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The Algebraic Theory of Spinors and Clifford Algebras-Claude Chevalley 1996-12-13 In 1982, Claude Chevalley expressed three specific wishes with respect to the publication of his Works. First, he stated very clearly that such a publication should include his non technical papers. His reasons for that were two-fold. One reason was his life long commitment to epistemology and to politics, which made him strongly opposed to the view otherwise currently held that mathematics involves only half of a man. As he wrote to G. C. Rota on November 29th, 1982: "An important number of papers published by me are not of a mathematical nature. Some have epistemological features which might explain their presence in an edition of collected papers of a mathematician, but quite a number of them are concerned with theoretical politics ( . . . ) they reflect an aspect of myself the omission of which would, I think, give a wrong idea of my lines of thinking". On the other hand, Chevalley thought that the Collected Works of a mathematician ought to be read not only by other mathematicians, but also by historians of science.
The Algebraic Theory of Spinors-Claude Chevalley 1954
The Algebraic Theory of Spinors-Claude Chevalley 1954
The Algebraic Theory of Spinors-Claude C. Chevalley 1954 Describes the algebraic and geometric applications to the theory of spinors and includes the principle of triality in eight dimensional space.
An Introduction to Clifford Algebras and Spinors-Roldao Da Rocha, Jr. 2016-05-19 This text explores how Clifford algebras and spinors have been sparking a collaboration and bridging a gap between Physics and Mathematics. This collaboration has been the consequence of a growing awareness of the importance of algebraic and geometric properties in many physical phenomena, and of the discovery of common ground through various touch points: relating Clifford algebras and the arising geometry to so-called spinors, and to their three definitions (both from the mathematical and physical viewpoint). The main point of contact are the representations of Clifford algebras and the periodicity theorems. Clifford algebras also constitute a highly intuitive formalism, having an intimate relationship to quantum field theory. The text strives to seamlessly combine these various viewpoints and is devoted to a wider audience of both physicists and mathematicians. Among the existing approaches to Clifford algebras and spinors this book is unique in that it provides a didactical presentation of the topic and is accessible to both students and researchers. It emphasizes the formal character and the deep algebraic and geometric completeness, and merges them with the physical applications. The style is clear and precise, but not pedantic. The sole pre-requisites is a course in Linear Algebra which most students of Physics, Mathematics or Engineering will have covered as part of their undergraduate studies.
The Theory of Spinors-Élie Cartan 2012-04-30 Describes orthgonal and related Lie groups, using real or complex parameters and indefinite metrics. Develops theory of spinors by giving a purely geometric definition of these mathematical entities.
The Theory of Spinors-Élie Cartan 2012-04-30 Describes orthgonal and related Lie groups, using real or complex parameters and indefinite metrics. Develops theory of spinors by giving a purely geometric definition of these mathematical entities.
Theory of Spinors and Its Application in Physics and Mechanics-Vladimir A. Zhelnorovich 2019-10-24 This book contains a systematic exposition of the theory of spinors in finite-dimensional Euclidean and Riemannian spaces. The applications of spinors in field theory and relativistic mechanics of continuous media are considered. The main mathematical part is connected with the study of invariant algebraic and geometric relations between spinors and tensors. The theory of spinors and the methods of the tensor representation of spinors and spinor equations are thoroughly expounded in four-dimensional and three-dimensional spaces. Very useful and important relations are derived that express the derivatives of the spinor fields in terms of the derivatives of various tensor fields. The problems associated with an invariant description of spinors as objects that do not depend on the choice of a coordinate system are addressed in detail. As an application, the author considers an invariant tensor formulation of certain classes of differential spinor equations containing, in particular, the most important spinor equations of field theory and quantum mechanics. Exact solutions of the Einstein–Dirac equations, nonlinear Heisenberg’s spinor equations, and equations for relativistic spin fluids are given. The book presents a large body of factual material and is suited for use as a handbook. It is intended for specialists in theoretical physics, as well as for students and post-graduate students of physical and mathematical specialties.
Theory Of Spinors: An Introduction-Moshe Carmeli 2000-04-12 Spinors are used extensively in physics. It is widely accepted that they are more fundamental than tensors, and the easy way to see this is through the results obtained in general relativity theory by using spinors — results that could not have been obtained by using tensor methods only.The foundation of the concept of spinors is groups; spinors appear as representations of groups. This textbook expounds the relationship between spinors and representations of groups. As is well known, spinors and representations are both widely used in the theory of elementary particles.The authors present the origin of spinors from representation theory, but nevertheless apply the theory of spinors to general relativity theory, and part of the book is devoted to curved space-time applications.Based on lectures given at Ben Gurion University, this textbook is intended for advanced undergraduate and graduate students in physics and mathematics, as well as being a reference for researchers.
The Geometry of Minkowski Spacetime-Gregory L. Naber 2003-01-01 This mathematically rigorous treatment examines Zeeman's characterization of the causal automorphisms of Minkowski spacetime and the Penrose theorem concerning the apparent shape of a relativistically moving sphere. Other topics include the construction of a geometric theory of the electromagnetic field; an in-depth introduction to the theory of spinors; and a classification of electromagnetic fields in both tensor and spinor form. Appendixes introduce a topology for Minkowski spacetime and discuss Dirac's famous "Scissors Problem." Appropriate for graduate-level courses, this text presumes only a knowledge of linear algebra and elementary point-set topology. 1992 edition. 43 figures.
Clifford Algebras and Lie Theory-Eckhard Meinrenken 2013-02-28 This monograph provides an introduction to the theory of Clifford algebras, with an emphasis on its connections with the theory of Lie groups and Lie algebras. The book starts with a detailed presentation of the main results on symmetric bilinear forms and Clifford algebras. It develops the spin groups and the spin representation, culminating in Cartan’s famous triality automorphism for the group Spin(8). The discussion of enveloping algebras includes a presentation of Petracci’s proof of the Poincaré–Birkhoff–Witt theorem. This is followed by discussions of Weil algebras, Chern--Weil theory, the quantum Weil algebra, and the cubic Dirac operator. The applications to Lie theory include Duflo’s theorem for the case of quadratic Lie algebras, multiplets of representations, and Dirac induction. The last part of the book is an account of Kostant’s structure theory of the Clifford algebra over a semisimple Lie algebra. It describes his “Clifford algebra analogue” of the Hopf–Koszul–Samelson theorem, and explains his fascinating conjecture relating the Harish-Chandra projection for Clifford algebras to the principal sl(2) subalgebra. Aside from these beautiful applications, the book will serve as a convenient and up-to-date reference for background material from Clifford theory, relevant for students and researchers in mathematics and physics.
Clifford Algebras and Their Applications in Mathematical Physics-John Stephen roy Chisholm 1986-07-31 William Kingdon Clifford published the paper defining his "geometric algebras" in 1878, the year before his death. Clifford algebra is a generalisation to n-dimensional space of quaternions, which Hamilton used to represent scalars and vectors in real three-space: it is also a development of Grassmann's algebra, incorporating in the fundamental relations inner products defined in terms of the metric of the space. It is a strange fact that the Gibbs Heaviside vector techniques came to dominate in scientific and technical literature, while quaternions and Clifford algebras, the true associative algebras of inner-product spaces, were regarded for nearly a century simply as interesting mathematical curiosities. During this period, Pauli, Dirac and Majorana used the algebras which bear their names to describe properties of elementary particles, their spin in particular. It seems likely that none of these eminent mathematical physicists realised that they were using Clifford algebras. A few research workers such as Fueter realised the power of this algebraic scheme, but the subject only began to be appreciated more widely after the publication of Chevalley's book, 'The Algebraic Theory of Spinors' in 1954, and of Marcel Riesz' Maryland Lectures in 1959. Some of the contributors to this volume, Georges Deschamps, Erik Folke Bolinder, Albert Crumeyrolle and David Hestenes were working in this field around that time, and in their turn have persuaded others of the importance of the subject.
Introduction to 2-Spinors in General Relativity-Peter O'Donnell 2003-04-03 This book deals with 2-spinors in general relativity, beginning by developing spinors in a geometrical way rather than using representation theory, which can be a little abstract. This gives the reader greater physical intuition into the way in which spinors behave. The book concentrates on the algebra and calculus of spinors connected with curved space-time. Many of the well-known tensor fields in general relativity are shown to have spinor counterparts. An analysis of the Lanczos spinor concludes the book, and some of the techniques so far encountered are applied to this. Exercises play an important role throughout and are given at the end of each chapter. Contents:Spinor GeometrySpinor AlgebraSpinor AnalysisLanczos Spinor Readership: Postgraduate level students and researchers. Keywords:Spinors;General Relativity;Gravitation;Space-TimeReviews:“... this book is good reading also for students not being acquainted with general relativity theory ... this is a well-written monograph.”Zentralblatt für Mathematik “This book is useful for those who are working or want to work with the two-spinor formalism and/or are interested in the Lanczos theory.”General Relativity and Gravitation
Clifford Algebra and Spinor-Valued Functions-R. Delanghe 2012-12-06 This volume describes the substantial developments in Clifford analysis which have taken place during the last decade and, in particular, the role of the spin group in the study of null solutions of real and complexified Dirac and Laplace operators. The book has six main chapters. The first two (Chapters 0 and I) present classical results on real and complex Clifford algebras and show how lower-dimensional real Clifford algebras are well-suited for describing basic geometric notions in Euclidean space. Chapters II and III illustrate how Clifford analysis extends and refines the computational tools available in complex analysis in the plane or harmonic analysis in space. In Chapter IV the concept of monogenic differential forms is generalized to the case of spin-manifolds. Chapter V deals with analysis on homogeneous spaces, and shows how Clifford analysis may be connected with the Penrose transform. The volume concludes with some Appendices which present basic results relating to the algebraic and analytic structures discussed. These are made accessible for computational purposes by means of computer algebra programmes written in REDUCE and are contained on an accompanying floppy disk.
Clifford Algebras and Spinors-Pertti Lounesto 2001-05-03 This is the second edition of a popular work offering a unique introduction to Clifford algebras and spinors. The beginning chapters could be read by undergraduates; vectors, complex numbers and quaternions are introduced with an eye on Clifford algebras. The next chapters will also interest physicists, and include treatments of the quantum mechanics of the electron, electromagnetism and special relativity with a flavour of Clifford algebras. This edition has three new chapters, including material on conformal invariance and a history of Clifford algebras.
Representation Theory of Finite Groups-Martin Burrow 2014-05-10 Representation Theory of Finite Groups is a five chapter text that covers the standard material of representation theory. This book starts with an overview of the basic concepts of the subject, including group characters, representation modules, and the rectangular representation. The succeeding chapters describe the features of representation theory of rings with identity and finite groups. These topics are followed by a discussion of some of the application of the theory of characters, along with some classical theorems. The last chapter deals with the construction of irreducible representations of groups. This book will be of great value to graduate students who wish to acquire some knowledge of representation theory.
An Introduction to Twistor Theory-S. A. Huggett 1994 Evolving from graduate lectures given in London and Oxford, this introduction to twistor theory and modern geometrical approaches to space-time structure will provide graduate students with the basics of twistor theory, presupposing some knowledge of special relativity and differenttial geometry.
Geometric Algebra for Physicists-Chris Doran 2007-11-22 Geometric algebra is a powerful mathematical language with applications across a range of subjects in physics and engineering. This book is a complete guide to the current state of the subject with early chapters providing a self-contained introduction to geometric algebra. Topics covered include new techniques for handling rotations in arbitrary dimensions, and the links between rotations, bivectors and the structure of the Lie groups. Following chapters extend the concept of a complex analytic function theory to arbitrary dimensions, with applications in quantum theory and electromagnetism. Later chapters cover advanced topics such as non-Euclidean geometry, quantum entanglement, and gauge theories. Applications such as black holes and cosmic strings are also explored. It can be used as a graduate text for courses on the physical applications of geometric algebra and is also suitable for researchers working in the fields of relativity and quantum theory.
Rotations, Quaternions, and Double Groups-Simon L. Altmann 2013-04-09 This self-contained text presents a consistent description of the geometric and quaternionic treatment of rotation operators, employing methods that lead to a rigorous formulation and offering complete solutions to many illustrative problems. Geared toward upper-level undergraduates and graduate students, the book begins with chapters covering the fundamentals of symmetries, matrices, and groups, and it presents a primer on rotations and rotation matrices. Subsequent chapters explore rotations and angular momentum, tensor bases, the bilinear transformation, projective representations, and the geometry, topology, and algebra of rotations. Some familiarity with the basics of group theory is assumed, but the text assists students in developing the requisite mathematical tools as necessary.
Clifford Algebras and Spinors-Pertti Lounesto 2001-05-03 This is the second edition of a popular work offering a unique introduction to Clifford algebras and spinors. The beginning chapters could be read by undergraduates; vectors, complex numbers and quaternions are introduced with an eye on Clifford algebras. The next chapters will also interest physicists, and include treatments of the quantum mechanics of the electron, electromagnetism and special relativity with a flavour of Clifford algebras. This edition has three new chapters, including material on conformal invariance and a history of Clifford algebras.
Rings, Fields, and Vector Spaces-B.A. Sethuraman 2013-04-09 Using the proof of the non-trisectability of an arbitrary angle as a final goal, the author develops in an easy conversational style the basics of rings, fields, and vector spaces. Originally developed as a text for an introduction to algebra course for future high-school teachers at California State University, Northridge, the focus of this book is on exposition. It would serve extremely well as a focused, one-semester introduction to abstract algebra.
Twistor Geometry and Field Theory-R. S. Ward 1991-07-26 Deals with the twistor treatment of certain linear and non-linear partial differential equations. The description in terms of twistors involves algebraic and differential geometry, and several complex variables.
Dirac Operators in Representation Theory-Jing-Song Huang 2007-05-27 This book presents a comprehensive treatment of important new ideas on Dirac operators and Dirac cohomology. Using Dirac operators as a unifying theme, the authors demonstrate how some of the most important results in representation theory fit together when viewed from this perspective. The book is an excellent contribution to the mathematical literature of representation theory, and this self-contained exposition offers a systematic examination and panoramic view of the subject. The material will be of interest to researchers and graduate students in representation theory, differential geometry, and physics.
The Geometry of Minkowski Spacetime-Gregory L. Naber 2003-01-01 This mathematically rigorous treatment examines Zeeman's characterization of the causal automorphisms of Minkowski spacetime and the Penrose theorem concerning the apparent shape of a relativistically moving sphere. Other topics include the construction of a geometric theory of the electromagnetic field; an in-depth introduction to the theory of spinors; and a classification of electromagnetic fields in both tensor and spinor form. Appendixes introduce a topology for Minkowski spacetime and discuss Dirac's famous "Scissors Problem." Appropriate for graduate-level courses, this text presumes only a knowledge of linear algebra and elementary point-set topology. 1992 edition. 43 figures.
Geometric Algebra Applications Vol. II-Eduardo Bayro-Corrochano 2020-06-19 This book presents a unified mathematical treatment of diverse problems in the general domain of robotics and associated fields using Clifford or geometric alge- bra. By addressing a wide spectrum of problems in a common language, it offers both fresh insights and new solutions that are useful to scientists and engineers working in areas related with robotics. It introduces non-specialists to Clifford and geometric algebra, and provides ex- amples to help readers learn how to compute using geometric entities and geomet- ric formulations. It also includes an in-depth study of applications of Lie group

theory, Lie algebra, spinors and versors and the algebra of incidence using the universal geometric algebra generated by reciprocal null cones. Featuring a detailed study of kinematics, differential kinematics and dynamics using geometric algebra, the book also develops Euler Lagrange and Hamiltoni- ans equations for dynamics using conformal geometric algebra, and the recursive Newton-Euler using screw theory in the motor algebra framework. Further, it comprehensively explores robot modeling and nonlinear controllers, and discusses several applications in computer vision, graphics, neurocomputing, quantum com- puting, robotics and control engineering using the geometric algebra framework. The book also includes over 200 exercises and tips for the development of future computer software packages for extensive calculations in geometric algebra, and a entire section focusing on how to write the subroutines in C++, Matlab and Maple to carry out efficient geometric computations in the geometric algebra framework. Lastly, it shows how program code can be optimized for real-time computations. An essential resource for applied physicists, computer scientists, AI researchers, roboticists and mechanical and electrical engineers, the book clarifies and demon- strates the importance of geometric computing for building autonomous systems to advance cognitive systems research.

Spinors and Calibrations-F. Reese Harvey 1990-04-25 Progress in mathematics is based on a thorough understanding of the mathematical objects under consideration, and yet many textbooks and monographs proceed to discuss general statements and assume that the reader can and will provide the mathematical infrastructure of examples and counterexamples. This book makes a deliberate effort to correct this situation: it is a collection of examples. The following table of contents describes its breadth and reveals the underlying motivation--differential geometry--in its many facets: Riemannian, symplectic, K*adahler, hyperK*adahler, as well as complex and quaternionic.

Advanced General Relativity-John Stewart 1993-11-26 A self-contained introduction to advanced general relativity.

The Spinorial Chessboard-Paolo Budinich 2012-12-06 Spinor theory is an important tool in mathematical physics in particular in the context of conformal field theory and string theory. These lecture notes present a new way to introduce spinors by exploiting their intimate relationship to Clifford algebras. The presentation is detailed and mathematically rigorous. Not only students but also researchers will welcome this book for the clarity of its style and for the straightforward way it applies mathematical concepts to physical theory.

Finite Group Theory-M. Aschbacher 2000-06-26 The book provides the basic foundations for the local theory of finite groups, the theory of classical linear groups, and the theory of buildings and BN-pairs.

Understanding Geometric Algebra for Electromagnetic Theory-John W. Arthur 2011-09-13 This book aims to disseminate geometric algebra as a straightforward mathematical tool set for working with and understanding classical electromagnetic theory. It's target readership is anyone who has some knowledge of electromagnetic theory, predominantly ordinary scientists and engineers who use it in the course of their work, or postgraduate students and senior undergraduates who are seeking to broaden their knowledge and increase their understanding of the subject. It is assumed that the reader is not a mathematical specialist and is neither familiar with geometric algebra or its application to electromagnetic theory. The modern approach, geometric algebra, is the mathematical tool set we should all have started out with and once the reader has a grasp of the subject, he or she cannot fail to realize that traditional vector analysis is really awkward and even misleading by comparison. Professors can request a solutions manual by email: pressbooks@ieee.org

Symmetry and the Standard Model-Matthew Robinson 2011-08-17 While theoretical particle physics is an extraordinarily fascinating field, the incredibly fast pace at which it moves along, combined with the huge amount of background information necessary to perform cutting edge research, poses a formidable challenge for graduate students. This book represents the first in a series designed to assist students in the process of transitioning from coursework to research in particle physics. Rather than reading literally dozens of physics and mathematics texts, trying to assimilate the countless ideas, translate notations and perspectives, and see how it all fits together to get a holistic understanding, this series provides a detailed overview of the major mathematical and physical ideas in theoretical particle physics. Ultimately the ideas will be presented in a unified, consistent, holistic picture, where each topic is built firmly on what has come before, and all topics are related in a clear and intuitive way. This introductory text on quantum field theory and particle physics provides both a self-contained and complete introduction to not only the necessary physical ideas, but also a complete introduction to the necessary mathematical tools. Assuming minimal knowledge of undergraduate physics and mathematics, this book lays both the mathematical and physical groundwork with clear, intuitive explanations and plenty of examples. The book then continues with an exposition of the Standard Model of Particle Physics, the theory that currently seems to explain the universe apart from gravity. Furthermore, this book was written as a primer for the more advanced mathematical and physical ideas to come later in this series.

Spinors, Clifford and Cayley Algebras-Robert Hermann 1974

Fundamental Concepts of Algebra- 1957-01-01 Fundamental Concepts of Algebra

Mathematics For Physics: An Illustrated Handbook-Adam Marsh 2017-11-27 This unique book complements traditional textbooks by providing a visual yet rigorous survey of the mathematics used in theoretical physics beyond that typically covered in undergraduate math and physics courses. The exposition is pedagogical but compact, and the emphasis is on defining and visualizing concepts and relationships between them, as well as listing common confusions, alternative notations and jargon, and relevant facts and theorems. Special attention is given to detailed figures and geometric viewpoints. Certain topics which are well covered in textbooks, such as historical motivations, proofs and derivations, and tools for practical calculations, are avoided. The primary physical models targeted are general relativity, spinors, and gauge theories, with notable chapters on Riemannian geometry, Clifford algebras, and fiber bundles.

Groups and Characters-Larry C. Grove 2011-09-26 An authoritative, full-year course on both group theory and ordinary character theory--essential tools for mathematics and the physical sciences One of the few treatments available combining both group theory and character theory, Groups and Characters is an effective general textbook on these two fundamentally connected subjects. Presuming only a basic knowledge of abstract algebra as in a first-year graduate course, the text opens with a review of background material and then guides readers carefully through several of the most important aspects of groups and characters, concentrating mainly on finite groups. Challenging yet accessible, Groups and Characters features: * An extensive collection of examples surveying many different types of groups, including Sylow subgroups of symmetric groups, affine groups of fields, the Mathieu groups, and symplectic groups * A thorough, easy-to-follow discussion of Polya-Redfield enumeration, with applications to combinatorics * Inclusive explorations of the transfer function and normal complements, induction and restriction of characters, Clifford theory, characters of symmetric and alternating groups, Frobenius groups, and the Schur index * Illuminating accounts of several computational aspects of group theory, such as the Schreier-Sims algorithm, Todd-Coxeter coset enumeration, and algorithms for generating character tables As valuable as Groups and Characters will prove as a textbook for mathematicians, it has broader applications. With chapters suitable for use as independent review units, along with a full bibliography and index, it will be a dependable general reference for chemists, physicists, and crystallographers.

Time-Reversal Symmetry-Ion I. Geru 2018-12-31 This book introduces new developments in the field of Time-Reversal Symmetry presenting, for the first time, the Wigner time-reversal operator in the form of a product of two- or three time-reversal operators of lower symmetry. The action of these operators leads to the sign change of only one or two angular momentum components, not of all of them. It demonstrates that there are six modes of time-reversal symmetry breaking that do not lead to the complete disappearance of the symmetry but to its lowering. The full restoration of the time-reversal symmetry in the six cases mentioned is possible by introducing six types of metaparticles. The book also confirms the presence of six additional time-reversal operators using a group-theoretical method. The problem is only where to seek these metaparticles. The book discusses time-reversal symmetry in classical mechanics, classical and relativistic electrodynamics, quantum mechanics and theory of quantized fields, including dynamical reversibility and statistical irreversibility of the time, Wigner's and Herring's criteria, Kramers theorem, selection rules due to time-reversal symmetry, Onsager's relations, Poincaré recurrence theorem, and CPT theorem. It particularly focuses attention on time-reversal symmetry violation. It is proposed a new method of testing the time-reversal symmetry, which is confirmed experimentally by EPR spectroscopy data. It shows that the traditional black-white point groups of magnetic symmetry are not applicable to magnetic systems with Kramers degeneration of energy levels and that magnetic groups of four-color symmetry are adequate for them. Further, it addresses the predicted structural distortions in Kramers three-homonuclear magnetic clusters due to time-reversal symmetry that have been identified experimentally. Lastly, it proposes a method of synthesis of two-nuclear coordination compounds with predictable magnetic properties, based on the application of the time-reversal transformation that was confirmed experimentally.

New Foundations in Mathematics-Garret Sobczyk 2012-10-26 The first book of its kind, New Foundations in Mathematics: The Geometric Concept of Number uses geometric algebra to present an innovative approach to elementary and advanced mathematics. Geometric algebra offers a simple and robust means of expressing a wide range of ideas in mathematics, physics, and engineering. In particular, geometric algebra extends the real number system to include the concept of direction, which underpins much of modern mathematics and physics. Much of the material presented has been developed from undergraduate courses taught by the author over the years in linear algebra, theory of numbers, advanced calculus and vector calculus, numerical analysis, modern abstract algebra, and differential geometry. The principal aim of this book is to present these ideas in a freshly coherent and accessible manner. New Foundations in Mathematics will be of interest to undergraduate and graduate students of mathematics and physics who are looking for a unified treatment of many important geometric ideas arising in these subjects at all levels. The material can also serve as a supplemental textbook in some or all of the areas mentioned above and as a reference book for professionals who apply mathematics to engineering and computational areas of mathematics and physics.

Algebraic and Dirac-Hestenes Spinors and Spinor Fields-W. A. Rodrigues 2002

From Spinors To Quantum Mechanics-Gerrit Coddens 2015-06-29 From Spinors to Quantum Mechanics discusses group theory and its use in quantum mechanics. Chapters 1 to 4 offer an introduction to group theory, and it provides the reader with an exact and clear intuition of what a spinor is, showing that spinors are just a mathematically complete notation for group elements. Chapter 5 contains the first rigorous derivation of the Dirac equation from a simple set of assumptions. The remaining chapters will interest the advanced reader who is interested in the meaning of quantum mechanics. They propose a novel approach to the foundations of quantum mechanics, based on the idea that the meaning of the formalism is already provided by the mathematics.In the traditional approach to quantum mechanics as initiated by Heisenberg, one has to start from a number of experimental results and then derive a set of rules and calculations that reproduce the observed experimental results. In such an inductive approach the underlying assumptions are not given at the outset. The reader has to figure them out, and this has proven to be difficult. The book shows that a different, bottom-up approach to quantum mechanics is possible, which merits further investigation as it demonstrates that with the methods used, the reader can obtain the correct results in a context where one would hitherto not expect this to be possible.

Parity-time Symmetry and Its Applications-Demetrios Christodoulides 2018-11-28 This book offers a comprehensive review of the state-of-the-art theoretical and experimental advances in linear and nonlinear parity-time-symmetric systems in various physical disciplines, and surveys the emerging applications of parity-time (PT) symmetry. PT symmetry originates from quantum mechanics, where if the Schrodinger operator satisfies the PT symmetry, then its spectrum can be all real. This concept was later introduced into optics, Bose-Einstein condensates, metamaterials, electric circuits, acoustics, mechanical systems and many other fields, where a judicious balancing of gain and loss constitutes a PT-symmetric system. Even though these systems are dissipative, they exhibit many signature properties of conservative systems, which make them mathematically and physically intriguing. Important PT-symmetry applications have also emerged. This book describes the latest advances of PT symmetry in a wide range of physical areas, with contributions from the leading experts. It is intended for researchers and graduate students to enter this research frontier, or use it as a reference book.