

Scientific Reasoning

Dr. John Dougherty

SoSe 2019

Meeting: Tues. 16:00–18:00 c.t., Ludwigstr. 31 - 028
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Course description

In this course we will investigate the kinds of reasoning involved in the pursuit of scientific knowledge. In the first part of the course we will look at general accounts of confirmation, which try to explain what counts as evidence in science and why. We will discuss some of the major problems that accounts like these face. In the second part of the course we will discuss current specific debates in philosophy of science. These will include problems related to measurement, experiment, simulations, analogies, and thought experiments. We will also discuss the role of different kinds of values in scientific reasoning, such as aesthetic and moral criteria and values like simplicity and unification.

Materials

The syllabus and reading list for the course is available on my website at <http://www.johndougherty.com/teaching.shtml>. The required readings will be available in the course Dropbox folder. A link to the folder will be provided in class. If you need any help locating copies of any of the recommended readings, or any other articles, I encourage you to ask me.

Evaluation

You may choose to submit a term paper at the end of the semester or give a presentation and submit an accompanying essay. In either case, you must register to do so on LSF during the period of 1–12 July, and the deadline for submission is 23 September. If you present, you should submit a 2500 word essay engaging with the class discussion about your presentation. If you choose to write a term paper it should be about 5000 words and engage with the philosophical literature. The papers will be marked according to quality of thesis, organization, argument execution, and—in the case of a term paper—evidence of research:

Quality of thesis

- 1.0 Explicit thesis and stakes
- 2.0 Explicit thesis
- 3.0 Identifiable thesis
- 4.0 Identifiable conclusion

Execution

- 1.0 Detailed and original argumentation
- 2.0 Strong arguments for all main claims
- 3.0 Some arguments for all main claims
- 4.0 Some arguments present

Organization

- 1.0 Explicitly ordered sections supporting thesis
- 2.0 Well-ordered argument
- 3.0 Identifiable sections
- 4.0 Some structure

Research

- 1.0 Command of relevant literature
- 2.0 Engagement with important relevant literature
- 3.0 Engagement with some relevant literature
- 4.0 Citation of relevant literature

30 April: Confirmation

Hempel, C. G. (1945). Studies in the logic of confirmation (I.). *Mind*, 54(213):1–26

7 May: Bayes

Sprenger, J. and Hartmann, S. (2019). Variation 1: Confirmation and induction. In *Bayesian Philosophy of Science*, pages 37–60. Oxford University Press

14 May: Error statistics

Mayo, D. G. and Spanos, A. (2006). Severe testing as a basic concept in a Neyman–Pearson philosophy of induction. *The British Journal for the Philosophy of Science*, 57(2):323–357

21 May: Experiment

Feest, U. (2016). The experimenters' regress reconsidered: Replication, tacit knowledge, and the dynamics of knowledge generation. *Studies in History and Philosophy of Science Part A*, 58:34 – 45

28 May: Measurement

Tal, E. (2014). Making Time: A Study in the Epistemology of Measurement. *The British Journal for the Philosophy of Science*, 67(1):297–335

4 June: Simulations

Parker, W. S. (2009). Does matter really matter? computer simulations, experiments, and materiality. *Synthese*, 169(3):483–496

18 June: Analogical models

Dardashti, R., Thébault, K. P., and Winsberg, E. (2015). Confirmation via analogue simulation: What dumb holes could tell us about gravity. *British Journal for the Philosophy of Science*, 68(1):55–89

25 June: Agent-based modeling

Frey, D. and Šešelja, D. (2018). What is the epistemic function of highly idealized agent-based models of scientific inquiry? *Philosophy of the Social Sciences*, 48(4):407–433

2 July: Nonempirical virtues

Forster, M. and Sober, E. (1994). How to tell when simpler, more unified, or less *ad hoc* theories will provide more accurate predictions. *The British Journal for the Philosophy of Science*, 45(1):1–35

9 July: No alternatives arguments

Dawid, R. (2013). The assessment of scientific underdetermination in string theory. In *String Theory and the Scientific Method*, chapter 3, pages 50–72. Oxford University Press

23 July: Thought experiments

Brendel, E. (2018). The argument view: are thought experiments mere picturesque arguments? In Stuart, M. T., Fehige, Y., and Brown, J. R., editors, *The Routledge Companion to Thought Experiments*, chapter 15, pages 281–292. Routledge