

Quantum Mechanics in Context: Pascual Jordan's 1936 *Anschauliche Quantentheorie* in Its Philosophical and Political Setting

Don Howard

University of Notre Dame

Abstract:

As another contribution to the larger HQ Quantum Textbooks project, this paper presents an analysis and historical situating of Jordan's influential 1936 textbook, *Anschauliche Quantentheorie. Eine Einführung in die moderne Auffassung der Quantenerscheinungen* (Berlin: Springer). A number of related themes will be explored:

1. The book reflects the Göttingen mathematical physics background out of which Jordan emerged. Even the title – *Anschauliche Quantentheorie* – deliberately echoes that of the very famous and widely-read *Anschauliche Geometrie* (Berlin: Springer, 1932) by Jordan's Göttingen mentor, David Hilbert, and Stephan Cohn-Vossen.
2. The book played a pivotal role in cementing the problematic but widespread impression of a deep affinity between the logical empiricist movement, with which Jordan was closely associated, and a broadly "Copenhagen" understanding of quantum mechanics. More specifically, Jordan emphasizes a subjectivist or epistemic interpretation of quantum mechanics with deep affinities to views then also being promoted by Heisenberg (but not Bohr!). Indeed, a distinctive feature of the book is the amount of space devoted to a discussion of the philosophical implications of quantum mechanics.
3. Another distinctive feature of the book is Jordan's effort to connect issues in quantum mechanics and biology, arguing that the new physics drives us to an "organic point of view," according to which the study of biological phenomena will reveal laws of nature with contents that are "essentially new" by comparison with laws pertaining exclusively to inorganic phenomena.
4. The book's composition and reception is conditioned by the fact of its having been published at a crucial moment in the political history of German physics and in Jordan's own career, as he was moving steadily and strongly toward the political right, a story now being explored in great detail by Richard Beyler.

All four of the mentioned features of the book – the invocation of the Göttingen heritage, the assimilation of the Copenhagen view to logical empiricism, the promotion of an organic conception of nature, and the political and personal/professional embedding – interact with one another in complicated and interesting ways. So, for example, one surmises that it is no accident that the conservative Jordan, writing in Germany in 1936, goes out of his way to emphasize that the Copenhagen version of quantum mechanics, the

Machian empiricist tradition, and the organic, biological conception of nature are all deeply incompatible with the “materialist” conception of nature. The political valence of the term “materialist” would not have been overlooked by Jordan’s German audience in 1936, likewise the political point of his reminding his audience on the very same page that Planck, von Laue, and Einstein were all well known for their skepticism about central principles of modern quantum mechanics as Jordan presents it in the book.