Lecture: Kant & Sci – Riemann & Helmholtz 22 Oct 2014 (1)

[*** bgth w/ slides on non-Euc geom & curvature ***]

Riemann

crucial [slides of glossary for R.'s terminology & concepts]

- crucial insight: measurement consists of superposition of magnitudes, & so requires a means of transporting "measuring rods" – & the effect of transportation is not something fixed a priori

- crucial insights:

∃ of consistent systems of non-Euc geom show that we cannot assume, as Kant did, that Euc geom is a priori form of intuition – indeed, one cannot even assume that the various combinations of geom axioms is necessary in any sense, or even necy consistent

⇒ Kant's analysis of space did not 'dig deep enough' for its starting points, which must be an entirely general conception of 'magnitude-concepts', which will then reveal the possibilities for systs of 'measure-relations' in space

⇒ role of approximation, inexactitude of measurement in applying geom'l possibilities to phys'l space

Lecture: Kant & Philosophy of Science - Riemann & Helmholtz

22 Oct 2014

②

Helmholtz

[should also use Parrini's characterization of sequences of possible experiences in topologically non-trivial spaces]

⇒ turned Riemann's construction on its head, (quote p. 9)

* instead of analytically characterizing possible metrical structures of space, determining possible measure-relations in that way, he rather begins with "mechanical" assumptions and constructs / derives (also possible mechanical constraints, fundamentally) character of possible metrical-relations & the relativity of measure

"a priori" concepts "constitutive" of geom.

① positions of points / bodies wrt other states regarded as 'fixed' is possible to measure ⇒ coords, which very continuously

② possibility of a "rigid body", to compare spatial magnitudes by congruence relations — n.b. this is not contained in possibility of coords, which don't really respect measure-relations

③ rotation does not affect spatial magnitudes —

⇒ measure relations are given by a Riemannian metric

— if we further assume 'free mobility' of bodies, we get spaces of constant curvature

role of visualization, construction of possible exps

— should (Frey clear, precise criteria shown) that Euc geom cannot be shown to be a priori form of spatial intuition: (quote from p. 3) (ad p. 11)

— n.b. this construction of possible experience in curved, non-Euc space does not contradict Kant's account in all aspects, for K. allowed that one can think whatever is not self-contradictory; and it does assume some concepts and constructions as 'a priori' —

Lecture: Kant & Sci-Rieman of Helmholtz 22 Oct 2014 (3)

Helmholtz, cont.

but it does show that one can accept the idea of a form of intuition that shapes our possible experience, but not our possible judgments of possible experience (contra Kant) and that it may not in the end be Euc

⇒ so it's can't be a priori in Kant's sense of the term

⇒ but leaves open the possibility, to be explored by Reichenbach, that it is a priori in a weaker sense

— diff't systems of geom are relatively consistent

— impossibility, when one does not take mechanical considerations into account, of telling whether we live in flat space or in the concave reflective surface

⇒ taking mechanical considerations into account may resolve this (shades of Newton)

⇒ seeds of Poincaré's conventionalism about geom of dyn

→ emphasis on possibility of diff't sorts of motions, what one requires is background structure to make them possible, harkens back to Newton's analysis of space based on the dynamical requirements of the Laws — but Helm. does it for more generally, sticking to the purely kinematical level