Prof Christian Wüthrich (christian.wuthrich@unige.ch)
Ryan Miller (ryan.miller@unige.ch)
Tannaz Najafi (tannaz.najafi@etu.unige.ch)

Département de philosophie
Université de Genève

Philosophy of Physics: The Physics of Time

SE 2h, A, Th 16-18, Saint Ours 013
Modules: MA6, MA8

https://wuthrich.net/teaching/_MA6_PhilPhys_2023bis.html

All readings will be made available on moodle.unige.ch (ID 15629).

The (a) readings are general introductions to the topic which do not presume prior knowledge. The (b) readings are more advanced, and generally take a contrasting view to that expressed in the (a) readings. Masters students or those unfamiliar with the topic are only expected to do the (a) readings. PhD students, or those already familiar with the topic, are only expected do the (b) readings. The presenter for the week should focus on the (b) reading, because it is more difficult, including how and why it disagrees with the (a) reading. Reading for the guest seminars will be made available two weeks in advance.

21.09. Introduction to the seminar, the topic, and classical background

28.09. Classical Spacetime: Substantivalism?
- 2a – Huggett ch9, What is Space?
- 2b – Mach, pp 222-237

05.10. Special Relativity 1: Whence Time?
- 3a – Huggett ch14, Spacetime and the Theory of Relativity
- 3b – Rea, Temporal Parts Unmotivated

12.10. Special Relativity 2: Arrow of Time
- 4a – Huggett ch10, Time
- 4b – Dieks ch8, Becoming, Relativity, and Locality

19.10. Special Relativity 3: The Present
- 5a – Huggett ch15, Time in Relativity
- 5b – Gilmore et al., Relativity and Three Four-Dimensionalisms

26.10. Thermodynamics: Arrow of Time

6a – North, Time in Thermodynamics

6b – Roberts ch6, There is No Thermodynamic Arrow

02.11. Guest Seminar: Emily Adlam

09.11. No seminar (Semaine de lecture)

16.11. General Relativity 1: Substantivalism?

8a – Earman & Norton, What Price Substantivalism?

8b – Brighouse, Spacetime and Holes

23.11. General Relativity 2: Arrow of Time

9a – Swinburne, Cosmic Simultaneity

9b – Read & Qureshi-Hurst, Getting Tense about Relativity

30.11. General Relativity 3: Time Travel?

10a – Smeenk & Wüthrich, Time Travel and Time Machines

10b – Zhao & Modesto, Quantum avoidance of Gödel's closed timelike curves

07.12. Guest Seminar: Kian Salimkhani

14.12. Guest Seminar: John Dougherty

21.12. Quantum Gravity: Whence Time?

13a – Wüthrich, The Emergence of Space and Time

13b – Chua & Callender, No Time for Time from No Time

Course description

Perhaps no other common-sense concept has had its philosophical analysis upended more by science than that of time. We will review how developments in physics have impacted philosophy of time, including Newton's attack on Aristotelian relationalism, special relativity's challenge to the distinction of space and time, thermodynamic attempts to explain why time only moves in one direction, general relativity's opening for the physical possibility of time-travel, and quantum gravity's suggestion that time is emergent rather than fundamental.

Both the metaphysics of time and the relevant history and philosophy of physics will be discussed, and papers and presentations may focus on history of philosophy, history of science, metaphysics of time, or history of philosophy as desired according to student interest. While some background in physics, mathematics, and philosophy will be helpful, all necessary concepts will be introduced throughout the course, and we will not assume any specific knowledge beyond high school mathematics.

This seminar will be conducted entirely in English, though papers may be submitted in French if desired.

Course requirements

For credit in philosophy:

- *MA6:* travail écrit de recherche avec soutenance (env. 25 pages, 50'000 signes)
- *MA8 (demi-module):* travail écrit de recherche (env. 12 pages, 24'000 signes) ou présentation orale durant le séminaire

Written work may focus on the history of philosophy of time in relation to physics, on metaphysical points in the philosophy of time (e.g., substantivalism, tense, four-dimensionalisms, etc) or on the impact of contemporary physics on philosophy of time (e.g. relativity, thermodynamics, quantum gravity, etc.).

Written work may be submitted in English or French, as the student prefers.

The university policy on use of AI in writing assignments may be found here:
https://www.unige.ch/index.php?cID=574

Contact Christian Wüthrich if you need credit in physics or in another programme.

Our expectation is that everyone prepares the assigned readings ahead of time, actively participates in the seminar (including those featuring a guest speaker), and accepts a reasonable share of presentation duties.

Seminar presentations

We expect everyone to do a brief presentation on one of the assigned readings. When it is your turn, please keep the following points in mind:

- While you will be the leader for the entire seminar on this day, including the discussion, the initial presentation should last (if given in one piece) about 15 to 20 minutes.
- Therefore, it is important to stick to the main points, the **(b)** author's *main thesis* and their *main argument*, rather than to give a complete or chronological list of points raised in the article.
- You are encouraged to use some *visual complement* (blackboard, powerpoint slides, handout), and to see this seminar as an opportunity to experiment with a format you have not yet tried.
- Make sure to read the article sufficiently ahead of time*,* so that we have time to make an appointment if you want to meet and discuss it before your presentation.
- Don't stress out if there is something in the article you don't understand after having made an effort to grasp it. In this case, try to articulate precisely what it is that you don't understand—and it may well become the topic of our seminar discussion.