

SPACE, TIME, AND MATTER
HPS 0545 – SPRING 2018

Class meetings

Monday, 6 – 8.30 PM
Room CL – 116

Instructor

Siska De Baerdemaeker

sad116@pitt.edu

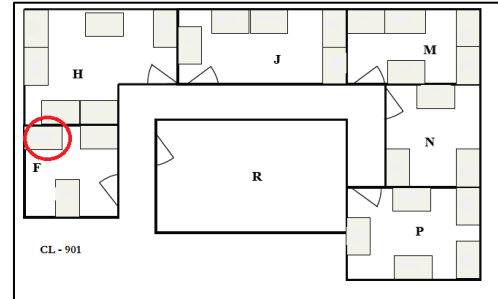
Office: Cathedral of Learning – 901 F

Mailbox: Cathedral of Learning – 1017

Office hours: Monday, 3 – 4 PM

Tuesday, 2 – 3 PM

Or by appointment



Readings

Required

All required readings will be posted on CourseWeb. Make sure to bring all required readings to class, in a format of your choosing.

Recommended

Kragh, Helge S. (2007). *Conceptions of Cosmos. From Myths to the Accelerating Universe: A History of Cosmology*. Oxford: Oxford University Press (Indicated by “Kragh” on the schedule)

North, John (2008). *Cosmos. An Illustrated History of Astronomy and Cosmology*. Chicago: The University of Chicago Press (Indicated by “North” on the schedule)

Pannekoek, Anton (1961). *A History of Astronomy*. London: George Allen & Unwin (Indicated by “Pannekoek” on the schedule)

Course description

Ever since the ancients first looked up at the sky, people have asked themselves questions: what are stars made of? Is the universe infinite? Does the evolution of the universe have a beginning or end, or is it eternal? The nature of the universe has been subject to human theorizing throughout history, and these theories have held a central place in physical sciences. This course is an introduction to the history of cosmology in the West from antiquity to the present day. We will investigate how models of the universe evolved from ancient Greece, through the Scientific Revolution of the 17th Century and the introduction of general relativity in the early 20th century, and into today. This historical survey will inform philosophical reflections, for example on the nature of space and time, and how these reflections informed the thinking about the universe throughout history.

This course is suitable for science and non-science majors.

Course goals

At the end of this course, students will have developed the following skills:

- History and philosophy of science
 - Give an overview of important episodes in the history of Western astronomy and cosmology
 - Explain historical and contemporary philosophical debates around the nature of space and time
- Historical skills
 - Read (excerpts from) scientific and philosophical texts in their historical context
 - Understand how different interpretations and reconstructions from historical sources can arise
- Philosophical skills
 - Write a short philosophical essay with a clear thesis statement and an argument in support of that thesis
 - Find relevant sources for an essay, and use and cite them correctly

Evaluation

Attendance and participation

You will be allowed one unexcused absence for this course. Any additional unexcused absences will result in 1% deducted from your total grade. Attendance will be graded based on short writing exercises at the end of class (I will ask you to write down one thing you found interesting or learned, and one thing you found confusing or did not understand).

Reading responses

The majority of assignments for this course will consist of weekly reading responses. I will distribute prompts for the reading responses at the end of each class. Given the variety of the material covered in class, the types of questions may vary accordingly. Regardless, you should aim your reading responses to be about a paragraph long. You should write your reading responses *entirely* in your own words, since those reading responses are meant as way to probe how you engage with the readings. Do not quote; paraphrase. Each reading response is worth 5%. 10 reading responses will be assigned, but only your 5 highest scores will count towards your final grade.

Essay

You will submit an essay of approx. 900 – 1100 words, in the style of an academic research paper. I will distribute prompts for the essay 3 weeks in advance, but you are free to propose a topic of your own choice. The essay is due 2/26. You can submit a revision of your essay to earn back maximally half of the points that you lost. The revision is due 3/19.

Final project

This course is intended to give you a historical overview of western cosmology, and related philosophical questions about the nature of space, time, and matter. The weekly reading responses and the essay prepare you to engage with historical texts and to read them in the appropriate historical contexts, or to analyze a philosophical debate. For your final project, you will apply those skills to analyze a historical episode or philosophical debate of your own choosing in greater depth than the brief writing assignments.

You will present your analysis in a format of your own choosing, e.g. an essay, a science-journalism article, a class presentation, a poster presentation, an extended blog post, a podcast, a video, etc. If you have a

different idea for a final project format, or if you would like to pursue a group project, you are welcome to discuss it with me.

Your grade for the project will be based on the submitted project proposal (5%; due 3/19), the project itself (27.5%), and your personal reflection (2.5%). The project and the personal reflection can be submitted any time between the approval of your project proposal and the final deadline (4/23). If your initial proposal was not approved, you are required to submit a revised proposal by 4/9. Those whose proposal has been approved can opt to submit a (partial) draft of their project by the same deadline (4/9) to receive feedback on their progress. Note that, given the flexibility for this part of the course, it will be crucial that we communicate about expectations for the project. I invite you to discuss ideas for your project with me and with your peers before you develop a proposal, although you will also receive feedback on the submitted proposal.

Grading breakdown

Attendance & participation	15*1% =	15%
Reading responses	5*5% =	25%
Essay	1*25% =	25%
Final project	1*35% =	35%
Total		100%

Note on late assignments

Assignments are due in class (except for the final project) on the date listed below in the tentative course schedule. Late assignments will be penalized by a reduction of 5% of your grade per day (including weekends) that the assignment is late.

Note on anonymous grading

I will grade your assignments anonymously. Please put your PeopleSoft number instead of your name on your assignments. The reason to grade anonymously is to eliminate the possible effects of implicit biases. For an introduction to implicit bias, take Project Implicit's "Implicit Association Test" (<https://implicit.harvard.edu/implicit>) or read the Stanford Encyclopedia of Philosophy's article on Implicit Bias (<https://plato.stanford.edu/entries/implicit-bias/>).

Tentative course schedule (subject to revision)

*Optional readings are indicated by *. These readings primarily serve as guides for further research in light of your essay or project.*

Week	Date	Topic	Readings
1	01/08	Introduction	*Stanley. "Why Physicists should Study History" <i>Physics Today</i> . 69(7), 38 (2016)
2	01/15		<i>MLK Day observed – No class</i>
3	01/22	Egypt & Mesopotamia: calendars	North. "Chapter 2: Ancient Egypt" Pannekoek. "Chapter 4: New-Babylonian Science" *North. "Chapter 3: Mesopotamia" *Pannekoek. "Chapter 5: The Chaldean Tablets"
4	01/29	Ancient Greek cosmology: structure of the world	Plato. <i>Timaeus</i> . Trans. Archer-Hind, London: MacMillan (1888): 27d – 34d. Pannekoek. "Chapter 11: Systems of World Structure" Podcast: "A Likely Story: Plato's Timaeus"

			<p>*Aristotle. <i>De Caelo</i>. Trans. Stocks. Oxford: Clarendon Press (1922): Book II, Ch. 4, 7, 8, 11, 13, 14.</p> <p>*North. "Chapter 4: The Greek and Roman Worlds": pp. 67 – 92</p>
5	02/05	Ancient Greek cosmology: matter and time	<p>Plato. <i>Timaeus</i>. Trans. Archer-Hind, London: MacMillan (1888): 52d – 61d</p> <p>Podcast: "Richard Sorabji on Time and Eternity in Aristotle"</p> <p>*Bodnar. "Aristotle's Natural Philosophy", <i>The Stanford Encyclopedia of Philosophy</i> (Winter 2016 Edition), Zalta (ed.)</p>
6	02/12	Hellenistic and Greco-Roman astronomy ESSAY PROMPTS DISTRIBUTED	<p>Ptolemy. <i>Almagest</i>. Trans. Toomer, London: Duckworth (1984): Book I, Ch. 1 – 8</p> <p>North. "Chapter 4: The Greek and Roman Worlds": pp. 92 – 123</p> <p>*Podcast: "Sky Writing: Astronomy, Astrology, and Philosophy"</p>
7	02/19	The translation movement and Islamic astronomy	<p>Podcast: "The Translation Movement"</p> <p>North: "Chapter 9: Western Islam and Christian Spain"</p> <p>*North: "Chapter 8: Eastern Islam"</p> <p>*Montgomery. <i>Science in Translation. Movements of Knowledge through Culture and Time</i>. Chicago: The University of Chicago Press. (2000): Excerpts</p>
8	02/26	Medieval authors on eternity ESSAY DUE	<p>Podcast: "Neverending Story: the Eternity of the World"</p> <p>Aquinas. <i>De Aeternitate Mundi</i>. Trans. Miller. From The Internet Medieval Sourcebook (1991, 1997): Excerpts</p> <p>Maimonides. <i>Guide for the Perplexed</i>. Trans. Friedlander. London: Routledge and Kegan Paul (1904): 2.25, 2.27</p> <p>*Podcast: "He Moves in Mysterious Ways: Maimonides on Eternity"</p> <p>*Seeskin. "Maimonides", <i>The Stanford Encyclopedia of Philosophy</i> (Spring 2017 Edition), Zalta (ed.)</p>
9	03/05	<i>Spring Break – No class</i>	
10	03/12	The Scientific Revolution: toward heliocentrism PROJECT INSTRUCTIONS DISTRIBUTED	<p>Galileo. A Dialogue Concerning the Two Chief World Systems: The Third Day. Trans. Stillman Drake. (1999): Excerpts</p> <p>Kuhn. <i>The Copernican Revolution</i>. Cambridge: Harvard University Press (1957): Chapter 4</p> <p>*Kragh. "Chapter 1: From Myths to the Copernican Universe": Section 1.4</p> <p>*North. "Chapter 12: The New Empiricism": pp. 321 – 377</p>
11	03/19	The Scientific Revolution: debates about space and time ESSAY REVISION DUE	<p>Okasha. <i>Philosophy of Science. A Very Short Introduction</i>. Oxford: Oxford University Press: pp. 95 – 103</p> <p>Du Châtelet. <i>Foundations of Physics</i>. Trans. Brading et al. (2017): Chapter 5 "On Space"</p> <p>*Detlefsen. "Emilie du Châtelet" <i>The Stanford Encyclopedia of Philosophy</i> (Winter 2017 Edition), Zalta (ed.)</p>
12	03/26	The 20 th Century: Einstein's theories of relativity PROJECT PROPOSAL DUE	<p>Norton. <i>Einstein for Everyone</i>. Pittsburgh: Nullarbor Press. (2017): "Special Relativity: The Principles", "Origins of Special Relativity"</p> <p>*Norton. <i>Einstein for Everyone</i>. Pittsburgh: Nullarbor Press. (2017): "General Relativity"</p>

13	04/02	The 20 th Century: early relativistic cosmology	Norton. <i>Einstein for Everyone</i> . Pittsburgh: Nullarbor Press. (2017): “Relativistic Cosmology” Podcast: “The Age of the Universe” *Kragh. “Chapter 3: Foundations of modern cosmology”
14	04/09	The 21 st Century: where we are right now PROJECT PROPOSAL REVISION DUE	Norton. <i>Einstein for Everyone</i> . Pittsburgh: Nullarbor Press. (2017): “Our Universe: What We See” NASA. LAMBDA Website on Λ CDM (2016): Explore different pages
15	04/16	Visit to the Special Collections at the Hillman Library	N/A
16	04/23	<i>Finals Week – No class</i> FINAL PROJECT + REFLECTION DUE	

Course policies

Classroom decorum

Philosophy happens in dialogue. It is therefore essential to the success of this course to cultivate a respectful and collaborative atmosphere in the classroom. Please do your best to contribute to a productive, supportive, and inclusive learning environment for yourself and your peers. Please refrain from personal attacks or comments. That said, speaking respectfully does not mean you will never disagree with your instructor or your classmates. If at any time during the course you have concerns related to classroom climate, you are strongly encouraged to raise them with me or with another trusted member of the university community.

Electronics policy

As class will be discussion-based, the use of laptops is discouraged. Most people overestimate their ability to multi-task. Further, research has shown that students taking notes electronically tend to type the lecture or discussion verbatim rather than processing the information. In general, hand-written note takers have a better conceptual understanding of the material than electronic note takers (<http://www.scientificamerican.com/article/a-learning-secret-don-t-take-notes-with-a-laptop/>).

Writing center

Effective written communication is important to philosophy and academic discourse. You are encouraged to make use of the Writing Center:

317B O'Hara Street Student Center

412-624-6556

<http://www.composition.pitt.edu/writingcenter/index.html>

Policy on non-discrimination

The University of Pittsburgh, as an educational institution and as an employer, values equality of opportunity, human dignity, and racial/ethnic and cultural diversity. Accordingly, the University prohibits and will not engage in discrimination or harassment on the basis of race, color, religion, national origin, ancestry, sex, age, marital status, familial status, sexual orientation, gender identity and expression, genetic information, disability, or status as a veteran. The University also prohibits and will not engage in retaliation against any person who makes a claim of discrimination or harassment or who provides information in such an investigation. Further, the

University will continue to take affirmative steps to support and advance these values consistent with the University's mission.

Disability services

If you have a disability that requires special testing accommodations or other classroom modifications, you need to notify both the instructor and Disability Resources and Services no later than the second week of the term. You may be asked to provide documentation of your disability to determine the appropriateness of accommodations. To notify Disability Resources and Services (DRS), call (412) 648-7890 (Voice or TTD), 412-228-5347 for P3 ASL users, drsrecep@pitt.edu, to schedule an appointment. The Disability Resources and Services office is located in 140 William Pitt Union on the Oakland campus.

Academic integrity policy

Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity (<http://provost.pitt.edu/faculty-resources/academic-integrity-freedom/academic-integrity-guidelines>). This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

There will be no tolerance for plagiarism; any violation will result in a minimum sanction of a zero score on the assignment. If you have any questions about how to properly use, cite or paraphrase sources, I will be more than happy to help you before the assignment is due.

Email communication policy

Each student is issued a University e-mail (username@pitt.edu) upon admittance. This e-mail address may be used by the University for official communication with students. Students are expected to read e-mail sent to this account on a regular basis. Failure to read and react to University communications in a timely manner does not absolve the student from knowing and complying with the content of the communications. The university provides an e-mail forwarding service that allows students to read their e-mail via other service providers (e.g., Gmail, Hotmail, Yahoo). Students that choose to forward their e-mail from their pitt.edu address to another address do so at their own risk. If e-mail is lost as a result of forwarding it does not absolve the student from responding to official communications sent to their University e-mail address. To forward e-mail sent to your University account, go to <http://accounts.pitt.edu>, log into your account, click on Edit Forwarding Addresses, and follow the instructions on the page. Be sure to log out of your account when you have finished. (For the full E-mail Communication Policy, please go to www.bc.pitt.edu/policies/policy/09/09-10-01.html.)

Copyright notice

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Statement on classroom recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.