

Integrated Liberal Studies / History of Science 202
Western Culture: Science, Technology, Philosophy II
The Making of Modern Science

Spring 2008

3 Credits; N (Natural Sciences), ILS / H (Humanities), Hist. Sci.; E (Elementary).
2 hours lecture (1:20 pm MW, 5206 Social Sciences), 1 hour discussion.
Open to freshmen.

Instructor

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Course Description: This course offers an introduction to the history of the sciences between the work of Isaac Newton in the late seventeenth century and Albert Einstein in the early twentieth, with the aim of understanding how science came to be so important in modern culture. Investigating the historical significance of such fundamental scientific concepts as gravity, energy, and evolution, and the complex interrelations between theory and experiment, we study the diverse ways that scientific and social values have been interwoven in Western culture. We explore the changing relations among science and technology, science and religion and science and the state, and cross both disciplinary and national boundaries to investigate the rise of the laboratory-based sciences, the changing cultural status of the scientist, and the professionalization of the scientific disciplines.

Note that this course conveys either **Natural Sciences** or **Humanities credit**, a difference that will be reflected in the discussion sections and examinations in ILS and History of Science respectively.

Book List (University Bookstore, Underground Textbook Exchange, A Room of One's Own)

Peter J. Bowler and Iwan Rhys Morus, *Making Modern Science: A Historical Survey* (Chicago: University of Chicago Press, 2005) Required

Betty Jo Teeter Dobbs and Margaret C. Jacob, *Newton and the Culture of Newtonianism* (Amherst, NY: Humanity Books, 1995) Required

Course Reader Available for \$28.00 from History of Science Dept. Office, Social Sciences 7143. Note that the office is open from 8-3 M-R (with extended hours in the first two weeks of semester), and there are no refunds on the reader. Required.

Note: All reading materials are also available on reserve at the College Library.

Assessment

Assessment is through three take-home essay exams written on selected topics (75% of the total grade), and section participation (25%). The section participation grade will test your comprehension of both lectures and readings, and some informal writing will be required for discussion sections.

First Take-Home Exam (20%): Distributed Feb. 20; due Feb 27.

Second Take-Home Exam (25%): Distributed April 2; due April 9.

Final Take-Home Exam (30%): Distributed April 30; due 9:45 A.M. Sat. May 17.

Honors Assessment

Honors students will work on a project on images and objectivity in the history of science, the details of which will be finalized early in the semester. It will be completed by May 7, and is worth 20% of the overall grade.

Participation and Performance

If you have a conflict between an academic requirement and any religious observance, please notify me of the specific dates concerned within the first two weeks of the course and I will find an alternative means for you to fulfill the requirement. Such requests are confidential.

In compliance with the Americans with Disabilities Act, 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.

If any problems arise, either academic or personal, that might jeopardize your performance in the course, you must try to inform me of the problem at the next available office hour, or by leaving a message with the Department of the History of Science (262-1406).

Syllabus

Items from the two books on our Book List are referred to by name (eg. **Bowler and Morus**, pp. 23-45). The other material is in the Course Reader. The readings listed are core material and ideally should be read before the relevant lecture.

Part 1: The New Sciences

Jan. 23 Introduction and The Natural Machine

Bowler and Morus, Chap. 1, "Science, Society and History" (optional), pp. 1-20.

Discussion Section: Introductions (discussing Science, Society, History and Time)

Jan. 28 Francis Bacon and the Reconstruction of Science

Bowler and Morus, pp. 23-45.

Francis Bacon, *The New Organon* (1620), in *The New Organon and Related Writings* ed. Fulton H. Anderson (New York: Liberal Arts Press, 1960), pp. 33-49 and 93-103.

Jan. 30 René Descartes on Method

René Descartes, *Discourse on Method* (1637), as excerpted in Ralph M. Eaton, ed. *Descartes: Selections* (New Haven and London: Yale University Press, 1996), pp. 1-37.

Discussion Section: Framing the Scientific Revolution

Feb. 4 The New Societies

Bowler and Morus, pp. 322-326 (and, for a thematic overview, 319-322).

Feb. 6 Isaac Newton and the New Natural Philosophy

Isaac Newton, "A New Theory About Light and Colours," (1672), and Queries 28 and 29 from *Optics* (4th ed., 1730) as excerpted in William Francis Magie, ed. *A Source Book in Physics* (Cambridge, MA: Harvard University Press, 1963), pp. 298-308.

Dobbs and Jacob, pp. 1-34.

Bowler and Morus, pp. 46-52.

Discussion Section: Newton's prisms and the Royal Society – the "Crucial" Experiment

Feb. 11 Mechanics as a Model for Natural Philosophy

Dobbs and Jacob, pp. 34-60.

Isaac Newton, *Principia Mathematica Philosophiae Naturalis* (1687), as excerpted in Magie, *A Source Book*, pp. 30-46.

Part 2: From the Enlightenment Experiment to Industrial Revolution

Feb. 13 Newton, Newtonianism and the Age of Enlightenment

Dobbs and Jacob, pp. 61-110

Discussion Section: Newton's Mechanics and Enlightenment

Feb. 18 Benjamin Franklin and the Electrical Fluid

I. Bernard Cohen, *Benjamin Franklin's Science* (Cambridge, MA and London: Harvard University Press, 1990), "Benjamin Franklin's Scientific Style," pp. 14-30.

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

Feb. 20 The Chemical Revolution and the Enlightenment Balance

Antoine-Laurent Lavoisier, *Elements of Chemistry in a New Systematic Order, Containing All the Modern Discoveries*, trans. Robert Kerr (New York: Dover, 1965), pp. xiii-xxxvii and 1-7.

Frederic L. Holmes, "The 'Revolution in Chemistry and Physics:' Overthrow of a Reigning Paradigm or Competition between Contemporary Research Programs?" *Isis* 91 (2000), 735-753.

Bowler and Morus, Chap. 3, "The Chemical Revolution," pp. 55-78.

Note: First Take-Home Exam Distributed

Discussion Section: Airs and Gases and the New Chemistry

Feb. 25 Electricity and Life

Mary Shelley, *Frankenstein, or, The Modern Prometheus* (New York: Doubleday, 1999), pp. 55-76.

Feb. 27 Linnaeus, Gender, and Natural History

Lisbet Koerner, "Carl Linnaeus in his Time and Place," in N. Jardine, J.A. Secord and E.C. Spary, eds. *Cultures of Natural History* (Cambridge: Cambridge University Press, 1996), pp. 145-162.

Bowler and Morus, Chap. 21, "Science and Gender," pp. 487-509.

Note: First Take-Home Exam Due

Discussion Section: Science and Gender, Travel and the Environment

March 3 Humboldt's Global Physics

Michael Dettelbach, "Humboldtian Science," in Jardine, et al., eds. *Cultures of Natural History*, pp. 287-304.

March 5 Science and the Industrial Revolution: Watt's Steam Engine

D.S.L. Cardwell, *Turning Points in Western Technology: A Study of Technology, Science and History* (New York: Science History Publications, 1972), pp. 60-101.

Bowler and Morus, pp. 391-403.

Discussion Section: Science and the Industrial Revolution

March 10 The Rise of Energy Physics

Heinz Otto Stribum, "Reworking the Mechanical Value of Heat: Instruments of Precision and Gestures of Accuracy in Early Victorian England," *Studies in History and Philosophy of Science* 26 (1995), 73-106.

Bowler and Morus, pp. 79-95.

Part 3: The Age of Progress and the Rise of Evolution

March 12 Lamarck's Zoological Philosophy

Jean-Baptiste Lamarck, *Zoological Philosophy: An Exposition with Regard to the Natural History of Animals* (1809) trans. Hugh Elliot (Chicago and London: University of Chicago Press, 1984), pp. 106-127.

Bowler and Morus, pp. 129-138 (including Cuvier's response to Lamarck).

Discussion Section: Energy and Progress

March 15-23 Spring Recess: No Class

March 24 Time and Change in Geology

Charles Lyell, *The Principles of Geology, Vol. I* ed. Martin J.S. Rudwick (Chicago and London: University of Chicago Press, [1830] 1990), pp. 1-4 and 75-91.

Bowler and Morus, Chap. 5, "The Age of the Earth," pp. 103-127.

March 26 Charles Darwin's search for a Vocation

David Young, *The Discovery of Evolution* (Cambridge: Cambridge University Press, 2nd ed., 2007), pp. 102-129.

Bowler and Morus, pp. 137-149.

Discussion Section: Darwin's Predecessors

March 31 The Devil's Chaplain

Film showing: "The Devil's Chaplain," (Timewatch, 1991).

Charles Darwin, *On the Origin of Species* (Cambridge, MA: Harvard University Press, 1964), pp. 1-6, 80-87, 126-130, 459-490.

April 2 Darwin's Theory of Evolution

Robert M. Young, *Darwin's Metaphor: Nature's Place in Victorian Culture* (Cambridge: Cambridge University Press, 1985), "Darwin's Metaphor: Does Nature Select?" pp. 79-125.

Note: Second Take-Home Exam Distributed

Discussion Section: The Origin of Species

April 7 The Reception of Darwin's Theory

Bowler and Morus, pp. 149-162, 341-343 and 354-360.

Ernst Haeckel, *The History of Creation: Or the Development of the Earth and Its Inhabitants by the Action of Natural Causes* (New York: D. Appleton, 1887), pp. 1-23.

April 9 Man, Race and Evolution: The Question of Progress

Francis Galton, *Hereditary Genius: An Inquiry into Its Laws and Consequences* (London: Macmillan, 1914; 1st ed. 1869), pp. 325-337.

Diane Paul, *Controlling Human Heredity: 1865 to the Present* (Amherst, NY: Humanities Press, 1995), pp. 22-49.

Note: Second Take-Home Exam Due

Discussion Section: Debating Darwin – Knowledge and Social Control

April 14 The Development of the Human Sciences: Measuring Man

Bowler and Morus, Chap. 13, “The Emergence of the Human Sciences,” pp. 299-316.

Franz Boas, “Human Faculty as Determined by Race,” (1894) in George E. Stocking, Jr., ed. *The Shaping of American Anthropology 1883-1911: A Franz Boas Reader* (New York: Basic Books, 1974), pp. 219-242.

Part 4: The Laboratory Sciences and the Modern World

April 16 Electricity and Magnetism: Telegraphy and the Empire

Bowler and Morus, pp. 403-414.

Bruce J. Hunt, “Doing Science in a Global Empire: Cable Telegraphy and Electrical Physics in Victorian Britain,” in Bernard Lightman, ed. *Victorian Science in Context* (Chicago and London: The University of Chicago Press, 1997), pp. 312-333.

Discussion Section: The Human Sciences and The Physics of Empire

April 21 Standards, Networks, and the Rise of the Teaching Laboratory

James Clerk Maxwell, “Introductory Lecture on Experimental Physics,” in *The Scientific Papers of James Clerk Maxwell*, ed. W.D. Niven (Cambridge: Cambridge Univ. Press, 1890), 241-255.

Graeme Gooday, “Precision Measurement and the Genesis of Physics Teaching Laboratories in Victorian Britain,” *British Journal for the History of Science* 23 (1990), 25-51.

April 23 Science in the United States: Surveys and Standards

Daniel J. Kevles, *The Physicists: The History of a Modern Scientific Community in America* (Cambridge, MA and London: Harvard University Press, 1995), pp. 25-59.

Discussion Section: Science in the United States

April 28 Rowland and Michelson: Pure and Practical Physics

A.A. Michelson and E.W. Morley, “On the Relative Motion of the Earth and the Luminiferous Ether,” (1887) as excerpted in Magie, *Source Book*, pp. 369-377.

H.A. Rowland, “The Highest Aim of the Physicist,” (1899) in Spencer R. Weart, ed. *Selected Papers of Great American Physicists* (New York: American Institute of Physics, 1976), pp. 91-103.

April 30 Time and Space circa 1905: Einstein's Theory of Relativity

Peter Galison, "Einstein's Clocks: The Place of Time," *Critical Inquiry* 26 (2000), 355-389.

John Stachel, "'What Song the Syrens Sang': How did Einstein Discover Special Relativity?" in John Stachel, *Einstein from 'B' to 'Z'* (Boston, Basel and Berlin: Birkhäuser, 2002), pp. 157-177.

Note: Final Take-Home Exam Distributed

Discussion Section: Einstein and the Cultures of Time and Space

May 5 Einstein's Relativity and its Reception

David Cassidy, *Einstein and Our World* (Amherst, NY: Humanity Books, 1998), pp. 35-47.

May 7 Einstein and the Legacies of the Great War

Bowler and Morus, pp. 463-468.

Fritz Stern, "Einstein's Germany," in G. Holton and Y. Elkana, eds. *Albert Einstein: Historical and Philosophical Perspectives* (Princeton, NJ: Princeton University Press, 1982), pp. 319-343.

Discussion Section: Modern Science

Saturday May 17 Final Examination Due (9:45 A.M.)

Grading Criteria for Essays

- A: For outstanding essays only. The 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). The relationships drawn between facts and ideas are sophisticated, subtle, and/or original. The writing is grammatically correct and succinct, and the argument flows well from point to point. Not a word is wasted!
- AB: For very good essays that for some reason fall short of the criteria described above. The argument may be murky at one point; information may be presented that doesn't directly or clearly contribute to the argument; the writing style may be awkward occasionally, or flawed by one or two consistent (if minor) grammatical errors.
- B: The basic good grade. The essay may pursue a straightforward but not particularly deep or sophisticated argument; it is okay as far as it goes, but doesn't penetrate into the material very far. It may have a flash of brilliance that isn't brought to fruition, because it is counterbalanced by a weakness in argumentation, minor grammatical problems, 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 thinking, or by 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 continually 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 here to show that you have attended a few lectures and/or done some of the reading, but the essay indicates no attempt at synthesis or thinking on your own, or 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; if it consists primarily of 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 is grounds for automatic failure on an assignment. If you use three or more words in a row from another source, the phrase must be placed in quotation marks and footnoted. Otherwise it is plagiarism. For more on what constitutes plagiarism and how to avoid it, consult *A Pocket Style Manual* by Diana Hacker, or the UW-Madison Writing Center website.

ILS / History of Science 202
Honors Project: Images and Objectivity in the History of Science
Spring 2008

Here we discuss the history of objectivity as this is revealed through the atlases and images of scientific publications. One facet of the project will involve reading a major new book on the subject, and participating in an online discussion of themes it raises. A second facet will involve each student choosing an image of particular interest and posting it online to enable us all to contribute to understanding when and how it was produced, what it was designed to illustrate, and its significance in the field to which it belongs. The final task will be to write a synthetic essay of 5-7 pages, due Wednesday May 7, describing the place of your chosen image in the history of scientific practice and conceptions of objectivity.

Our book is: Lorraine Daston and Peter Galison, *Objectivity* (New York/Cambridge, MA: Zone Books 2007), available at the University Book Store (though possibly not right at the beginning of the course), and on reserve at the College Library.

Daston and Galison focus in particular on the illustrations contained in scientific atlases, identifying a transition from images that sought to be true to nature (often idealized representations of a typical specimen), to an ideal of mechanical objectivity (for example, a photograph of one specimen, warts and all). This they relate to the changing identity of scientists, from the early eighteenth to the mid twentieth century. We will discuss the book in three different units (discussing chaps. 1-3 between Feb. 4 and Feb. 20; chaps. 4-6 between March 3 and April 2; and chap. 7 – and the topic of images and objectivity as a whole – between April 9 and April 30).

Each student will be asked to **contribute at least one original comment on the book in each of the three discussion units**. In one of the first two discussion units, in addition to discussing the book you will **post online an image of your own choosing**, indicating the central features of its production and describing briefly why you regard it as interesting.

In addition each student will **respond to at least one comment and one image, in the first two discussion segments**, and **respond to at least one comment in the final discussion segment**. So our online discussion is designed to generate a collaborative conversation that moves between the book and images.

Identifying an interesting image, you are welcome to choose one that Daston and Galison illustrate (in which case you will seek to learn as much as you can about the image by investigating its original context yourself), or to choose one from our course materials, or to locate your own. You need not confine yourself to atlas images in the way that Daston and Galison do (and might well consider whether the fact that the image did or did not appear in an atlas is critical to understanding its significance).

Assessment

The honors project is worth 20% of your overall grade, divided as follows:

1/5 each: virtual discussion of the book and your images, in three sessions*

2/5: synthetic essay

In addition, I will hold one in-person, face-to-face discussion, near the end of each discussion unit. You must attend at least one of these. They will be held on Tuesday February 26 at 4 PM; Thursday March 27 at 11 AM; and Friday April 25 at 3:30 PM (at different times of the week so that schedules allow everyone to attend at least one). If it is

impossible for you to make one of these times, please contact me.

*To fulfill your requirement for the virtual discussion you must:

1. Pose an open-ended discussion question concerning the different chapters of the book under consideration, on the discussion portion of a 202 course website. This should be a question aimed at eliciting a discussion, not one where you ask what happens in the rest of the book or ask someone to define something.
2. Post one image for discussion within either of the first two discussion segments, describing briefly the context in which it was produced (when and by whom it was made, what it is designed to illustrate) and identifying why you find it interesting.
3. Respond thoughtfully in each discussion segment to at least one other person's discussion question (and/or the comments presented in the same thread as that question); and to at least one other person's image in the first two segments.

A thoughtful question (whether or not anyone replies to that question), a single thoughtful response, and, if applicable, a thoughtful image posting, will earn you a grade of at least a "B" for that discussion segment. To earn a higher grade, there are several options:

- a) continue the discussion further in the same thread or image you first responded to;
- b) respond to others' responses to your question;
- c) engage with more than one question thread or image.

(Note that I reserve the right to collate threads if it turns out that a number of the lines of discussion fall together.)

All discussion contributions must be signed, and all contributions must show respect for the views of others even if you disagree with someone else.

In grading you on the discussion, I will pay particular attention to the quality of your questions and comments, the sophistication you show in grappling with the broader questions this book and your image raise; and to evidence that you finished reading the book.

Schedule

You may submit to the discussion within the following dates:

Chaps. 1-3, from 2/4 to 2/20

Chaps. 4-6, from 3/3 to 4/2

Chap. 7, from 4/9 to 4/30.

You must attend one face-to-face meeting (in Social Sciences 7130) on either:

Tuesday February 26 at 4 PM

Thursday March 27 at 11 AM

Friday April 25 at 3:30 PM.

The synthetic Honors essay is due Wednesday May 7, at lecture.

Our Virtual Discussion: Posting Online

All honors students will be added to the **ILS 202** learn@UW class website, and the discussion forum is located under the discussion section as “Honors Project: Images and Objectivity.” You will be able to contribute discussion on the topics: “Images to Consider” and “Discussing Daston and Galison, Chaps 1-3,” and etc.

The procedure in discussing the relevant chapters of the book is simple. The topic is listed on the website and you are able to read existing messages and add your own messages. These can be viewed in a threaded format preserving the order of replies and postings.

Since students are not able to post images directly to class websites at UW, we will follow a two-step procedure to make your images accessible.

1. Email me a copy of your **image** as an attachment, saved as a jpg file with a resolution appropriate to web displays, e.g. 72ppi. In the body of your email include your **comments** describing the production of the image and the reasons it interests you. My email address is: rastaley@wisc.edu
2. I will post the image and your comments in a single message to the “Images to Consider” topic, with the title: “From [your name].”

You and fellow students will then be able to view and respond to your image by adding messages to the topic. These too can be displayed in a threaded format, and it is possible for replies to any given message to include the original message (which may be helpful when making a point closely related to the image itself).

Research Resources

In many cases the works that Daston and Galison cite themselves will provide the first step in exploring either the particular images they discuss, or the themes and issues they raise – so follow endnotes! But there are also several helpful resources for those looking for images or interested in the visual culture of science or objectivity.

Images

Our library system has many atlases of the kind Daston and Galison investigate. Another good source of images is:

Album of Science, vols. 1-4 (New York: Scribner, 1978) Special Collections (Memorial Lib.): Reference, Non-circulating Q126 A468 1978.

Local exhibits might spark your interest:

The Kohler Art Library is hosting “The Scientist’s Eye: Dialogues between Art & Science. An Exhibition of Artist and Rare Books from the Kohler Art Library and Special Collections (Memorial Library),” from Jan. 14 to Feb 16. See <http://art.library.wisc.edu/exhibits/index.html>

Many of the exhibits at the Special Collections of Memorial Library have drawn on resources from the history of science, including the current exhibit on “Stormy Weather,” from Nov. 2007- Feb. 8, 2008. See <http://specialcollections.library.wisc.edu/exhibits/>

On the Visual Culture of Science

Elizabeth Edwards, *Raw Histories: Photographs, Anthropology and Museums* (Oxford; New York: Berg, 2001).

Peter Galison and Caroline A. Jones, eds. *Picturing Science, Producing Art* (New York: Routledge, 1998).

Ann Shteir and Bernard Lightman, eds. *Figuring It Out: Science, Gender, and Visual Culture* (Dartmouth College Press/University Press of New England, 2006).

Jennifer Tucker, *Nature Exposed: Photography as Eyewitness in Victorian Science* (Johns Hopkins University, 2005).

Edward R. Tufte, *Visual Explanations: Images and Quantities, Evidence and Narrative* (Cheshire, Conn.: Graphics Press, [1997] 2000).

Two recent course syllabi offers an overview, and an upcoming conference may be of interest:

Prof. Joe Dumit, MIT course syllabus on “Science, Technology, Medicine and Visual Culture:” <http://web.mit.edu/dumit/www/syl-vis.html>; and on “Scientific Visualization Across Disciplines: A Critical Introduction:” <http://ocw.mit.edu/OcwWeb/Science--Technology--and-Society/STS-067Spring-2005/Readings/>

The Visual Culture Cluster at UW-Madison is hosting a public conference on “Visualizing Science” on February 7-8, 2008. For information see <http://www.visualculture.wisc.edu/Events/0708/newdirections.htm>

On Objectivity

There’s a great deal of philosophical discussion of objectivity. The following book offers an important historical study of statistics and objectivity:

Theodore M. Porter, *Trust in Numbers: the Pursuit of Objectivity in Science and Public Life* (Princeton: Princeton University Press, 1995).

ILS / History of Science 202
Honors Project: On a Topic of Your Choice
Spring 2008

Honors students have the option to develop an independent project on a topic of their choice in consultation with myself (and perhaps also with others interested in pursuing independent projects). We will meet together (or as a group) to outline ideas for a project, talk about progress and the issues it has raised, and then to present a final product. This is a chance to take up an interest in alchemy and science, the religious implications of Newton's work, or anything else that takes your fancy in the history of science between Newton and Einstein. (It need not be something we deal with in class.)

Progress

I hope that over the next couple of weeks you will be able to choose a topic and begin making headway on a project. To help in that process I have included below a brief guide to general research resources. There are often more specific guides for particular areas (like topics in the history of physics, or medicine, for example) which you should search out with the help of librarians, or ask me about.

We will meet together or as a group at least three times, at times to be arranged:

1. Early in the semester, to discuss topic choices. This will be a chance to describe one or two possible topics, giving some idea of the resources available and how you envisage investigating a field or pursuing a line of argument. Meeting together should allow us to help refine each other's ideas and offer valuable suggestions.
2. In the middle of the semester, to discuss progress and the issues raised by your work in more concrete detail.
3. Towards the end of the semester, for project presentations.

But certainly feel free to contact me at any stage of your work – just phone or email me to arrange a meeting.

Assessment

Your formal tasks are

I. To submit an essay of 10-15 pages, double spaced and documented.

Or:

II. To give a 10 minute presentation on a topic of your choice to your section (or honors colleagues), with 5 minutes for questions. The form and character of the presentation is up to you, but think about how best to present your research to others. In addition you would then submit a shorter written paper of 7-10 pages (double spaced and documented).

Written work is to be submitted by Wednesday May 7, at lecture; the Honors project will be worth 20% of your overall grade.

Research Resources

As you refine your topic and begin research it is helpful to work on two fronts: investigating primary sources (books, letters etc. from the people, period, and subject you are interested in) and secondary sources (the approaches that historians and others have taken to the material before you).

Primary Sources

I can't recommend too strongly the importance of using a variety of materials from the period or field in which you are interested in order to build historical understanding. We are particularly fortunate because the UW-M library system has excellent collections of relevant books, journals, and manuscript holdings. If you are interested in Newton, read more widely than the brief excerpts in the Course Reader; if you want to know how Darwin's work was received, read the writings of his supporters and critics; to gauge how science plays into popular culture browse through newspapers like the *Illustrated London News* or *McClure's Magazine*. The Special Collections Department of Memorial Library has a number of excellent History of Science collections, including materials from chemistry, alchemy, glaciology, Joseph Priestley's publications, and a small collection of Newton's own books. Go to their website <http://specialcollections.library.wisc.edu/> and look under Collections for more details. Robin Rider, the Curator and Head of the Department, is a historian of science and will be very willing to help interested students if you make an appointment. Likewise the Historical Services Department of the Ebling Library (Health Sciences) has extremely good resources. The curator, Micaela Sullivan-Fowler, offers individual mentoring and even keeps a supply of M&Ms on hand for needy researchers.

Secondary Sources

It is also extremely helpful to know how others have approached a field in order to refine and broaden your understanding. Your TA and I can help with suggestions. For a far more inclusive coverage that we can offer, there is an internet bibliography of books and articles in history of science, medicine and technology with the nickname Eureka. RLIN's History of Science and Technology (HST) database contains entries in the annual bibliographies published in *Isis* from 1975 to the present; from the Current Bibliography of the History of Technology (published in *Technology and Culture* annually) from 1987; and from the annual Italian bibliography (*Bibliografia Italiana di Storia della Scienza*) from the summer of 1997.

How to get there:

1. From the Libraries homepage go to E-Resource Gateway: Article Databases and More
 2. In the By Name search look for History of Science, Technology, Medicine
- Please note that for older material you should go directly to the cumulative bibliographies of the journals *Isis* or *Technology and Culture*. And of course there are many other bibliographies that will help you navigate through literature on a topic. Research librarians will often have invaluable suggestions on ways to approach your interest.

There are also several reference works that provide orientations to individuals and/or topics in the history of science. Valuable general references include:

Dictionary of Scientific Biography and other national and subject area dictionaries of biography

Companion to the History of Modern Science, eds. R.C. Olby, G.N. Cantor, J.R.R. Christie, and M.J.S. Hodge, (London: Routledge, 1990)

Science in the Twentieth Century, eds. John Krige and Dominique Pestre, (Amsterdam: Harwood Academic, 1997)

The Reader's Guide to the History of Science, ed. A. Hessenbruch, (London: Fitzroy Dearborn, 2000)

Web Resources

The History of Science Society runs a web site with many links to History of Science related websites: http://www.hssonline.org/teach_res/resources/mf_resources.html ECHO (Exploring and Collecting History Online) incorporates an index of more than 5,000 websites related to the History of Science, Technology, Medicine, and Industry, many with excerpts and annotations. Go to <http://echo.gmu.edu/>

Finally

Enjoy the fruits of history, the taste of research – and find a good way to communicate them!

