton (1822-1911)," and "The Comparative Worth of Different Races," from *Hereditary Genius: An Inquiry into Its Laws and Consequences*. (1869), 30, 325-337. *The Down-Side of Progress: Degeneration*

THEN AND NOW Reading (optional): Eugenics Today

<<http://beaconcast.live.subhub.com/articles/20080422>>

12/2: *The Down-Side of Progress: Degeneration*

H. G. Wells, *The Time Machine*, 55-112, 157-168

**Week 15: Progress in Science and Society ca. 1900**

12/7: *The End of Nature? Entropy and the Cosmological Future*

H. G. Wells, *The Time Machine*, 112-156, 225-234

12/9 : *Science at the Brink*

\*Alfred Russel Wallace, *The Wonderful Century: Its Successes and Its Failures* (London: Swan Sonnenschein and Co., 1898), pp. 150-156, 367-379.

\*receive final essay question\*

**Week 15+**

12/14: *The Big Picture: What does it all mean?*

\*Final essay due Monday, December 21, by NOON in ILS 202 Learn@UW drop-box.