

PHIL 128: Philosophy of Science

Spring 2020

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Office Hours: Moses Hall 310, M/W 9:30-10:30

Classes

- 3 lectures each week: M/W/F, 12-1, Wheeler 102
- 1 section each week.

Assessment

- Midterm exam: 20%
- Final exam: 20%
- Midterm paper: 15%
- Final paper: 35%
- Class participation: 10%

You will receive a letter grade for each component. Your final grade is calculated by converting each letter grade into a number, taking the average of those numbers (weighted by the percentages above), and converting the resulting number back into a letter grade, using the following schemes:

Letter-to-number conversion	Number-to-letter conversion (boundaries are rounded upwards)
A = 95	$> 93.5 = A$
A- = 92	$90 - 93.5 = A-$
B+ = 88	$86.5 - 90 = B+$
B = 85	$83.5 - 86.5 = B$
B- = 82	$80 - 83.5 = B-$
C+ = 78	$76.5 - 80 = C+$
C = 75	$73.5 - 76.5 = C$
C- = 72	$70 - 73.5 = C-$
Etc...	Etc...
F = 60	$< 60 = F$

Academic Integrity

Plagiarism is not tolerated and will be taken extremely seriously. “Turnitin” software will be used to check all assignments for possible plagiarism. That said, I strongly encourage you to discuss the material in this class with other students. It is fine to get feedback from other students on drafts of papers or argument maps. But your finished work must then be your own. This means that having talked about your draft with friends, you should sit down and revise your work yourself. For further guidance, please see the UC Berkeley statement on academic integrity: <http://sa.berkeley.edu/conduct/integrity>.

Classroom climate

Discussion is an essential part of productive philosophical inquiry. Discussion can take many forms: you can propose your own idea, add support to someone else’s idea, clarify it, distinguish it from related ideas, and so on. Discussion can also include criticism. Indeed, criticism can sharpen our ideas, deepen understanding, and reveal novel insights, so it is encouraged and

expected. Still, *all discussion must be conducted with collegiality and civility*. This includes discussion in class, in section, and online. This is not always easy. There may be times when someone expresses an idea that strikes you as silly, immoral, or offensive. If you wish to challenge the idea, be sure to target the idea itself rather than the person who expressed it. It is never appropriate to demean or denigrate fellow students or instructors. In addition, all students are expected to comply with the Student Code of Conduct: <https://sa.berkeley.edu/code-of-conduct>

Disabled Students' Program

If you require disability accommodations, please contact the campus DSP office at <https://dsp.berkeley.edu> and ask them to send me a letter of accommodation. Then, please come and talk with me as early as possible in the semester about what accommodations you may need for this class, even if you are not certain you will need them, so that we can make arrangements in advance. Accommodations requested at the last minute are not always possible to arrange.

Graduate Student Instructors

Graduate Student Instructors (GSIs) assist in various aspects of teaching here at Berkeley. Your GSI runs your weekly section and is available to talk during their office hours each week. Please note that your GSI is *not* expected to be available to talk outside their office-hour times, respond to involved philosophical questions by email (they will respond to administrative questions within 2 business days), or read and comment on drafts of your work prior to submission.

Policy on Sexual Violence and Harassment

Sexual violence and sexual harassment have no place in a learning environment. If you or someone you know experiences sexual violence or harassment, there are options, rights, and resources, including assistance with academics, reporting, and medical care.

Visit survivorsupport.berkeley.edu or call the 24/7 Care Line at [510-643-2005](tel:510-643-2005).

Course Overview

This class will investigate how our conceptions of space, time, and chance have been shaped by developments in modern science. We'll start by discussing the structure of space and time in classical and relativistic physics. We'll then turn to the notion of chance and its role in statistical mechanics and evolutionary biology. Along the way, we'll use these topics as gateways into more general issues in the philosophy of science such as scientific realism vs anti-realism, reductionism, the nature of scientific laws, the metaphysics of objective chance, and the demarcation problem. Over the semester we will build towards a certain picture of the world that explains how the different sciences hang together. This class has no prerequisites: all the relevant science will be introduced in class from scratch.

Readings

Readings marked ** are optional; all others are required. All readings will be available in PDF format through the bCourses site. You are expected to complete all readings assigned to each class by the time that class begins. If you find the readings difficult, that's fine—in fact, that is expected! But please try to get through the reading before class. Try to formulate what you don't understand as a succinct question. We will discuss the readings in class and there will be opportunities to ask questions.

Unit 1: Space and time in classical physics / Laws of nature

Weds 22 Jan
Class 1

Introduction

Fri 24 Jan
Class 2

The bucket argument

- Dasgupta, “Substantivalism vs Relationalism in Classical Physics”, sections 1-3

Mon 27 Jan
Class 3

Symmetry arguments

- Dasgupta, “Substantivalism vs Relationalism in Classical Physics”, sections 4-5

Weds 29 Jan
Class 4

Galilean spacetime

- Dasgupta, “Substantivalism vs Relationalism in Classical Physics”, section 6

Fri 31 Jan
Class 5

Philosophy Lab: Space in classical physics

Mon 3 Feb
Class 6

Laws and natural kinds I

- Lewis, “New Work for a Theory of Universals”, pp. 343-347 and pp. 364-368
- Loewer, “Humean Supervenience” pp. 176-187

Weds 5 Feb
Class 7

Laws and natural kinds II

- Beebe, “The Non-Governing Conception of Laws of Nature”, pp. 578-592
- Loewer, “Humean Supervenience” pp. 187-201

Fri 7 Feb
Class 8

Philosophy Lab: Laws and natural kinds

Supplementary reading:

- Sklar, *Space, Time, and Spacetime*, chapter 3 (a classic overview of the substantivalism vs relationalism debate)
- The Leibniz-Clarke correspondence, reprinted in Huggett, *Space from Zeno to Einstein*, chapter 8: “Leibniz and Clark”
- Earman and Roberts, “Contact with the Nomic Part II”
- Cohen and Callender, “A Better Best System Account of Lawhood”

Unit 2: Space and time in relativistic physics / Scientific realism

- Mon 10 Feb**
Class 9
- Special Relativity I**
- Maudlin, *Philosophy of Physics: Space and Time*, chapter 4: “Special Relativity”
- Weds 12 Feb**
Class 10
- Special Relativity II**
- Maudlin, *Philosophy of Physics: Space and Time*, chapter 4: “Special Relativity”
- Fri 14 Feb**
Class 11
- General Relativity**
- Maudlin, *Philosophy of Physics: Space and Time*, chapter 6: “General Relativity”
- Mon 17 Feb**
- No class (academic holiday)**
- Weds 19 Feb**
Class 12
- Philosophy Lab: Space and time in relativistic physics**
- Fri 21 Feb**
Class 13
- The epistemology of geometry**
- Reichenbach, *The Philosophy of Space and Time*, chapter 1, pp. 10-19 and 35-37
- Mon 24 Feb**
Class 14
- Scientific realism I: Natural kinds**
- Sider, *Writing the Book of the World*, chapter 1 and chapter 3 pp. 39-44
- Weds 26 Feb**
Class 15
- Scientific realism II: Unobservables**
- Van Fraassen, *The Scientific Image*, chapter 2: “Arguments Concerning Scientific Realism”, pp. 6-25
- Fri 28 Feb**
Class 16
- Philosophy Lab: Scientific realism**

Supplementary reading:

- Friedman, “Geometry, Convention and the Relativized Apriori: Reichenbach, Schlick, and Carnap”
- Godfrey-Smith, *Theory and Reality*, chapter 2, “Logic plus Empiricism”; chapter 12, “Scientific Realism”
- Sklar, *Space, Time and Spacetime*, chapter 2: “The Epistemology of Geometry”

Unit 3: Is there a scientific explanation of the flow of time? / Chance

Mon 2 March
Class 17

Entropy and statistical mechanics I

- North, “Time in Thermodynamics”

Weds 4 March
Class 18

Entropy and statistical mechanics II

- North, “Time in Thermodynamics”

Fri 6 March

Mid-term exam

Mon 9 March
Class 19

Chance

- Briggs, “The Metaphysics of Chance”
- Loewer, “David Lewis’ Humean Theory of Objective Chance”

Weds 11 March
Class 20

The flow of time

- Loewer, “Two Accounts of Laws and Time”

Fri 13 March
Class 21

Philosophy Lab: Chance and the flow of time

Supplementary reading:

- Albert, *Time and Chance*, chapters 3 and 4
- Albert, “The Difference Between the Past and the Future”
- Lewis, “Humean Supervenience Debugged”
- Briggs, “The Anatomy of the Big Bad Bug”
- Gillies, *Philosophical Theories of Probability*, pp. 88-105, 113-136
- Carroll, “Are Boltzmann Brains Bad?”

Unit 4: Is there a scientific explanation of our existence? / Science vs pseudoscience

Mon 16 March **No class**

Weds 18 March **No class**

Fri 20 March **The biological design argument**
Class 22

- Sober, *Philosophy of Biology*, chapter 2: “Creationism”, pp. 27-39

Mon 30 March **Creationism and the demarcation problem**
Class 23

- Sober, *Philosophy of Biology*, chapter 2: “Creationism”, pp. 39-57

Weds 1 April **Fitness**
Class 24

- Mills and Beatty, “The Propensity Interpretation of Fitness”
- Sober, “Two Faces of Fitness”

Fri 3 April **Philosophy lab: Natural selection and creationism**
Class 25

Mon 6 April **Adaptationism**
Class 26

- Sober, *Philosophy of Biology*, chapter 5: “Adaptationism”
- **Gould and Lewontin, “The Spandrels of San Marco and the Panglossian Paradigm”

Weds 8 April **Natural selection and normativity**
Class 27

- Plantinga, *Warrant and Proper Function*, chapter 12: “Is Naturalism Irrational?”

Fri 10 April **Philosophy Lab: Adaptation and normativity**
Class 28

Supplementary reading:

- Sober, *Evidence and Evolution*, chapters 1 and 2 (detailed discussion of Bayesianism and intelligent design)
- Orr, “Darwin vs Intelligent Design (Again)”; Behe, “The Sterility of Darwinism”, Orr, “H. Allen Orr Responds” (a back and forth on natural selection vs intelligent design)
- Sober, *Philosophy of Biology*, chapter 3 (on fitness)
- Sterelny and Griffiths, *Sex and Death* chapter 10: “Adaptation, Perfection, Function”

Unit 5: The unity of science / Laws and chance revisited

- Mon 13 April**
Class 29
- Physicalism and the unity of science**
- Papineau, *Thinking About Consciousness*, pp. 13-18 and 232-257
- Weds 15 April**
Class 30
- The disunity of science**
- Fodor, “Special Sciences (Or: The Disunity of Science as a Working Hypothesis)”
 - **Kitcher, “1953 and all that: A Tale of Two Sciences”
- Fri 17 April**
Class 31
- Against disunity**
- Loewer, “Why is There Anything Except Physics?”
- Mon 20 April**
Class 32
- Philosophy lab: The disunity of science**
- Weds 22 April**
Class 33
- Unity through chance**
- Albert, “Physics and Chance”
- Fri 24 April**
Class 34
- Unity through laws**
- Callender and Cohen, “Special Sciences, Conspiracy, and the Better Best System Account of Lawhood”
- Mon 27 April**
Class 35
- Philosophy lab: The unity of science**
- Weds 29 April**
No class
- Fri 1 May**
Final exam

Supplementary reading:

- Frisch, “Why Physics Can’t Explain Everything”
- Weslake, “Statistical Mechanical Imperialism”