PHIL 60S: Introduction to the Philosophy of Science

Zachary Hall
TuTh 1:30-3:30 PM
Lathrop 190

Summer 2025

Course Description

This course considers three related questions: what is the scope, nature, and value of science? It also serves as an introduction to several more specific topics in the philosophy of science, including but not limited to: the nature of theoretical entities, the question of whether the sciences comprehensively describe all of reality generally construed (e.g. do they leave room for free will?), the question of whether the fact of conceptual change through history challenges the objectivity of the sciences, the role the human being plays in scientific theory-construction, emergence versus reductionism, and the value of scientific inquiry.

Contact and Office Hours

Email: zhall@stanford.edu Office: 90-92H

Office Hours: Tuesdays 3:30-5:30 pm and by appointment (at least 24 hours notice required).

TA: Hyoung Sung Kim (hyoungsk@stanford.edu)

Expectations

Please do your best to be on time. Use of technology is fine, but I reserve the right to ask you to put away your phone, laptop, tablet, etc. Please be as attentive and engaged as your energy allows. Each session will feature a combination of lecture and discussion intended to help you navigate these difficult readings, so this is in the interest of your comprehension and hence final grade.

Assignments and Evaluation

Your grade will be determined by two short papers [%30 each], a final exam [%30], and participation and attendance [%10]. **Use of generative AI to write your paper directly is strictly prohibited and will result in failing the course. You may use generative AI to give feedback on drafts, or for finding further background information, if you cite its use.** You will have the opportunity to revise one of the papers of your choice for a full regrade in response to feedback from the course grader. **The rubric for the papers is available at end of this document**. The final exam will consist in short answers in which you can demonstrate your comprehension of the various ideas presented in the readings and discussed in lecture, as well as ability to reason to your own views about them.

Disabilities and Accommodations

Students who may need an academic accommodation based on the impact of a disability must initiate the request with the Office of Accessible Education (OAE). Professional staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for the teaching staff dated in the current quarter in which the request is being made. Students should contact the OAE as soon as possible since timely notice is needed to coordinate accommodations.

Participation

To participate in this course fully, you must show sustained engagement with the readings for and philosophical issues central to each week of the course. Possible means to do so are:

1. Raise topical and focused discussion questions during in-person meetings, or respond to those questions topically and with focus.
2. In the "Discussions" section of the Canvas page, post a discussion question on the readings for a given week in time for others to consider them before a given meeting.
3. Respond to one of the questions as described in (2) in a productive and charitable spirit, either on those discussion boards or in person.
4. Write me with questions about the material (especially as concerns your papers) to which I will try to respond either via email, in one of our course meetings, or in office hours.
5. Email me or meet with me in office hours to discuss paper ideas or drafts.

(1) is strongly encouraged for those who manage to feel comfortable doing so, but you will not be penalized if you primarily participate in other ways. (4) and (5) will almost certainly improve your papers, perhaps by multiple letter grades.

Your grade for participation will be determined by the degree to which you achieve full participation as described above. Absences and tardiness are *pro tanto* relevant factors for determining your participation grade.

Attendance and Tardiness Policy

Attendance is mandatory. If you miss one of our meetings, please email me and the teaching staff explaining your absence and either (i) arrange to meet with one of us to cover material you missed or (ii) demonstrate comprehension of the week's material and clarify as needed via email correspondence (exceptions granted at my discretion). **Failing to do this once is a (supercedable) ground for getting a 0 for your entire attendance grade**. Otherwise, your attendance grade is determined by the fraction $(\text{Time Present} + \text{Time Excused or Made-Up})/(\text{Total Scheduled Time for Course})$.

Calendar

Some readings and exact dates of discussion subject to change. Optional readings marked with **. All readings available on Canvas or hyperlinked to internet source.

Week 1, 06/23 - 06/27: Big Picture, Empiricism, Theory-Ladenness, Scientific Explanation and Understanding

- (Tuesday, June 24)
  Internet Encyclopedia of Philosophy, "Pseudoscience and the Demarcation Problem"
  Amber Dance, "Scientists are fixing flawed forensics that can lead to wrongful convictions" in ScienceNews
  Paul R. Thagard, "Why Astrology is a Pseudoscience"

  **Hegel, *Introduction to the Philosophy of Nature*, pp. 3-14 (Starting from "A. Ways of considering nature")

- (Thursday, June 26)
  Alan Chalmers, *What is This Thing Called Science?*, Ch. 1-2
  Wesley Salmon, "Scientific Explanation" (Chapter 1 of *Introduction to the Philosophy of Science*, Kenneth F. Shaffner, Wesley C. Salmon, John D. Norton.)

  **A.J. Ayer, *Language, Truth, and Logic*, Ch. 1
  **David Lewis, "Statements Partly About Observation"
  **Crispin Wright, "The Verification Principle: Another Puncture–Another Patch"
  **Stanford Encyclopedia of Philosophy, "Logical Empiricism"

Prompt for Paper 1, due end of Week 3 [Friday at 5pm] (2 pages, double-spaced): Consult Wikipedia's list of topics characterized as pseudoscience. Choose a topic close to a true science with which you are familiar. Try to articulate what distinguishes the two, explaining relevant background as needed. **Other than the virtue-epistemological approach**, which response to the demarcation problem is most helpful to do this and why? (Consult the document uploaded to the main Canvas folder for reference for a list of approaches.) In closing, consider what else you need to consider to resolve the demarcation problem more fully to your satisfaction.

Week 2, 06/30 - 07/04: Induction, Falsification

- (Tuesday, July 1) Chalmers, Ch. 3-4
  Clark Glymour, "Realism and the Nature of Theories," Introduction and

§§1-2 (Chapters 3.1-3.2 of *Introduction to the Philosophy of Science*, Kenneth F. Shaffner, Wesley C. Salmon, John D. Norton.)

**Hall, Zachary, "Kant on Material Unity, Systematicity, and Progressive Approximation of Nomic Necessity" (Under Review at *Synthese*.)
**John Earman and Wesley Salmon, "The Confirmation of Scientific Hypotheses" (Chapter 2 of *Introduction to the Philosophy of Science*, Kenneth F. Shaffner, Wesley C. Salmon, John D. Norton.)

- (Thursday, July 3) Chalmers, Ch. 5-7

  **W.V.O. Quine, "Two Dogmas of Empiricism"

Prompt for Paper 2, due end of Week 6 [Friday at 5pm] (2 pages, double-spaced): In Chapters 1-4, Chalmers raises issues (i) for the idea that the science is "based on" observable facts and (ii) for the idea that science is "derived" from those facts. Summarize both sorts of issues raised in one page. Then, for whichever sort of issue [(i) or (ii)] challenges your understanding of science more, explain how it challenges that understanding and indicate what requires further consideration for understanding science in light of the issue.

Week 3, 07/07 - 07/11: Laws of Nature

- (Tuesday, July 8) Chalmers, Ch. 14
  Emily Velasco, "Some Alloys Don't Change Size When Heated. We Now Know Why" in *The Caltech Weekly*
  Stanford Encyclopedia of Philosophy, "Laws of Nature," §§1-6, 10

- (Thursday, July 10) Mark Wilson, *Physics Avoidance*, pp. 54-56 (starting from Section ii) + Ch. 6
  Ted Sider, *Writing the Book of the World*, Ch. 3

Week 4, 07/14 - 07/18: Biology and Emergence

- (Tuesday, July 15) Elliott Sober, "Taxa and Geneology" (*The Philosophy of Evolutionary Theory*, Ch. 7)
  Sandra Mitchell, "Dimensions of Scientific Law"

- (Thursday, July 17) Kim Sterelny and Paul E. Griffiths, *Sex and Death - An Introduction to Philosophy of Biology*, Ch. 7
  Timothy O'Connor, "Emergent Properties"

  **P. W. Anderson, "More is Different"

Week 5, 07/21 - 07/25: Realism, Antirealism, Free Will

- (Tuesday, July 17)
  Chalmers, Ch. 15

  **Pierre Duhem, *The Aim and Structure of Physical Theory*, pp. 7-10, 19-30, 165-179
  **Clark Glymour, "Realism and the Nature of Theories" (Chapter 3 of *Introduction to the Philosophy of Science*, Kenneth F. Shaffner, Wesley C. Salmon, John D. Norton.)

- (Thursday, July 24)
  "Laws of Nature" in the Internet Encylopedia of Philosophy, §5f
  "Compatibilism" in the Stanford Encyclopedia of Philosophy, §§1-2
  Jaegwon Kim, "The Myth of Nonreductive Materialism"

  **Stanford Encyclopedia of Philosophy, "Laws of Nature," §4

  **William Bechtel and Robert C. Richardson, "Emergence and Complex Systems"

  **Wilfrid Sellars, *Empiricism and the Philosophy of Mind*
  **Adrian Haddock, "McDowell and Idealism"

  **Peter Tse, "Appendix 2: Ontological Indeterminism Undermines Kim's Argument against the Logical Possibility of Mental Causation " in *The Neural Basis of Free Will: Criterial Causation*

Week 6, 07/28 - 08/01: Anarchy, Reason As Self-Determining, Creativity (all readings listed Tuesday optional, lecture notes will be posted for future reference); Paradigms and Incommensurability: Kuhn

- (Tuesday, July 29)
- **Chalmers, Ch. 10-11
  **Mark Wilson, *Physics Avoidance*, pp. 1-50
- (Thursday, July 31) Chalmers Ch. 8

Week 7, 08/04 - 08/08: "Constitutivism": Michael Friedman's Response to Kuhnian Incommensurability; Research Programs: Lakatos

- (Tuesday, August 5) Michael Friedman, *Dynamics of Reason*, Lecture II
- (Thursday, August 7) Chalmers Ch. 9

Week 8, 08/11 - 08/15: Value

- (Tuesday, August 12) **Hume, *A Treatise of Human Nature*, pp. 466-470 (From "But to make these general reflexions more clear and convincing..." to end of Section I.)
  Stanford Encyclopedia of Philosophy, "Moral Non-Naturalism," §§1-2
  **John Lippitt, "Kierkegaard, 'the Public', and the Vices of Virtue-Signalling: The Dangers of Social Comparison", §2, introductory portion, §2.4, §3
  **Bernard Williams, *Truth and Truthfulness*, Ch. 6, §1, §4
- (Thursday, August 14) No readings—review session.

Rubric and Writing Guide for Papers

Grading

I will grade your papers with three considerations in mind: (1) structure [%40], (2) content [%40], (3) and grammatical correctness/style [%20].

> ***Structure:*** can I identify your main claims and is it clear how they are related, both in the body of the paper and in the introduction (which should be a roadmap to the body)? If the answer is "yes", the paper earns an A for this component, with points lost in proportion to how difficult it was to identify the main claims and their intended relations. Note that good style helps with good structure. See **Organization/Structure** section below for more.
>
> ***Content:*** The most important thing is to make sure you have a clear thesis that addresses the prompt – failing to do this will earn an F for this component. The next most important thing is whether or not every claim you make is either (a) an obvious representation of the portion of the text cited or (b) sufficiently clear, both in what is said and in the supporting reasons offered for the claim. See **Clarity** and *Audience* below for more on (b). This source also provides some good tips and examples:
> http://writing2.richmond.edu/writing/wweb/philosophy/research.html
>
> ***Grammatical Correctness/Style:*** you will lose letter grades as a function of how difficult it is to read your paper, both owing to grammatical errors / typos and in language that does not directly express a claim, give reasons for the claim, or serve to structure the ideas of the paper. A paper without any of these defects automatically earns an A for this component. See **Clarity, Concision,** and **Style** below for more.

Audience: Assume that your reader is willing to think about philosophy, but either has not taken this course or is taking it for the first time. So: explain everything about your view to your reader and make your paraphrases of the main texts as unobjectionable as possible. Imagine that your reader disagrees with claims you make or doubts their truth and make it your goal to demonstrate the strength of your view even to this person.

Feedback: The teaching staff will not edit your papers or mark grammatical mistakes. We expect you to find and fix these on your own through the drafting process. A helpful strategy for catching grammatical mistakes and other typos is to read your paper out loud (or have a friend or a computer read it to you).

When giving feedback on your papers, we will make three or four comments high-level comments to keep in mind for the next assignment, in addition to any other in-line comments we see fit. We highly encourage you to come to office hours to discuss the comments on your paper if they are unclear or simply to discuss them in more detail.

Feedback will be hierarchical, which means that I will not give comments regarding aspects of your paper lower on the hierarchy if comments need to be made about aspects higher in the hierarchy. Lack of feedback in an area in the rubric (e.g. content) does not mean there were no problems affecting your grade.

The hierarchy: [1]

- **Topic.** Does this paper follow the instructions of the assignment?
- **Thesis.** Is the thesis clear and clearly engaged with a relevant topic? Is the way the thesis is defended clear?
- **Structure.** Does each paragraph have a point? Is it evident how the paragraph contributes something towards the thesis?
- **Quality of exposition.** Does the paper accurately represent the views you are discussing? Is the paper charitable to the ideas of others?
    - *Advice:* Reconstruct the author's arguments as charitably as possible. If you think that some famous author has made an obvious mistake, consider whether it is more likely that you, as someone new to the ideas, have made a mistake in interpretation. Avoid personal attacks or excessive praise.
    - Only explain the aspects of the author's work that are relevant to your thesis. You do not need to summarize everything the author said. When explaining an author's arguments, keep your comments and criticisms separate from your exposition.
- **Quality of arguments.** Does the paper exemplify good reasoning and use appropriate data and evidence? Are there compelling reasons offered for each claim made? Are the links in the chains of reasoning legitimate and adequately explained?
    - *Advice***:** Whenever you make a claim, ask yourself: 'Why should the reader believe what I say?' After each paragraph, ask yourself: 'Have I supplied enough explanation so that the reader can understand and agree with everything I've said?'

[1] I borrow this hierarchy from Taylor Madigan at Stanford University.

- **Clarity.** Are all aspects of the paper clear, or are certain parts ambiguous, nebulous, or vague?
    - Use familiar vocabulary and simple, straightforward prose whenever possible.
    - Define key terms and concepts.
    - Say *exactly* what you mean. If you mean a word, use it. Do not worry about varying word choice.
    - Use concrete examples to illustrate a point when possible and helpful.
- **Concision**. Does each sentence and word contribute something to the paper? Are there redundancies?
    - Keep sentences and paragraphs short. Get straight to the point. Avoid fluff, including grandiose introductions and conclusions. Aim for argumentative density.
- **Organization/Structure.** Is the paper as whole organized well? Are individual paragraphs organized well?
    - Use connective words such as "because," "since," "thus," "therefore," "however," "but," etc. However, only use these words if you really mean them! If you say "P, thus Q" you are saying that P is a good reason to accept Q. Use signposts to guide your reader (For example: in the Introduction: "In section 1, I will show …"; in a body: "We now turn to A's objections to B, where we will see that …"). This also contributes to the overall clarity of the paper.
- **Style.**
    - Be concise and clear.
    - Use active, rather than passive, verbs.
        - Example: 'Zach graded the papers.' vs. 'The papers were graded by Zach.'
    - Minimize the following:
        - 'be' verbs: am, are, is, was, were, been, being
        - nominalizations, i.e., turning non-nouns into nouns
        - Adjectives and adverbs
        - Use of it, this, that, and there