Saturday, June 26 PM 1:30-4:30, Room 141

Session 1 (room 141): **19th Century Philosophy of Science**

David Hyder, "Kant, Helmholtz and the Determinacy of Physical Theory"
David K. Nartonis, "19th Century Spiritualism and the American Response to Locke, 1852 to 1875"
Justus Lentsch, "Logical Principles and Psychological Laws: C.S. Peirce's Pragmatism and the Logical Basis of Psychology"
Alfred Nordmann-Chair

"Kant, Helmholtz and the Determinacy of Physical Theory"
David Hyder

In this paper, I analyse Helmholtz's arguments for the centrality of forces in the opening sections of his *Conservation of Energy* monograph, paying special regard to Helmholtz's insistence on the "determinacy" of physical science. According to Helmholtz, science aims at the "full comprensibility" of nature, meaning that we are driven to describe changing phenomena by means of maximally general mathematical laws, which laws should involve only concepts that are empirically determinate. Helmholtz applies these Kantian principles to prove that the intensity of forces must be a function of position, and that since position is definable only in relative space, force functions must be definable with regard only to the relative positions of the mass-points comprising a physical system. I claim that this argument derives from Kant's criticisms of Newton's parallelogram law of force additivity in the *Metaphysical Foundations of Natural Science*: for both Helmholtz and Kant, forces can only be well defined if they are conceived as connections between pairs of material points, thus all such definitions may take account only of the relative or "empirical" spaces determined by these points. Kant erroneously believes that, because the "pure empirical construction" of the concept of force in intuition requires the supposition of at least two mass-points, he can show that Newton's law of force addition is apodictically necessary. In Kant as well, this argument depends on the claim that only central forces are consistent with the determinacy or *Bestimmtheit* of physical concepts.

Common to Kant and Helmholtz is thus the conviction that forces, and laws for the combination of forces, that are defined relative to absolute space are "transcendent" and empirically indeterminate, thus that they have no place in physical theory. Helmholtz martials this purely philosophical argument against competing electromagnetic theories: they are to be rejected because they involve such transcendent magnitudes. I conclude by arguing that Helmholtz's 1854 defence of the *Conservation of Energy* against the physicist Rudolf Clausius's objections makes evident a direct connection between these arguments concerning the determinacy of physical concepts and the much later papers on geometry. Helmholtz accuses Clausius of defining forces with reference to coordinate systems that exist "only on paper", and objects that such definitions cannot "be applied [*übertragen*] to physical reality." He lays special emphasis on the empirical conditions which are required to establish the congruence relations holding between pairs of points,

objecting that Clausius's forces are absolute and transcendent in the senses I have just outlined.

If this interpretation is correct, we may have to adjust our view of Helmholtz as a simple empiricist opponent of Kant. My suggestion is rather that Helmholtz modifies Kant's system from within, in that he systematically transforms Kant's constitutive principles of the natural sciences into regulative ones. The metrical relations defined in geometry, in Helmholtz's late view, are empirical in the sense that we could lack the means to measure with "real things". But geometry retains its transcendental character precisely because it is *required* for the formulation of general physical laws.

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"19th Century Spiritualism and the American Response to Locke, 1852 to 1875"
David K. Nartonis

John Locke's *Essay concerning human understanding* brought a recognizably modern philosophy of science to America in the 18th century. But, from the American Revolution to at least the Civil War, Scottish textbook authors, Thomas Reid and Dugald Stewart, interpreted Locke's philosophy for American college faculty and students. Reid promoted Locke's inductive methods but rejected hypothetical laws and invisible entities. Stewart, who supplanted Reid almost everywhere in the 1820s, promoted a fuller version of Locke's philosophy. Like Reid, however, Stewart argued for an intuitive component in scientific methodology that Locke denied. About the same time, Richard Whately showed in his widely used logic textbook that induction and deduction played equally important roles in the study of nature. There followed a minor revival of Descartes' concept of science as a system of axioms.

After 1850, there were three parallel lines of additional development. William Hamilton, whose book augmented Stewart as an American college text, enlarged the role of intuition in science, along the lines developed by Kant. Building instead on Stewart's linguistic nominalism, J. S. Mill argued for an even purer induction than Reid. At the same time, working scientists put increasing emphasis on Stewart's notion of probably verified hypotheses. With all this being sorted out in American colleges in the third quarter of the 19th century, one might expect popular notions of science to be equally complex. So far, however, cultural historians have narrowly focused on the popularity of Reid's "Baconian" philosophy among conservative religious groups. By way of contrast, I will examine in my paper the popular notion of science among perhaps the most liberal religious group in 19th-century America — the Spiritualists. Contrary to published scholarly opinion that the Spiritualists were also Baconian followers of Reid, I find all the competing, 19th-century definitions of science reflected in the Spiritualists' widely read periodicals. I also find evidence that the growing professionalism of the academic disciplines, after 1850, increasingly quashed a vigorous popular discussion of the philosophy of science.

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"Logical Principles and Psychological Laws: C.S. Peirce's Pragmatism and the Logical Basis of Psychology"

Justus Lentsch

Classical American Pragmatism is often said to be replaced by Logical Empiricism in the philosophy of science. Charles Sanders Peirce, having invented pragmatism in his most influential papers from 1877/78 as a methodological strategy to clarify the meaning of abstract concepts, is frequently reproached with proposing a kind of naturalized philosophy incorporating a psychologistic theory of inquiry. He is charged with grounding the validity of logical reasoning on psychological assumptions. Contrary to this critique, Peirce himself regards pragmatism as a "theory of logical analysis" (CP 6.490) and emphasises that he had derived even his early pragmatism "[..] from a logical and non-psychological study of the essential nature of signs" (MS 137, 1904).

Astonishingly, the remark by Peirce's biographer Max Fisch in his "Chronicle of Pragmatism" (1965) that there is an intimate relationship between the genesis of pragmatism and Peirce's long-life discussion of the experimental psychology and psychophysics of his days is still widely ignored: In fact, Peirce was familiar with the writings of Fechner, Helmholtz and Wundt, holding even for several years the translation rights for Wundt's "Vorlesungen □ber die Menschen- und Thierseele" (1863). Moreover, Peirce's path-breaking psychophysical laboratory study at Johns Hopkins (in collaboration with his disciple Joseph Jastrow) on weight discrimination disproving Fechner's concept of a threshold ("Unterschiedsschwelle") has first introduced experimental psychology in the United States. And, as very recent work on Peirce's philosophy of psychology has shown (Girel 2003), Peirce has read William James' epoch-making "Principles of Psychology" very closely: He was sympathetic to many of James' psychological discoveries but maintains that their significance is obscured because of logical confusions. In opposition to James, Peirce developed the view that psychophysical phenomena have to be connected with logical distinctions in order to make a consistent theory of cognition (cf. e.g. MS 325, n.d.).

The objective of this paper is to elucidate the impact Peirce's critical reading of the contemporaneous developments in psychology has on the genesis of pragmatism. It argues a positive and a negative thesis:

First, there is in fact an intimate relationship between the genesis of Peirce's pragmatism and his views on psychology. In particular, this concerns the continuous and mediate viz. inferential nature of cognition and the logical features of physiological regularities of habit formation.

Second, in Peirce's philosophical architectonic as well as in his classification of the sciences, physical laws indeed depend on psychical ones. But as the latter are themselves genuinely dependent on logical principles (and not vice versa), the challenge of psychologism to Peirce's theory of inquiry and his pragmatism is misled.