

ILS 202 Study Guide: Unit I Readings Fall 2002

Welcome to the Unit I "Reading Guide" for ILS 202! The aim is to point you to the major issues raised by the readings each week so that you can be fully prepared for thoughtful discussion in your section meetings, and, ultimately, for the take-home essay questions. Often I will also help out by giving a little background on the reading and its author, defining terms, and noting key concepts developed in the text that are particularly important for this course. You will note as the course continues that the weekly guides get a little shorter and less specific; this is because I expect you to have absorbed some of the reading techniques modeled in the earlier guides. I will be handing out the subsequent units' study guides at the beginning of each new unit.

Your best strategy is to read through the guide once before you begin the reading, then have it alongside the text as you read. You can jot down notes right by the questions, or you can take notes in your readings or on a separate piece of paper. There is space for expanded note-taking on the back of each page and often at the end of the guide for each week.

Week 1 (Week of Sept. 3, 2002): Legacies of the Scientific Revolution

E. O. Wilson, *Consilience*, 22-37 (Reader)

This week's reading is a selection from the recent book *Consilience: The Unity of Knowledge*, by Edward O. Wilson, a biologist who was a founder of the science of sociobiology (now more often known as "evolutionary psychology") and who has a penchant for big thinking. *Consilience* is about past and present efforts to discover an underlying unity of knowledge. I chose this selection because it does two things suitable for this introductory week of the course: it gives a brief overview of the leading features of the Enlightenment, and it describes some of the chief strands of scientific/philosophical thinking that led to it.

The reading also provides a first chance to hone your critical reading skills. Wilson is not an historian by training, and to make some of his rhetorical points, he stretches some of the categories used by historians. No historian, for example, would consider Francis Bacon (1561-1626) a "founder" of the Enlightenment (a movement generally understood to begin in the 1680s), even though many of his ideas would recur among Enlightenment thinkers. Keep an eye out for ways in which Wilson is not just presenting information but using it to offer you a particular view of the Enlightenment.

Questions (I refer to the original page numbers):

pp. 22-24 (bottom): What were some of the main features of the Enlightenment? How was science related to these features, according to Wilson? When did it begin, according to Wilson, and when did it end? (Note that some different dates will be given in lecture.)

pp. 24-28: Bacon is known for what method of investigating nature? What are the main

attributes of this method?

p. 29: According to Bacon, what tendencies of human nature can get in the way of discovering truths about nature? How does he propose to overcome them?

pp. 30-31: What is Descartes' method? How does it differ from Bacon's?

pp. 31-34: What is reductionism? Why does Wilson think it's so great, and how does he argue for its superiority as a method? What might be some weaknesses or limitations of his argument?

pp. 34-36: How does Wilson define deism? How is it involved in the problem of "science versus religion," according to Wilson?

p. 37: What does Wilson say about the relationship between science and freedom? Do you think the dangers he suggests are real?

Key concepts: Enlightenment; Scientific Revolution; induction; deduction; reductionism; deism; atheism.

Random undefined words:

(23) "Terror": the period of the French Revolution in 1793-94 when the radical revolution took over and beheadings became common.

(23) Condorcet: a figure Wilson introduced earlier in the text. The Marquis de Condorcet was an ultimate Enlightenment figure—he believed that everything, including society, was subject to rational, discoverable laws, and that humanity was on a path to perfection.

A note on dictionary use: you should all own and use a dictionary. My rule of thumb about new words is: if a new word comes up once, you can probably get away without knowing it. If it comes up again, you probably need to look it up.

Week 2 (Week of Sept. 10): Newton

Betty Jo Teeter Dobbs & Margaret Jacob, *Newton and the Culture of Newtonianism*, 1-20, 38-60; Newton excerpts (Reader)

Introduction:

Your readings this week are among the most intense and difficult of the semester; please allot enough time to read and think about them. (A typical expectation for homework/classwork time at this university is an average of two hours of homework for every hour of class or lecture time. This varies greatly from course to course, of course. It would surprise me if the reading this week took you six whole hours, but it would not surprise me if it took you four or five, if you are reading carefully, taking notes, and trying to answer reading guide questions. Of course, study time outside of class may be devoted to other activities besides reading, such as: going over your class notes; doing written work required for your sections; thinking over the relationship between lectures and readings; assembling questions you want to go over in discussion.) To start, it would be a good idea to print out this reading guide and read through it twice, first before you start the readings, and again alongside the readings. (This is an unusually long and detailed reading guide this week because of the difficulty of the readings.) If you have already done the reading before receiving this, see if you can answer the questions. If not, take another look at the reading.

You have two readings for this week. The reading by Dobbs and Jacob, like that last week by E. O. Wilson, is a “secondary source,” a work by historians analyzing and interpreting events in the past. The selections from Newton’s *Principia* (1687) are called “primary sources”—the writings of the time that historians use as their main data. When you read a secondary source, you are getting both information and interpretation of the events of the past, and you should keep that in mind as you read. When you read a primary source, you get to be the historian, working to interpret the meaning of what the original author wrote. In both cases, you should practice reading actively and critically. I urge you not only to use a pencil, pen, or highlighter (if you’re thinking of selling your books at the end of the course, pencil marks that you can erase will get you a higher resale price), but also to make comments to yourself in the margin and take some notes on a separate sheet of paper that summarize the bigger picture and the main illustrative points, as well as jotting down any questions you have. This will help you when you return to the material for discussion and essay-writing.

Dobbs and Jacob, *Newton and the Culture of Newtonianism*

Newton and the Culture of Newtonianism is a collaboration by two leading historians of science, Betty Jo Teeter Dobbs (now deceased) and Margaret Jacob. Dobbs pretty much single-handedly rewrote our understanding of Newton’s life and thought with her dogged investigation of his alchemical work and her efforts to understand how it related to his now-familiar ideas in physics and mathematics. The revised picture of Newton that emerges from her work is reflected in the first half of the D&J book, which you are reading this week. (More on Jacob when we get to her half of the book.)

In writing about Newton’s thought, Dobbs seeks to show you how Newton’s ideas **drew from others and developed over time**. As you read, try to keep in mind this bigger picture; it will help you focus on the significance of each section in the overall sixty-page story, rather than

getting lost in the details. It should also help you figure out which information is really important and which you can probably not worry about getting fully. For instance, the section on pp. 28-31 is titled, "Newton's Discovery of Stoic Philosophy and His Later Alchemy." The existence of "Stoic Philosophy" in the section title suggests this is an important idea in the section. On the other hand, in this section, on p. 29 she writes that "most of his early alchemical sources were distinctly Neoplatonic in tone"—but she doesn't define "Neoplatonic." For readers who already know the term, this signals something, but since she doesn't bother going into details, you probably shouldn't spend time worrying about not knowing what it means if the term is new to you. If there are major historical references I think you should know that she doesn't define at all, I will define them at the end of the reading guide. If there are other terms you don't know and think you should, do look them up in a dictionary.

Reading Questions:

Introduction (pp. 1-2): what are the two "revolutions" of the seventeenth century that Newton experienced? Why is Newton considered one of the great men of science?

Part 1: Isaac Newton (1642-1727): Overall, what is the main theme that Dobbs sees as ruling Newton's intellectual life?

A good way to derive this answer from the various sections of this biographical sketch would be to write out the title of each section heading, followed by a few notes on the main substance of that section. Then step back and ask, "what role does this topic play in the larger story?" The questions below are designed to call your attention to the key concepts Dobbs introduces

pp. 8-12: What did Newton's concept of Truth encompass? What did he think was the best method for getting to it?

p. 13: What is the idea of the "aether"? Why was it useful to mechanical philosophers in the seventeenth century?

p. 14: What is an "active principle," and how is it different from a mechanical cause?

pp. 15-20: you do not need to know the details of these two sections, just their overall existence in the story of Newton's life and work. (Note that the apple story is mentioned here; it is also worth attending to the description of Descartes' system of vortices at the bottom of p. 17.)

pp. 21-27: What potential religious problem was perceived to exist with atomism (also called "corpuscularianism") in the seventeenth century? How did mechanical philosophers try to solve the problem? How did Newton try to solve the problem?

pp. 28-31: According to Dobbs, what did the Stoic philosophy offer to Newton? How did this relate to his alchemical work?

pp. 32-34: What was the chief contention of Arian theology? Why was it dangerous for Newton to be an Arian?

pp. 38-46: What problem(s) did Newton's *Principia* solve? What ideas did he introduce to solve

those problems? What problem(s) did his ideas open up?

pp. 46-56: How did Newton's ideas about gravity and the nature of matter change after the *Principia*? How were these changes connected to his religious views?

pp. 57-60: According to Dobbs, how did the Newtonian physics taken up by Newton's younger contemporaries and followers differ from Newton's own concerns?

Thought question: If Newton's theological ideas remained private and never became part of the intellectual legacy he handed on to others, is it really necessary to study them? If so, why? If not, why not? What does your answer tell you about your views on the purposes of studying history?

D&J Vocabulary:

p. 7: Renaissance: the self-conscious "rebirth" of the arts, literature, and learning undertaken by the humanists of the fifteenth and sixteenth centuries, in which they sought to recover and even surpass the heights of civilization reached by the ancient Greeks and Romans.

p. 7: Reformation: the religious movement of the sixteenth century aimed at reforming the Catholic church. It ultimately led to "Protestants" leaving the Catholic church, led most prominently by Martin Luther (hence the "Lutheran" church). The idea was to reform the church away from dependence on priests and church-based dogma and encourage the belief that every person could have a direct connection with God.

p. 21: Providence: God's foreseeing care for God's creatures. (adjectival form is "providential.")

p. 28: antiquity: the period of history before about 500 C.E. (usually referring to Roman or Greek antiquity).

Isaac Newton, *Mathematical Principles of Natural Philosophy*, tr. Andrew Mott, 1727.
Excerpts (Definition V, Laws, Introduction to Book III, and General Scholium).

*Note down any vocabulary confusions you have and bring them to class!

Definition V, Laws and Corollaries: I've included these so you can get the flavor of his reasoning. You don't need to read Corollary 2 carefully yet, though you might want to now.

In each case, you have a statement followed by a paragraph. a) What is the relationship between these two? Can you describe the sort of reasoning involved here? b) What claims about nature are embedded in this paragraph?

Rules of Reasoning: These are epistemological rules—that is, about how we are to use our human intellectual powers to understand the world.

a) What sources of information does Newton think you can use to obtain reliable knowledge?

b) What value does Newton place on observation and induction? On deductive reasoning? (Note that he even though doesn't use the latter term, he might still use the method.)

c) What is his problem with hypotheses?

d) Would you say that Newton follows his own rules?

General Scholium: What role does God play in Newton's system?

Week 3 (Week of Sept. 17): From Newton's Science to Newtonianism

Overview:

This week we are considering the broader Enlightenment culture in which Newtonianism played a prominent part. In terms of our big-picture question of how new knowledge of nature was assimilated into Western culture, this week plays a key role: we focus here on the ways in which different groups appropriated Newton's ideas and offered them to new audiences beyond simply those of natural philosophers. In lectures, readings, and discussions, we will consider the cultural values that came to be attached to Newton's ideas and to scientific thought in general in the eighteenth century.

For this week you are reading most of the second half of the Dobbs and Jacob book (pp. 61-101 and 104-110), along with a selection from Jean Desaguliers' *Course of Experimental Philosophy* (1734) in the reader. Desaguliers was one of the most successful Newtonian lecturers and one of D&J's prime examples.

Dobbs and Jacob: The second half of this book is devoted to the appropriation and interpretation of Newton's ideas from the 1687 publication of the *Principia* all the way up to the turn of the nineteenth century. This is Jacob's territory, and you can probably tell from the shift in writing style that it has a different chief author from the first half of the book. Notice that this section tends to range back and forth in time throughout the period covered. As far as possible, try to note when particular ideas or themes under discussion became prominent: is a given idea associated with a particular person or time, or is it being attributed to the whole Enlightenment period?

*Overall, how does Jacob characterize the relationship between Newton's ideas and "Newtonianism"?

pp. 65-71: Given Newton's own heretical private beliefs, how could the "holy alliance" (p. 68) between Newtonianism and Anglicanism come about? What did they have in common? More generally, according to Jacob, how did Newtonianism fit with the political and religious order in Britain after 1689?

71-95: According to Jacob, by what means and in what venues did Newtonianism spread? To which segments of society, in which countries? How many varieties of Newtonianism does she suggest there were? (You will have to ferret this out; she doesn't give a list anywhere.) With what values or assumptions were these Newtonianisms variously associated?

95-101: How does Jacob describe the relationship(s?) between Newtonianism and Christian belief? (Which sorts of Christian belief?)

104-110: What contrasts does Jacob draw between English natural philosophy and that in continental Europe (also called "the Continent"), particularly in France?

Desaguliers:

Preface: How does Desaguliers characterize Cartesianism (the philosophy of Rene Descartes)? On what grounds does he argue that Newton's approach to physics is better?

What methods does he think will yield true and reliable knowledge of nature?

What are the role(s?) of demonstration experiments, according to Desaguliers?

What does this Preface tell us about the broader social phenomenon of demonstration experiments and lectures?

Lecture III: Note that Plate 12, referred to on p. 120ff., is reproduced at the end of this reading.

What is the point of Desaguliers' discussion of machines (or "Engines," as he sometimes calls them), as exemplified by the crane?

If this discussion is to be understood as "Newtonian" (as would seem to be implied by the preface), what makes it so? How has Desaguliers broadened or shifted the parameters of "Newtonianism" from that represented by Newton's own work?

Compare the presentation of Newton's Corollary 2 at the end of the Desaguliers reading with the original Corollary 2 in the *Principia* (in the Newton reading for last week). The words are the same, but the lead-up is completely different. How would you describe the difference? What difference does this make for how we are to understand "Newton" versus "Newtonianism"?

Synthetic question: How does your own reading of Desaguliers jibe with Jacob's presentation of him, and of British Newtonianism in general?

Week 4 (Week of Sept. 24): Matter, Electricity, and Life

This week we are looking at two major mid-18th century developments in science that affected natural philosophers' views about matter. The lecturer-demonstrators of the mid-eighteenth century introduced spectacular and eye-popping new electrical phenomena with their equipment, leading to puzzled speculation about the nature of electricity. This is the subject of Tuesday's lecture. At just the same time, new experiments on the fresh-water hydra or polyp raised difficult questions about the nature of living matter (the subject of Thursday's lecture). Both are discussed in the context of Enlightenment science and religious belief in the article by Thomas Broman (a faculty member here in the Department of the History of Science). The three primary sources—Desaguliers on electricity and Gronovius and Trembley on the polyp—plunk you down into the time period and give you a sense for just how novel and bizarre these phenomena seemed to their investigators, as well as their modes of investigation. Note that the Desaguliers and Gronovius readings are both contributions to the *Philosophical Transactions* of the Royal Society of London, the leading English-language scientific journal of the period (and still one of the most prestigious general science journals), published for England's leading scientific society.

If you are curious to see more of what was being reported and discussed in the *Phil Trans.*, you can access it on-line at:

<<http://www.jstor.org/browse/02607085/.41-.50?config=jstor&frame=noframe&userID=80683180@wisc.edu/018dd5531800509fd09a&dpi=3>>. If you want to browse, a good place to start is the section titled "Front Matter," which includes the Table of Contents of any given volume. Or if you are frustrated at trying to download it, visit Memorial Library's Special Collections [top floor, Memorial Library] and look at it there (Call Number: AP R889 L84 P; give volume dates you are interested in. They let you look at 4 vols. at once.)

Thomas Broman, "Matter, Force, and the Christian World View in the Enlightenment."
Forthcoming in *Science and the Christian Tradition: Twelve Case Histories* (U. of Chicago Press, 2003)

1. What were the chief problems with the idea of "force" (in particular the gravitational force) that natural philosophers were grappling with in the late 17th and early 18th centuries?
2. What problems did the polyp present to naturalists and natural philosophers of the 18th century? How did this fit into larger issues about the nature of living matter?
3. What were the "subtle fluids"? How did the concept of "subtle fluids" alter natural philosophers' thinking about the nature of matter?

Jean T. Desaguliers, "Some Thoughts and Experiments concerning Electricity," *Philosophical Transactions of the Royal Society*, 1739-1741 [No. 453, July-Oct. 1739], 41: 186-193

1. What sort of method does Desaguliers set up for investigating electricity? Would you call it "Newtonian"? How so, how not?
2. What assumptions about the nature of electricity does Desaguliers reveal in this paper?

"Extract of a Letter from J. F. **Gronovius**, M. D. at Leyden, November 1742 to Peter Collinson, F. R. S. concerning a Water Insect, Which, Being Cut into Several Pieces, Becomes So Many Perfect Animals," *Philosophical Transactions of the Royal Society*, 1742-1743, 42: 218-220.

1. What does this letter tell you about the interest in the polyp beyond Trembley? What does it tell you about the way scientific news traveled in the eighteenth century?

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.

1. As you read this, keep the Desaguliers selection in mind. What preoccupations to Desaguliers and Trembley have in common?
2. Trembley describes his experiments and observations in extreme and vivid detail. What purposes might such elaborate description serve?
3. What problem for natural history did Trembley see the polyp as presenting? (Is this answer the same as your answer to Broman, question 2, or different?) How did Trembley try to resolve the problem through investigation? How did he end up resolving it intellectually?
4. What can the case of Trembley and the polyp tell us about how students of nature assimilate new information?

Vocabulary note: the word "insect" in the eighteenth century referred to small invertebrates in general.

Comparative/synthetic questions:

2. In what ways is it fair to call Desaguliers and Trembley "Newtonians"? In what ways do their investigations move beyond the categories of Newton's science?
3. What (if anything) do you find striking about the nature of the inquiry into electricity and the polyp presented here? Anything unexpected? Funny? Disappointing? What can your reaction to this reading tell us about our assumptions about science today versus the ways in which Desaguliers and Trembley were conducting his investigations in the mid-18th century?

ILS 202: Western Culture: Science, Technology, Philosophy II
Fall 2002

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Welcome to ILS 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 many of the key ideas of modern science. This course therefore explores 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 processes by which scientists and non-scientists have assimilated new information and changed their ideas about nature. We will see how scientific ideas have developed in relation to religious belief systems, on the one hand, 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 both to nature and also to their own material needs and belief systems; and
- ☞ to learn some basic scientific concepts, how they came into being, and how they have mattered in Western culture.

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 skills 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.

A note on lecture etiquette: once the lecture begins, you may not read newspapers, use headphones, or otherwise do obviously non-attentive activities. Cell phones must also be turned off. This is a matter of courtesy both to me and to others in the class.

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)
Four essays of approximately 1000 words each: 20% each. The last essay will ask you to draw on the course as a whole, with some emphasis on the final unit.

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*

(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.

IMPORTANT DATES:

Thursday, October 3: Essay 1 due

Thursday, October 24: Essay 2 due

Thursday, Nov. 21: Essay 3 due

Thursday, Dec. 19: Essay 4 due (exam period; exam due in TA box by 3 pm)

All essays are due **at lecture 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.

Academic Performance and Accommodation:

Extensions are only granted if requested before the due date, and only in case of illness or other serious emergency. (A printer failure does not qualify.) 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 (3.0 on a scale of 4), after one day it would receive a B/BC (2.75), after two days a BC (2.5), after three a BC/C (2.25), after four a C (2.0). **NOTE: LATE TAKE-HOME FINAL EXAMS WILL NOT BE ACCEPTED.**

Appealing a grade: If you have questions about a grade, you should first talk to the teaching 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 ILS Chair, Prof. Laura McClure. She 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.

Access and Accommodation: I will make every effort to honor requests for reasonable accommodations made by individuals with disabilities. (If you think you qualify for accommodation, please contact the McBurney Disability Resource Center [263-2741; <http://jumpgate.acadsvcs.wisc.edu/~mcburney/>] to establish your eligibility for services.) Requests for accommodation can be responded to more effectively if I receive them as far in advance as possible, preferably at the beginning of the semester. Such requests are confidential.

Religious Observance: If religious holidays or observances conflict with your participation in this course, please come talk to me **well in advance** for us to work out alternative arrangements.

If any other 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, or by leaving a message with the History of Science department administrator (262-1406).

Lecture/Reading Schedule
ILS 202 Fall 2002

Sept. 3 (1) Course introduction

UNIT I: SCIENCE AND THE ENLIGHTENMENT

Sept. 5 (2)	Legacies of the Scientific Revolution	Wilson (Reader)
Sept. 10 (3)	The Newtonian synthesis	Dobbs & Jacob, <i>Newton and the Culture of Newtonianism</i> , 1-60
Sept. 12 (4)	Newton's philosophy: method, matter, and metaphysics	Newton excerpts (Reader)
Sept. 17 (5)	Spreading Enlightenment	Dobbs & Jacob, 61-101, 104-110
Sept. 19 (6)	Science and Enlightenment in France	Desaguliers, <i>Course of Experimental Philosophy</i> (Reader); Newton corol. 2
Sept. 24 (7)	The nature of matter: from atomic attraction to subtle fluids	Broman, Desaguliers, Gronovius, Trembley (Reader)
Sept. 26 (8)	Living matter and the problem of the soul	receive 1st essay assignment 9/26

UNIT II: MACHINES AND ORGANISMS/INDUSTRIAL CULTURE AND ROMANTICISM

Oct. 1 (9)	Science and the industrial revolution	Dobbs & Jacob, 110-123
Oct. 3 (10)	The emergence of the scientist	1st essay due Thursday, 10/3
Oct. 8 (11)	Romantic Science	
Oct. 10 (12)	The new technologies of transportation and communication	Shelley, Otis, Secord (Reader)
Oct. 15 (13)	The energy concept in Britain: work and world view	Smith, Helmholtz, Russett (Reader)
Oct. 17 (14)	The animal machine: force and physiology	receive 2nd essay assignment 10/17

UNIT III: HISTORY AND PROGRESS: THE EVOLUTION OF EVOLUTION

Oct. 22 (15)	Progress and history	David Young (Reader)
Oct. 24 (16)	The History of the Earth and Life on It	2nd essay due Thursday, 10/24
Oct. 29 (17)	Temporalizing the Chain of Being	Review D. Young, 81-93; Darwin; R.
Oct. 31 (18)	Darwin's theory and its genesis	Young, parts I-IV (Reader)
Nov. 5 (19)	Scientific reception of Darwin's theory	R. Young, part V-end; Sedgwick, Owen,
Nov. 7 (20)	Darwinism and world-views	Gray (Reader); start Wells' <i>Time Machine</i>
Nov. 12 (21)	Social Darwinism	H. G. Wells, <i>The Time Machine</i> (all)
Nov. 14 (22)	The down-side of progress: Entropy and degeneration	receive 3rd essay assignment 11/12

UNIT IV: SCIENCE AND THE EXPERIENCE OF MODERNITY

Nov. 19 (23)	Science and the modern condition	3rd essay due Thursday, 11/21
Nov. 21 (24)	Modern time/space I	Kraepelin, Shlain (Reader)
Nov. 26 (25)	Modern time/space II	No reading; Thanksgiving
	Thanksgiving	
Dec. 3 (26)	The revolutions in physics	Millikan, Russell (Reader)
Dec. 5 (27)	Einstein's relativity	
Dec. 10 (28)	Cultural "relativity"	Review Readings
Dec. 12 (29)	The Big Picture: Taking the long view	receive final essay question Thursday, 12/12

Final essays due Thursday, December 19, by 3 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 think-work 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.

The A-F system translates on your transcripts into a 4-point scale, where A = 4, AB = 3.5, B = 3, BC = 2.5, C = 2, D = 1, and F = 0. On any given assignment, you may receive a grade that is different from one of these, reflecting a penumbra around each grade (e.g., the "B" grade might range between 2.76 and 3.25). Thus you can tell if your paper is at the high, middle, or low end of the grade range for any given assignment.

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>).