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

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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]

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?

**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?

Optional:
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)?


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?

- 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)?

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?


Week 9 – Replication Crisis in Science –

- Ioannidis, John, (2005) “Why Most Published Research Findings are False”, *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?


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?

April 3 – In-class presentations