THE UNIVERSITY OF WESTERN ONTARIO
DEPARTMENT OF PHILOSOPHY
Graduate Course Syllabus 2018-2019
Philosophy 9213B
Philosophy of Scientific Experimentation

Winter Term 2019
Thurs. 2:30 p.m.-5:30 p.m.
STVH-1145

Instructor: Jackie Sullivan
Office Hours: TBA
Email: jsulli29@uwo.ca

Description

Science advances our understanding of the world and ourselves primarily by means of experiments. Yet, what is an experiment? How do experiments differ across different areas of science? How do experiments produce knowledge? Are experiments always knowledge-generating? What differentiates a successful experiment from an unsuccessful experiment? Answering these questions by exploring historical, philosophical and theoretical analyses of experimentation in the physical, biological and mind-brain sciences will be the primary aims of this course.

Texts

The texts for this course will consist of philosophical and scientific journal articles that are accessible through Western's library system and will be made available via Dropbox as PDFs.

Requirements

50% - Research Paper (3500-4500 words)
15% - In-class presentation (on one assigned reading)
15% - In-class presentation (on research paper)
20% - Attendance & Participation (clear demonstration of having read the assigned readings)

All students will be required to write a research paper that will be due at the end of the term. Each student is also required to do two in-class presentations. The primary aim of the first presentation is to raise questions about the assigned readings for discussion. The purpose of the second presentation will be to provide a 15-20 min presentation of the final research paper. As the course will be conducted as a seminar, registered students and auditors are expected to come to class prepared to discuss the assigned readings.

Rules for auditors

If you plan to take this course for credit as an auditor you are required to do one in-class presentation and miss no more than 5 of the lectures.

Department policies

The Department of Philosophy Policies which govern the conduct, standards, and expectations for student participation in Philosophy courses are available on the Department's website.

Tentative Schedule of Classes

(Some of the topics will likely change, but ideally, the topics listed here will be covered)

Week 1 – Course Introduction

- Uljana Feest and Frederick Steinle, "Experiment" from OUP

Week 2 – Underdetermination – Can evidence from experiments be used conclusively to refute a scientific theory? Is there such a thing as "a crucial experiment"? Is it legitimate to accept a theory as objectively true just so long as it is consistent with the available evidence?

- Pierre Duhem "Physical Theory and Experiment" (1954) [from Curd & Cover 2nd edition 2013]
- Donald Gilles "The Duhem Thesis and the Quine Thesis" (1993) Philosophy of Science in the Twentieth Century (Oxford: Blackwell)[from Curd & Cover 2nd edition 2013]

Additional but not required readings

- W.V. Quine "Two Dogmas of Empiricism" (1951) [from Curd & Cover 2nd edition 2013]

Week 3 – Experimentation and Realism – What is the relationship between phenomena "created" in the laboratory and phenomena occurring in the world? Does the ability to manipulate entities under controlled conditions of laboratory legitimate the conclusion that those entities are real?

- Ian Hacking (1981), "Do we see through a microscope?" (reprint) original paper appeared in *Pacific Philosophical Quarterly* 62 (4).
- Ian Hacking (1984), "Experimentation and Scientific Realism" [from Curd & Cover 2nd Edition 2013, 1140-1155].
- David B. Resnik (1994), "Hacking's Experimental Realism" [from Curd & Cover 2nd Edition 2013, 1156-1171].

Week 4 – Data, Phenomena, Locality – What is the relationship between data and claims about phenomena that data are used to substantiate? Do we see phenomena directly or only indirectly? What about data? Can data and/or claims about phenomena travel beyond local laboratory contexts?

- James Bogen and James Woodward (1988), "Saving the Phenomena" *Philosophical Review* 97 (3): 303-352.
- Sabina Leonelli (2009), "On the Locality of Data and Claims about Phenomena", *Philosophy of Science* 76: 737-749.

Optional:

- Jacqueline Sullivan (2009), "The Multiplicity of Experimental Protocols: A Challenge to Reductionist and Non-reductionist Accounts of the Unity of Neuroscience", Synthese,

Week 5 – Measurement & the Experimenter's Regress- When new entities are postulated in science and the available technology is insufficient for detecting those entities, when can an investigator be certain to have developed a reliable detection technique and how can he/she measure the reliability and accuracy of these detection techniques without falling victim to circular reliance on the detection technique itself (i.e.,experimenter's regress)?

- Allan Franklin (1994) "The Experimenter's Regress", *Studies in the History and Philosophy of Science*, Vol. 25, No. 3, pp. 463-491.
- Collins, H.M. (1994) "The Experimenter's Regress", *Studies in the History and Philosophy of Science*, Vol. 25, No. 3, pp. 493-503.
- Chang, H. (2004). Inventing Temperature: Measurement and Scientific Progress, OUP. Chapter 2
- 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.

Week 6 – Reliability, Severity and Robustness – When does an investigator have good grounds for believing that the data production process is reliable and that the data may be used to ground theoretical claims? Are multiple detection techniques required? Is one trial as good as a hundred?

- Cartwright, N. (1991). Replicability, reproducibility and robustness: Comments on Harry Collins. *History of Political Economy* 23, 143-155.
- Deborah Mayo (1991) "Novel Evidence and Severe Tests", *Philosophy of Science* 58(4), 523-552.
- William Wimsatt, "Robustness, Reliability and Overdetermination" [to be added on Owl]

Reading week – NO CLASS

Week 7 – Validity – When can an investigator be certain that the type of phenomenon he/she is trying to measure is actually the one detected in the laboratory (construct validity)? Can an investigator be certain that conclusions reached in the context of the laboratory are legitimately applicable to the real world (external validity)?

- Francesco Guala (2003) "Experimental Localism and External Validity" *Philosophy of Science* 70: 1195-1205.
- Cronbach, L. and Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Bulletin* 52, 281-302. [Taken from A Paul Meehl Reader]
- Campbell, D. T. et al. (1979). Experimental and Quasi-Experimental Designs for Generalized Causal Inference. Chap. 2 & 3.
- Mook, D.G. (1983). In defense of external validity. *American Psychologist* 379-387.

Week 8 – Null-hypothesis testing – Are there differences between physics and other areas of science in terms of the kinds of errors that arise that may negatively impact hypothesis testing and data interpretation? Are values more prone to enter some areas of science rather than others?

- Hempel, C. (1965). Science and human values. *In Aspects of Scientific Explanation*. New York: The Free Press, pp. 81-96.
- Meehl, P. E. (1967). Theory-testing in psychology and physics: A methodological paradox. *Philosophy of Science* 34, 103-115.
- Douglas, H. (2000). Inductive risk and values in science. *Philosophy of Science* 67, 559-579.

Week 9 – Replication Crisis in Science –

- Open Science Collaboration (2015), ""Estimating the reproducibility of psychological Science" *Science* 349.
- Gilbert, King, Pettigrew, Wilson (2015) "Comment on "Estimating the reproducibility of psychological science" *Science* 351.
- Anderson, et al. (2015)"Response to Comment on "Estimating the reproducibility of psychological Science" *Science* 351.
- Ioannidis, John, (2005) "Why Most Published Research Findings are False", *PLoS Medicine*
- Ioannidis, John, (2014) "How to Make More Published Research True", *PLoS Medicine*

Week 10 – Types of Experiments: Animal Models – What kind of knowledge can be gleaned from animal models? Are model organisms truly models? What epistemic role do animal models play in science? Do experiments using animal models differ from 'ordinary' experiments?

- Ankeny, Rachel A. (2000). "Fashioning Descriptive Models in Biology: Of Worms and Wiring Diagrams", Philosophy of Science 67: S260-S272.
- Ankeny, Rachel A., and Sabina Leonelli. 2011. "What's So Special about Model Organisms?" *Studies in History and Philosophy of Science* 41:313–23.
- Marcel Weber (2014), Experimental Modeling in Biology: In Vivo Representation and Stand-Ins as Modeling Strategies, *Philosophy of Science* 81(5): 756-769.

Week 11 – Types of Experiments: Simulations – Can computer simulations be used to arrive at true claims about the world? Are simulations really experiments? If they are experiments, are they on an epistemic par with experiments that involve material interventions?

- Mary S. Morgan, (2003), "Experiments without Material Intervention: Model Experiments, Virtual Experiments and Virtually Experiments" In H. Radder (Ed.), *The philosophy of scientific experimentation.*
- Wendy Parker (2009), "Does Matter Really Matter? Computer Simulations, Experiments and Materiality", *Synthese* 169: 483-496.
- Emily Parke (2014), Experiments, Simulations and Epistemic Privilege. *Philosophy of Science*, Vol. 81 (4): 516-536.

April 3 – In-class presentations