

History and Philosophy of Science

Fall 2012

Syllabus-Draft

Updated version of the syllabus can be found at

<http://thehangedman.com/teaching/2012/history-and-philosophy-of-science/>

Course Information

HIST/PHIL 3328 History and Philosophy of Science and Medicine

Fall 2012 M/W 10:00am–11:15am

Professor Contact Information

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Office Hours TBA

Course Pre-requisites, Co-requisites, and/or Other Restrictions

This course is an upper-level course in the humanities, and presupposes the basic skills of reading, analyzing, and writing at an academic level. No particular knowledge of philosophy or the sciences is presupposed, but students unused to reading and writing about difficult, sometimes fairly technical material are urged to consult with the professor early and often.

Course Description

Science plays an enormously influential role in our society. As a social institution, it commands enormous respect and social influence, as well as vast sums of funding. It produces results that are greatly sought after, for both good and ill. At the same time, science generates great controversy when it collides with various religious, economic, and educational agendas. The adjective “scientific” garners almost immediate respectability to whatever it is applied, and, in some circles, it is a prerequisite for being taken seriously. Yet to many it also bespeaks alienation, abstraction, and a void of meaning, useless in our attempt to understand values. Some even deride science as mere ideology and power-mongering, as sexist, racist, or elitist.

Science is open to interpretation and critique; as a result, it stands in need of explanation, elaboration, justification, limitation, or change. History and philosophy of science attempts to understand how and why science works, to explain its successes and occasionally uncover its failures, to interpret its results, and to discover, what, if any, are its limits. Historians and philosophers of science also try to situate science in the broader scheme of human activities and social institutions, and to understand the way in which our particular cognitive, social, political, and moral situation impacts its development.

In this course, we will try to better understand what counts as science and explore whether we can demarcate science from non-science or pseudo-science. We will ask what the *aim* of science is, what it is trying to produce. We will explore a variety of challenges to our common ways of understand how and why science works, as well as challenges to whether science works as we believe that it does. We will explore the too-often ignored connections between the scientific process and our ethical and political values, attempting to determine whether and to what extent such human values play a role in science, and to what extent such a role is legitimate and compatible with the objectivity or reliability of scientific knowledge.

Student Learning Objectives/Outcomes

1. Students will analyze and interpret a significant body of primary works in philosophy of science.
2. Students will develop their ability to read, analyze, and write about complex texts.
3. Students will demonstrate knowledge of the major questions and traditions in the philosophy of science.
4. Students will be able to critically analyze and discuss the nature of, value of, and challenges to science as an intellectual and cultural institution.

Required Texts

Books are on order at **Off Campus Books** (561 West Campbell Road near Fuzzy's)

- *Philosophy of Science: The Central Issues* by Curd and Cover (WW Norton) [C&C]
- *Theory and Reality: An Introduction to the Philosophy of Science* by Peter Godfrey-Smith (University of Chicago) [PGS]
- *The Structure of Scientific Revolutions (50th Anniversary Edition)* by Thomas Kuhn (SSR)
- Online readings at the course website. [OR]

Schedule of Topics and Readings

0. Introductions

M 8/27

- What is Philosophy of Science? History of Science?
- Why Do We Want a Theory of Science?

- Why History and Philosophy of Science?
 - PGS 1.1-1.4
- Syllabus Review

I. What is science?

In this class, we will consider some very basic ideas about the nature and history of science, as well as the attempt by philosophers and others to explain the difference between science and non-science or pseudo-science.

W 8/29

- *A Very Brief History of Science*
 - PGS 1.5
- *The Common Conception of the Scientific Method*
 - Stephen S. Carey, from *A Beginner's Guide to Scientific Method* [OR]
 - PGS 2

W 9/5

- *Science as a Process and Practice*
 - Peter Medawar, “Is the Scientific Paper a Fraud?” [OR]
 - John Dewey, from *How We Think* [OR]
 - Going Further: Frederick Suppe, “The Structure of a Scientific Paper” [OR]; Peter Lipton, The Best Explanation of a Scientific Paper [OR]; Allan Franklin & Colin Howson, Comment on “The Structure of a Scientific Paper” [OR]; Frederick Suppe, Reply to Commentators [OR]; Matthew J. Brown, “John Dewey’s Logic of Science” [OR]; Frederick Grinnell, from *The Everyday Practice of Science* [OR]

M 9/10

- *The Process of Science in Action: John Snow’s Research on Cholera*
 - Goldstein and Goldstein, “Snow on Cholera” [OR]

W 9/12

- *Demarcating Science - Philosophical*
 - Karl Popper, “Science: Conjectures and Refutations” [C&C]
 - Imre Lakatos, “Science and Pseudoscience” [C&C]
 - PGS 4, 7.2
 - *For the Perplexed*: Sven Ove Hansson, “Science and Pseudo-Science” [OR]
 - *Going Further*: Paul Thagard, “Why Astrology Is a Pseudoscience” [C&C]; Thomas Kuhn, Logic of Discovery or Psychology of Research? [C&C]; Paul Churchland, “How Parapsychology Could Become a Science” [OR]

M 9/17

- Demarcating Science - Practical
 - Susan Haack, “**Trial and Error: The Supreme Court’s Philosophy of Science**” [OR]
 - *Going Further*: Michael Ruse, ”Creation-Science Is Not Science“ [C&C]; Larry Laudan, ”Commentary: Science at the Bar—Causes for Concern“ [C&C]; Ruse, ”Response“ [C&C]

II. The Aims of Science

Part of understanding what science is involves understanding what it aims at, what its distinctive goals are. In this unit, we consider a variety of proposals for the what science aims at.

W 9/19

- *The Aim of Science is Explanation*
 - Carl G. Hempel, “Two Basic Types of Scientific Explanation” [C&C]
 - PGS 13.1-13-2
 - *For the Perplexed*: Rudolf Carnap, ”The Value of Laws: Explanation and Prediction” [C&C]
 - *Going Further*: Carl G. Hempel, The Thesis of Structural Identity; Carl G. Hempel, Inductive-Statistical Explanation; Peter Railton, A Deductive-Nomological Model of Probabilistic Explanation; David-Hillel Ruben, ”Arguments, Laws, and Explanation” [All in C&C]

M 9/24

- *The Aim of Science is Unified Knowledge*
 - **Kitcher - “Explanatory Unification”** [OR]
 - Paul Oppenheim and Hilary Putnam, ”Unity of Science as a Working Hypothesis” [OR]
 - PGS 13.3
 - *Going Further*: Carnap, ”Logical Foundations of the Unity of Science“ [OR]; John Dupré, ”Metaphysical Disorder and Scientific Disunity” [OR]

W 9/26

- Class is cancelled

M 10/1

- *The Aim of Science is to Discover the Laws of Nature*
 - A. J. Ayer, “What Is a Law of Nature?”
 - PGS 13.4
 - *Going Further*:

W 10/3

- ... Not Laws of Nature, but Causal Powers
 - Nancy Cartwright, [Do the Laws of Physics State the Facts?] [C&C]

M 10/8

- The Aim of Science is Significant Truth
 - Philip Kitcher, from *Science, Truth, and Democracy*

III. Challenging Science

In this unit, we will discuss a variety of historical, philosophical, and sociological challenges to science. Some are legitimate challenges to the authority of science itself, but most attempt to leave that unchanged while challenging our understanding of *why* science is successful or authoritative. We will examine the following provocative challenges to science or our theories of science.

W 10/10

- Induction cannot be Justified
 - David Hume, from *An Enquiry Concerning Human Understanding*
 - PGS 3

M 10/15

- Theory is Underdetermined by Evidence
 - Pierre Duhem, “Physical Theory and Experiment” [C&C]

W 10/17

- Observation is Theory-Laden
 - Norwood Russell Hanson, “**Observation**” [OR]
 - PGS 10.3

M 10/22

- Scientists are Dogmatic
 - Thomas Kuhn, “**The Function of Dogma in Scientific Research**” [OR]
 - Thomas Kuhn on Normal Science, [SSR] Ch. I-V
 - PGS 5

W 10/24

- Scientific Revolutions are Revisionary
 - Kuhn [SSR] Ch VI-IX
 - PGS 6.1-6.2
 - Going Further: Larry Laudan, “Dissecting the Holist Picture of Scientific Change” [C&C]

M 10/29

- Science Does Not Progress Towards the Best Theory
 - Kuhn [SSR] Ch X-XIII & Postscript
 - PGS 6.3-6.5
 - Going Further: Ernan McMullin, "Rationality and Paradigm Change in Science" [C&C]

W 10/31

- Science Has No Method
 - Paul Feyerabend, from *Against Method* [OR]
 - PGS 7.4-7.5
 - **Halloween!** Come dressed up, in honor of epistemological anarchism!

M 11/5

- Scientific Theories are Incommensurable
 - Paul Feyerabend, "How to Be a Good Empiricist: A Plea for Tolerance in Matters Epistemological"
 - PGS 7.6

W 11/7

- Science Has No Special Authority
 - Paul Feyerabend, "How to Defend Society Against Science"

M 11/12

- Science is Socially Constructed
 - Bruno Latour, "Laboratories" [OR]
 - PGS 8

W 11/14

- Science is Sexist
 - Kathleen Okruhlik, "Gender and the Biological Sciences" [C&C]
 - PGS 9

M 11/19-11/21

- *Fall Break!*

IV. Values in Science

M 11/26

- Values and the Will to Believe (William James)

W 11/28

- Scientists Make Value-Judgments (Rudner / Hempel)
 - Richard Rudner, “The Scientist Qua Scientist Makes Value Judgments” [OR]
 - Carl Hempel, “Science and Human Values” [OR]

M 12/3

- Science is Insulated from Non-Epistemic Value-Judgments
 - Thomas S. Kuhn, “Objectivity, Value Judgment, and Theory Choice” [C&C]
 - Ernan McMullin, “Values in Science” [OR]

W 12/5

- Underdetermination, Objectivity, and Values in Science
 - Helen E. Longino, “Values and Objectivity” [C&C]
 - Elizabeth Anderson, “Uses of Value Judgments in Science: A General Argument, with Lessons from a Case Study of Feminist Research on Divorce” [OR]

M 12/10

- The Inductive Risk Argument Against Value-Free Science
 - Heather Douglas, “Rejecting the Ideal of Value-Free Science” [OR]

W 12/12

- How Far Do Values Influence Science?
 - Matthew J. Brown, “Values Beyond Underdetermination and Inductive Risk” [OR]

Grading

Assignments

1. Class Participation (9 pts) - Class attendance, quality of contributions to the life of the class. 5pts + Participation (4.0 scale) - Absences - (1/2) * Tardies
2. Homework and In-class Assignments (5)
3. Midterm Exam (8)
4. Peer-Mark Assignments (5) - Several times during the semester, students will provide feedback on early stages of their research papers.
5. Research Paper (18) - Details TBA. Grade includes not only final paper but work throughout the semester.

Final Grades

Final grade will be calculated on a 4.0 scale by taking your points divided by ten. So, for example, a student with a 33 would have a 3.3 or a B+. 41+ points is an A+, 38+ points is an A, 35+ points is an A-, 32+ is a B+, 28+ is a B, 25+ is a B-, etc.

Grading Standards

1. Indicates *excellent* work, going beyond the expectations of the course to display subtle and nuanced understanding, clear and effective presentation, and intellectual rigor, insight, creativity, and sophistication.
2. Indicates *good* work, thoughtful and careful, clear and consistent, without major errors.
3. Indicates *adequate* or *average* work that meets all basic course expectations, but may involve unclear writing, lack of sophisticated understanding, or unsupported or insufficiently developed ideas. Some serious errors may be present.

Work which deserves a grade less than C will display some of the following problems: it fails to show adequate understanding of the text; it fails to understand the assignment; it fails to articulate a coherent or adequate argument; it fails to reflect on the content of the course; it displays such pervasive grammatical errors as to be highly obscure in meaning.

Late Work / Make-Up Exams

No late work or make-up exams will be allowed without consent of the professor *prior* to the due/exam date, except in situations where University policy requires it.

Class Attendance Policy

While reading and writing are crucial parts of the course, the central philosophical activity is live discussion. While class will occasionally involve bits of lecture, this is merely an instrument to a more well-informed discussion and other structured activities. **Attendance is thus considered mandatory.** Missed classes will count against your participation grade, and egregious absenteeism will be grounds for an **F** in the course at the professor's discretion. In-class assignments and activities likewise cannot be made up unless the professor agrees to it before the class is missed. Disruptive late arrivals or early departures are poor classroom citizenship and will also negatively impact your participation.

Further standard University policies can be found at <http://go.utdallas.edu/syllabus-policies>

These descriptions and timelines are subject to change at the discretion of the Professor.