AKPhil 8: History and Philosophy of Physics 1

Zeit: Freitag 9:00–10:30 Raum: KIP SR 3.401

AKPhil 8.1 Fr 9:00 KIP SR 3.401

Newtons Philosophie der Physik - zeitlos — •Helmut Hille — Fritz-Haber-Straße 34, D-74081 Heilbronn

Newtons lat. verfasstes Werk von 1686 "Philosophiae Naturalis Principia Mathematica" wird u. a. übersetzt mit "Mathematische Grundlagen der Naturphilosophie" (Ed Dellian) oder "Die mathematischen Prinzipien der Physik" (V. Schüler), während ich denke, dass Newton seine Naturphilosophie zur Physik nach mathematischen, also rationalen Prinzipien entwickeln wollte. Es war der von Descartes (1596-1650) propagierte Rationalismus, dem er zu folgen suchte, weshalb Newtons Werk eigentlich mit "Philosophie der Natur nach Prinzipien der Mathematik" übersetzt werden müsste. Leider vermengte Newton in seiner Definition III Descartes "Erstes Naturgesetz" gleich mit Teilen seines 1. Axioms. Eine konsequente Axiomatik unter Einbeziehung der Gravitation in einer aktualisierten Sicht zeigt grundlegende Gemeinsamkeiten von klassischer und moderner Physik auf und ist m.E. geeignet, alle Teile durch ein vertieftes Verständnis einander zu nähern.

AKPhil 8.2 Fr 9:30 KIP SR 3.401

On the post-Newtonian period in the development of mechanics — •Dieter Suisky — Institut für Physik, Humboldt-Universität zu Berlin, Newtonstr. 15, 12489 Berlin

Leonhard Euler is famous as the leading mathematician of the 18th century whereas Emilie du Châtelet is known for the translation of Newton's *Principia* into French. Châtelet's *Institutions de physique* had been published in 1740, after Eulers *Mechanica* (1736) but before d'Alembert's *Traité* (1743). A German translation, entitled *Naturlehre*, was rapidly published in 1743 while Euler's comprehensive treatise *Anleitung zur Naturlehre* had been issued only posthumously in 1862.

In this contribution it will be demonstrated that the followers of Newton and Leibniz did merge and modify basic principles of their predecessors by introducing new principles, exemplified for Euler's procedure to invent physical notions being completely commensurable with the Leibnizian representation of the calculus.

Châtelet based the *Institutions* on Descartes's concept of extension, Newton's *Principia* and, Leibniz's principles of sufficient reason and conservation of living forces. Projected onto Euler's program, Châtelet's progress is inherently hampered by the restricted use of the language of calculus whereas the translation suffers losses from the lack of an adequate German physical terminology. Euler elaborated thoroughly both components in the *Anleitung* such that one can make use of Euler's consistently formulated conceptual frame even for the analysis of contemporary problems.

AKPhil 8.3 Fr 10:00 KIP SR 3.401

Euler's mechanics as a unified theory of matter and motion — •Dieter Suisky — Institut für Physik, Humboldt-Universität zu Berlin, Newtonstr. 15, 12489 Berlin

Leonhard Euler (1707 - 1783) is famous as the leading mathematician of the 18th century. Though his pioneering work on mechanics had an essential influence in 18th century, its impact on the 19th century has been obscured by the overwhelming success of his mathematical writings.

The following features make the difference to the theories of Euler's predecessors Descartes, Newton and Leibniz: (i) a unified approach to mechanics based upon a universal model of the body and the introduction of algorithms for the modelling and solution of mechanical problems, called *Auflösungskunst*, (ii) the rigorous statement on the priority of *relative motion*, based upon the introduction of *observers*, called Zuschauer (*Mechanica*, 1736). This is comprehensively elaborated in the *Anleitung zur Naturlehre* (published 1862, but not mentioned by Mach) and maintained in the *Theoria* (1765), completed with the relative motion of two observers who are comparing their observations. The results confirm (iii) the invariance of the equation of motion in inertial systems (maintained by Einstein) and, (iv) the explanation of the origin of forces. Finally, (v) the reliability of mechanics is based both upon experience and mathematical foundation of the algorithms which are turned out to be in harmony with the physical foundation of measuring procedures. Einstein added the invariance of light velocity preserving all basic essentials of Euler's theory.