



Foundations of Relational Realism: A Topological Approach to Quantum Mechanics and the Philosophy of Nature (Contemporary Whitehead Studies)

Michael Epperson, Elias Zafiris

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If there is a central conceptual framework that has reliably borne the weight of modern physics as it ascends into the 21st century, it is the framework of quantum mechanics. Because of its enduring stability in experimental application, physics has today reached heights that not only inspire wonder, but arguably exceed the limits of intuitive vision, if not intuitive comprehension. For many physicists and philosophers, however, the currently fashionable tendency toward exotic interpretation of the theoretical formalism is recognized not as a mark of ascent for the tower of physics, but rather an indicator of sway--one that must be dampened rather than encouraged if practical progress is to continue.

In this unique two-part volume, designed to be comprehensible to both specialists and non-specialists, the authors chart out a pathway forward by identifying the central deficiency in most interpretations of quantum mechanics, and indeed, in modern philosophy more generally: That in the conventional, metrical depiction of extension, inherited from the Enlightenment, objects are characterized as fundamental to relations--i.e., such that relations presuppose objects but objects do not presuppose relations. The authors, by contrast, argue that in quantum mechanics physical extensiveness fundamentally entails not only relations of objects, but also relations of relations. In this way, quantum mechanics exemplifies a concept of extensive connection that it is fundamentally topological rather than metrical, and thus requires a logico-mathematical framework grounded in category theory rather than set theory.

By this thesis, the fundamental quanta of quantum physics are properly defined as units of *logico-physical relation* rather than merely units of physical relata as is the current convention. Objects are always understood as relata, and likewise relations are always understood objectively. Objects and relations are thus coherently defined as mutually implicative. The conventional notion of a history as 'a story about fundamental objects' is thereby reversed, such that the classical 'objects' become the story by which we understand physical systems that are fundamentally histories of quantum events.

These are just a few of the novel critical claims explored in this volume--claims whose exemplification in quantum mechanics will, the authors argue, serve more broadly as foundational principles for the philosophy of nature as it evolves through the 21st century and beyond.

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