

PHIL 3601W: Scientific Thought (Spring 2018, 4 units)

December 21, 2017

Instructor: Prof. Samuel C. Fletcher (scfletch@umn.edu)

Lectures: Tu/Th 9:20–11:00 in Blegen 250

Office Hours: Tu/Th 11:15–12:15 in Heller 754, and by appointment

Grader: Nathan Lackey (lacke039@umn.edu)

Office Hours: Tu 12:30–1:30 in Heller 770, and by appointment

Course Website: <https://ay17.moodle.umn.edu/course/view.php?id=8218>. Please check Moodle often for course updates.

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

E.D. Klemke, Robert Hollinger, David Wÿss Rudge with A. David Kline, eds., *Introductory Readings in the Philosophy of Science*, 3rd ed., Prometheus, 1998. (Hereafter *KHR*.)

Both are available at the campus bookstore, the former as an e-book through the library reserves, and a copy of the latter is on reserve at the Wilson library.

Other Required Materials: Please bring to every lecture loose-leaf paper and either a pencil or a pen in blue or black ink.

Description and Objectives

This course is a writing-intensive introduction to the philosophy of science, the philosophical study of the nature and implications of science, its place and purpose in the human endeavor, and its relation to other activities and disciplines of knowledge. We will consider some ideas developed over the last century about, for example, the nature of scientific theory, evidence, and explanation; how scientific theories are confirmed; scientific methodology and change; the organization of the scientific community; the role of values and culture in science; and science's connection with philosophy, understood more broadly. By the end of the semester, students will:

1. develop some facility with the structure and writing of philosophical argumentation;
2. be able to identify and describe some of the main ideas and figures of twentieth century philosophy of science; and

3. have a subtler and more nuanced understanding of the nature of science and its role in and connection with society and philosophy.

Students should be ready to be challenged in lecture to think about science—and philosophy—in a different way than they may be accustomed.

Grading

Basis for Evaluation

Short Reading Responses (16%) You will be expected to submit at least *eight* one-page (about 250-word) responses to readings of your choosing, with no more than one per class session and at least half focusing on a primary source (i.e., rather than *PGS*). These responses should summarize the article, chapter, or section's main argument and critically engage with it, e.g., with a pointed question, objection, or note of ambiguity or unclarity. Each response will be graded on a rubric available on Moodle; for additional feedback, please contact your grader. A response to a particular reading should be submitted before the lecture for which it is assigned. No late responses will be accepted. At least four responses must be completed by 3/6 (halfway through the semester); students who complete more than eight responses will have their highest eight scores count towards their grade.

Participation (9%) In class there will be individual and group learning exercises that will be graded for completeness, not correctness, on a 3-point scale. This includes in-class peer review of rough drafts of short papers. For group learning exercises, group assignments will be made ahead of time, starting on 1/18 and switching on 2/20 and 4/5.

Short Papers (30%) There will be *three* short papers (2–3 pages, or 500–750 words), each of which is worth 10% and will focus on a different skill important in philosophical writing: evaluating arguments, formulating and arguing for a thesis, and anticipating and responding to objections. Each short paper will go through three stages: rough draft (2%), peer review (for which, see the item on participation above), and final draft (8%). Details about the writing, critiquing, and revision process and the grading thereof will be discussed in class. Late rough drafts will not be accepted. Late final drafts will be accepted up to 24 hours after they're due through Moodle or at your TA's office, but with a multiplier of 75% (i.e., the final score on a late short paper will be 75% of the regular score). After 24 hours, late final drafts will not be accepted.

Term Paper (25%) The final paper (1,500–2,000 words), due by the end of the day on Sunday, May 6th, will be a persuasive philosophical essay applying each of the writing skills practiced through the short papers to a topic, or a connection between topics, discussed in class. This can be an extension of a short paper.

Final Exam (20%) The exam will take place in our usual classroom from 8:00–10:00 on Saturday, May 12th and will cover key material in the readings and lectures through a variety of question types, such as multiple choice, short answer, and fill-in-the-blank.

Extra Credit (+2.8%) Before most classes you will have an additional opportunity to reflect on what you found most interesting—and most confusing—in the readings through a prompt on Moodle. Each of these “reflection prompts,” worth +0.1%, must be completed by the morning before class (i.e., by 7:00 a.m.) to receive (extra) credit.

If you request to submit a short or term paper for regrading, you must provide in writing an argument detailing the grounds for your request no more than one week but no less than one day (24 hours) after grades for that paper are released. If your request is granted, the resulting new grade overrides the old one, whether higher or lower.

Understanding Your Letter Grade

How to Compute Your Letter Grade

$90 > B+ \geq 87$						$80 > C+ \geq 77$						$70 > D+ \geq 67$							
$A \geq 93$				$87 > B \geq 83$				$77 > C \geq 73$				$67 > D \geq 63$				$F < 60$			
$93 > A- \geq 90$				$83 > B- \geq 80$				$73 > C- \geq 70$				$63 > D- \geq 60$							

Grades in the following ranges represent the following corresponding levels of achievement relative to the level necessary to meet course requirements:

- A:** Outstanding.
- B:** Significantly above.
- C:** Adequate in every respect.
- D:** Worthy of credit despite not fully meeting course requirements.
- F:** Not meeting enough course requirements to be deserving of credit.

Students taking this course “pass/fail” will receive an “S,” representing satisfactory achievement, for any standard final letter grade of “C-” or higher that he or she would have been assigned. Such students will receive an “N,” representing unsatisfactory achievement, for any standard final letter grade of “D+” or lower that he or she would have been assigned.

For additional information about University policies about grading and transcripts, please refer to: <http://policy.umn.edu/education/gradingtranscripts>.

Policies

Student Conduct Code

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to the Board of Regents Policy: Student Conduct Code. To review the Student Conduct Code, please see: http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf.

Note that the conduct code specifically addresses disruptive classroom conduct, which means “engaging in behavior that substantially or repeatedly interrupts either the instructor’s ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities.”

Use of Personal Electronic Devices in the Classroom

Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. (For complete information, please reference: <http://policy.umn.edu/education/studentresp>.)

In this class, the use of laptops, tablets, and other electronic devices is permitted as long as it would not reasonably be a distraction to others. Reasonable distractions include movies and social media. Students violating this policy will be asked to put their offending device away for the rest of the class session, and may also lose participation credit for that day.

Writing Resources

Student Writing Support (SWS) offers free writing instruction for all University of Minnesota students at all stages of the writing process. In face-to-face and online collaborative consultations, SWS consultants help students develop productive writing habits and revision strategies. SWS consultants are teachers of writing: graduate and undergraduate teaching assistants and professional staff. Some consultants specialize in working with multilingual writers, and others have experience with writing in specific disciplines. Consulting is available by appointment online and in Nicholson Hall, and on a walk-in basis in Appleby Hall. For more information, go to writing.umn.edu/sws or call 612-625-1893. In addition, SWS offers a number of web-based resources on topics such as avoiding plagiarism, documenting sources, and planning and completing a writing project.

Scholastic Dishonesty

You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. (Student Conduct Code: http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf.) If it is determined that a student has

cheated, he or she may be given an “F” or an “N” for the course, and may face additional sanctions from the University. For additional information, please see: <http://policy.umn.edu/education/instructorresp>.

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: <http://www1.umn.edu/oscai/integrity/student/index.html>. If you have additional specific questions regarding what would constitute scholastic dishonesty in the context of this class, please ask.

Make-up Work for Legitimate Absences

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include illness (inclusive of dependents), participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, religious observances, and participation in formal University system governance. Such circumstances do not include voting in local, state, or national elections. For complete information, please see: <http://policy.umn.edu/education/makeupwork>.

Under such legitimate circumstances leading a student to be absent for any graded activity, that student must contact me about it at least two weeks in advance, or as soon as possible if the circumstances are known later.

Appropriate Student Use of Class Notes and Course Materials

Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: <http://policy.umn.edu/education/studentresp>.

Sexual Harassment

“Sexual harassment” means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual’s work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult the Board of Regents’ policy on the matter: <http://regents.umn.edu/sites/regents.umn.edu/files/policies/SexHarassment.pdf>.

Equity, Diversity, Equal Opportunity, and Affirmative Action

The University provides equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gen-

der expression. To this effect, please notify me if you have a preferred name or pronoun not indicated in your official enrollment data. For more information, please consult the Board of Regents' policy on the matter: http://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity_Diversity_EO_AA.pdf.

Disability Accommodations

The University of Minnesota is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations. If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact the DRC at 612-626-1333 to arrange a confidential discussion regarding equitable access and reasonable accommodations. If you are registered with the DRC and have a current letter requesting reasonable accommodations, please contact me as early in the semester as possible to discuss how the accommodations will be applied in the course. For more information, please see the DRC website, <https://diversity.umn.edu/disability/>.

Mental Health and Stress Management

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: <http://www.mentalhealth.umn.edu>.

Academic Freedom and Responsibility

Academic freedom is a cornerstone of the University. Within the scope and content of the course as I have defined it, this includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study, but they are responsible for learning the content of any course of study for which they are enrolled. Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help, including me, the Philosophy Department Chair Prof. Valerie Tiberius (tiberius@umn.edu), your adviser, or College of Liberal Arts Associate Dean for Arts and Humanities Jane Blocker (block023@umn.edu).

Tentative Course Schedule

As the section title indicates, the course schedule is open to (reasonable) modification in light of the class's progress. Primary (non-PGS) sources, except for those anthologized in KHR, will be linked in the Moodle site. You are advised to have the reading assigned for a particular day done before that day's lecture.

Date	Topic	Reading	Assignments Due
Tu 1/16	Introduction/Philosophical Writing	Course Syllabus, PGS 1.1–1.4	
Th 1/18	The Scientific Revolution	PGS 1.5, Ravetz, Tamny	(begin group assignments)
Tu 1/23	The Rise of Logical Positivism	PGS 2.1–2.3, Schlick	
Th 1/25	The Fall of Logical Empiricism	PGS 2.4–2.6, KHR 18 (Putnam)	
Tu 1/30	Induction and Confirmation	PGS 3.1–3.3	SP #1 rough draft
Th 2/1	The New Riddle of Induction	PGS 3.4, Goodman	
Tu 2/6	Popper's Falsificationism	PGS 4.1–4.3, KHR 1 (Popper)	SP #1 final draft
Th 2/8	The Critique of Falsificationism	PGS 4.4–4.6, Salmon	
Tu 2/13	Kuhn on Normal Science	PGS 5	
Th 2/15	Kuhn vs. Popper	Kuhn, Popper	
Tu 2/20	Kuhn on Revolutionary Science I	PGS 6	(groups switch)
Th 2/22	Kuhn on Revolutionary Science II	KHR 26 (Kuhn)	
Tu 2/27	After <i>Structure</i> : Lakatos	PGS 7.1–7.3	SP #2 rough draft
Th 3/1	After <i>Structure</i> : Feyerabend	PGS 7.4–7.6, KHR 3 (Feyerabend)	
Tu 3/6	Mertonian Sociology of Science	PGS 8.1–8.2, Merton	SP #2 final draft
Th 3/8			(class canceled)
Tu 3/13			(spring break)
Th 3/15			(spring break)
Tu 3/20	Sociology of Scientific Knowledge	PGS 8.3, Barnes & Bloor	
Th 3/22	Latour's Sociology of Science	PGS 8.4, Latour	
Tu 3/27	Gender and/in Science	PGS 9.1–9.3, Okruhlik	

Date	Topic	Reading	Assignments Due
Th 3/29	Feminist Philosophy of Science	PGS 9.4, Harding	
Tu 4/3	Naturalism	PGS 10.1–10.2, Maddy	SP #3 rough draft
Th 4/5	Theory and Observation	PGS 10.3, KHR 19 (Hanson)	(groups switch)
Tu 4/10	The Organization of Science	PGS 11, Solomon	SP #3 final draft
Th 4/12	Scientific Realism	PGS 12.1–12.3, KHR 22 (Maxwell)	
Tu 4/17	Scientific Anti-Realism	PGS 12.4–12.6, Stanford	
Th 4/19	Representation, Models, Truth	PGS 12.7, Giere	
Tu 4/24	Scientific Explanation	PGS 13.1–13.3, KHR 14 (Salmon)	
Th 4/26	Scientific Law I	PGS 13.4, Beebee	
Tu 5/1	Scientific Law II	KHR 13 (Cartwright), du Bois	
Th 5/3	Natural vs. Social Sciences	KHR 6 (Taylor), KHR 7 (Kuhn)	
Su 5/6			Final essay
Sa 5/12			8:00–10:00, exam

References

- [Barnes & Bloor] Barry Barnes and David Bloor (1982), “Relativism, Rationalism and the Sociology of Knowledge,” in *Rationality and Relativism*, Martin Hollis and Steven Lukes (eds.), MIT Press, pp. 21–47.
- [Feel free to skip the footnotes.]
- [Beebee] Helen Beebee (2000), “The Non-Governing Conception of Laws of Nature,” *Philosophy and Phenomenological Research* 61(3): 571–594
- [Feel free to skim sections 5–6.]
- [du Bois] W. E. B. du Bois (2000), “Sociology Hesitant,” *boundary 2* 27(3): 37–44.
- [Giere] Ronald Giere (1988), “Models and Theories,” ch. 3 of his *Explaining Science: A Cognitive Approach*, University of Chicago Press, pp. 62–91.

- [Skip the sections on “The Linear Oscillator” (pp. 68–74) and “What about Axiomatic Presentations of Classical Mechanics?” (pp. 87–89).]
- [Goodman] Nelson Goodman (1983), “The New Riddle of Induction,” ch. 3 of his *Fact, Fiction, and Forecast*, 4th ed., Harvard University Press.
- [Sections 3–5 are the most important.]
- [Harding] Sandra Harding (1996), “Rethinking Feminist Epistemology: What Is ‘Strong Objectivity’?” in *Feminism and Science*, Evelyn Fox Keller and Helen E. Longino (eds.), Oxford University Press, pp. 235–248. Abridged version, originally published in *Feminist Epistemologies* (1993), Linda Alcoff and Elizabeth Potter (eds.), Routledge.
- [Kuhn] Thomas Kuhn (1970), “Logic of Discovery or Psychology of Research?” in *Criticism and the Growth of Knowledge*, Imre Lakatos and Alan Musgrave (eds.), Cambridge University Press, pp. 1–24.
- [Latour] Bruno Latour (1987), “Opening Pandora’s Black Box,” ch. 1 of his *Science in Action*, Harvard University Press, pp. 1–17.
- [Maddy] Penelope Maddy (2007), *Second Philosophy*, Oxford University Press.
- [Read only the first three paragraphs of the introduction, and section II.1.]
- [Merton] Robert K. Merton (1973), “The Normative Structure of Science,” in *The Sociology of Science*, Norman W. Stoner (ed.), University of Chicago Press, pp. 267–278. Originally published as “Science and Technology in a Democratic Order,” *Journal of Legal and Political Sociology* 1 (1942): 115–26.
- [Okruhlik] Kathleen Okruhlik (1994), “Gender and the Biological Sciences,” *Canadian Journal of Philosophy* 24(Supp. 20): 21–42.
- [Popper] Karl Popper (1970), “Normal Science and its Dangers,” in *Criticism and the Growth of Knowledge*, Imre Lakatos and Alan Musgrave (eds.), Cambridge University Press, pp. 51–58.
- [Ravetz] J. R. Ravetz (1990), “The Copernican Revolution,” in *Companion to the History of Modern Science*, R. C. Olby, G. N. Cantor, J. R. R. Christie, and M. J. S. Hodge (eds.), Routledge, pp. 201–216.
- [Skip section 6.]
- [Salmon] Wesley Salmon (1981), “Rational Prediction,” *British Journal for the Philosophy of Science* 32: 115–125.
- [Schlick] Moritz Schlick. “Positivism and Realism.” Originally appearing in German in *Erkenntnis* (1932/3) 3, translated by David Rynin in *Synthese* (1948) 7: 478–505.
- [Skip section 1 (i.e., start on page 482).]

[Solomon] Miriam Solomon (1994), “Social Empiricism,” *Nous* 28(3): 325–343.

[Feel free to skip the endnotes.]

[Stanford] P. Kyle Stanford (2003), “Pyrrhic Victories for Scientific Realism,” *The Journal of Philosophy* 100(11): 553–572.

[Tamny] Martin Tamny (1990), “Atomism and the Mechanical Philosophy,” in *Companion to the History of Modern Science*, R. C. Olby, G. N. Cantor, J. R. R. Christie, and M. J. S. Hodge (eds.), Routledge, pp. 597–609.