AGPhil 6: History and Philosophy of Physics

Time: Wednesday 14:30–16:45 Location: H 2033

Invited Talk AGPhil 6.1 Wed 14:30 H 2033

Majorana's oscillator and the philosophy of neutrino physics — •Silvia De Bianchi — Sapienza, University of Rome, Italy

The aim of this paper is to claim the relevance of a philosophical understanding of neutrino physics, which deserves careful analysis in its historical development. In this paper I shall investigate the origin of Majorana's oscillator, which B. Touschek suggested to investigate for its consequences in dealing with energy spectra. The equation implied in Majorana theory of neutrino has not yet been object of extensive studies, so that its meaning and consequences are far to be understood.

In what follows, I start throwing some light on it, by exploring the background from which E. Majorana advanced his theory. I shall refer to H. Weyl's foundations of Quantum Mechanics and to the method of second quantization applied to the Maxwell-Dirac field equation. Majorana's theory appears to be ascribed to Weyl's treatment of the dynamical problem of quantum physical systems in his Theory of Groups and Quantum Mechanics. Weyl's non-linear solution derives from a specific condition that presupposed the application of a variational principle slightly different from Dirac's. I shall explore the reasons why both Weyl and Majorana criticized Dirac's use of positive and negative energy states in dealing with neutral particles.

Conclusively, I shall present further possible research topics concerning: 1. Weyl's reflections on positive and negative transitions of the elettromagnetic field. 2. Majorana's spinor as a specification of Weyl's spinor. 3. The implications of 1. and 2. for the philosophy of space and time.

AGPhil 6.2 Wed 15:15 H 2033

Kant's Theory of Mathematical Physics — •Katharina Kraus — Department of History and Philosophy of Science, University of Cambridge, Free School Lane, Cambridge, CB2 3RH, United Kingdom

Kant's theory of natural science neither follows Leibniz's rational metaphysics nor fully endorses Newton's and Galileo's mathematical foundation of the sciences. Rather, Kant proposes a theory according to which scientific cognition results from a combination of metaphysical concept formation and mathematical construction. The äpplicationöf mathematics to concepts that are metaphysically derived presupposes a special metaphysics of nature. For Kant, mathematical physics as a pure, synthetic a priori natural science is paradigmatic for all sciences. In this paper, I will present three different lines of interpretation of the special metaphysics of nature, the weak reading according to Buchdahl's (1969) "looseness of fit"between transcendental principles and empirical laws, Friedman's (1992) strong reading suggesting a strong correspondence between them, and an alternative reading according to Plaass' (1965) idea of metaphysical construction. A comparison of these three interpretations will show which of them could still be appropriate to a philosophical foundation of modern physics. I will also examine to what extent Kant's idea of a pre-mathematical metaphysical concept formation could be seen as a precursor of a semantic view of theories.

AGPhil 6.3 Wed 15:45 H 2033

The postponed Euler-Lambert-Kant discussion in the mirror of the Schlick-Cassirer debate — •Dieter Suisky — Institut für Physik, Humboldt-Universität zu Berlin

Striving for a discussion with the leading mathematicians of his time was a crucial peculiarity in Kant's attempts to reconsider the basic principles of physics and metaphysics (compare Kant's letter to Euler in 1749 and the correspondence with Lambert between 1765 and 1770). In a letter to Johann III Bernoulli (1781), Kant commented in retrospect that it would be worthwhile "seine (Lambert's) Bemühung mit der meinigen zu vereinigen, um etwas Vollendetes zu Stande zu bringen". Though in fact it was Kant who postponed all opportunities which were offered to him by Lambert, he was right in demanding and expecting a completion of his works.

It will be argued that the missed opportunity was revived, first of all in the debates between physicists, mathematicians and the schools of Neo-Kantianism and logical empiricism initiated and performed by Cassirer, Schlick, Reichenbach, Einstein and Weyl. The keystone, however, was delivered by Einstein whose theory of space and time replaced not only the former versions constructed by Newton, Leibniz and Euler, but provided the basis of a new philosophical interpretation. As an unpleasant result for the Kantians, Schlick questioned some of Kant's previously groundbreaking assumptions ("Nun müssen wir freilich in ihrem ... Dogma, die Philosophie biete unbedingt wahre apriorische Grundsätze dar, eine höchst unglückliche Äußerung erblicken.").

AGPhil 6.4 Wed 16:15 H 2033

Are there elements of Leibniz's theory in Newton? On the different shapes of Newton's 2nd Law — •Dieter Suisky — Institut für Physik, Humboldt-Universität zu Berlin

The representation of Newton's 2nd Law underwent several modifications between 1684 and 1687. It will be argued that some of them are probably related to Leibniz's critique of Cartesian mechanics in 1686. In comparison to the preliminary versions in the manuscripts entitled De Motu (1684a, 1684b), the final version of the 2nd Law published in the Principia (1687) is distinguished by two modifications. De Motu (a): "The change of the *state of motion and rest* is proportional to the *force impressed* and is made in the direction of the right line in which that force is impressed." De Motu (b): "The change of *motion* is proportional to the force impressed ..." In 1686, Leibniz published his famous attack upon Cartesian mechanics replacing the quantity of motion with the moving force and in 1687 appeared the name of "moving force" also in the Principia completing the previously denoted impressed force. "The change of motion is proportional to the *motive force impressed* ..."

Finally, in the French translation published in 1759, du Châtelet interpreted Newton in the spirit of Leibniz by omitting the word "impressed" and maintaining the word "moving". In the Institutions published in 1740, du Châtelet has already accentuated the Leibniz related interpretation by adding that the "change in the direction and the velocity are always due to an external force because otherwise the change would be without *sufficient reason*".