

ILS 202: Western Culture: Science, Technology, Philosophy II
History of Science 202: The Making of Modern Science
Spring 2002

Prof. Lynn Nyhart
7127 Social Science Bldg.
262-3970
Office Hours: Weds. 1:20-3:15 pm
and by appointment
email: lknyhart@facstaff.wisc.edu

Teaching Assistants:
Brent Ruswick (ILS secs. 301, 302, 304, 305)
Paul Erickson (ILS secs. 303, 306, 307)
Christina Matta (HS all sections)

Welcome to ILS 202/History of Science 202! Over the course of this semester, we will examine the rise of modern science. Briefly put, between the late seventeenth century and the early twentieth century, science evolved from being the pursuit of a small elite into a central element of our culture. Although many world-changing scientific developments would take place in the twentieth century, the fundamental attitudes about how science should serve society—attitudes that are very much still with us—were first developed in this earlier period, as were some of the key ideas of modern science. This course is therefore organized around the question, “Just how did this co-evolution of science and society take place?” In lectures, readings, and discussions, we will treat such pivotal intellectual developments as Newtonianism, Darwin's evolution theory, and the concept of the conservation of energy. 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 relationship between science and belief systems on the one hand, and science and technology on the other. These big, messy, important relationships remain central to understanding the condition of modern Western and global culture today.

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 science is a living, changing enterprise made by people responding not just to nature but also to their own material needs and belief systems;
- ☞ learn some basic scientific concepts, how they came into being, and how they have mattered to society.

But this course also serves a larger purpose: to improve your ability to think historically 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.

Getting there:

The various parts of the course are designed to work together to help you accomplish these goals.

Lectures not only provide important information but also model the analytical-critical and synthetic activities you will be working on in the course. To get the most out of lecture, take careful notes and go over them right after lecture to remind you of the big picture and to identify places you might want some clarification on in the next lecture or in discussion section.

Readings are an essential part of this course. They are designed to complement the lectures, not duplicate them. They are also the basis for in-depth **discussions** each week (on which your class participation grade depends). To be fully prepared for your discussion section, you need to do more than just pass your eyes over all the assigned readings before your section meets. You should highlight sentences that seem significant to you, think about them as a whole, and consider how they relate to each other and to the lectures. To help you do that, each week you will receive a "reading guide" via email with a focus question or set of questions for you to think about as you read. It is a good idea to jot down your responses to these questions as you read; your Teaching Assistant may require some responses to be handed in or some other forms of feedback/assessment as part of the discussion participation requirement.

Take-home essays: The essay questions ask you to think synthetically, drawing material from different weeks together into a unified picture. Every essay you write should take the form of an argument supporting a thesis. Since all essays are open-book, grading will NOT depend solely or even primarily on the correctness of the facts marshaled for your argument; this correctness is assumed as a base-point. Rather, much of your grade will be based on the persuasive power, sophistication, originality, and succinctness of your argument. (More on this during the course.)

All of these different aspects of the course are reflected in the **Grading Structure:**

Participation in Discussion Sections 20% (including writing assignments for your TA)

First take-home essay: 20% (not more than 1000 words)

Second take-home essay: 30% (not more than 1000 words)

Final take-home essay: 30% (not more than 1000 words)

Nuts and Bolts:

Books to Buy: (University Book Store):

Margaret Jacob and Betty Jo Teeter Dobbs, *Newton and the Culture of Newtonianism*

H. G. Wells, *The Time Machine*

David Cassidy, *Einstein and Our World*

(optional: Diana Hacker, *A Pocket Style Manual*)

A *Course Reader* is available for purchase at ASM Student Print in the basement of Memorial Union.

A copy of all readings is on reserve at College Library.

Nuts and Bolts (cont.)

IMPORTANT DATES:

THURSDAY, February 21: First take-home essay due

TUESDAY, April 16: Second take-home essay due

THURSDAY, May 16: Final take-home essay due

All essays are due in your T.A.'s mailbox by 4:30 p.m. on the due date unless otherwise specified.

Essays **MUST** be typed or word-processed. It is a good idea to keep a photocopy for yourself, and if you are word-processing, to keep a floppy-disk copy.

Extensions are only granted if requested before the due date, and only in case of illness or other serious emergency. All extensions will have a definite new due date established. Papers received after the new due date will be subject to late paper penalties.

Late paper policy: any piece of writing that you hand in late without an extension will have the following penalties assessed: a quarter of a grade for every working day late. For example, if the paper on its merits deserves a B, after one day it would receive a B/BC, after two days a BC, after three a BC/C, after four a C. NOTE: LATE TAKE-HOME FINAL EXAMS WILL NOT BE ACCEPTED.

If any problems arise, either academic or personal, which might jeopardize your performance in the course, you must try to inform Prof. Nyhart after lecture or by the soonest available office hour, by or by leaving a message with the History of Science secretary (262-1406).

If you have questions about a grade, you should first talk to the Course Assistant who gave you the grade. If the problem is not resolved, come talk to me. If we cannot come to a satisfactory conclusion, the next step is for you to speak with the History of Science Undergraduate Chair, Prof. Michael Shank, or the ILS Chair, Prof. Booth Fowler. He will attempt to resolve the issue informally and inform you of the appeals procedures if no resolution is reached informally. This set of steps is in line with L & S policy and should be available to you in any course, not just this one.

Lecture/Reading Schedule

Jan.22 Course introduction

UNIT I: SCIENCE AND THE ENLIGHTENMENT

Jan. 24	Legacies of the Scientific Revolution	Reader, 3-11 (Wilson)
Jan. 29	The Newtonian synthesis	Dobbs & Jacob, <i>Newton and the Culture of Newtonianism</i> , 1-60
Jan. 31	Newton's philosophy: method, matter, and metaphysics	Reader, 12-24 (Newton)
Feb. 5	Spreading Enlightenment	Reader, 25-36 (Sutton)
Feb. 7	Newtonian research programs	Dobbs & Jacob, 61-101, 104-110
Feb. 12	The nature of matter: from atomic attraction to subtle fluids	Reader, 37-72 (Hankins, Vartanian)
Feb. 14	Living matter and the problem of the soul	receive first essay assignment Thursday, Feb. 14

UNIT II: THE SCIENCES OF TRANSFORMATION IN AN AGE OF PROGRESS: EVOLUTION AND ENERGY

Feb. 19	Enlighteners and romantics	First essay due Thursday Feb. 21
Feb. 21	Science and the industrial revolution	Dobbs& Jacob, 110-123
Feb. 26	Romantic Science	Reader, 73-103 (Shelley, Secord, Morus)
Feb. 28	The new technologies of transportation and communication	
Mar. 5	Progress and history	Reader, 103-160 (Young, Chambers)
Mar. 7	The order of nature and the history of life	
Mar. 12	Geological history and the problem of method	Reader, 161-205 (Young, Darwin)
Mar. 14	Darwin's theory and its genesis	
Mar. 19	Scientific reception of Darwin's theory	Reader, 206-250 (Desmond/Moore)
Mar. 21	Darwinism and world-views	

SPRING BREAK

Apr. 2	The energy concept in Britain: work and world view	Reader, 251-287 (Smith, Helmholtz, Russett)
Apr. 4	The animal machine: force and physiology	
Apr. 9	The down-side of progress: Entropy and degeneration	H. G. Wells, <i>The Time Machine</i> (all)
Apr. 11	Professional and popular science	receive 2nd essay assignment Tuesday, April 9

UNIT III: SCIENCE AND THE EXPERIENCE OF MODERNITY

Apr. 16	Education for science and citizenship	2nd essay assignment due Tuesday, April 16 Reader 288-333 (Cahan, Hansen) Reader 334-345 (Kraepelin, Millikan); Review reader 93-103 (Morus) Cassidy, <i>Einstein and our World</i> , 7-34 Cassidy, <i>Einstein and Our World</i> , 35-47, 60-67 Reader, 346-366 (Russell, Kern) Review Readings receive final essay questions Thursday May 9
Apr. 18	Generating faith in science: "scientific" medicine	
Apr. 23	Experiencing modern time/space	
Apr. 25	The revolutions in physics	
Apr. 30	Einstein's relativity	
May 2	Cultural relativity	
May 7	The Big Picture I: Putting the synchronic pieces together	
May 9	The Big Picture II: The long view	

Final essays due Thursday, May 16, by 4:30 pm

Late take-home essays will not be accepted.

Grading Scale for Essays:

- A: For outstanding essays only. Thesis and argument are clear, thought-provoking, and based on correctly understood facts; material used to support the argument synthesizes ideas from different parts of the course (readings, lectures, discussions from different weeks); relationships drawn between facts and ideas are sophisticated, subtle, and/or original. Writing is grammatically correct and succinct. The argument flows well from point to point, without any puffery or wasted words.
- AB: For very good essays that for some reason fall short of the criteria listed above. For example, the argument may be murky in one place; information may be presented that doesn't directly or clearly contribute to the argument; writing style may be awkward here and there, or flawed by one or two consistent (if minor) grammatical errors.
- B: Your basic okay grade. The essay may pursue a straightforward but not especially deep or sophisticated argument; it is okay as far as it goes, but doesn't penetrate the material very far. It may have a flash of brilliance that is unfulfilled, counterbalanced by minor grammatical problems, a weakness in argumentation, and/or a significant misunderstanding of events or chronology.
- BC: The essay shows some of the basics of the ideal essay, but is weakened by a lack of serious thought or writing problems. It may make superficial connections without offering sufficient evidence to make the connections plausible or persuasive, or it may have what is in principle a good argument supported by incorrect facts or chronology. Alternatively, it may provide a fairly solid argument with minor flaws, from which the reader is repeatedly distracted by awkward or ungrammatical prose.
- C: A grade signifying some serious problem in essay-writing. It may deliver facts without a recognizable thesis or argument; it may wander away from the point; or it may be a thoughtful attempt so weakened by writing problems (grammar, punctuation, word choice) that it is difficult for the reader to understand a crucial point you are trying to make.
- D: A marginal grade. There may be enough in here to show you have attended a few lectures and/or done some of the reading, but the essay indicates no effort at synthesis or thinking on your own, or else shows a serious misunderstanding of the nature of the material and/or the assignment. Also used for essays that are just barely coherent.
- F: For unacceptable essays. An essay may be judged unacceptable if it contains plagiarism (see below); if it consists primarily in content inappropriate to the question or the material for this course; if it shows a complete misunderstanding of the course content; or if the writing fails to meet standard college-level requirements of basic communication in English.

Plagiarism: plagiarism is a serious breach of academic integrity and may be grounds for failure on the assignment plagiarized (take-home exam or paper). If you use 3 or more words in a row from another source, it must be placed in quotation marks and footnoted. Otherwise, it is plagiarism. For more on what constitutes plagiarism and how to avoid it, consult the Pocket Manual by Diana Hacker or see the UW Writing Center's handout "Quoting, Paraphrasing, and Acknowledging Sources" (online at: <http://www.wisc.edu/students/plagiarism.pdf>). It would also be wise to review the UW's student guide on academic misconduct (at: <http://www.wisc.edu/students/amsum.htm>).