Lu Chen

PHIL 4XX/5XX *Metaphysics of Science*

Spring 2021

Syllabus

Course description: Quinean holism says that metaphysics is continuous with science, together tested by our experience. But what does it mean in practice? How can contemporary metaphysics and modern science collaborate? In this course, we will study how we can apply metaphysical tools to scientific theories, including general relativity, quantum mechanics and biology, in studying the structure of reality. In doing so, we also hope to deepen our understanding of the nature of metaphysics and empirical sciences.

Requirements: having taken the course *Ontology* is highly recommended; comfortableness with formal language. (Formal backgrounds in science are welcome but not required.)

Tentative reading schedule:

Week 1	Introduction	No reading
Week 2	Science and Metaphysics I	Ladyman, J. Ross, D. 2007, *Everything Must Go*, (Chapter 1. Secs. 1.1 – 1.4)
Week 3	Science and Metaphysics II	Morganti, M. Tahko, T. 2017. "Moderately Naturalistic Metaphysics": 2557-2570.
Week 4	Time and Relativity I	A Crash Course in Special Relativity. Putnam (1967), "Time and Physical Geometry": 240-3. Smart (1963) "Anthropocentricity of Some Temporal Concepts" etc.: 132-42. Prior, A., (1970). "The Notion of the Present," *Studium Generale*, 23: 245–48.
Week 5	Time and Relativity II	Stein, H. (1991) "On Relativity Theory and the Openness of the Future," *Philosophy of Science* 58, 147–67. Callender, Craig. (2000). "Shedding Light on Time." *Philosophy of Science*.
Week 6	Time and the Human Mind	Butterfield, "Seeing the Present," *Mind* (1984): 161-176. Callender, Craig "The Common Now," *Philosophical Issues*, 18: 339-61.
Week 7	Arrow of Time I	Brown, H. R. and Uffink, J. "The Origins of Time-Asymmetry in Thermodynamics: The Minus First Law," Studies in History and Philosophy of Modern Physics, 32 (2001), pp. 525-38. Price, H. "On the Origins of the Arrow of Time: Why There is Still a Puzzle About the Low Entropy Past,"
Week 8	Arrow of Time II	Callender, C. "There is No Puzzle About the Low Entropy Past," Ch.11 and 12 in C. Hitchcock, ed., *Contemporary Debates in Philosophy of Science.* Blackwells, 2004. Parker, Daniel (2005) Thermodynamic Irreversibility: Does the Big Bang Explain what it Purports to Explain?

Week 9	Determinism in Modern physics I	Popper. (1950) "Indeterminism in quantum mechanics and classical physics" Dear (1961) "Determinism in Classical Physics"
Week 10	Determinism in Modern Physics II	Earman, J. (1986) *A Primer on Determinism*: 1-21; 30-40; 59-61.
Week 11	Determinism in Quantum Mechanics	Bell's theorem. *Encyclopedia* Niall Shanks (1993) "Quantum Mechanics and Determinism." Earman: 231-3.
Week 12	What is life? I	Schrödinger, E., 1944. *What is Life? The Physical Aspect of the Living Cell*, Cambridge: Cambridge University Press.
Week 13	What is life? II	Harold (2001) *The Way of the Cell: Molecules, Organisms and the Order of Life*: 217-58.
Week 14	No Class	*Final paper is due*

Requirement

20% Class Activities

20% Presentation (about 20 minutes) + Discussion.

30% Three short essays

30% Essay exam or Term paper.

Class Activities: include class presence and participation.

Presentation: You are required to present once (about 20 minutes) in the semester on your reflection on part of the assigned readings, followed by class discussion (about 15 minutes). You should submit your outline to me (with bullet points) at least 24 hours before your presentation. In your presentation, you should (1) clearly explain the aspects of the reading that you focus on; **do not cover everything**! (2) your thoughts on those aspects, (3) support your thoughts with reasons, (4) prepare one or more questions for discussion (moderated by you or me).

Ideally, presentations shall be distributed evenly among Week 2-13. The order of presentation will be determined in the beginning of the semester.

Three short essays: During the semester, I will give you specific essay questions for you to write on to deepen your understanding of the class material.

Essay exam or Term paper: You can choose to write a term paper (8-10 pages) on any topic you are interested, in which case you will need to submit your research plan and prospectus on Week 11 and 12. You can also choose to do an essay exam, which will contain 4-5 essay questions. You will have about five days to finish the exam.