

Philosophy 9303: Measurement

Measurement is a central part of scientific practice. As Lord Kelvin once put it, in words now inscribed on the façade of a building at the University of Chicago, “If you cannot measure, your knowledge is meager and unsatisfactory.” What is measurement, and is Kelvin right to view it as an essential part of scientific knowledge? Histories of science often focus on successful measurements as anchoring a field of study. Similarly, in philosophy of science, successful measurements are often taken to decide among competing theories. Recently there has been a renewed interest in understanding measurement, and its role in how scientific theories represent the world, among philosophers of science, and this seminar will survey this work. We will approach questions regarding measurement from three different perspectives: (i) historical analysis of case studies, including Smith and Seth *Brownian Motion*, and Chang’s *Inventing Temperature*; (ii) considering what properly accounting for the role of measurement reveals about the structure of scientific theories and broader epistemological questions; (iii) challenges regarding how to introduce and justify measurable quantities in the social sciences. The course will not presume background knowledge of the relevant scientific areas.

Evaluation:

- Participation (20 %): One goal of the seminar is to have lively and well-informed philosophical discussions. To fulfill this goal, please come to class prepared to contribute actively, based on careful reading and reflection on the topics raised in the assigned readings. Half of your participation grade will be based on your participation over the course of the term. You will receive full marks for thoughtful and productive contributions to discussion. The other half will be based on a 30 minute presentation, on a topic of your choice. (Typically the presentation will focus on the topic you have chosen to write a paper about, although that is not required.)
- Commentaries (10 %): Please post short commentaries (about 250 - 500 words) on the assigned readings by 5:00 p.m. Monday each week. These will be posted to an online discussion forum on OWL, accessible to everyone in the class. In these posts, you should either (i) identify one of the main contributions you think the assigned paper makes, and briefly characterize this contribution and explain what is interesting or exciting about, or (ii) pose a question regarding one of the paper’s central claims (either a question of clarification, or a potential objection). While I encourage you to post a commentary each week, you can skip up to two weeks without penalty.
- Paper (70 %): You will be evaluated based on either (1) a research paper due at the end of the term (6,000 - 7,500 words), or (2) three shorter papers due roughly every 4 weeks. For option (1), a brief description of the paper topic and / or outline, along with a bibliography, is one month before the last seminar meeting; the final paper itself will be due the week after the final seminar meeting. I expect to help refine the topic and find appropriate readings in light of this initial proposal. For option (2), students will be responsible for choosing topics for three papers, in consultation with me, of approximately 2,000 words each, based on the readings and seminar discussion.

Course Website & Readings: Assigned readings, supplementary readings, updated schedules, and commentaries will be posted on the website.

Tentative Schedule

Below I have specified readings and topics for the term. This schedule is tentative: we may take more than one week for some of the topics below, and there are other potential topics listed below that we could

pursue instead (based on the interest of the class). I will post a regularly updated schedule on the website based on how quickly we move through these topics and reflecting any changes.

- Introduction and Overview
Assigned reading: None.
Optional further reading: [Tal, 2015], [Cartwright and Chang, 2002]
- Theory and Measurement
Assigned reading: [Kuhn, 1961]; [Smith, 2002]
Optional further reading: [Harper, 2011]
- Conventionalism and Representation
Assigned reading: [Van Fraassen, 2010], Chapters 5-7
Optional further reading: [Poincaré, 2012] (“The Measure of Time”), [Reichenbach, 1928] (selections)
- Representational Theory of Measurement
Assigned reading: [Suppes, 1998]; [Luce and Suppes, 2002] (selections)
Optional further reading: [Wolff, 2020], Chapter 5 (overview and summary)
- Calibration and Iteration: Temperature
Assigned reading: [Chang, 2004] (Chapters 2,5)
Optional further reading: (background reading, to be determined)
- Molecular Reality (two weeks)
Assigned reading: [Van Fraassen, 2009]; [Demopoulos, 2022]; [Smith and Seth, 2020], (Chapters 6-7, Postscript)
Optional further reading: [Achinstein, 2002]; [Psillos, 2011]; [Coko, 2020]
- Data and Phenomena
Assigned reading: [Bogen and Woodward, 1988]
Optional further reading: [Woodward, 2011]; [Massimi, 2011]
- Models, Measurement, and Uncertainty
Assigned reading: [Tal, 2020]; [Staley, 2020]
Optional further reading: [Van Fraassen, 2012]; [Ritson and Staley, 2021]
- Varieties of Realism
Assigned reading: [Isaac, 2019]; [Teller, 2018]
Optional further reading: [Stein, 1989]
- Measurement and the Structure of Theories
Assigned reading: [Demopoulos, 2022] (selections)
Optional further reading: [Friedman, 2020]

- Measuring Social Quantities
Assigned reading: [Cartwright and Runhardt, 2014]
Optional further reading: [Porter, 1996] (Chapters 2-3), [Gould, 1996]
- Happiness and Well-Being
Assigned reading: [Angner, 2013]
Optional further reading: [Hausman, 2015]; [Alexandrova, 2017] (selections)

Other possible topics to replace some of those above:

- Metaphysics of Quantities: [Mundy, 1987], selections from [Wolff, 2020]
- Laws and Measurement: selections from [Roberts, 2008],

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