Lectures 6 & 7: Relativity and the fate of the Kantian apriori

Main figures: Einstein, Schlick, Reichenbach

1. The 18th century picture in physics
   (a) Galilean relativity
   – democracy of inertial reference frames
   – addition of velocities
   (b) Absolute space and time
2. The 19th century picture in physics
   (a) Maxwell's equations and "c"
   – stationary relative to the aether
   (b) The Michelson-Morley experiment
   (c) Lorentz-Fitzgerald contraction
3. Einstein's breakthrough (1905)
   "On the electrodynamics of moving bodies"
   – relativity of simultaneity, length, duration
   – Lorentz transformations

4. Ernst Mach (1836–1919) and positivism
    (a) Anti-materialist
    (b) Anti-realist
    (c) Anti-metaphysical
    (d) Against direct representationalist theories of perception
5. Moritz Schlick (1882–1936)
    (a) "The philosophical significance of the principle of relativity" (1915)
        – no separation between formal and experiential
    (b) Chair of natural philosophy at the University of Vienna (1922)
6. Einstein's general theory of relativity (1916)
    (a) No absolute acceleration (equivalence principle)
        – Newton's bucket
        – physicist in a box
    (b) Non-euclidean geometry
    (c) Experimental confirmation
        i. Precession of the perihelion of Mercury
        ii. Eclipse experiment (1919)
    (d) Laws are preserved by arbitrary diffeomorphisms (general covariance)
        – event coincidences
        Einstein: "Space and time are divested of their last traces of thinghood."
7. Schlick on relativity, redux
    (a) Underdetermination of theory by data
    (b) Simplicity as a guide to truth?
    (c) From GTR to conventionalism
8. Reichenbach on relativity
    (a) The apriori: constitutive vs. necessary