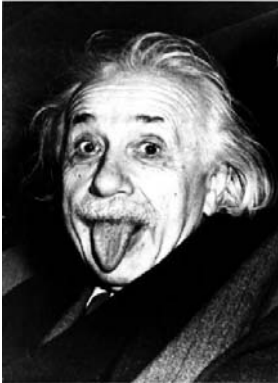


PHIL 2400H: Philosophy, Science, and Nature



Fall 2007
MWF, 12:20–1:10 pm
219 Peabody Hall

Instructor: Yuri Balashov

Office: 124 Peabody Hall
Email: yuri@uga.edu
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Office hours:
Mon & Fri: 11:00 am – 12:00 pm
and by appointment

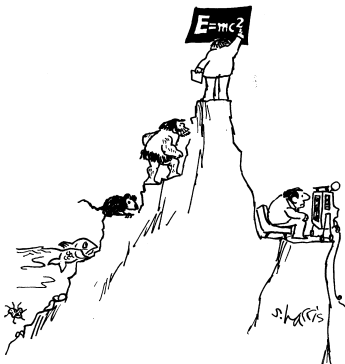


Course Website: <http://yuri.myweb.uga.edu/phil2400h.html>

Philosophy of science is one of the central areas of contemporary philosophy. It deals with philosophical problems raised by science and with the implications that science has for traditional philosophical problems. *General* philosophy of science is concerned with problems common to all or most sciences. For example: Is scientific knowledge superior to other kinds of knowledge? If so, what makes it so? What does it mean to explain something in science? Is scientific belief cumulative over time, or is it subject to evolution or catastrophic change? Does the (often spectacular) empirical success of scientific theories give us sufficient reason to believe in the existence of unobservable entities postulated by them (quarks, genes, tectonic plates, etc.).

Besides general philosophy of science, there are “philosophies” of particular sciences: physics, biology, psychology, economics, and others. These sub-disciplines of the philosophy of science focus on particular foundational and conceptual problems arising in the historical development and current state of the special sciences. Not surprisingly, some of these problems are closely entangled with the more general issues studied by the general philosophy of science.

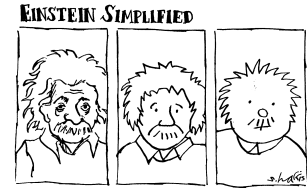
This course is primarily devoted to the philosophy of physics. But it draws on the resources of the general philosophy of science as well. The main purpose of the course is to introduce you to a major transformation in our views of space and time precipitated by Albert Einstein’s Theory of Relativity. We will focus on the conceptual foundations, as well as broader methodological, philosophical, and perhaps even cultural implications of this theory.



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Relativity Theory is undoubtedly one of the greatest achievements of the human intellect.

In popular opinion, this theory is obscure and shrouded in mystery and paradox. In fact, however, Special Relativity (SR) is remarkably clear and is more accessible to the non-specialist audience than is commonly believed. The basic concepts of SR can be learned using a vivid language of spacetime diagrams employing very little mathematics, but also without unduly sacrificing rigor.



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Historically, the way to SR was paved by critically reassessing some of our deeply entrenched intuitions about space, time, and motion in light of certain unexpected experimental findings. In learning SR, we can do no better than retrace some crucial steps Einstein and other famous physicists made in their fascinating intellectual journey to this theory. By the end of the course you will be prepared to accept initially counterintuitive concepts and results of SR as natural outcomes of a new way of thinking about space and time.

FORMAT:

- Lecture and discussion. Student class presentations. Class participation will be strongly encouraged.

TEXTS:

- Robert Geroch, *General Relativity From A to B*. Chicago, 1978
- Leo Sartori, *Understanding Relativity*. Berkeley: University of California Press, 1996
- Additional notes and handouts will be available on the course WWW site:
<http://yuri.myweb.uga.edu/phil2400h.html>

REQUIREMENTS:

- Several problem sets (45%)
- Midterm in-class exam (20%)
- Final take-home exam (20%)
- Group presentation (10%)
- Class participation (5%)

ATTENDANCE, OFFICE HOURS AND OUTSIDE HELP:

There is no formal attendance requirement. But you will *not* succeed in this class unless you are *with it* at any moment. I will have regular office hours (Mon & Fri: 11:00 am – 12:00 pm) and will also be available at other time (by appointment). Please understand that my office hours are for you to use. Of course, if you have difficulty understanding the readings or the lectures, you are especially encouraged to see me. Such difficulties are best handled when they are addressed immediately. At the same time, do not expect any help from me outside class if you do not attend class.

SCHEDULE, READINGS AND ASSIGNMENTS (FOR THE FIRST HALF OF THE CLASS):

- Aug 17, F — Introduction. The impact and significance of the theory of relativity. Readings: None.
- Aug 20, M — Introduction. Course overview and mechanics. **Completed questionnaire due.** Readings: Sartori 1–5.
- Aug 22, W — Events and space-time. Introduction to the Aristotelian framework. Readings: Geroch 3–10. **Introductory problem/question set due** (not to be graded).
- Aug 24, F — Objects and processes in the Aristotelian space-time. Readings: Geroch 11–28; Sartori 139–141.
- Aug 27, M — Objects and processes in the Aristotelian space-time: Light and its propagation. Readings: Geroch 28–36.
- Aug 29, W — **Problem set #1 due.** From the Aristotelian to Galilean space-time. Readings: Geroch 37–45; Sartori 5–12.
- Aug 31, F — TBA
- Sept 3, M — No class. Labor Day.**
- Sept 5, W — No class. I will be at a conference.**
- Sept 7, F — No class. I will be at a conference.**
- Sept 10, M — The Galilean view: a “democratic framework.” Readings: Geroch 45–52; Sartori 12–16.
- Sept 12, W — The Galilean view: a “democratic framework.” Readings: Geroch 45–52; Sartori 12–16 (again!).
- Sept 14, F — **Problem set #2 due.** Intermission-I: Philosophical reflection on the ideas of relativity, invariance, perspectivalism, and objectivity. Readings: None.
- Sept 17, M — Difficulties with the Galilean view. Electromagnetic phenomena. Propagation of light. Ether theories. Readings: Sartori 26–29.
- Sept 19, W — Historical background of special relativity. **Student presentation:** The Michelson-Morley experiment. Readings: Sartori 17–19; 26–46.
- Sept 21, F — Historical background of special relativity—cont’d. The postulates of relativity. Readings: Sartori 19–21, 48–54.

Sept 24, M — Historical background of special relativity—cont'd. The postulates of relativity. Readings: Sartori 19–21, 48–54 (again!).

Sept 26, W — Intermission-II: How are scientific theories created, and how do they get confirmed and refuted by experiment?

Sept 28, F — The postulates of relativity: the Lorentz transformations. Readings: Sartori 97–103*.

Oct 1, M — Review and catch-up.

Oct 3, W — **Midterm Exam, Part I.**

Oct 5, F — **Midterm Exam, Part II.**

Oct 8, M —

Oct 10, W —

Oct 12, F —