AGPhil 5: Foundations of Quantum Mechanics 1

Zeit: Dienstag 14:00–16:00 Raum: SR 113

Hauptvortrag AGPhil 5.1 Di 14:00 SR 113

Das Messproblem der Quantenmechanik: eine philosophische Bilanz — •Michael Esfeld — Université de Lausanne, Lettres-Philosophie, CH-1015 Lausanne

Das Messproblem der Quantenmechanik besteht darin, dass es keine Theorie geben kann, welche die folgenden drei Aussagen zusammen anerkennt: A Die quantenmechanische Zustandsbeschreibung eines Systems ist vollständig. B Der quantenmechanische Zustand eines Systems entwickelt sich gemäss der Schrödingergleichung. C Messungen haben definitive Ergebnisse. Wenn man C anerkennt, muss man entweder A oder B zurückweisen. Der Vortrag zeigt die Optionen auf, die sich in diesem Falle ergeben, und bewertet diese. Dabei werden ich auch auf die Quantenfeldtheorie und die Ansätze zu einer Theorie der Quantengravitation eingehen.

Hauptvortrag AGPhil 5.2 Di 14:45 SR 113

Berry phase and quantum structural realism — •Holger Lyre — Philosophy Department, University of Magdeburg

Two main claims are made in this lecture: First, the Berry phase is a geometric quantum holonomy that is directly rooted in the very structure of quantum theory itself. Common wisdom tells us that the state space of quantum theory is a projective Hilbert space. This structure is however insufficient to account for the Berry phase, the full quantum structure must rather be considered as a U(1) principal bundle over the projective Hilbert space. Second, this quantum bundle structure should ontologically be seen as a real and causally effcacious trace of nature, the quantum phase therefore directly supports ontic structural realism.

AGPhil 5.3 Di 15:30 SR 113

Time Remains: Observable Succession in Quantum Gravity — •Karim Thebault[1] and Sean Gryb[2] — [1]Ludwig Maximilian University, Munich, Germany — [2]University of Utrecht, Utrecht, Netherlands

Even classically, it is not entirely clear how one should understand the implications of general covariance for the role of time in physical theory. On one popular view, the essential lesson is that change is relational in a strong sense, such that all that it is for a physical degree of freedom to change is for it to vary with regard to a second physical degree of freedom. This implies that there is no unique parameterization of time slices, and also that there is no unique temporal ordering. At a quantum level this approach to general relativity is generally understood to lead to a universe eternally frozen in an energy eigenstate. Here we will start from a different interpretation of the classical theory, and in doing so show how one may avoid this acute 'problem of time' in quantum gravity. Under our view, duration is still regarded as relative, but temporal succession is taken to be absolute. This is consistent with general covariance because it can be maintained only by the addition of an arbitrary time parameter corresponding to the minimal temporal structure necessary for a succession of observations to be represented. This approach to the classical theory of gravity is argued to then lead to a relational quantization methodology, such that it is possible to conceive of dynamical observables within a theory of quantum gravity.