CORE 124: Revolutions in Scientific Understanding (Part I)

TLC 023   |   Tuesdays & Thursdays, 9:30–10:45 AM   |   website: http://blackboard.uidaho.edu/

Instructors

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Course Plan & Learning Objectives

What is science? At its most fundamental level, it is an attempt to understand our world. But even from this simple suggestion, difficult questions arise concerning the nature of understanding, explanation, progress, and objectivity. How has our conception of science and the methods of science changed through time? Can we make sense of scientific knowledge growing gradually or are outmoded paradigms instead simply replaced? What was the “scientific revolution” and what was so revolutionary about it?

To address these sorts of historical and philosophical questions properly, we’ll need to acquaint ourselves with some history of science. In the Fall semester, we’ll trace the development of science from its ancient roots through around the 19th century (the Spring term will slow this breakneck pace somewhat to concentrate on the biological sciences). You will thus develop your ability to collect and synthesize information from a large amount of written text. You will learn and integrate knowledge about scientific practice and philosophical method. We will spend a significant amount of time developing your skill at careful thinking and writing. Expect to be seriously challenged by this course — but expect also to greatly improve your abilities as a university student and scholar.

Requirements

Learning is a private and public business. In the private sphere, I can only urge you to own your learning: don’t read and study to pass the final; study to increase your knowledge, understanding, and abilities. In the public sphere, you have a responsibility (as part of a classroom community) to assist in others’ learning by coming prepared and willing to participate in the discussion in an informed and thoughtful way. What lecturing we do — and it won’t be a tremendous amount — will not make much sense unless you have done the reading for class carefully. That’s not to say that you shouldn’t have questions about it. In fact, a regular requirement will be to keep a written Reading Journal in which you jot down what you find most important or interesting, questions or points you want to bring up in class. We will not collect these on a regular basis, but rather do random and unannounced checks. Your best bet for receiving a decent grade on this assignment will thus be to stay current (with entries for at least every class meeting). You may keep your journals either electronically or on paper, but in either case, they must be available for checking; you will have your journal with you in class or keep it current on the Blackboard site — failure to do so when a check occurs will result in a failing mark for that check; retroactive marks or extensions will not be given (unless accompanied by a written excuse from a doctor or university official such as a dean, professor, or coach). However, we shall drop your lowest mark from this assignment.

There will be five or so (2 page) written assignments, two of which will be re-writes. Your lowest score on the short essays will be dropped (but only if you complete all the assignments). For your final essay, you will take one of these short assignments and expand it into a longer (5–8 page) research paper.

There will be regularly scheduled short quizzes on the main features of the reading and lecture/discussion. We will also occasionally impose short unannounced (AKA “pop”) quizzes to provide further incentive for staying on top of things. There will also be an hour-final exam.

We have high expectations of you: that you attend each class, that you engage with the discussion, that you complete work on time (late assignments will be penalized by 5% of a grade per partial day late1). You may expect of us in return to be willing and available outside of class to help you make the transition from high school to university. We will happily read drafts, discuss questions/issues, and help you sort out your thoughts. You are always welcome without an appointment at our office hours — if you cannot make them, we can always figure out an alternative time. While you may of course stop by our offices unannounced, be prepared to be rebuffed occasionally if we are occupied with other matters. Professor Slater can also be contacted on IM from time to time (at mslater@uidaho.edu) for short questions or for arranging meetings and will set his IM status to “Distractible” when he is in his office and can easily set down his other work.

1 For example, say you turn a 100-point assignment in a few hours (but less than a day) late; and suppose you score 80 points. Your score will be penalized 5% of the total possible score (or 5 points) to a 75. If it is turned in two days late, it goes down 10% to 70, and so on.
Assessment Summary

Assessment will be based on a point-system (600 points total) to make determining where you stand grade-wise as simple as possible for you. In addition to these, extra-credit assignments may be made available.

Active, Productive, and Informed Participation: 60 points total
- You are expected to be present (on time) for each class and active in discussion (but not dominating)

Journal Checks 40 points total
- at random intervals, graded on simple scale:
  - ‘pass’, ‘needs improvement’, ‘not completed’, or ‘exemplary’ (bonus points)

Midterm: 50 points
5–6 Quizzes (some of which may be "surprise", one of which will be dropped) 100 points
Short Written Assignments: 200 points
Final Essay: 100 points
Final Exam: 50 points
600 points total

Grades: A range (540–600 pts), B range (480–539 pts), C range (420–479 pts), D range (360–419 pts), F (<360 pts).

Required Texts

Please buy a copy of the following texts, all available at the UI bookstore:
- Ferris, *Coming of Age in the Milky Way*
- Gribbin, *The Scientists*
- Matthews, *The Scientific Basis of Modern Philosophy*
- Kuhn, *The Structure of Scientific Revolutions*
- Other readings will be made available online.

Sources and Academic Honesty

There are lots of sources of information on the web concerning the topics in this class. And you’re welcome to make use of them so long as you keep two things in mind. First, obviously, any source that is cited or consulted must be acknowledged as such. Second (also pretty obvious!): not all sources are equal in accuracy, reliability, worth, &c. Remember if you consult sources such as Sparknotes, Cliffnotes, Wikipedia, and various course webpages from other universities that these are not “refereed publications” and so not trustworthy. You’ll do better to look at mainstream publications, or some of the various Internet Encyclopedias (see website for links).

Students who plagiarize or commit any other form of academic dishonesty will receive at a minimum a zero on the work in question. Action may also be taken in the Student Judicial system. In terms of citing sources and using quotations, when in doubt, cite. Unless otherwise instructed, you must include a Works Consulted/Cited page even if your only source was the primary source upon which your essay focuses. Cite correctly all materials used including primary sources, textbooks, materials from the internet, and lectures.

Reasonable Accommodations

Students who require accommodation should notify one of us in the first week of class. All accommodations must be approved through Disability Support Services (DSS) located on the third floor of the Idaho Commons Building (208-885-7200; dss@uidaho.edu). If you need accommodations, we will be happy to work with you and DSS, and will do our best to support you in your work.

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2 This is not to say that they are inaccurate, just that there are relatively few measures take to ensure that they are accurate.
3 We will discuss appropriate conventions in class, but an excellent source that you will likely find useful for your entire university career is G. Harvey’s *Writing with Sources*. For the Dean of Students’ Academic Integrity site which includes UI Policies, and Student Academic Dishonesty Resources see http://www.students.uidaho.edu/default.aspx?pid=45708.
The document provides a rough schedule of readings for a course, emphasizing that it is subject to change and not to be kept. Readings are designated by authors: Ferris's *Coming of Age in the Milky Way* with 'F', Gilbert's *The Scientists* with 'G', and Matthews' *The Scientific Basis of Modern Philosophy* with 'M'.

**The Beginning: Ancient Attempts at Understanding Our World**
(readings for this first section of the course will be made available online at the Blackboard site)

1. **August 21st** | Introduction: What is Science? What are Revolutions?

2. **August 23rd** | Creation Myths

3. **August 28th** | Philosophies of Nature

4. **August 30th** | First Writing Workshop
   - Quiz #1

**Cause and Explanation**

5. **September 4th** | Natural Geometry and its Discontents
   - Selections from Plato and Aristotle (PDF)
   - Essay #1 Due

6. **September 6th** | Explanation and Teleology
   - Selections from Aristotle's *Physics* and *Posterior Analytics* (in Matthews, pp. 7–32); Matthews' introductory material is optional.
   - Selections from Lucretius, *The Nature of Things* (PDF)
   - Ferris, *Coming of Age in the Milky Way* (henceforth 'F'): Chapter 1

7. **September 11th** | Résumé / Synthesis

8. **September 13th** | Second Writing Workshop
   - Quiz #2

**Early Scientific Revolution**

9. **September 18th** | The Raising and Lowering of the Roof, Discovery of the Earth
   - F: Chapters 2–3

10. **September 20th** | Copernicus and the Calendar
    - Gribbin, *The Scientists* (henceforth 'G'): pp. 3–18
    - Essay #2 Due

11. **September 25th** | The Human Sciences Broached
    - Hippocratic Writings (PDF)
    - G: pp. 19–32

12. **September 27th** | Résumé / Synthesis
    - Quiz #3

**Scientific Method**

13. **October 2nd** | Empiricism and Rationalism
    - Boyle's Experimentalism (G: pp. 134–142)
    - Descartes, selections from the *Discourse on Method* (M: pp. 92–94)
    - background on Descartes (G: pp. 107–118) — optional
    - Selections from the writings of William of Ockham (PDF)

14. **October 4th** | The Sun Worshipers
    - F: Chapter 4
    - G: Chapter 2 — optional

15. **October 9th** | The First Scientists
    - Gilbert and Galileo (G: pp. 68–82)
MECHANISM AND THE EXPERIMENTAL PHILOSOPHY

17. October 16th | Galileo and the Invention of the Telescope
   - G: pp. 85–92
   - F: pp. 83–89
   - Peer Review of Essay #3 Due

18. October 18th | Galileo’s Publications
   - G: pp. 97–103
   - F: pp. 90–101
   - Selections from The Assayer, Dialogues, and Discourses (M: pp. 56–86)

19. October 23rd | Galileo and the Church
   - Galileo’s “Letter to the Duchess Christina” (PDF)
   - Brecht, Galileo (short play) — optional
   - Quiz #4

20. October 25th | Résumé
   - Essay #4

THE NEWTONIAN REVOLUTION & BEYOND

21. October 30th | Hooke, Halley, and Newton
   - G: pp. 149–188 (skim biographical details), 190–202
   - F: Chapter 6

22. November 1st | Absolute Space and Time
   - Newton’s “Scholium on Absolute Space and Time”, “Rules of Reasoning”, and “General Scholium” (M: 146–153)

23. November 6th | Expansion of the Universe
   - F: Chapter 7–8

24. November 8th | The Problem of Induction
   - F: Chapter 9

25. November 13th | Einstein’s Relativistic Revolution
   - F: Chapter 10

26. November 15th | Résumé

Thanksgiving Break

REVOLUTION & PROGRESS

27. November 27th | Kuhn, The Structure of Scientific Revolutions, Chapters 1–4

28. November 29th | Kuhn, The Structure of Scientific Revolutions, Chapters 5–7
   - Quiz #5

29. December 4th | Kuhn, The Structure of Scientific Revolutions, Chapters 8–10

30. December 6th | Résumé
   - Final Essay Due