Philosophy 754: Foundations of Relativity Theory

Chris Smeenk

csmeenk2@uwo.ca, ext. 85754
Office Hours: M 3-4, F 1-2:30, or by appointment

Evaluation: Participation, weekly short responses, presentation, and either (1) a research paper due at the end of the term, or (2) four shorter papers due roughly every 3-4 weeks. For option (1), a brief description of the paper topic and / or outline, along with a bibliography, is due March 24th, and I am happy to consult with students. For option (2), students will be responsible for choosing topics for 5-page papers based on the readings and seminar discussion. Students choosing either option will give a 30 minute presentation, on a topic of their choice (in consultation with me). Short responses: brief comments (about 300-500 words) on papers to be discussed in the seminar, due weekly at 5:00 p.m. on Sunday before class (full credit for six responses).

I will aim to insure that the seminar is accessible to students who are not familiar with the relevant mathematics and physics, although I will presume basic undergraduate mathematics. If there is an interest in doing so, I would be willing to hold optional sessions devoted to more technically detailed discussions.

Course Website & Readings: Assigned readings, supplementary readings, updated schedules, and short responses will be posted on the website. Although I haven’t placed orders at the bookstore, you should consider purchasing: Earman, World Enough and Spacetime; Geroch, General Relativity from A to B; and Einstein et al., The Principle of Relativity.

Topics

• Introduction: Space, Time and Motion in Classical Mechanics
  - Earman, World Enough and Spacetime, Chapters 2-3.

• Special Relativity and Minkowski Spacetime (1-2 weeks)
  - Geroch, General Relativity from A to B (selections).
  - di Salle, Understanding Space-Time, Chapter 4 (4.1-4.3).

• General Relativity and Relativistic Spacetimes (3-4 weeks)
  - Einstein’s path to general relativity: Einstein, “The Foundation of the General Theory of Relativity,” in The Principle of Relativity (selections); selections from historical literature, e.g. Renn et al., Einstein's Zurich Notebook
  - Geroch, General Relativity from A to B (selections).
  - di Salle, Understanding Space-Time, Chapter 4 (4.4-4.7).

• Hole Argument and Background Independence (2-3 weeks)
- Earman, World Enough and Spacetime, Chapter 9.
- Belot, “Background Independence” (preprint, selections).

**Time and Change in General Relativity**
- Relativistic McTaggart: Thoroughly Modern or Thoroughly Muddled? (Earman - Maudlin exchange in Philosopher’s Imprint)
- Earman and Belot, “Pre-Socratic Quantum Gravity,” in Physics Meets Philosophy at the Planck Scale (selections).

**Reconsidering Relationalism**

**“Constructive” / neoLorentzian Approach to Special Relativity**
- Harvey Brown, Physical Relativity: Space-time Structure from a Dynamical Perspective (selections).

**Conventionality of Simultaneity and Geometry**
- Reichenbach, Philosophy of Space and Time (selections).
- Torretti, Relativity and Geometry (selections).

**Black Holes and Singularities**
- Earman, Bangs, Crunches, Whimpers, and Shrieks (selections).

**Other Possible Topics**
- Time’s Arrow
- Time travel and causal structure
- Relativistic cosmology
- Observation and prediction in general relativity