AGPhil 4: Quantum-Classical Divide II

Time: Thursday 14:00–15:45 Location: SPA SR22

Invited Talk AGPhil 4.1 Thu 14:00 SPA SR22

Quantum Flesh on Classical Bones: Semiclassical Bridges across the Quantum-Classical Divide — •Alisa Bokulich — Center for Philosophy and History of Science, Boston University, Boston, MA, USA

Traditionally quantum mechanics is viewed as having made a sharp break from classical mechanics, and the concepts and methods of these two theories are viewed as incommensurable with one another. A closer examination of the history of quantum mechanics, however, reveals that there is a strong sense in which quantum mechanics was built on the backbone of classical mechanics. As a result, there is a considerable structural continuity between these two theories, despite their important differences. These structural continuities provide a ground for semiclassical methods in which classical structures, such as trajectories, are used to investigate and model quantum phenomena. After briefly tracing the history of semiclassical approaches, I will show how current research in semiclassical mechanics is revealing new bridges across the quantum-classical divide.

AGPhil 4.2 Thu 14:45 SPA SR22

***Umdeutung:* The Development of Quantum Mechanics as a Process of Reinterpretation.** — •Christoph Lehner — Max-Planck-Institut für Wissenschaftsgeschichte, Berlin

In 1925, Werner Heisenberg famously entitled his first paper on what was soon to be known as matrix mechanics "On the quantum theoretical reinterpretation (*Umdeutung*) of kinematic and mechanical relations." In my talk, I will analyze the centrality of this reinterpretation for the development of the new theory and for understanding the relation of matrix to classical mechanics. I will also consider the development of wave mechanics by Erwin Schrödinger in 1926 and analyze it as a parallel process of reinterpretation.

I will argue that this model offers a more realistic picture of the change of foundational theories than Kuhn's model of paradigm change.

AGPhil 4.3 Thu 15:15 SPA SR22

Experimental tests of the quantum superposition principle — •Hendrik Ulbricht — Physics and Astronomy, University of Southampton, Southampton SO17 1BJ, United Kingdom

New technological developments allow to explore the quantum properties of very complex systems, bringing the question of whether also macroscopic systems share such features, within experimental reach. The interest in this question is increased by the fact that, on the theory side, many suggest that the quantum superposition principle is not exact, departures from it being the larger, the more macroscopic the system. Testing the superposition principle intrinsically also means to test suggested extensions of quantum theory, so-called collapse models. We will report on three new proposals to experimentally test the superposition principle with nanoparticle interferometry, optomechanical devices and by high resolution spectroscopy.