AGPhil 4: Integrated History and Philosophy of Quantum Mechanics

Time: Tuesday 14:00–15:45 Location: HS XVII

Invited Talk AGPhil 4.1 Tue 14:00 HS XVII

History and Philosophy of Physics in Physics Education — •Oliver Passon — Bergische Universität Wuppertal

This talk deals with the relation between HPP and physics education. The largest overlap between these fields is the discourse on the so-called Nature of Science (NoS), i.e. the inclusion of meta-knowledge about the natural sciences in physics education. I discuss current trends and desirable developments.

AGPhil 4.2 Tue 14:45 HS XVII

Reflections on a Revolution — •Noah Stemeroff — University of Bristol, Bristol, UK

The development of quantum mechanics marks a turning point in the philosophical interpretation of physical theory. The early architects of quantum mechanics are claimed to have banished the last vestiges of philosophical intuition from the foundations of physics. Through the discovery of the fundamentally irrational, and indeterministic, nature of the quantum world, these physicists are credited with reorienting physical inquiry toward a more direct reliance on empirical facts, which no longer required (or were even amenable to) any intuitive picture.

However, this story is far from the actual facts. By the end of the 1920s, the founders of modern quantum mechanics had settled on a basic interpretation of quantum theory. Yet, central problems remained unresolved. In the search for new physics, the early architects of quantum mechanics did not, as one would expect, renounce forms of speculative philosophy. This talk will trace the history of the philosophical interpretation of the quantum revolution by its founders: Niels Bohr, Werner Heisenberg, and Wolfgang Pauli. In particular, it will focus on Pauli and Heisenberg's decades-long attempt to come to terms with the meaning of the quantum revolution and its implications for the future of scientific inquiry. Much of this history has been lost in the traditional narratives surrounding the interpretation of quantum mechanics, but it can shed important light not only on the early history of theory, but also on the nature of philosophical discourse within the practice of science itself.

AGPhil 4.3 Tue 15:15 HS XVII

Einstein's Sanity Check: The Forgotten Paper on the Quantum Theory of Ideal Gases — •Kabir Singh Bakshi — Department of History and Philosophy of Science, University of Pittsburgh

Einstein's three papers on the quantum theory of ideal gases, his second "statistical trilogy", stand as important finger-posts for the history and philosophy of physics. First, on the more personal side, they mark a transition point in Einstein's oeuvre. The second statistical trilogy has been variously characterized as Einstein's "last decisive positive contribution to physical statistics" (Born 1969, "In Memory of Einstein") and "the end of [Einstein's] substantive contributions to the development of quantum theory" (Howard 1990, "Nicht Sein Kann was Nicht Sein Darf ..."). And second, on the more intellectual side, the second statistical trilogy, with its early development of quantum statistics, has been viewed as a harbinger of quantum mechanics, thus serving as a transition point from the old quantum theory to the new quantum mechanics (Monaldi 2019, "The Statistical Style of Reasoning").

In this paper I critically engage with the third paper in the trilogy. By going in detail through the first two and the third paper, I show the difference in aim, content, and methodology of the papers. I also argue, contra the consensus in historiographical analysis, against the claim that the third paper is best understood exclusively as Einstein's response to Ehrenfest's criticism. Instead, I claim that a fuller picture highlights the third paper as Einstein's attempt to perform a sanity-check on his new - and unintuitive - quantum theory of gases.