AKPhil 7: Wissenschaftstheorie II

Zeit: Dienstag 18:00–19:00   Raum: KGI-HS 1015

AKPhil 7.1   Di 18:00   KGI-HS 1015

Nominalismus und Spekulation in der Physik — •Wätzold Plaum — NWFI Mathematik Universität Regensburg 93040 Regensburg

Die zunehmende kognitive Partikularisierung in der Physik bringt die Gefahr mit sich, dass Erkenntnisziele physikalischer Grundlagenforschung zusehends schwerer zu erreichen sind. Insbesondere die Komplexitätssteigerung der theoretischen Forschung birgt die Gefahr, vom experimentellen Standpunkt gesehen bedeutungslose Forschung hervorzubringen. Der Vortrag versucht die spekulativen Anteile der referenziellen Beziehung von Experiment und Theorie zu beleuchten, wobei insbesondere die Rolle der Heuristik und des Gedankenexperimentes zu berücksichtigen sind. Daran anknüpfend soll der naive Nominalismus im Kontext dieser Problematik kritisch diskutiert werden.

AKPhil 7.2   Di 18:30   KGI-HS 1015

A Meta-Theory of Physics *and* Computation — •Martin Ziegler — University of Paderborn

Mathematical proofs that several unrelated natural definitions of 'computability' (e.g. based on *Turing machine* TM, λ calculus, μ-recursion) are in fact equivalent, have led to what is known as the *Church-Turing Hypothesis* (CTH): every function that nature can be exploited to compute, can also be calculated on a TM. Since a TM provably cannot decide the *Halting Problem H* (basically the question of whether a given program satisfies the minimum requirement of correct software in that it terminates), this means that no physical (e.g. quantum) computer whatsoever can solve it either. However all attempts for *formal* arguments in favor of the CTH have failed so far; and in fact its validity is currently hotly disputed (buzzword: hypercomputation).

We notice that those disputes arise mostly from disagreeing conceptions of "nature": Already Classical Mechanics (CM) admits a bounded solid body B to have the entire H encoded as engraving and thus to 'solve' H by probing B. This is of course doubly impractical: 1) an ideal probe or body exists only *in CM*; and 2) even *within CM* one cannot *construct* (e.g. carve) B without solving H in the first place.

Credo 1: The CTH makes formal sense only *relative* to a specific physical theory (instead of vaguely referring to "nature")! Credo 2: Introduce *construct*ionism to (Ludwig's concept of) physical theories!

Since CTH is concerned equally with both physics and computer science, we propose their formal synthesis (based on 1 and 2) as a means for settling the above disputes and the state of the CTH itself.