PHIL 3115: Philosophy of Science

Swann 325 Mondays & Wednesdays 3:30-4:45

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Course Description

Science, whatever else it may be, is a human enterprise. While scientists all pursue the production of significant knowledge — they do so by using various methods, relying on different levels of support, organizing themselves into groups, and pursuing distinct sets of concerns. These social elements of science have important implications for *how* knowledge is produced and *how* it should be evaluated. In this course, we explore central issues in philosophy of science with a focus on the "big picture" — science as it is practiced by the many and varied scientists in the world. These issues include the role of values in science, the nature of objectivity, and even the production of ignorance.

This course is an introduction to the philosophy of science. It is aimed at an advanced undergraduate: a student who has experience critically engaging with primary source material, but one that may be totally new to philosophy. This means that the required readings often are more difficult than introductory texts, and may use concepts, terminology, or ideas that may be novel. Expect to be challenged — but also expect to be supported.

Texts

All texts will be made available through Canvas and Perusall. Optional texts that complement this course include:

Barker, Gillian and Philip Kitcher. *Philosophy of Science: A New Introduction*. Oxford University Press

Chalmers, AF. *What is this thing called science?* 3rd Ed. Open University Press.

Okasha, Samir. *Philosophy of Science: A Very Short Introduction*. Oxford University Press

Learning Objectives

The central aim of the course is to develop an understanding of some central issues in philosophy of science. This will be accomplished through engaging with the lectures, assigned readings and participating in the class discussions.

But there are secondary goals. One is to give a "big picture" view of science as it is practiced — a view that might help one engage with science as a practicing scientist or just someone affected by scientific work. Another, to gain insight both into the history of science and critiques of science. And finally, a third is to develop skills of critical thinking and reasoning, as well as how to employ these in writings of various formats.

More schematically, you will:

- Gain facility with central issues and core concepts of philosophy of science, using these to describe, analyze, and explain contemporary and historical scientific practice;
- Develop skills of argument analysis by learning to identify arguments, concepts, and distinctions in scholarly texts;
- Develop skills of critical writing—demonstrated in work that clearly evaluates arguments, establishes positions , and employs reasons and inferences;
- Develop skills of verbal communication that support critical and productive discussion, by providing substantive contributions and responding respectfully to feedback and request for clarification.

Course Format

For the first twelve weeks of the course, each session will involve lectures (between 30–50 minutes) interspersed with activities and classroom discussion. The remaining weeks are dedicated to group work on the final project. Attendance at all sessions is required.

You are expected to have completed the assigned reading—usually no more than 25 pages of text—prior to coming to class.

Course Schedule

Week	Date	Topic	Required Readings
			Who does science?
1	Aug 22nd	People around the globe	Harding, Sandra. 2015. *Objectivity and Diversity: Another Logic of Scientific Research*. University of Chicago Press, pp. 1-25 (Ch. 1–"New Citizens, New Societies: New Sciences, New Philosophies?") *Recommended* UNESCO. 2021. UNESCO Science Report: the race against time for smarter development. (Consider the tables and diagrams in "Global Trends", pp. 29–136) *NATURE INDEX.* 2022*.* Tracking the collaborative networks of five leading science nations. *Nature,* 603: S10-S11. ➢ Look through the statistics on the NatureIndex (link)
	Aug 24th	People working together	Longino, Helen. 1990. *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry*. Princeton University Press. pp. 62–82. *Recommended* Godfrey-Smith, Peter. 2003. *Theory and Reality*. 1st ed. Chicago University Press, pp. 136–148. (Ch. 9 "Feminism and Science Studies")
2	Aug 29th	People with different experiences	Douglas, Heather. 2021. *The Rightful Place of Science: Science, Values, and Democracy*. Consortium for Science, Policy & Outcomes, pp. 9–36 (Ch. 1–"The Pervasive Entanglement") *Recommended* Toole, Briana. 2021. Recent Work in Standpoint Epistemology. *Analysis* 81(2): pp. 338–350. Anderson, Elizabeth. 2004. Uses of Value Judgments in Science: A General Argument, with Lessons from a Case Study of Feminist Research on Divorce. *Hypatia*, 19(1): 1–24 (**NOTE: Online Lecture—Prof Out of Town**)
	Aug 31st	People with different politics	Douglas, Heather. 2017. Science, Values, and Citizens. In Marcus P Adams, Zvi Biener, Uljana Feest and Jacqueline Anne Sullivan (eds.) *Eppur Si Muove: Doing History and Philosophy of Science with Peter Machamer: A Collection of Essays in Honor of Peter Machamer*, Springer, pp. 83–96 (**NOTE: Online Lecture—Prof Out of Town**)
			What do scientists do?
3	Sept 5th		**No Class** **(First Case Study Released)**
	Sept 7th	Perform Experiments	Hacking, Ian. 1983. *Representing and Intervening*. Cambridge University Press, pp. 149–185. (Chs. 9&10 "Experiment" and "Observation") *Recommended* Feest, Uljana and Friedrich Steinle. Experiment. In Paul Humphreys (ed.) T*he Oxford Handbook of Philosophy of Science*. Oxford University Press, pp. 274–295.

4	Sept 12th	Confirm Theories	Godfrey-Smith, Peter. 2003. *Theory and Reality*. 1st ed. Chicago University Press, pp. 54-71. (Ch. 3 "Induction and Confirmation")
	Sept 14th	Explore Models	Weisberg, Michael. 2007. Who is a modeller? *British Journal for the Philosophy of Science*, 58(2): 207–33. *Recommended* Frigg, Roman and Stephan Hartmann. 2020. Models in Science. In Ed Zalta (Ed.) *Stanford Encyclopedia of Philosophy*. (link) (Especially §§1, 4–5). **(First Case Study Essay Due)**
5	Sept 19th	Generate Data	Bogen, James and James Woodward. 1988. Saving the Phenomena. *The Philosophical Review*, 97(3): 303–352 (Read only up to page 326) *Recommended* Anderson, Chris. 2008. The End of Theory: The Data Deluge Makes the Scientific Method Obsolete. *Wired*. (link) **(Second Case Study Released)**
	Sept 21st	Craft Stories	Cleland, Carol. 2002. Methodological and Epistemic Differences between Historical Science and Experimental Science. *Philosophy of Science,* 69: 474-–496. *Recommended:* Currie, Adrian. 2017. Hot-Blooded Gluttons: Dependency, Coherence, and Method in the Historical Sciences. *British Journal for the Philosophy of Science*, 68: 929–952.
		How should scientists behave?	
6	Sept 26th	A Scientific Method? (Part I)	Karl Popper. 1963. *Conjectures and Refutations: The Growth of Scientific Knowledge*. Routledge and Kegan Paul, pp. 33–41 (Ch. 1, sections I–III). Karl Popper. 1959. *The Logic of Scientific Discovery*. Revised ed, pp. 3–20 (Ch. 1, sections 1–6).
	Sept 28th	A Scientific Method? (Part II)	Peter Godfrey-Smith. 2003. *Theory and Reality: An Introduction to the Philosophy of Science.* University of Chicago Press, pp. 57–74 (Ch. 4–"Popper: Conjecture and Refutation") *Recommended:* Tim Lewens. The Meaning of Science: An Introduction to the Philosophy of Science, pp. 3–33 (chapter 1, "How Science Works") **(Second Case Study Due)**
7	Oct 3rd	A Scientific Method? (Part III)	Thomas Kuhn. 1996. *The Structure of Scientific Revolutions*, 3rd ed. University of Chicago Press, pp. 10–42 (Chs. 2–4).
	Oct 5th	A Scientific Method? (Part IV)	Thomas Kuhn. 1996. *The Structure of Scientific Revolutions*, 3rd ed. University of Chicago Press, pp. 92–135 (Chs. 9, 10). *Recommended:* Godfrey-Smith, Peter. 2003. *Theory and Reality: An Introduction to the Philosophy of Science*. University of Chicago Press, pp. 75–86 (Ch. 5–"Kuhn and Normal Science")
8	**Oct 10th & 12th**		**Midterm Project**
9	Oct 17th		**No Class (Fall Break)**
	Oct 19th	A Scientific Method? (Part V)	Feyerabend, Paul. 1970. *Against Method*. 3rd ed. Verso, pp. 9–53. (Introduction and Chs. 1-5 — feel free to ignore the extremely long footnotes). *Recommended*:

			Peter Godfrey-Smith. 2003. *Theory and Reality: An Introduction to the Philosophy of Science.* Chicago: University of Chicago Press, pp. 110–121 (Sects. 7.4–7.7)
10	Oct 24th	Objective Results	Douglas, Heather. 2004. Science, Policy, and the Value-Free Ideal. Pittsburgh University Press, pp. 115–132. (Ch. 6 "Objectivity in Science")
	Oct 26th	Paper	Latour, Bruno and Steve Woolgar. 1979. *Laboratory Life* pp. 43–53, 69–89 *Recommended:* Smaldino, Paul E. and Richard McElreath. 2016. The Natural Selection of Bad Science. *Royal Society Open Science*, 3:160384. **(Midterm Project Due)**
			What organizes science?
11	Oct 31st	Democratic Principles	Kitcher, Philip. 2001.Science, Truth and Democracy. Oxford University Press. (Ch. 10–"Well-Ordered Science")
	Nov 2nd	Peer Review	Remco Hessen and Liam Kofi Bright. 2021. Is Peer Review a Good Idea? *British Journal for the Philosophy of Science*, 72(3): 635–663. *Recommended:* Belluz, Julia and Steven Hoffman. 2015. Let's stop pretending peer review works. *Vox Magazine* (link) **(Final day for Resubmitting Case Studies)**
12	Nov 7th	Money	Avin, Shahar. 2019. Centralized funding and epistemic exploration. *British Journal for the Philosophy of Science*, 70(3): 629–656. *Recommended* Avin, Shahar. 2017. Science funding is a gamble so let's give out money by lottery. *Aeon Magazine*. (link) ➢ Check out SimScience! (link)
	Nov 9th	Fame and Impact	Strevens, M. 2003. The role of the priority rule in science. *The Journal of Philosophy*, 100(2), 55–79. Editorial Team. 2009. Credit where credit is due. *Nature Cell Biology*, 11(1). (link) *Recommended* Latour, Bruno and Steve Woolgar. 1979. Laboratory Life, pp. 189–208
13			
14	**No Class Nov 23rd (Student Recess)**		**Final Group Project**
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ASSESSMENT

The course involves four core methods of assessment: (i) reading assignments and participation; (ii) essays developed in response to case studies; (iii) a midterm project, and; (iv) a final project.

Assessment Breakdown	
Reading Assignment	15%
Class Participation	15%
Case Study 1	10%
Case Study 2	10%
Midterm Assignment	20%
Final Project	30%

Grade Scale	
A	90–100
B	80–89
C	70–79
D	60–69
F	0–59

For those who take the class ***pass/fail***: in order to receive a grade of "satisfactory," you must receive a grade of 70% or higher, and you must complete the case studies, midterm assignment, and group project.

Reading Assignments:

For the first twelve weeks of the course, you will be required to complete the assigned readings on Perusall and make several substantive comments per reading. Perusall is an online platform that facilitates collaboration and good reading practices. It allows you to comment directly on the readings alongside other features.

Perusall employs an AI-based system to adjudicate your contributions. I recommend making at least 5 such comments. When determining your grade, I won't rely solely on this system and will exercise my own judgment. Examples of what I take a substantive contribution to include those that:

a. outline the argument of the section/paragraph and relates it to the goals of the paper;
b. points to a technical concept or distinction, and provides some clarification of what it means in context;
c. raises a question about an argument, concept, distinction, or piece of evidence and articulates why this question is important (for instance, if you are confused about what something means, explain what you are confused about);
d. provide a useful explanation of a difficult stretch of text; or
e. relates concepts, topics, or themes to other elements of the course in an interesting and illuminating way.

Your grade will be calculated by the number of readings you complete satisfactorily. This will be pass/fail for each session. For those sessions with more than one required reading, only those on Perusall will determine your success.

Class Participation:

Class participation is not just mere attendance. It is expected that you will have completed the reading for the day's session and have come to class ready to discuss it.

Your class participation grade reflects your engagement with these readings, your contributions to class discussions and activities, and your commitment to fostering a positive and respectful learning environment.

Your class participation grade will be based on the following criteria:

- **Quality of contributions: "**Quality" here is measured in terms of the extent it helps the class as a group come to understand the structure and content of the readings. Helpful contributions can come in any number of forms: well-supported guesses about puzzling passages, relating elements of argument to one another, spelling out a difficult concept, offering a using example, or simply asking a question and explaining why such a question is an important one to address.
- **Regularity of contributions:** Regularity does not mean asking the same question ("Well what does *this* mean?") every five minutes every class. Regularity instead is measured in terms of the frequent occurrence—across class sessions—of helpful contributions.
- **Respect for others:** Your behavior in class should facilitate a positive learning environment for all class participants. Experiences of others', when offered, should be treated with respect. Arguments, reasons, and evidence should be treated charitably—interpreted so as to bring out the most helpful contributions to class discussions and activities. Being disrespectful about others' experiences, uncivil or rude in response to others' contributions, or being deliberately uncharitable are discouraged.
- **Commitment to the learning environment:** Your behavior should support the learning objectives. Such behavior means participating and being attentive, considerate, and

punctual. Doing homework for other courses, noodling about on your phone, being late, or falling asleep in class detracts from such a learning environment and is discouraged.

- **Contributions to the final project:** group project work will take up the final three weeks of class. Your grade on the final project will be determined by what work the group produces. However, your participation grade will be affected by your own assessments in the reflective exercise—as well as the feedback you receive from other group members. More detailed instructions about this group project will be provided in week 11.

Attendance and Missed Classes:

Showing up is required and expected. Though there is no penalty for missing a single session—there are repercussions for missing multiple classes. If you miss 6 classes, your final grade is docked by 20 points, 8 classes 30 points, and 10 classes 40 points.

Case Study Essays:

In each of the first two units ("**Who does science?**" and "**What do scientists do?**") you will be assigned a **case study**. Drawing on classroom discussions, and further reading where necessary, you will write **a 1200-to-1500-word essay** providing philosophical analysis. Case studies will be released on **Monday** (in weeks 3 and 5), and due the **Wednesday** of the following week at **11:59pm** (in weeks 4 and 6)**.**

The case studies are marked sufficient/insufficient. You may resubmit an insufficient discussion response *twice*— but all resubmissions must include an additional document that responds to the feedback and outlines what steps you have taken as a result. The final day I will accept resubmissions is **Wednesday Nov 2nd at 11:59PM.**

The rubric used to evaluate these essays can be found on canvas (link).

Midterm Project:

The **midterm project** involves three elements. The first two will take place in-class during **week 7**, the third you will complete on your own. This project will assess your skills in analysing case studies, your knowledge of the course material, and your participation. The completion of all elements is due **Wednesday October 26th** at **11:59PM.**

More information on the midterm project, and the evaluation rubric, can be found on canvas (link).

Final Group Project:

The final project will see you organizing into small groups to address issues in contemporary scientific practice.

You should anticipate collaborating on a philosophical essay and a presentation, providing a group log of your contributions to the group work, and completing a reflective exercise about your experience of the course, your participation in the group project, and the participation of your fellow group members.

More details about the format and assessment will be released in week 9.

The Terms and Conditions

Academic Integrity and Collaboration:

Honesty and transparency are important features of good scholarship. On the flip side, plagiarism and cheating are serious academic offenses with serious consequences. If you are discovered engaging in either behavior in this course, you will earn a failing grade on the assignment in question, and further disciplinary action may be taken.

You are required to cite all sources you use in your submitted work. This includes both direct quotations and cases where you use someone else's ideas. "Sources" include papers, journals,

conversations, anything found on the internet, and so on. Basically, if the thought did not originate with you, you should provide an in-text citation and a reference list. For a clear description of what counts as plagiarism, cheating, and/or the use of unauthorized sources, please see the Student Code of Conduct: http://www.catalog.gatech.edu/rules/19.

Your case study essays, midterm project, and final project should be crafted and written on your own. You may talk with others about your ideas—you may even use the ideas discussed in class—but these ideas must be made your own. That means working by yourself to develop your own ideas, providing your own reasons, and explaining things in your own words. See the relevant rubrics for more detail.

If you have questions about my integration of the university's honor code into this course, please do not hesitate to ask: my aim is to foster an environment where you can learn and grow, while ensuring that the work we all do is honest and fair.

For more information about Georgia Tech's standards with respect to academic integrity, you can also check out the following link: http://honor.gatech.edu/

Accommodations for Students:

If you wish to request an accommodation due to a documented disability, please inform me and contact Disability Services as soon as possible. They can be reached at dsinfo@gatech.edu or 404-894-2563 (voice)/ 404-894-1664 (TDD).

I encourage you to discuss with me what you need to succeed—if you need direction, assistance or accommodation, please get in touch with me as soon as possible. I also encourage you to make use of the academic and pastoral resources at https://success.gatech.edu

Extensions, Late Assignments:

Time management is important. It is especially important in this course where you are responsible to your fellow students—completing peer reviews and collaborating on group projects.

Late submissions are not accepted for the case study, midterm project, or final project. Late completions of Perusall readings are also not accepted.

Finally, note that extensions will not generally be permitted, but if you think you are subject to an exceptional circumstance, please discuss it with me outside of class (and as soon as possible).

Student-Faculty Expectations:

To produce a positive teaching and learning environment, instructors and students must partner with one another in and out of the classroom. Mutual respect is at the heart of such a partnership and is characterized by respectful language and imagery, punctuality and care for others' time, clear and thorough communication, access to resources, and an openness to dialogue and debate. As a Georgia Tech faculty member, I am committed to such respect and I invite you to join me in working towards the best possible learning environment, so that all can meet their highest ambitions. Please explore Tech's policies on this for more information: https://catalog.gatech.edu/rules/22/

As part of this, I am committed to students from all diverse backgrounds and perspectives. I see such diversity is a resource, strength, and benefit and will endeavor to present materials and activities in class that respect and support this diversity, including (but not limited to): gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, and culture.

I encourage and appreciate suggestions for ways that the classroom can better support learning, inclusion, and the effectiveness of the course for you personally, or for other students or student groups.

Student Use of Mobile Devices in the Classroom:

As research on learning shows, unexpected noises and movement automatically divert and capture people's attention, which means you are affecting everyone's learning experience if your cell phone or laptop makes noise or is visually distracting during class. While you may take notes on your laptop, but I request that you turn the sound off so that you do not disrupt other students' learning.