

Prof Christian Wüthrich (christian.wuthrich@unige.ch)

Département de philosophie
Université de Genève

Philosophy of Physics: Quantum Mechanics

SE2, A, Je 16-18, B111
Modules: MA6, MA7, MA8

http://wuthrich.net/teaching/_MA6_PhilPhys_2019.html

Primary reading: Tim Maudlin (2019). *Philosophy of Physics: Quantum Theory*. Princeton UP.

All other readings will be made available on moodle.unige.ch (ID 2422).

- 19.09. Introduction to the seminar and the topic (CW)
*Maudlin, Ch. 1.
- 26.09. Some basics of the quantum formalism (CW)
*David Z Albert (1992). *Quantum Mechanics and Experience*. Ch. 2, pp. 17-43.
- 03.10. Guest seminar: Laura Feline (Roma 3), *Mechanistic explanation in physics: the measurement problem*.
- 10.10. The quantum recipe
Maudlin, Ch. 2, pp. 36-59; *Albert, Ch. 2, pp.43-60.
- 17.10. The quantum recipe (continued)
Maudlin, Ch. 2, pp. 59-78; *Albert, Ch. 4.
- 24.10. The wave function and the quantum state
Maudlin, Ch. 3; *Albert, Ch. 3.
- 31.10. Guest seminar: Erik Curiel (LMU Munich), *Title TBD*.
- 07.11. *No seminar* (semaine de lecture)
- 14.11. Collapse theories and the problem of local beables
Maudlin, Ch. 4, pp. 94-115; *Albert, Ch. 5.
- 21.11. Collapse theories and the problem of local beables (continued)
Maudlin, Ch. 4, pp. 115-136; *Albert, Ch. 5.
- 28.11. Guest seminar: Flavia Padovani (Drexel University), *Title TBD*.
- 05.12. Pilot wave theories and Bohmian mechanics
Maudlin, Ch. 5; *Albert, Ch. 7.
- 12.12. Many worlds
Maudlin, Ch. 6; *Albert, Ch. 6.
- 19.12. Guest seminar: Juliusz Doboszewski (University of Bonn), *Title TBD*.

Readings marked with an asterisk (*) are not mandatory.

Course description

The philosophy of physics deals with methodological, epistemological, and metaphysical issues in physics. This seminar has the dual purpose of systematically introducing the background necessary to do research in philosophy of physics as well as discussing current research in the field.

The focus of the seminar this semester will be on the philosophy of quantum mechanics. We will read and discuss Tim Maudlin's new book on the philosophy of quantum mechanics. This book is introductory, but very rich, and so will also serve as an opportunity to study the deepest philosophical challenges arising from quantum mechanics more broadly. In particular, we will focus on the measurement problem and its proposed solutions, as well as on quantum non-locality. The regular seminar will be interspersed with talks by leading experts on their current research in the philosophy of physics.

While some background in physics, mathematics, and philosophy will be helpful, we will not assume any specific knowledge beyond high school mathematics.

This seminar will be in English.

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

Contact me if you need credit in physics or in another programme.

My 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

I 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 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, 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.