SCIENCE & SOCIETY

From the Age of Newton to the Age of Darwin

HIS 295-02; Spring 2014
Mon, Wed, Fri: 10:00-10:50 am; Noyce 1245

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Spring Office Hours:
Mon, 1:30-3:30 pm
Thur, 10-11:45am

Course Overview

This course examines the rise of modern science from the transformative period of Isaac Newton and the scientific revolution to the time of Charles Darwin (c. 1660-1880). During this key period, science not only emerged as the most authoritative form of knowledge, but also began to exert a powerful influence on the fabric of western society. Over the course of the semester, we will explore how revolutionary developments in the physical, biological and human sciences were connected to profound changes in the social, political, and economic world, such as the emergence of the Enlightenment, the industrial revolution, new forms of imperialism and statecraft, religious debates, and the growing emphasis on racial and sexual difference.

The course readings focus on the historical factors that have shaped how scientific knowledge was constructed; how and why it gained assent; and how different groups have employed this knowledge to serve particular ends. Our goal, therefore, is not simply to understand how science has shaped society, but also to probe how social and ideological factors have structured the world of science itself, conditioning the kind of knowledge it produces. As we shall see, even fields like mathematics or the "hard" physical sciences cannot be fully understood without an appreciation of the social context surrounding them.

Given the vast scope of our topic, the course follows a case-study approach that explores four key facets of modern science: experimentation, measurement, classification, and visualization. Each unit of the course, therefore, represents a unique "story" about how a particular set of knowledge-making practices were shaped by social and historical forces, and in turn, how the science they produced transformed important aspects of the world around them. By tracing the rise of experimentation, for example, the readings and documents illuminate how the new culture of experimental philosophy was tied to political crises of the seventeenth century, the creation of new social spaces and audiences for the Enlightenment of the eighteenth century, and the industrial world of the nineteenth century. I have tried to choose readings that will cover a diverse spectrum of scientific fields, geographic regions, social groups, and types of media, while still offering a cohesive picture about the larger trends at work.

Required Texts

The following required texts can be purchased at the Campus Bookstore, and should be widely available from other online vendors. A copy of each will also be placed on 1-day reserve at Burling Library:

- **Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, NJ: Princeton University Press, 1985 or 2011).
- Ken Alder, *The Measure of All Things: The Seven-Year Odyssey and the Hidden Error that Transformed the World* (New York: Free Press, 2003).
- D. Graham Burnett, *Trying Leviathan: The Nineteenth-Century New York Court Case that Put the Whale on Trial and Challenged the Order of Nature* (Princeton & Oxford: Princeton University Press, 2007).

Note: There are a number of shorter articles, essays, and primary sources that are also required reading for the course. These will be distributed in two course packets during the semester.

**You can also access a free electronic version of *Leviathan and the Air-Pump* through the ACLS Humanities E-book series (a link is available through Grinnell College's library catalogue: https://cat.lib.grinnell.edu:443/record=b1998443~S1).

Course Requirements & Policies

Class Sessions & Participation

Over the course of the semester, the vast majority of our time will be devoted to class discussion. We will typically discuss the readings as one group, although there will be several occasions where we will break down into smaller groups to facilitate the conversation or focus on a4ns2 (2 (l)-2 a)4 (4ns2 (

session, and will use the overall average to calculate your participation grade. I will also email you a participation grade every two weeks so that you are aware of where you stand in this respect. And please feel free to come and talk with me if you have questions or concerns about how you are doing in class discussions (or about ways to improve your participation).

Class Attendance

If you cannot attend class, and would like to make up the lost participation grade, you can email me a short response essay (a couple of paragraphs) addressing one of the discussion questions for that particular day. It must be sent within one week of the missed class. If you are unable to attend multiple classes because of significant medical or personal issues (or because of travel connected to college approved activities), please contact me directly and we will work out an appropriate arrangement.

Four Short Papers (3-5 pages)

There are no exams in this class. Instead, you will be required to write 4 concise essays that demonstrate your grasp of the material in each section, and your ability to analyze historical sources in light of these issues. I will distribute the essay prompts and guidelines for each assignment at least 10 days before hand. All written work will be submitted electronically through the drop-box function on our pioneer web course module.

Extensions & Late assignments

Late papers will receive a deduction of 1/3 of a letter grade per day. Exceptions may be made for extraordinary medical or personal issues. Each student is also allowed a **one time extension** in which they may turn in a written assignment up to a week after the deadline without incurring any penalty. You should email me in advance so that I am aware that you plan to use your extension for a particular assignment. Note that the college requires ALL coursework to be submitted by the end of exam week (unless you are taking an incomplete in the class); so nothing will be accepted after this date.

Paper Rewrites

The honing of writing skills is a major focus of this class and the written assignments. Accordingly, everyone has the *option* of rewriting each paper once & submitting it for an entirely new grade. For more details, see the "Guidelines for Revising Essays" on Pioneer web (under the Assignment tab).

Disabilities:

If you have specific physical, psychiatric or learning disabilities and require accommodations, please let me know early in the semester so that your learning needs may be appropriately met. You will need to provide documentation of your disability to the Associate Dean and Director of Academic Advising, Joyce Stern, whose office is located in Rosenfield Center (x3702).

Religious Holidays:

The religious observance policy of the college states:

Week 2:

Week 5: Mathematics as the New Language of the Universe

Mon (Feb. 17th): Thomas Kuhn, "The Function of Measurement in Modern Physical Science,"
Alexandre Koyré, "An Experiment in Measurement,"

Wed (Feb. 19th): Clifford Conner, "How was Nature 'Mathematized'?,"
Londa Schiebinger, "Scientific Women in the Craft Tradition,"

Fri (Feb. 21st): James Joule, "On the Mechanical Equivalent of Heat,"
Charles Babbage, "On Tables of the Constants of Nature and Art,"

Week 6: The Measure of Enlightenment

Mon (Feb. 24th): Alder, *The Measure of All Things*, prologue & ch. 1-2 (pp. 1-67).

Wed (Feb. 26th): *The Measure of All Things*, ch. 3-4 (pp. 69-123).

Fri (Feb. 28th): *The Measure of All Things*, ch. 5 (pp. 125-159).

Week 7: Precision, Objectivity, and Error

Mon (Mar. 3rd): Alder, *The Measure of All Things*, ch 6-8 (pp. 161-233).

Wed (Mar. 5th): *The Measure of All Things*, ch. 9-10* (pp. 235-89).
*chapter 10 can be skimmed

Fri (Mar. 7th): *The Measure of All Things*, ch. 11 (pp. 291-323).

Week 8: A Calculating World

Mon (Mar. 10th): *The Measure of All Things*, ch. 12 & epilogue (pp. 325-350)
Theodore Porter, "Making Things Quantitative,"

Wed (Mar. 12th): Group A: Miles Ogborn, "Excise Geographies,"
Group B: William Ashworth, "'System of Terror': Samuel Bentham, Accountability and Dockyard Reform during the Napoleonic Wars,"

Fri (Mar. 14th): TBA

Second Paper due Friday, March 14th by 9:00 pm

Section III:

The Power of Classification

Week 9: The Classifying Impulse

Mon (Mar. 31st): Peter Dear, “A Place for Everything: The Classification of the World,”

Section IV
Visualizing Knowledge

Week 12: New Graphic Techniques

Mon (Apr. 21st): Tom Koch, *Cartographies of Disease: Maps, Mapping, and Medicine* (excerpts)

Wed (Apr. 23rd): Frederick Holmes & Kathryn Olesko, "The Images of Precision: Helmholtz and the Graphical Method in Phy