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## PHIL 3115: PHILOSOPHY OF SCIENCE

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### COURSE DESCRIPTION

Science, whatever else it may be, is a human enterprise. While all scientists 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 who should be a part of the scientific process.

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?* 3<sup>rd</sup> 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
<b>Who Does Science?</b>			
1	Aug 21	People around the globe	Harding, Sandra. 2015. "New Citizens, New Societies: New Sciences, New Philosophies?" <i>Recommended:</i> UNESCO. 2021. "UNESCO Science Report: the race against time for smarter development." (Consider the tables and diagrams in "Global Trends", pp. 29–136) ( <a href="#">link</a> ) <i>NATURE INDEX</i> . 2022. "Tracking the collaborative networks of five leading science nations" ( <a href="#">link</a> ) ➤ Look through the statistics on the NatureIndex ( <a href="#">link</a> )
	Aug 23	People working together	Longino, Helen. "Values and Objectivity" ( <a href="#">link</a> ) <i>Recommended:</i> Godfrey-Smith, Peter. "Feminism and Science Studies" ( <a href="#">link</a> ) Merton, Robert. "The Sociology of Science" (only available in hardcover-link)
2	Aug 28	People with different experiences	Martin, Emily. "The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-Female Roles." ( <a href="#">link</a> ) <i>Recommended</i> Toole, Briana. 2021. "Recent Work in Standpoint Epistemology." ( <a href="#">link</a> ) Anderson, Elizabeth. 2004. "Uses of Value Judgments in Science: A General Argument, with Lessons from a Case Study of Feminist Research on Divorce." ( <a href="#">link</a> )
	Aug 30	People with different politics	Kovaca, Karen. "Evaluating Community Science" ( <a href="#">link</a> ) <i>Recommended</i> Douglas, Heather. "The Pervasive Entanglement" ( <a href="#">link</a> ) Douglas, Heather. "Science, Values, and Citizens." ( <a href="#">link</a> )
<b>What Do Scientists Do?</b>			
3	Sept 4		<b>Official School Holiday - No Class (First Case Study Released)</b>
	Sept 6	Confirm Theories	Godfrey-Smith, Peter. "Induction and Confirmation" ( <a href="#">link</a> )
4	Sept 11	Generate Data	Bogen, James and James Woodward. "Saving the Phenomena" (303–326) ( <a href="#">link</a> ) <i>Recommended</i> Anderson, Chris. "The End of Theory: The Data Deluge Makes the Scientific Method Obsolete." ( <a href="#">link</a> ) Pietsch, Wolfgang. "Aspects of theory-ladenness in data-intensive science." ( <a href="#">link</a> )
	Sept 13	Perform Experiments	Hacking, Ian. "Experiment" and "Observation". ( <a href="#">link</a> ) <i>Recommended</i>

Feest, Uljana and Friedrich Steinle. "Experiment." (link)

**First Case Study due Sept 17th by end of day**

			Weisberg, Michael. "Who is a modeller?" (link) <i>Recommended</i>
5	Sept 18	Explore Models	Frigg, Roman and Stephan Hartmann. "Models in Science." (Especially §§1, 4–5). (link)

**Second Case Study Released**

	Sept 20	Craft Stories	Cleland, Carol. "Methodological and Epistemic Differences between Historical Science and Experimental Science." (link) <i>Recommended:</i> Currie, Adrian. "Hot-Blooded Gluttons: Dependency, Coherence, and Method in the Historical Sciences."
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**How Should Science Be Practiced?**

6	Sept 25	A Scientific Method? (Part I)	Karl Popper. "Conjectures and Refutations" (Ch. 1, sections I–III). Karl Popper. "The Logic of Scientific Discovery." (Ch. 1, sections 1–6).
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	Sept 27	A Scientific Method? (Part II)	Tim Lewens. "How Science Works" (link) <i>Recommended:</i> Peter Godfrey-Smith. "Popper: Conjecture and Refutation" (link)
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**Second Case Study Due by Oct 1st, End of Day**

7	Oct 2	A Scientific Method? (Part III)	Thomas Kuhn. " <i>The Structure of Scientific Revolutions</i> " (Chs. 2–4). (link)
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	Oct 3	A Scientific Method? (Part IV)	Thomas Kuhn. " <i>The Structure of Scientific Revolutions</i> " (Chs. 9–10). (link) <i>Recommended:</i> Godfrey-Smith, Peter. "Kuhn and Normal Science" (link) Thomas Kuhn. " <i>The Structure of Scientific Revolutions</i> " (Chs. 8). (link)
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8	Oct 9		<b>Fall Break - No Class</b>
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	Oct 12	A Scientific Method? (Part V)	Feyerabend, Paul. 1970. " <i>Against Method</i> ." (Introduction and Chs. 1-5 — feel free to ignore the extremely long footnotes). <i>Recommended:</i> Peter Godfrey-Smith. "Lakatos, Laudan, Feyerabend, and Frameworks" (§§7.4–7.7)
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9	Oct 16		<b>Midterm Assignment</b>
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	Oct 18		<b>Midterm Assignment</b>
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**What Organizes Science?**

10	Oct 23	Objectivity	Douglas, Heather. "Objectivity in Science" (link)
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	Oct 25	Productivity	Smaldino, Paul E. and Richard McElreath. "The Natural Selection of Bad Science." (link)
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**Midterm Assignment Due October 29th, end of day**

	Oct 30	Peer Review	Remco Hessen and Liam Kofi Bright. "Is Peer Review a Good Idea?" <i>Recommended:</i>
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11			Belluz, Julia and Steven Hoffman. "Let's stop pretending peer review works." (link)
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**Deadline for Resubmitting Case Studies: Nov 5th, end of day**

	Nov 1	Government	Kitcher, Philip. "Well-Ordered Science" (link)
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	Nov 6	Money	Avin, Shahar. 2017. Science funding is a gamble so let's give out money by lottery. (link)
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12			➤ Check out SimScience! (link) <i>Recommended</i>
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			Avin, Shahar. "Centralized funding and epistemic exploration." (link)
Nov 8	Fame and Impact	Latour, Bruno and Steve Woolgar. <i>Laboratory Life</i> (pp. 43–53, 69–89) (link)	
		Editorial Team. "Credit where credit is due." (link)	
		<i>Recommended</i>	
		Strevens, M. "The role of the priority rule in science."	
		Latour, Bruno and Steve Woolgar. "Laboratory Life" (pp. 189–208) (link)	
13			
14	<b>No Class Nov 22 (Student Recess)</b>		<b>Final Group Project &amp; Project Presentations</b>
15			

## 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.

Assignment	% of total grade	Assessment	Grade Scale
Case Study 1	15	Complete (14)   Insufficient (0)	A: 90–100
Case Study 2	15	Complete (14)   Insufficient (0)	B: 80–89.5
Midterm Assignment	15	Midterm Rubric   Essay Rubric (link)	C: 70–79.5
Final Project	30	Final Project Rubric   Essay Rubric (link)	D: 60–69.5
Readings	20 (1 x 20)	Complete (1)   Incomplete (0)	F: 0–59.5
Participation	5	Participation Rubric (link)	

For those who take the class *pass/fail*: 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.

### 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 or more classes**, the highest grade you can achieve is a "B", 8 or more a "C", and 10 or more a "D".

You can think of this another way. You have 5 "freebies"—5 absences to use to go to career fairs, grad school appointments, or if you're just not feeling the reading for that week.

Only serious circumstances of serious medical illness, bereavement, or other emergencies will be "excused" absences. Documentation will be required for excused absences.

### 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 **Sunday** of the following week at **11:59pm** (in weeks 4 and 6).

The case studies are marked complete/insufficient. What counts as complete versus insufficient is made clear on the case study rubric available on Canvas and at the following (link).

You may resubmit an insufficient discussion response— 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 **Sunday November 5th by end of day**.

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 9**, the third you will complete on your own. This project will assess your skills in analyzing case studies, your knowledge of the course material, and your participation. The completion of all elements is due **Sunday October 29<sup>th</sup> by 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 can be found on Canvas ([link](#)).

*Reading Assignments:*

The readings for the course will be access through the third-party Perusall platform. You must use this platform to complete the readings. Perusall is both a community space—you'll be leaving comments which can be seen by your peers—and a means for me to track your engagement with the reading.

**Some warnings and guidance:** you *must* be connected to the internet while you access the Perusall platform. Moreover, Perusall does not perform well on phones or tablets, and struggles with having multiple sessions open. I encourage you to complete these readings using a laptop or desktop computer in an area with a strong internet connection. If this presents a problem, do get in touch.

Your completion grade for each reading is determined by three metrics: (1) completing the reading, (2) time spent engaging with the reading, and (3) the comments that you leave. For each reading, you are required to make at least **three** substantive comments.

**Note:** just leaving comments will not be sufficient to get the grade for each sessions reading. You need to read the reading too.

I encourage you to use the platform as a place to express your uncertainties, questions, and confusions. I read through these comments and often contribute to discussions in preparation for each session.

Perusall employs AI to evaluate your comments. Sometimes it doesn't do a good job, however, determining what is a good comment. Examples of what I take to be substantive comments include those that:

- a. Outline the argument of the section/paragraph and relates it to the goals of the paper;
- b. Point to a technical concept or distinction, and provides some clarification of what it means in context;
- c. Raise 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;
  - e. Relate concepts, topics, or themes to other elements of the course in an interesting and illuminating way;
  - f. Connect the reading to outside sources or materials in a useful and illuminating way.

You must complete the reading **two hours before class**—after this point, the system will continue to track your activity, but it will not count towards your grade.

*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. There will be several classroom sessions devoted to discussion.

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. It will be evaluated according to the participation rubric (link). To anchor your expectations: if you merely show up but don't participate in classroom discussions, you'll receive a "D" (or 3/5).

*CIOS Incentive:*

If 75% of the class completes the CIOS survey, then I will forgive **one** incomplete reading. If 85% of the class completes the CIOS survey, I will forgive **two** incomplete readings.

## 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.

Your work 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 seminars—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.

In this class, the use of chat GPT or any other AI text-generating software will be seen as a violation of academic integrity. The class will use Turnitin to check for both plagiarism and AI-generated text.

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>.

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](mailto: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. Late submissions and 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). In general, only circumstances covered by an ODS letter, or situations of medical, family, or technological emergency will warrant an extension.

*Student-Faculty Expectations:*

I believe that mutual respect is at the heart of the student-teacher relationship. In general, this 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. I am committed to such mutual respect and encourage everyone in the class to work towards the best possible learning environment so that all can meet their highest ambitions. Please explore Tech's policies on for more information: <https://catalog.gatech.edu/rules/22/>

As part of my commitment to mutual respect, I encourage and value students from 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:*

Unless by prior arrangement—for instance, your computer has died—I do not allow mobile phones. Keep them in your bags and on silent.

While you may take notes on your laptop, I request that you turn the sound off so that you do not disrupt other students' learning.