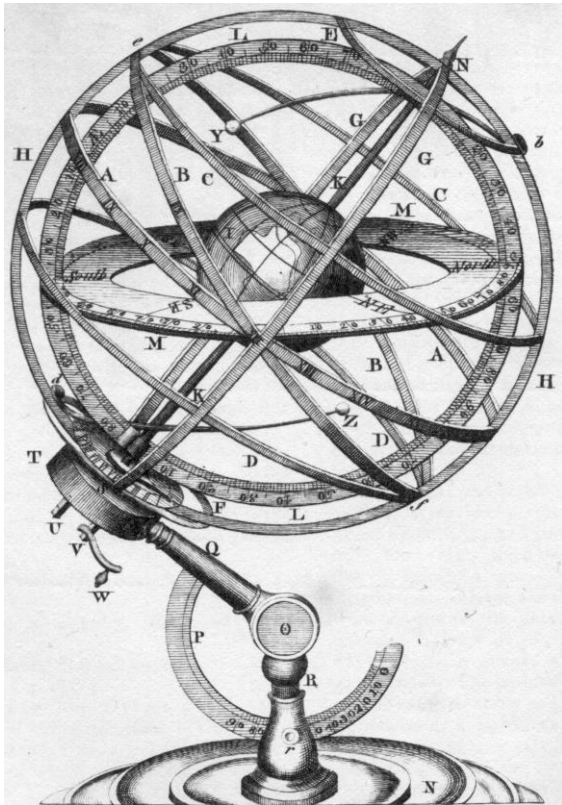


Philosophy of Science (PHI 4400)

W-F, 10:00-11:50 a.m.
SO/300



Armillary sphere

Instructor: Dr. Marina P. Banchetti

Office: SO 280

Contact Information: 297-3816 or
banchett@fau.edu

Office Hours: M, 10:00 a.m.-12:00 p.m.
M, 1:00-3:00 p.m.
W-F, 2:00-3:00 p.m.

Textbooks Required:

Anthony O'Hear, *An Introduction to the Philosophy of Science* (Oxford: Oxford University Press, 1989).

Peter Godfrey-Smith, *Theory and Reality: An Introduction to the Philosophy of Science* (Chicago: The University of Chicago Press, 2003).

All other required and recommended readings and videos are posted on Blackboard.

Course Credit Hours, Pre-Requisites, Co-Requisites, and Role in Curriculum:

This 3-credit course fulfills the 20th century philosophy requirement for the philosophy major. There are no official pre-requisites for this course. However, since this is an advanced philosophy course that deals with science in some detail, background in philosophy and science are highly recommended.

The glossary of philosophical and scientific terms that is attached to the end of this syllabus is designed to supplement, not to replace, the recommended background in these disciplines.

Current Catalog Description:

This course is an examination of the central concepts of the theory of knowledge within the context of scientific investigation; the nature and structure of scientific knowledge, the nature of formal reasoning, the role of observation, the function of models, the nature of perception, scientific explanation, scientific truth, probabilistic and inductive inference and the nature of causal laws.

Course Objectives:

The objective of this course is to provide an overview of the main issues in contemporary philosophy of science. These issues include the nature and goals of scientific explanation, the validation of scientific knowledge, the historical development of scientific knowledge, and the ontological import of scientific knowledge.

The questions covered under these topics include: "What form do scientific explanations take?", "How do we validate theoretical hypotheses?", "What is the distinction between normal science and revolutionary science?", and "Are the postulated entities of science to be taken as real, existing entities (even when they are unobservable in principle) or, rather, are they (along with the theory of which they form a part) to be taken as instruments for the achievement of certain scientific goals?"

The course will also provide students with an understanding of the activity of philosophy: How philosophers ask questions, how they think about and attempt to answer them, and how they critique the answers given by others as they provide their own alternative answers.

Academic Expectations:

IMPORTANT: As a professor, I have high academic expectations from students. My courses are conducted as University-level courses, not as extensions of high school classes.

All students in my courses are expected to have successfully made the transition from high school to University and are expected to demonstrate:

- Intellectual and personal maturity
- Serious attitude
- Clear priorities
- Self-discipline
- Commitment
- Work ethic
- Time management skills

These intellectual and personal traits are imperative for success in this course. One important difference that distinguishes college level classes from high school classes is that, in college, the

burden of the educational effort is on the shoulders of the student -- the professor conveys information and answers questions, but it is the student's responsibility to become an "active" learner.

Another difference is the amount of study time that is required for a class. The traditional college norm is that, for every credit hour (i.e., standard 50-minute period) per week spent in the classroom, a student should plan on spending at least two hours per week, outside the classroom, learning the subject matter of the course.

Florida Atlantic University conforms to the above-described expectations. Therefore, students in this course will be expected to complete at least two hours of course work outside of class for every one credit hour, that is, at least eight (8) hours of studying outside of class (reading, reviewing, or otherwise studying the material until it is fully mastered).

Students are expected to come to class prepared, that is, they are expected to have read and digested the reading assigned during the previous class period and to have reviewed previous lecture notes. Classes will be conducted with the assumption that students are fully prepared in this manner.

If a student is unable to purchase the textbooks at the beginning of the semester, it is his/her responsibility to find a way to access the assigned readings until he/she is able to purchase the books. No excuses will be accepted for not completing the required reading in a timely manner and as assigned.

Attendance is not taken in this class. However, given the abstract and complex nature of the subject matter, students are strongly advised to maintain perfect attendance, to arrive on time, and not to leave early (see also the "Policy on Classroom Conduct" on p. 5 of this syllabus).

Course Mechanics:

Each class period will consist of lecture and discussion of the assigned readings.

Reading assignments, video viewing assignments, quiz dates, or exam dates will not be announced in class or by e-mail. All of this information is listed in the 'Course Outline', which begins on p. 7 of this syllabus. Students should, therefore consult the syllabus regularly in order to keep up with the work in this course.

The "Glossary of Terms" at the end of this syllabus is designed to assist students unfamiliar either with philosophical terminology, scientific terminology, or both. Please refer to this glossary if you encounter unfamiliar terms in the assigned readings or in class. The glossary is not exhaustive. Thus, if a particular term is not defined in the glossary, please do not hesitate to ask the professor to explain its meaning.

Course Evaluation Method:

Quizzes

There will be regular quizzes based on assigned readings and class lectures. The purpose of these quizzes is to allow students to regularly assess their progress in the course and to identify any areas in which further study is required.

The quiz dates are listed in the 'Course Outline', along with the material covered by each quiz.

Quizzes may be administered either at the beginning or end of class. Students are, therefore, strongly advised not to be absent, not to be late for class, and not to leave class early.

There will be 10 quizzes and the average of these quizzes is worth $\frac{1}{4}$ (25%) of the class grade, and student will receive a '0' for each quiz that is missed.

Exams

There will be an exam after each major segment that is covered, for a total of four (4) exams. These exams may be a combination of multiple choice/true-false, short answer, and/or essays questions. Each exam is worth $\frac{1}{4}$ (25%) of the class grade. Students will receive a '0' for each missed exam.

Study guides for each of the exams (including the final exam) are posted on Blackboard. The study guides list the concepts and ideas for which students will be responsible on the exams.

The exam dates are listed in the 'Course Outline'. Students will receive a '0' for each missed exam.

Final Exam

There will be no cumulative final exam. Instead, Exam #3 will be given on the scheduled date for the final exam, which is **Wednesday, December 14, 7:45-10:15 a.m.**

Grading Policy:

- Quiz Average: 25%
- Exam #1: 25%
- Exam #2: 25%
- Exam #3: 25%

Grading Scale:

100-92: A
91-90: A-
89-88: B+
87-82: B
81-80: B-
79-78: C+
77-72: C
71-70: C-
69-68: D+
67-62: D
61-60: D-
Below 60: F

Make-up policy:

The dates for all quizzes and exams are listed on the syllabus, and students will receive a '0' for each missed quiz and/or exam. There will be no make-up work permitted for a missed quiz or exam, unless this is due to a University-approved absence (see "Attendance and University Absence Policy", on p. 7 of this syllabus, for a list of approved University absences).

As per University policy, if a quiz or exam is missed due to another University-approved absence, the student is responsible for notifying the professor prior to the date of the examination and to bring written documentation to justify the absence.

If a quiz or exam is missed due to illness, the student is responsible for bringing written documentation, signed by a medical professional, upon his/her return to University.

In either of these cases, the professor will arrange for the student to make-up the missed exam during the professor's office hours.

Extra-Credit Policy:

There will be absolutely no extra credit work permitted in this course.

Policy on Incompletes:

The following University policy on grades of incomplete will be strictly followed:

Should a student need to request an 'I' (Incomplete) grade for this course, that student must provide (1) a written request stating his/her reasons for requesting an incomplete and (2) written documentation to support his/her reasons for making the request.

Without exception, the student making the request must have completed at least 75% of the course work and must be passing the course with at least a 'C' average.

If a student meets these criteria, I will consult the Chair of the department and, if both the Chair and I approve of the student's request, I will decide upon a deadline for the work to be completed by the student.

In all cases, University policy states that if the work is not completed by the established deadline, the Registrar's Office will automatically change the 'I' to an 'F'.

Once the student has turned in all of the work required to complete the course by the stated deadline, he/she bears full responsibility for following through and confirming that the 'I' has been changed to a grade.

Absolutely no exceptions will be made to this policy.

Policy on Classroom Conduct:

The college or University classroom is a place for the conveyance of knowledge. Ideally, there is productive interaction between the professor and the students that helps facilitate the achievement of this goal. For this reason, a set of customary rules of courtesy applies to classroom

situations, particularly at the college level. Both professors and students have rights and responsibilities, both should respect the other, both should do all they can do to help the educational process to achieve its maximum effectiveness and to help the classroom truly become an environment for learning. The policies below are not exhaustive but provide some specific expectations in this class:

- Students should attend class consistently, arrive on time, and not leave early.
- Students should always communicate and interact respectfully with the professor and with all their fellow students.
- Respectful communication applies to e-mail exchanges, which should be courteous and not overly informal in tone.
- Students should avoid monopolizing or interrupting classroom discussion.
- Students should avoid monopolizing the professor's office hours at the detriment of other students.
- Students should make an appointment if they need to speak with the professor outside of the designated office hours.
- Eating and drinking in class is not permitted.
- Videotaping or recording class lectures is not permitted.
- Students are not allowed to use laptops or other electronic devices in class.
- As per University Policy, cellular phones and pagers should be turned off during class (see p. 7 of syllabus for University Policy on communication devices.)

Policy on Plagiarism:

"While those who pass on their knowledge to us through their writings deserve our thanks, those who steal the writings of others and present them as their own ideas deserve the greatest reproach [...] and are deserving of strict reprimand and punishment." (Marcus Vitruvius Pollio, *De architectura libri decem*, Book VII, Introduction, Part 3. London: Benjamin Bloom Pub., 1968)

Plagiarism, i.e., the presenting of the words or ideas of another person as one's own, is a serious academic offense, which may result in failure in a course or in suspension from the University. The philosophy department and its faculty will, absolutely and without exception, enforce the University policy regarding plagiarism.

Quotation of another person's words must be indicated in one of the standard ways. This applies to all quoted material, including passages, sentences, and important parts of sentences that are used *verbatim*. Do not paraphrase or virtually quote passages by changing a few words or the word order.

Relating the information in a quote by using different word or expressions, without paraphrasing, also requires citation.

As well, the use of another person's ideas, even without quoting or paraphrasing, requires citation. The source of all quoted matter and the source of all ideas and information that are taken from the work of another person and that are not a matter of general knowledge must be indicated by the proper use of reference notes. Remember this: When in doubt as to whether or not citation is required, it is better to be safe and use reference notes than not to use them.

If not familiar with the proper use of reference notes, either consult with your professor or consult one of the many reference manuals available in the library (such as the MLA manual of style, the Chicago manual of style, or the APA (American Psychological Association) manual of style). Always inquire whether your professor has a particular stylistic preference regarding citations (that is, either MLA, Chicago style, or APA).

Remember this: Reference notes show that an idea or information came from a published source. Quotation marks show that the specific words of another person are being used. Students are expected to be familiar with section 6C5-4.001 of the Florida Administrative Code (printed on p. 72 of the University Catalog), which describes the penalties incurred by students when they engage in academic irregularities such as plagiarism.

Drop-Dates:

The students are advised to keep the following dates in mind:

August 26: Last day to register/drop/add or withdraw with full refund.

September 3: Last day to register/drop/add or withdraw without receiving a W.

November 18: Last day to drop or withdraw without receiving F.

Officially dropping a course is the student's responsibility. If, for whatever reason, a student stops attending class, completing the assignments, or taking the tests, that student should make sure he/she officially drops this course. Otherwise, he/she will receive an 'F' in the course. No exceptions will be made to this.

Official Holidays and Breaks:

September 5: Labor Day.

October 10-11: Fall Break.

November 11: Veteran's Day.

November 24-27: Thanksgiving Recess.

Other Important Dates:

December 6: Last day of classes.

December 7: Reading Days

December 8-14: Final examination week.

December 19: Grades due in Registrar's office by 9:00 a.m.

Communication Devices:

In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cell phones, are to be disabled in class sessions.

Attendance on the First Day of Class:

Students are required to attend the first day of class for any course in which they are registered. If a student misses the first day of class for any reason, the student may be administratively withdrawn from the course.

Attendance and University Absence Policy:

Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance.

Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities

It is the student's responsibility to give the instructor notice prior to any anticipated absence and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence." (<http://www.fau.edu/academic/registrar/catalogRevs/academics.php>)

Florida Atlantic University Code of Academic Integrity (Honor Code):

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other.

Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see: http://www.fau.edu/regulations/chapter4/4.001_Honor_Code.pdf.

Accommodations for Students with Disabilities:

In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are

available for students on all campuses. For more information, please visit the SAS website at www.fau.edu/sas/

Counseling and Psychological Services (CAPS) Center:

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <http://www.fau.edu/counseling/>

Course Outline

Key to Abbreviations:

IPS: Anthony O'Hear, *Introduction to the Philosophy of Science*.

TR: Peter Godfrey-Smith, *Theory and Reality: An Introduction to the Philosophy of Science*.

CTE: "From Copernicus to Einstein" (in "Readings" folder - Blackboard: "Content").

R: "Readings" folder (Blackboard: "Content").

V: "Videos" folder (Blackboard: "Content").

PART I

Explanation and the Empirical Basis of Scientific Knowledge

August 24, 2016

Readings:

- 1. Anthony O'Hear, "Science as an Intellectual Activity" (IPS, pp. 1-11).
- 2. Anthony O'Hear, "Science and Culture" (IPS, pp. 202-232).
- 3. Peter Godfrey-Smith, "Introduction" (TR, pp. 1-18).
- 4. "Philosophy of Science" (in "Contents" folder).

Recommended Reading:

- Hans Reichenbach, "The Copernican View of the World" (CTE).
- Hans Reichenbach, "Ether" (CTE).

Video 1: "Two Statues: An Introduction to the Philosophy of Science" (V).

August 26, 2016

Quiz #1 – Readings 1-4, Video 1, and lecture notes.

Reading:

- 5. Carl Hempel, "Two Models of Scientific Explanation" (R).
- 6. Peter Godfrey-Smith, "Logic Plus Empiricism" (TR, pp. 19-38).

Recommended Reading:

- Hans Reichenbach, "The Special Theory of Relativity" (CTE) (R – Part I).
- Hans Reichenbach, "The Relativity of Motion" (CTE) (R – Part I).

Video 2: "A Brief History of Science: Antiquity to the Late Middle Ages" (V).

Video 3: "The Rise of Logical Positivism" (V).

August 31, 2016

Reading:

- 7. Carl Hempel and Paul Oppenheim, "Studies in the Logic of Explanation" (R – Part I).
- 8. Peter Godfrey-Smith, "Explanation" (TR, pp. 190-201).

Recommended Reading:

- Hans Reichenbach, "The General Theory of Relativity" (CTE) (R – Part I).
- Hans Reichenbach, "Space and Time" (CTE) (R – Part I).

Video 4: "A Brief History of Science: Renaissance to the Copernican Revolution" (V).

Video 5: "The Fall of Logical Positivism" (V).

September 2, 2016

Quiz #2 – Readings 5-8, Videos 2-5, and lecture notes.

Reading:

- 9. Anthony O'Hear, "Induction" (IPS, pp. 12-34).
- 10. Karl Popper, "The Problem of the Empirical Basis" (R – Part I).

Video 6: "A Brief History of Science: The Copernican Revolution to the Darwinian Synthesis" (V).

Video 7: "Classical Empiricism and Logical Positivism" (V).

September 7, 2016

Reading:

- 11. Anthony O’Hear, “Observation and Theory” (IPS, pp. 82-105).
- 12. Peter Godfrey-Smith, “Naturalistic Philosophy in Theory and Practice” (TR, pp. 149-162).

September 9, 2016**Reading:**

- 13. Norwood Russell Hanson, “Observation” (R – Part I).

September 14, 2016

Quiz #3 – Readings 9-13, Videos 5-7, and lecture notes.

Reading:

- 14. Andy Pickering, “Against Putting the Phenomena First: The Discovery of the Weak Neutral Current” (R – Part I)

September 16, 2016**Reading:**

- 15. Andy Pickering, “Against Putting the Phenomena First: The Discovery of the Weak Neutral Current”

Exam #1 – Wednesday, September 21, 2016**PART II**

**The Historical Development of Scientific Knowledge:
Scientific Revolutions and Paradigm Shifts**

September 23, 2016**Reading:**

- 16. Rudolf Carnap, “The Confirmation of Laws and Theories” (R – Part II).
- 17. Peter Godfrey-Smith, “Induction and Confirmation” (TR, pp. 39-56).

Video 8:

- “How Does Science Work? Three Views” (V).

September 28, 2016

Quiz #4 – Reading 16 and 17, Video 8, and lecture notes.

Reading:

- 18. Karl Popper, “Science: Conjectures and Refutations” (R – Part II).
- 19. Anthony O’Hear, “Science and Non-Science” (IPS, 54-81) and 15. “Falsification” (IPS, pp. 35-53).
- 20. Peter Godfrey-Smith, “Popper: Conjecture and Refutation (TR, pp. 57-74).

September 30, 2016

Reading:

- 21. Anthony O’Hear, “Probability” (IPS, pp. 144-176).
- 22. Imre Lakatos, “Falsification and the Methodology of Scientific Research Programmes” (R – Part II).

October 5, 2016 – University Closed Due to Hurricane Threat

October 7, 2016 - University Closed Due to Hurricane Threat

October 12, 2016

Quiz #5 – Short essay on Thomas Kuhn.

Readings:

- 23. Thomas Kuhn, “The Function of Dogma in Scientific Research” (R – Part II).
- 24. Peter Godfrey-Smith, “Kuhn and Normal Science” (TR, pp. 75-86).

October 14, 2016

Readings:

- 25. Thomas Kuhn, “The Nature and Necessity of Scientific Revolutions” (R – Part II).
- 26. Peter Godfrey-Smith, “Kuhn and Revolutions” (TR, pp. 87-101).

Recommended Reading:

- Anna Elise Rohmets, “Do Kuhnian Revolutions Suit Biology? (R – Part II).

October 19, 2016

Reading:

- 27. Larry Laudan, “Dissecting the Holist Picture of Scientific Knowledge” (R – Part II).
- 28. Peter Godfrey-Smith, “Lakatos, Laudan, Feyerabend, and Frameworks” (TR, pp. 102-121).

- 29. Peter Godfrey-Smith, "Naturalism and the Structure of Science" (TR, pp. 163-172).

Recommended Reading:

- Richard Bernstein, "Scientific Revolutions and Incommensurability" (R - Part II).

Exam #2 - Friday, October 21, 2016

PARTS III-IV

**Reductionism and the Unity of Science:
Alternative Views**

**Progress Without Truth:
Critical Perspectives Across the Sciences**

October 26, 2016

Reading:

- 30. Anthony O'Hear, "Scientific Reductions" (IPS, pp. 177-201).
- 31. Carl Hempel, "Theoretical Reduction" (R - Part III).

October 28, 2016

Quiz #6 - Readings 30-32 and lecture notes.

Reading:

- 32. Paul Oppenheim and Hilary Putnam, "Unity of Science as a Working Hypothesis", (R - Part III).
- 33. Patrick Suppes, "The Plurality of Science" (R - Part III).

November 2, 2016

Reading:

- 34. Paul Churchland, "Matter and Consciousness" (R - Part III).
- 35. Jaegwon Kim, "'Downward Causation' in Emergentism and Nonreductive Physicalism" (R - Part III).

November 4, 2016

Quiz #7 - Readings 33-35 and lecture notes.

Reading:

- 36. Marina Banchetti and Jean-Pierre Llored, "Reality Without Reification: Philosophy of Chemistry's Contribution to Philosophy of Mind" (R – Part III).
- 37. David Newth and John Finnigan, "Emergence and Self-Organization in Chemistry and Biology," from *The Australian Journal of Chemistry* 2006, pp. 841-848 (R – Part III).

November 9, 2016

Reading:

- 38. Stephen Kellert, "In the Wake of Chaos" (R – Part III).

Video 9: "Causality and Complexity", Derek Raine (Copernicus Center) (V).

November 11 – Veteran's Day (University Closed)

November 16, 2016

Reading:

- 39. Brian G. Henning, "Swarms, Colonies, Flocks, and Schools: Exploring the Ontology of Collective Individuals", from *Metanexus Magazine* 2009 (R – Part III).

Recommended Reading:

- Brian G. Henning, "The Ontology of Collective Individuals and the Process Turn" (R – Part III).

November 18, 2016

Quiz #8 – Readings 36-39, Video 9, and lecture notes.

Reading:

- 40. Larry Wright, "The Case Against Teleological Reductionism" (R – Part III).

November 23, 2016

Reading:

- 41. Anthony O'Hear, "Scientific Realism" (IPS, 106-143).
- 42. Peter Godfrey-Smith, "Scientific Realism" (TR, pp. 173-189).
- 43. Ian Hacking, "Experimentation and Scientific Realism" (R – Part IV).
- 44. Jeffrey A. Barrett, "Toward a Pragmatic Account of Scientific Knowledge" (R – Part IV).

Recommended Reading:

- Mi Gyung Kim, "The 'Instrumental' Reality of Phlogiston" (R – Part IV).
- Meinard Kuhlmann, "What is Real?" (from *Scientific American*, August 2013) (R – Part IV).

Video 10: "Particles, Fields, and the Future of Physics", Sean Carroll (California Institute of Technology) (V).

November 24-27, 2016 – Thanksgiving Recess

November 30, 2016

Quiz #9 – Readings 40-44, Video 10, and lecture notes.

Reading:

- 45. Ruth Hubbard, "Have Only Men Evolved?" (R – Part IV).
- 46. Peter Godfrey-Smith, "Feminism and Science Studies" (TR, pp. 136-148).

Recommended Reading:

- Peter Godfrey-Smith, "Bayesianism and Modern Theories of Evidence" (TR, pp. 202-218).
- Peter Godfrey-Smith, "Empiricism, Naturalism, and Scientific Realism?" (TR, pp. 219-232).

December 2, 2016 (Last Day of Class)

Quiz #10 – Cancelled (highest quiz grade will be doubled to replace Quiz #10)

Reading:

- 47. Peter Godfrey-Smith, "The Challenge from Sociology of Science" (TR, pp. 122-135).
- 48. Leslie Stevenson, "Is Science Value-Neutral?" (R – Part IV).
- 49. R.C., Lewontin, Steven Rose, and Leon Kamin, "Not in Our Genes" (R – Part IV).

December 6, 2016 – Official Last Day of Classes

Exam #3 – Wednesday, December 14, 7:45-10:15 a.m.