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Département de philosophie
Université de Genève

Epistemology of Science

SE, A, Me 12-14, L208
Modules: MA3

http://wuthrich.net/teaching/_MA3_EpistSci_2019.html

18.09. Introduction to the seminar and the topic (BLB and CW)

Part 1: Non-empirical testing in string theory

25.09. Richard Dawid (2019). The significance of non-empirical confirmation in fundamental physics. In R. Dardashti, R. Dawid, and K. Thébault (eds.), *Why Trust a Theory? Epistemology of Fundamental Physics*, Cambridge University Press, 99-119.

02.10. Cristin Chall (2018). Doubts for Dawid's non-empirical theory assessment. *Studies in History and Philosophy of Modern Physics* **63**: 128-135.

Part 2: Universality-based non-direct tests

09.10. Robert W Batterman (2019). Universality and RG explanations. *Perspectives on Science* **27**: 26-47.

16.10. Radin Dardashti, Karim P Y Thébault, and Eric Winsberg (2017). Confirmation via analogue simulation: what dumb holes could tell us about gravity. *British Journal for the Philosophy of Science* **68**: 55-89.

23.10. Karen Crowther, Niels Linnemann, and Christian Wüthrich (forthcoming). What we cannot learn from analogue experiments. *Synthese*.

Part 3: Are numerical simulations non-direct tests of theories?

30.10. Eric Winsberg (2009). Computer Simulation and the Philosophy of Science. *Philosophy Compass* **4**: 835-845.

07.11. *No seminar* (semaine de lecture)

13.11. Wendy S Parker (2009). Does matter really matter? Computer simulations, experiments, and materiality. *Synthese* **169**: 483-496.

20.11. **Guest seminar**: Vincent Lam (University of Bern), *Reading TBD.*

27.11. Claus Beisbart (2018). Are computer simulations experiments? And if not, how are they related to each other?. *European Journal for Philosophy of Science* **8**: 171-204.

04.12. Florian J Boge (2019). Why computer simulations are not inferences, and in what sense they are experiments. *European Journal for Philosophy of Science* **9**: 13.

Part 4: A particular case: Cosmology (simulations and testing inflation)

11.12. **Guest seminar**: Marie Gueguen (University of Pittsburgh), *Reading:* On robustness in cosmological simulations. Manuscript, 2019.

18.12. Chris Smeenk (2017). Testing inflation. In K. Chamcham, J. Silk, J.D. Barrow, and S. Saunders (eds.), *The Philosophy of Cosmology*, Cambridge University Press, 206-227.

Course description

Science produces knowledge by articulating hypotheses about the world, which are then empirically assessed through observations and experiments. However, these direct means of testing may not be the only way to gain scientific knowledge; in fact, several methods of non-direct theory assessment have been proposed. A first example of non-direct testing are computer simulations, which are centrally used e.g. in cosmology and in the climate sciences. But can we really learn something genuinely new about the world from running these simulations? If so, how should we understand the resulting form of knowledge? Should we think of computer simulations as inferences or experiments? Second, material analogue systems constitute a different way in which a system under study can be simulated. For instance, it has been claimed that we may learn something about black holes from studying water in motion in a tub. But how do we know that those material systems adequately represent relevant properties of black holes, i.e., that black holes really exhibit the kind of universal behaviour that is being emulated in these distinct physical systems? Third, can we test a physical theory by checking its mathematical consistency as it has been claimed by some proponents of string theory? The seminar will address these questions and so aims at a better understanding of the nature and status of the non-direct testing of scientific hypotheses.

This seminar will be in English.

Course requirements

For credit in philosophy:

- *MA3:* travail écrit de recherche avec soutenance (env. 25 pages, 50'000 signes)

Contact one of us if you need credit 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 author's *main thesis* and their *main argument*, rather than to give a complete or chronological list of points raised in the article.
- We 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.