



Seminar: Topics in Philosophy of Physics

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Spring 2024

Website: http://wuthrich.net/teaching/_USI_PhilPhysSem_2024.html

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The philosophy of physics deals with methodological, epistemological, and metaphysical issues in physics. This seminar addresses topics in the philosophy of space and time as they relate to physics, the philosophical implications of quantum physics, the physical origin of the direction of time, or issues in the philosophy of cosmology and the philosophy of quantum gravity.

For the spring semester 2024, the topics are (1) presentism and modern physics, (2) time travel in physics, and (3) the disappearance and re-emergence of spacetime in quantum gravity.

The readings are available at icorsi at <https://www.icorsi.ch/course/view.php?id=18038>.

Prerequisites. Participants should have successfully completed the course *Introduction to Philosophy of Physics*, or be similarly prepared.

Course requirements and evaluation

My expectation is that everyone prepares the assigned readings ahead of time, actively participates in the seminar, and accepts a reasonable share of presentation duties. As this is a seminar rather than a lecture course, the grade will be determined by the points obtained from the following type of evaluation:

1. *Seminar presentation(s)* (8 points): Each participant will give at least one seminar presentation (see below).
2. *Seminar participation* (2 points): For each topic, every participant is to send me by email one (or two) discussion questions (no more than a paragraph) on any one of the four papers of the corresponding topic by Sunday midnight before we discuss the topic (i.e., by 14 April, 21 April, and 5 May), for a credit of up to half a point per topic. The remaining half point for participation will be given based on class participation.

Please let me know in advance if you are unable to participate, e.g., because of an emergency or if you are sick.

Seminar presentations

I expect everyone to do (at least) one 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 half-seminar on this day, including the discussion, the initial presentation should last (if given in one piece) no more than 40 to 45 minutes.
- It is important to stick to the main points, the author's main thesis and their main argument, rather than to give a complete or chronological list of points raised in the article.
- I encourage you to use some visual complement (blackboard, powerpoint slides, hand-out), and to see this seminar as an opportunity to get some experience with this.
- 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.
- Do not stress out if there is something in the article you do not 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.
- In this sense, it is not the job of the presenter to offer a conclusive analysis of a paper; rather, it is to prepare the ground for our discussion.
- You should, however, raise at least some critical points to be discussed.

Tentative schedule

The readings must be read in advance of the seminar; an asterisk indicates background reading.

Introduction, the disappearance of spacetime in quantum gravity

Tuesday, 9 April 2024, 9:30-13:00

- Nick Huggett and Christian Wüthrich. Emergent spacetime and empirical (in)coherence. *Studies in History and Philosophy of Modern Physics* **44** (2013): 276-285.
- Sam Baron and Baptiste Le Bihan. Composing spacetime. *Journal of Philosophy* **119** (2022): 33-54.

1 The emergence of spacetime in quantum gravity and spacetime functionalism

Monday, 15 April 2024, 13:30-17:00

- Vincent Lam and Christian Wüthrich. Laws beyond spacetime. *Synthese* **202** (2023): 71.

- Elena Castellani and Sebastian de Haro. Duality, fundamentality and emergence. In David Glick, George Darby, and Anna Marmodoro (eds.), *The Foundation of Reality: Fundamentality, Space, and Time*. Oxford University Press (2020), 195-216.

Tuesday, 16 April 2024, 09:30-13:00

- David Yates. Thinking about spacetime. In Christian Wüthrich, Baptiste Le Bihan, and Nick Huggett (eds.), *Philosophy Beyond Spacetime: Implications from Quantum Gravity*. Oxford University Press (2021), 130-154.
- David Chalmers. Finding space in a non-spatial world. In Christian Wüthrich, Baptiste Le Bihan, and Nick Huggett (eds.), *Philosophy Beyond Spacetime: Implications from Quantum Gravity*. Oxford University Press (2021), 155-182.

2 Presentism and modern physics

Monday, 22 April 2024, 13:30-17:00

- Simon Saunders. How relativity contradicts presentism. In Craig Callender (ed.), *Time, Reality, and Existence*. Cambridge University Press (2002), 277-292.
- Christian Wüthrich. The fate of presentism in modern physics. In Roberto Ciuni, Kristie Miller, and Giuliano Torrenco (eds.), *New Papers on the Present—Focus on Presentism*. Philosophia Verlag (2013), 91-131.

Tuesday, 23 April 2024, 09:30-13:00

- Fay Dowker. Being and becoming on the road to quantum gravity; or, the birth of a baby is not a baby. In Nick Huggett, Keizo Matsubara, and Christian Wüthrich (eds.), *Beyond Spacetime: the foundations of quantum gravity*. Cambridge University Press (2020), 133-142.
- Carlo Rovelli. Neither presentism nor eternalism. *Foundations of Physics* **49** (2019): 1325-1335.

3 Time travel in physics

Monday, 6 May 2024, 13:30-17:00

- Kurt Gödel. A remark about the relationship between relativity theory and idealistic philosophy. In Paul Arthur Schilpp (ed.), *Albert Einstein Philosopher-Scientist. Library of Living Philosophers*. Open Court Publishers (1949), 557-562.
- Gordon Belot. Dust, time, and symmetry. *British Journal for the Philosophy of Science* **56** (2005): 255-291 (skip §4).

Tuesday, 7 May 2024, 09:30-13:00

- Frank Arntzenius. Time travel: double your fun. *Philosophy Compass* **1** (2006): 599-616.
- *Chris Smeenk, Frank Arntzenius, and Tim Maudlin. Time travel and modern physics. *Stanford Encyclopedia of Philosophy* (2023), <https://plato.stanford.edu/entries/time-travel-phys/>.
- Jenann Ismael. Closed causal loops and the bilking argument. *Synthese* **136** (2003), 305-320.