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Scientists have been debating the meaning of quantum mechanics for over a century. This book for graduate students and researchers gets to the root of the problem: the contextual nature of empirical truth, the laws of observation, and how these impact on our understanding of quantum physics. Bridging the gap between nonrelativistic quantum mechanics and quantum field theory, this novel approach to quantum mechanics extends the standard formalism to cover the observer and their apparatus. The author demystifies some of the aspects of quantum mechanics that have traditionally been regarded as extraordinary, such as wave–particle duality and quantum superposition, by emphasizing the scientific principles. Including key experiments and worked examples throughout to encourage the reader to focus on empirically sound concepts, this book avoids metaphysical speculation and alerts the reader to the use of computer algebra to explore quantum experiments of virtually limitless complexity. This title, first published in 2017, has been reissued as an Open Access publication on Cambridge Core.

GEORGE JAROSZKIEWICZ is a mathematical physicist recently retired from the School of Mathematical Sciences, University of Nottingham. His research interests are focused on the fundamental differences between quantum and classical mechanics.

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The Theory of Observation

GEORGE JAROSZKIEWICZ

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