Quantum Mechanics And Experience David Z Albert

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Quantum Mechanics and Experience - David Z Albert 1994-03-15
Presents a guide to the basics of quantum mechanics and measurement.
Many Worlds? - Simon Saunders 2010-06-24
What does realism about the quantum state imply? What follows when quantum theory is applied without restriction, if need be, to the whole universe? These are the questions which an illustrious team of philosophers and physicists debate in this volume. All the contributors are agreed on realism, and on the need, or the aspiration, for a theory that unites micro- and macroworlds, at least in principle. But the further claim argued by some is that if you allow the Schrödinger equation unrestricted application, supposing the quantum state to be something physically real, then this universe is one of countlessly many others, constantly branching in time, all of which are real. The result is the many worlds theory, also known as the Everett interpretation of quantum mechanics. The contrary claim sees this picture of many worlds as in no sense inherent in quantum mechanics, even when the latter is allowed unrestricted scope and even given that the quantum state itself is something physically real. For this picture of branching worlds fails to make physical sense, let alone common sense, even on its own terms. The status of these worlds, what they are made of, is never adequately explained. Ordinary ideas about time and identity over time become hopelessly compromised. The concept of probability itself is brought into question. This picture of many branching worlds is inchoate, it is a vision, an error. There are realist alternatives to many worlds, some even that preserve the Schrödinger equation unchanged. Twenty specially written essays, accompanied by commentaries and discussions, examine these claims and counterclaims in depth. They focus first on the question of ontology, the existence of worlds (Part 1 and 2), second on the interpretation of probability (Parts 3 and 4), and third on alternatives or additions to many worlds (Parts 5 and 6). The introduction offers a helpful guide to the arguments for the Everett interpretation, particularly as they have been formulated in the last two decades.
Mathematical Foundations of Quantum Mechanics - John von Neumann 1955
This text shows that insights in quantum physics can be obtained by exploring the mathematical structure of quantum mechanics. It presents the theory of Hermitean operators and Hilbert spaces, providing the framework for transformation theory, and using th
Foundations of Relational Realism - Michael Epperson 2013-06-20
Foundations of Relational Realism presents an intuitive interpretation of quantum mechanics, based on a revised decoherent histories interpretation, structured within a category theoretic topological

formalism.

The Cambridge Companion to Einstein - Michel Janssen 2014-05-19

These fourteen essays by leading historians and philosophers of science introduce the reader to the work of Albert Einstein. Following an introduction that places Einstein's work in the context of his life and times, the essays explain his main contributions to physics in terms that are accessible to a general audience, including special and general relativity, quantum physics, statistical physics, and unified field theory. The closing essays explore the relation between Einstein's work and twentieth-century philosophy, as well as his political writings.

Variational Principles in Dynamics and Quantum Theory - Wolfgang Yourgrau 2012-04-26

DIVHistorical, theoretical survey with many insights, much hard-to-find material. Hamilton’s principle, Hamilton-Jacobi equation, etc. /div

Foundations of Quantum Mechanics - Travis Norsen 2017-08-17

Authored by an acclaimed teacher of quantum physics and philosophy, this textbook pays special attention to the aspects that many courses sweep under the carpet. Traditional courses in quantum mechanics teach students how to use the quantum formalism to make calculations. But even the best students - indeed, especially the best students - emerge rather confused about what, exactly, the theory says is going on, physically, in microscopic systems. This supplementary textbook is designed to help such students understand that they are not alone in their confusions (luminaries such as Albert Einstein, Erwin Schroedinger, and John Stewart Bell having shared them), to sharpen their understanding of the most important difficulties associated with interpreting quantum theory in a realistic manner, and to introduce them to the most promising attempts to formulate the theory in a way that is physically clear and coherent. The text is accessible to students with at least one semester of prior exposure to quantum (or "modern") physics and includes over a hundred engaging end-of-chapter "Projects" that make the book suitable for either a traditional classroom or for self-study.

Quantum Mechanics - Fraassen Van 1991

The author argues that quantum theory admits a plurality of interpretations, each aiding further understanding of the theory, but also advocating specifically the Copenhagen Variant of the Modal Interpretation. That variant is applied to topics like the Einstein-Podolsky-Rosen paradox and the problem of 'identical' particles.

Not Even Wrong - Peter Woit 2007-03-09

When does physics depart the realm of testable hypothesis and come to resemble theology? Peter Woit argues that string theory isn't just going in the wrong direction, it's not even science. Not Even Wrong shows that what many physicists call superstring “theory” is not a theory at all. It makes no predictions, not even wrong ones, and this very lack of falsifiability is what has allowed the subject to survive and flourish. Peter Woit explains why the mathematical conditions for progress in physics are entirely absent from superstring theory today, offering the other side of the story.

Space from Zeno to Einstein - Nick Huggett 1999-04-01

Learning through original texts can be a powerful heuristic tool. This book collects a dozen classic readings that are generally accepted as the most significant contributions to the philosophy of space. The readings have been selected both on the basis of their relevance to recent debates on the nature of space and on the extent to which they carry premonitions of contemporary physics. In his detailed commentaries, Nick Huggett weaves together the readings and links them to our modern understanding of the subject. Together the readings indicate the general historical development of the concept of space, and in his commentaries Huggett explains their logical relations. He also uses our contemporary understanding of space to help clarify the key ideas of the texts. One goal is to prepare the reader (both scientist and nonscientist) to learn and understand relativity theory, the basis of our current understanding of space. The readings are by Zeno, Plato, Aristotle, Euclid, Descartes, Newton, Leibniz, Clarke, Berkeley, Kant, Mach, Poincaré, and Einstein.

Quantum Non-Locality and Relativity - Tim Maudlin 2011-05-06

The third edition of Quantum Non-Locality and Relativity has been

carefully updated to reflect significant developments, including a new chapter covering important recent work in the foundations of physics. A new edition of the premier philosophical study of Bell's Theorem and its implication for the relativistic account of space and time Discusses Roderich Tumiulka's explicit, relativistic theory that can reproduce the quantum mechanical violation of Bell's inequality. Discusses the "Free Will Theorem" of John Conway and Simon Kochen Introduces philosophers to the relevant physics and demonstrates how philosophical analysis can help inform physics

Quantum Worlds - Olimpia Lombardi 2019-04-11

Offers a comprehensive and up-to-date volume on the conceptual and philosophical problems related to the interpretation of quantum mechanics.

Quantum Mechanics and Experience - David Z. ALBERT 2009-06-30

Foundations of Space-Time Theories - Michael Friedman 2014-07-14

This book, explores the conceptual foundations of Einstein's theory of relativity: the fascinating, yet tangled, web of philosophical, mathematical, and physical ideas that is the source of the theory's enduring philosophical interest. Originally published in 1983. The Princeton Legacy Library uses the latest print-on-demand technology to again make available previously out-of-print books from the distinguished backlist of Princeton University Press. These editions preserve the original texts of these important books while presenting them in durable paperback and hardcover editions. The goal of the Princeton Legacy Library is to vastly increase access to the rich scholarly heritage found in the thousands of books published by Princeton University Press since its founding in 1905.

Einstein and the Quantum - A. Douglas Stone 2015-10-06

The untold story of Albert Einstein's role as the father of quantum theory Einstein and the Quantum reveals for the first time the full significance of Albert Einstein's contributions to quantum theory. Einstein famously rejected quantum mechanics, observing that God does not play dice. But, in fact, he thought more about the nature of atoms, molecules, and the emission and absorption of light—the core of what we now know as quantum theory—than he did about relativity. A compelling blend of physics, biography, and the history of science, Einstein and the Quantum shares the untold story of how Einstein—not Max Planck or Niels Bohr—was the driving force behind early quantum theory. It paints a vivid portrait of the iconic physicist as he grappled with the apparently contradictory nature of the atomic world, in which its invisible constituents defy the categories of classical physics, behaving simultaneously as both particle and wave. And it demonstrates how Einstein's later work on the emission and absorption of light, and on atomic gases, led directly to Erwin Schrödinger's breakthrough to the modern form of quantum mechanics. The book sheds light on why Einstein ultimately renounced his own brilliant work on quantum theory, due to his deep belief in science as something objective and eternal.

Time and Chance - David Z. ALBERT 2003-02-28

This book is an attempt to get to the bottom of an acute and perennial tension between our best scientific pictures of the fundamental physical structure of the world and our everyday empirical experience of it. The trouble is about the direction of time. The situation (very briefly) is that it is a consequence of almost every one of those fundamental scientific pictures--and that it is at the same time radically at odds with our common sense--that whatever can happen can just as naturally happen backwards. Albert provides an unprecedentedly clear, lively, and systematic new account--in the context of a Newtonian-Mechanical picture of the world--of the ultimate origins of the statistical regularities we see around us, of the temporal irreversibility of the Second Law of Thermodynamics, of the asymmetries in our epistemic access to the past and the future, and of our conviction that by acting now we can affect the future but not the past. Then, in the final section of the book, he generalizes the Newtonian picture to the quantum-mechanical case and (most interestingly) suggests a very deep potential connection between the problem of the direction of time and the quantum-mechanical measurement problem. The book aims to be both an original contribution to the present scientific and philosophical understanding of these

matters at the most advanced level, and something in the nature of an elementary textbook on the subject accessible to interested high-school students. Table of Contents: Preface 1. Time-Reversal Invariance 2. Thermodynamics 3. Statistical Mechanics 4. The Reversibility Objections and the Past-Hypothesis 5. The Scope of Thermodynamics 6. The Asymmetries of Knowledge and Intervention 7. Quantum Mechanics Appendix: Gedankenexperiments with Heat Engines Index Reviews of this book: The foundations of statistical mechanisms are often presented in physics textbooks in a rather obscure and confused way. By challenging common ways of thinking about this subject, Time and Chance can do quite a lot to improve this situation. --Jean Bricmont, Science Albert is perfecting a style of foundational analysis that is uniquely his own...It has a surgical precision...and it is ruthless with pretensions. The foundations of thermodynamics is a topic that has accumulated a good deal of dead wood; this is a fire that will burn and burn. --Simon W. Saunders, Oxford University As usual with Albert's work, the exposition is brisk and to the point, and exceptionally clear...The book will be an extremely valuable contribution to the literature on the subject of philosophical issues in thermodynamics and statistical mechanics, a literature which has been thin on the ground but is now growing as it deserves to. --Lawrence Sklar, University of Michigan

The Many-Worlds Interpretation of Quantum Mechanics - Bryce Seligman Dewitt 2015-03-08

A novel interpretation of quantum mechanics, first proposed in brief form by Hugh Everett in 1957, forms the nucleus around which this book has developed. In his interpretation, Dr. Everett denies the existence of a separate classical realm and asserts the propriety of considering a state vector for the whole universe. Because this state vector never collapses, reality as a whole is rigorously deterministic. This reality, which is described jointly by the dynamical variables and the state vector, is not the reality customarily perceived; rather, it is a reality composed of many worlds. By virtue of the temporal development of the dynamical variables, the state vector decomposes naturally into orthogonal vectors, reflecting a continual splitting of the universe into a multitude of mutually unobservable but equally real worlds, in each of which every good measurement has yielded a definite result, and in most of which the familiar statistical quantum laws hold. The volume contains Dr. Everett's short paper from 1957, "'Relative State' Formulation of Quantum Mechanics," and a far longer exposition of his interpretation, entitled "The Theory of the Universal Wave Function," never before published. In addition, other papers by Wheeler, DeWitt, Graham, and Cooper and Van Vechten provide further discussion of the same theme. Together, they constitute virtually the entire world output of scholarly commentary on the Everett interpretation. Originally published in 1973. The Princeton Legacy Library uses the latest print-on-demand technology to again make available previously out-of-print books from the distinguished backlist of Princeton University Press. These editions preserve the original texts of these important books while presenting them in durable paperback and hardcover editions. The goal of the Princeton Legacy Library is to vastly increase access to the rich scholarly heritage found in the thousands of books published by Princeton University Press since its founding in 1905.

After Physics - David Z. Albert 2015

Here the philosopher and physicist David Z Albert argues, among other things, that the difference between past and future can be understood as a mechanical phenomenon of nature and that quantum mechanics makes it impossible to present the entirety of what can be said about the world as a narrative of “befores” and “afters.”

The Wave Function - Alyssa Ney 2013-04-08

This is a new volume of original essays on the metaphysics of quantum mechanics. The essays address questions such as: What fundamental metaphysics is best motivated by quantum mechanics? What is the ontological status of the wave function? Does quantum mechanics support the existence of any other fundamental entities, e.g. particles? What is the nature of the fundamental space (or space-time manifold) of quantum mechanics? What is the relationship between the fundamental ontology of quantum mechanics and ordinary, macroscopic objects like tables, chairs, and persons? This collection includes a comprehensive

introduction with a history of quantum mechanics and the debate over its metaphysical interpretation focusing especially on the main realist alternatives.

the tiller of waters - hoda barakat 2004

This spellbinding novel narrates the many-layered recollections of a hallucinating man in devastated Beirut. The desolate, almost surreal, urban landscape is enriched by the unfolding of the family sagas of Niqula Mitri and his beloved Shamsa, the Kurdish maid. Mitri reminisces about his Egyptian mother and his father who came back to settle in Beirut after a long stay in Egypt. Both Mitri and his father are textile merchants and see the world through the code of cloth, from the intimacy of linen, velvet, and silk to the most impersonal of synthetics. Shamsa in turn relates her story, the myriad adventures of her parents and grandparents who moved from Iraqi Kurdistan to Beirut. Haunting scenes of pastoral Kurds are juxtaposed against the sedentary decadence of metropolitan residents. Barakat weaves into her sophisticated narrative shreds of scientific discourse about herbal plants and textile crafts, customs and manners of Arabs, Armenians, and Kurds, mythological figures from ancient Greece, Mesopotamia, Phoenicia, and Arabia, the theosophy of the African Dogons and the medieval Byzantines, and historical accounts of the Crusades in the Holy Land and the silk route to China.

Quantum Computing - Eleanor G. Rieffel 2014-08-29

A thorough exposition of quantum computing and the underlying concepts of quantum physics, with explanations of the relevant mathematics and numerous examples. The combination of two of the twentieth century's most influential and revolutionary scientific theories, information theory and quantum mechanics, gave rise to a radically new view of computing and information. Quantum information processing explores the implications of using quantum mechanics instead of classical mechanics to model information and its processing. Quantum computing is not about changing the physical substrate on which computation is done from classical to quantum but about changing the notion of computation itself, at the most basic level. The fundamental unit of computation is no longer the bit but the quantum bit or qubit. This comprehensive introduction to the field offers a thorough exposition of quantum computing and the underlying concepts of quantum physics, explaining all the relevant mathematics and offering numerous examples. With its careful development of concepts and thorough explanations, the book makes quantum computing accessible to students and professionals in mathematics, computer science, and engineering. A reader with no prior knowledge of quantum physics (but with sufficient knowledge of linear algebra) will be able to gain a fluent understanding by working through the book.

Metaphysical Essays - John Hawthorne 2006-04-06

John Hawthorne is widely regarded as one of the finest philosophers working today. He is perhaps best known for his contributions to metaphysics, and this volume collects his most notable papers in this field. Hawthorne offers original treatments of fundamental topics in philosophy, including identity, ontology, vagueness, and causation. Six of the essays appear here for the first time, and there is a valuable introduction to guide the reader through the selection.

Was Einstein Wrong? - Enrique Morales-Riveira 2004

The author explains for us, in this epistemological discourse, how the theory of relativity and the standard model of subatomic particles is leading modern physics down an ominous dead-end street.

Quantum Theory: Concepts and Methods - A. Peres 2006-06-01

There are many excellent books on quantum theory from which one can learn to compute energy levels, transition rates, cross sections, etc. The theoretical rules given in these books are routinely used by physicists to compute observable quantities. Their predictions can then be compared with experimental data. There is no fundamental disagreement among physicists on how to use the theory for these practical purposes. However, there are profound differences in their opinions on the ontological meaning of quantum theory. The purpose of this book is to clarify the conceptual meaning of quantum theory, and to explain some of the mathematical methods which it utilizes. This text is not concerned with specialized topics such as atomic structure, or strong or weak

interactions, but with the very foundations of the theory. This is not, however, a book on the philosophy of science. The approach is pragmatic and strictly instrumentalist. This attitude will undoubtedly antagonize some readers, but it has its own logic: quantum phenomena do not occur in a Hilbert space, they occur in a laboratory.

Knowledge of Life Today - Jean Gayon 2019-04-30

Knowledge of Life Today presents the thoughts of Jean Gayon, a major philosopher of science in France who is recognized across the Atlantic, especially for his work in philosophy and the history of life sciences. The book is structured around Gayon's personal answers to questions put forward by Victor Petit. This approach combines scientific rigor and risk-taking in answers that go back to the fundamentals of the subject. As well as the relationship between philosophy and the history of science, Gayon discusses the main questions of the history and philosophy of biology that marked his intellectual journey: Darwin, evolutionary biology, genetics and molecular biology, human evolution, and various aspects of the relationship between biology and society in contemporary times (racism, eugenics, biotechnology, biomedicine, etc.).

A Universe from Nothing - Lawrence M. Krauss 2012-01-10

Bestselling author and acclaimed physicist Lawrence Krauss offers a paradigm-shifting view of how everything that exists came to be in the first place. “Where did the universe come from? What was there before it? What will the future bring? And finally, why is there something rather than nothing?” One of the few prominent scientists today to have crossed the chasm between science and popular culture, Krauss describes the staggeringly beautiful experimental observations and mind-bending new theories that demonstrate not only can something arise from nothing, something will always arise from nothing. With a new preface about the significance of the discovery of the Higgs particle, A Universe from Nothing uses Krauss’s characteristic wry humor and wonderfully clear explanations to take us back to the beginning of the beginning, presenting the most recent evidence for how our universe evolved—and the implications for how it’s going to end. Provocative, challenging, and delightfully readable, this is a game-changing look at the most basic underpinning of existence and a powerful antidote to outmoded philosophical, religious, and scientific thinking.

Speakable and Unspeakable in Quantum Mechanics - J. S. Bell 2004-06-03

John Bell, FRS was one of the leading expositors and interpreters of modern quantum theory. He is particularly famous for his discovery of the crucial difference between the predictions of conventional quantum mechanics and the implications of local causality, a concept insisted on by Einstein. John Bell's work played a major role in the development of our current understanding of the profound nature of quantum concepts and of the fundamental limitations they impose on the applicability of the classical ideas of space, time and locality. This book includes all of John Bell's published and unpublished papers on the conceptual and philosophical problems of quantum mechanics, including two papers that appeared after the first edition was published. The book includes a short Preface written by the author for the first edition, and also an introduction by Alain Aspect that puts into context John Bell's enormous contribution to the quantum philosophy debate.

What Is Real? - Adam Becker 2018-03-20

The untold story of the heretical thinkers who dared to question the nature of our quantum universe Every physicist agrees quantum mechanics is among humanity's finest scientific achievements. But ask what it means, and the result will be a brawl. For a century, most physicists have followed Niels Bohr's Copenhagen interpretation and dismissed questions about the reality underlying quantum physics as meaningless. A mishmash of solipsism and poor reasoning, Copenhagen endured, as Bohr's students vigorously protected his legacy, and the physics community favored practical experiments over philosophical arguments. As a result, questioning the status quo long meant professional ruin. And yet, from the 1920s to today, physicists like John Bell, David Bohm, and Hugh Everett persisted in seeking the true meaning of quantum mechanics. What Is Real? is the gripping story of this battle of ideas and the courageous scientists who dared to stand up for truth.

Quantum Ontology - Peter J. Lewis 2016-06-13

Metaphysicians should pay attention to quantum mechanics. Why? Not because it provides definitive answers to many metaphysical questions- the theory itself is remarkably silent on the nature of the physical world, and the various interpretations of the theory on offer present conflicting ontological pictures. Rather, quantum mechanics is essential to the metaphysician because it reshapes standard metaphysical debates and opens up unforeseen new metaphysical possibilities. Even if quantum mechanics provides few clear answers, there are good reasons to think that any adequate understanding of the quantum world will result in a radical reshaping of our classical world-view in some way or other. Whatever the world is like at the atomic scale, it is almost certainly not the swarm of particles pushed around by forces that is often presupposed. This book guides readers through the theory of quantum mechanics and its implications for metaphysics in a clear and accessible way. The theory and its various interpretations are presented with a minimum of technicality. The consequences of these interpretations for metaphysical debates concerning realism, indeterminacy, causation, determinism, holism, and individuality (among other topics) are explored in detail, stressing the novel form that the debates take given the empirical facts in the quantum domain. While quantum mechanics may not deliver unconditional pronouncements on these issues, the range of possibilities consistent with our knowledge of the empirical world is relatively small-and each possibility is metaphysically revisionary in some way. This book will appeal to researchers, students, and anybody else interested in how science informs our world-view.

David Lynch Swerves - Martha P. Nochimson 2013-04-15

Beginning with Lost Highway, director David Lynch “swerved” in a new direction, one in which very disorienting images of the physical world take center stage in his films. Seeking to understand this unusual emphasis in his work, noted Lynch scholar Martha Nochimson engaged Lynch in a long conversation of unprecedented openness, during which he shared his vision of the physical world as an uncertain place that masks important universal realities. He described how he derives this vision from the Holy Vedas of the Hindu religion, as well as from his layman’s fascination with modern physics. With this deep insight, Nochimson forges a startlingly original template for analyzing Lynch’s later films—the seemingly unlikely combination of the spiritual landscape envisioned in the Holy Vedas and the material landscape evoked by quantum mechanics and relativity. In David Lynch Swerves, Nochimson navigates the complexities of Lost Highway, The Straight Story, Mulholland Drive, and Inland Empire with uncanny skill, shedding light on the beauty of their organic compositions; their thematic critiques of the immense dangers of modern materialism; and their hopeful conceptions of human potential. She concludes with excerpts from the wide-ranging interview in which Lynch discussed his vision with her, as well as an interview with Columbia University physicist David Albert, who was one of Nochimson’s principal tutors in the discipline of quantum physics.

Time and Chance - David Z. ALBERT 2009-06-30

This book is an attempt to get to the bottom of an acute and perennial tension between our best scientific pictures of the fundamental physical structure of the world and our everyday empirical experience of it. The trouble is about the direction of time. The situation (very briefly) is that it is a consequence of almost every one of those fundamental scientific pictures--and that it is at the same time radically at odds with our common sense--that whatever can happen can just as naturally happen backwards. Albert provides an unprecedentedly clear, lively, and systematic new account--in the context of a Newtonian-Mechanical picture of the world--of the ultimate origins of the statistical regularities we see around us, of the temporal irreversibility of the Second Law of Thermodynamics, of the asymmetries in our epistemic access to the past and the future, and of our conviction that by acting now we can affect the future but not the past. Then, in the final section of the book, he generalizes the Newtonian picture to the quantum-mechanical case and (most interestingly) suggests a very deep potential connection between the problem of the direction of time and the quantum-mechanical measurement problem. The book aims to be both an original contribution

to the present scientific and philosophical understanding of these matters at the most advanced level, and something in the nature of an elementary textbook on the subject accessible to interested high-school students. Table of Contents: Preface 1. Time-Reversal Invariance 2. Thermodynamics 3. Statistical Mechanics 4. The Reversibility Objections and the Past-Hypothesis 5. The Scope of Thermodynamics 6. The Asymmetries of Knowledge and Intervention 7. Quantum Mechanics Appendix: Gedankenexperiments with Heat Engines Index Reviews of this book: The foundations of statistical mechanisms are often presented in physics textbooks in a rather obscure and confused way. By challenging common ways of thinking about this subject, Time and Chance can do quite a lot to improve this situation. --Jean Bricmont, Science Albert is perfecting a style of foundational analysis that is uniquely his own...It has a surgical precision...and it is ruthless with pretensions. The foundations of thermodynamics is a topic that has accumulated a good deal of dead wood; this is a fire that will burn and burn. --Simon W. Saunders, Oxford University As usual with Albert's work, the exposition is brisk and to the point, and exceptionally clear...The book will be an extremely valuable contribution to the literature on the subject of philosophical issues in thermodynamics and statistical mechanics, a literature which has been thin on the ground but is now growing as it deserves to. --Lawrence Sklar, University of Michigan

The Refrigerator and the Universe - Martin Goldstein 1995

This book explains the laws of thermodynamics for science buffs and neophytes alike. The authors present the historical development of thermodynamics and show how its laws follow from the atomic theory of matter, then give examples of the laws' applicability to such phenomena as the formation of diamonds from graphite and how blood carries oxygen.

Making Sense of Quantum Mechanics - Jean Bricmont 2016-01-12

This book explains, in simple terms, with a minimum of mathematics, why things can appear to be in two places at the same time, why correlations between simultaneous events occurring far apart cannot be explained by local mechanisms, and why, nevertheless, the quantum theory can be understood in terms of matter in motion. No need to worry, as some people do, whether a cat can be both dead and alive, whether the moon is there when nobody looks at it, or whether quantum systems need an observer to acquire definite properties. The author’s inimitable and even humorous style makes the book a pleasure to read while bringing a new clarity to many of the longstanding puzzles of quantum physics.

The Emergent Multiverse - David Wallace 2012-05-24

The Emergent Multiverse presents a striking new account of the 'many worlds' approach to quantum theory. The point of science, it is generally accepted, is to tell us how the world works and what it is like. But quantum theory seems to fail to do this: taken literally as a theory of the world, it seems to make crazy claims: particles are in two places at once; cats are alive and dead at the same time. So physicists and philosophers have often been led either to give up on the idea that quantum theory describes reality, or to modify or augment the theory. The Everett interpretation of quantum mechanics takes the apparent craziness seriously, and asks, 'what would it be like if particles really were in two places at once, if cats really were alive and dead at the same time'? The answer, it turns out, is that if the world were like that—if it were as quantum theory claims—it would be a world that, at the macroscopic level, was constantly branching into copies—hence the more sensationalist name for the Everett interpretation, the 'many worlds theory'. But really, the interpretation is not sensationalist at all: it simply takes quantum theory seriously, literally, as a description of the world. Once dismissed as absurd, it is now accepted by many physicists as the best way to make coherent sense of quantum theory. David Wallace offers a clear and up-to-date survey of work on the Everett interpretation in physics and in philosophy of science, and at the same time provides a self-contained and thoroughly modern account of it—an account which is accessible to readers who have previously studied quantum theory at undergraduate level, and which will shape the future direction of research by leading experts in the field.

The Quantum Mechanics of Minds and Worlds - Jeffrey A. Barrett 1999-12-09

Jeffrey Barrett presents the most comprehensive study yet of a problem that has puzzled physicists and philosophers since the 1930s. The standard theory of quantum mechanics is in one sense the most successful physical theory ever, predicting the behaviour of the basic constituents of all physical things; no other theory has ever made such accurate empirical predictions. However, if one tries to understand the theory as providing a complete and accurate framework for the description of the behaviour of all physical interactions, it becomes evident that the theory is ambiguous, or even logically inconsistent. The most notable attempt to formulate the theory so as to deal with this problem, the quantum measurement problem, was initiated by Hugh Everett III in the 1950s. Barrett gives a careful and challenging examination and evaluation of the work of Everett and those who have followed him. His informal approach, minimizing technicality, will make the book accessible and illuminating for philosophers and physicists alike. Anyone interested in the interpretation of quantum mechanics should read it.

The World in the Wave Function - Alyssa Ney 2021-03-16

If quantum theories of the world are true-and empirical evidence suggests they are-what do they tell us about us, and the world? How should quantum theories make us reevaluate our classical conceptions of material objects? Nearly a century after the development of quantum theories, a consensus has yet to emerge. Many still wonder about what these theories may be telling us about ourselves and our place in the universe. Alyssa Ney here defends and develops a particular framework for understanding the world as it is described by quantum theories. This framework was initially suggested by Schrödinger in the 1920's and was further defended as an account of reality by two philosophers of physics in the 1990's who described it as a necessary point of view for those who argue that quantum theories are correct representations of our world. This framework is called wave function realism, which interprets quantum theories such that its central object is the quantum wave function, interpreted as a field on an extremely high-dimension space. This theory views us, and all objects, as ultimately constituted out of the wave function, and though we seem to occupy three dimensions, the fundamental spatial framework of quantum worlds consists of many more dimensions. Alyssa Ney argues for and advances this view, with the goal of making a case for how this theory how it might be applied to more other relativistic quantum theories, including quantum field theories. Her conclusion develops an account of how we as human beings might ultimately see ourselves and the objects around us as constituted out of the wave function.

The Everett Interpretation of Quantum Mechanics - Jeffrey A. Barrett 2012-05-20

Hugh Everett III was an American physicist best known for his many-worlds interpretation of quantum mechanics, which formed the basis of his PhD thesis at Princeton University in 1957. Although counterintuitive, Everett's revolutionary formulation of quantum mechanics offers the most direct solution to the infamous quantum measurement problem--that is, how and why the singular world of our experience emerges from the multiplicities of alternatives available in the quantum world. The many-worlds interpretation postulates the existence of multiple universes. Whenever a measurement-like interaction occurs, the universe branches into relative states, one for each possible outcome of the measurement, and the world in which we find ourselves is but one of these many, but equally real, possibilities. Everett's challenge to the orthodox interpretation of quantum mechanics was met with scorn from Niels Bohr and other leading physicists, and Everett subsequently abandoned academia to conduct military operations research. Today, however, Everett's formulation of quantum mechanics is widely recognized as one of the most controversial but promising physical theories of the last century. In this book, Jeffrey Barrett and Peter Byrne present the long and short versions of Everett's thesis along with a collection of his explanatory writings and correspondence. These primary source documents, many of them newly discovered and most unpublished until now, reveal how Everett's thinking evolved from his days as a

graduate student to his untimely death in 1982. This definitive volume also features Barrett and Byrne's introductory essays, notes, and commentary that put Everett's extraordinary theory into historical and scientific perspective and discuss the puzzles that still remain.

Quantum Computation and Quantum Information - Michael A. Nielsen 2000-10-23

First-ever comprehensive introduction to the major new subject of quantum computing and quantum information.

Quantum Processes Systems, and Information - Benjamin Schumacher 2010-03-25

A new and exciting approach to the basics of quantum theory, this undergraduate textbook contains extensive discussions of conceptual puzzles and over 800 exercises and problems. Beginning with three elementary 'qubit' systems, the book develops the formalism of quantum theory, addresses questions of measurement and distinguishability, and explores the dynamics of quantum systems. In addition to the standard topics covered in other textbooks, it also covers communication and measurement, quantum entanglement, entropy and thermodynamics, and quantum information processing. This textbook gives a broad view of quantum theory by emphasizing dynamical evolution, and exploring conceptual and foundational issues. It focuses on contemporary topics, including measurement, time evolution, open systems, quantum entanglement, and the role of information.

The Conceptual Foundations of Quantum Mechanics - Jeffrey A. Barrett 2020-01-02

This book provides an introduction to the conceptual foundations of quantum mechanics, from classical mechanics and a discussion of the quantum phenomena that undermine our classical intuitions about how the physical world works, to the quantum measurement problem and alternatives to the standard von Neumann-Dirac formulation.