

Geometry Of Quantum Theory

Recognizing the mannerism ways to acquire this ebook **Geometry Of Quantum Theory** is additionally useful. You have remained in right site to begin getting this info. acquire the Geometry Of Quantum Theory belong to that we give here and check out the link.

You could buy lead Geometry Of Quantum Theory or get it as soon as feasible. You could quickly download this Geometry Of Quantum Theory after getting deal. So, in the same way as you require the book swiftly, you can straight get it. Its so utterly easy and suitably fats, isnt it? You have to favor to in this ventilate

Geometry of Quantum Theory - Veeravalli
Seshadri Varadarajan 2013-04-15

The present work is the first volume of a substantially enlarged version of the mimeographed notes of a course of lectures first given by me in the Indian Statistical Institute, Calcutta, India, during 1964-65. When it was suggested that these lectures be developed into

a book, I readily agreed and took the opportunity to extend the scope of the material covered. No background in physics is in principle necessary for understanding the essential ideas in this work. However, a high degree of mathematical maturity is certainly indispensable. It is safe to say that I aim at an audience composed of professional mathematicians, advanced graduate

students, and, hopefully, the rapidly increasing group of mathematical physicists who are attracted to fundamental mathematical questions. Over the years, the mathematics of quantum theory has become more abstract and, consequently, simpler. Hilbert spaces have been used from the very beginning and, after Weyl and Wigner, group representations have come in conclusively. Recent discoveries seem to indicate that the role of group representations is destined for further expansion, not to speak of the impact of the theory of several complex variables and function-space analysis. But all of this pertains to the world of interacting subatomic particles; the more modest view of the microscopic world presented in this book requires somewhat less. The reader with a knowledge of abstract integration, Hilbert space theory, and topological groups will find the going easy.

Quantum Mechanics in the Geometry of Space-Time - Roger Boudet 2011-06-13

This book continues the fundamental work of Arnold Sommerfeld and David Hestenes formulating theoretical physics in terms of Minkowski space-time geometry. We see how the standard matrix version of the Dirac equation can be reformulated in terms of a real space-time algebra, thus revealing a geometric meaning for the “number i ” in quantum mechanics. Next, it is examined in some detail how electroweak theory can be integrated into the Dirac theory and this way interpreted in terms of space-time geometry. Finally, some implications for quantum electrodynamics are considered. The presentation of real quantum electromagnetism is expressed in an addendum. The book covers both the use of the complex and the real languages and allows the reader acquainted with the first language to make a step by step translation to the second one.

Geometry, Topology and Quantum Field

Theory - P. Bandyopadhyay 2013-03-09

This is a monograph on geometrical and

topological features which arise in quantum field theory. It is well known that when a chiral fermion interacts with a gauge field we have chiral anomaly which corresponds to the fact that divergence of the axial vector current does not vanish. It is observed that this is related to certain topological features associated with the fermion and leads to the realization of the topological origin of fermion number as well as the Berry phase. The role of gauge fields in the quantization procedure has its implications in these topological features of a fermion and helps us to consider a massive fermion as a soliton (skyrmion). In this formalism chiral anomaly is found to be responsible for mass generation. This has its relevance in electroweak theory where it is observed that weak interaction gauge bosons attain mass topologically. The geometrical feature of a skyrmion also helps us to realize the internal symmetry of hadrons from reflection group. Finally it has been shown that noncommutative geometry where the space time

manifold is taken to be $X = M \times \mathbb{Z}_2$ has its relevance in the description of a massive 4 fermion as a skyrmion when the discrete space is considered as the internal space and the symmetry breaking leads to chiral anomaly. In chap. 1 preliminary mathematical formulations related to the spinor structure have been discussed. In chap.

Quantum Mechanics for Mathematicians - Leon Armenovich Takhtadzhian 2008

This book provides a comprehensive treatment of quantum mechanics from a mathematics perspective and is accessible to mathematicians starting with second-year graduate students. In addition to traditional topics, like classical mechanics, mathematical foundations of quantum mechanics, quantization, and the Schrodinger equation, this book gives a mathematical treatment of systems of identical particles with spin, and it introduces the reader to functional methods in quantum mechanics. This includes the Feynman path integral

approach to quantum mechanics, integration in functional spaces, the relation between Feynman and Wiener integrals, Gaussian integration and regularized determinants of differential operators, fermion systems and integration over anticommuting (Grassmann) variables, supersymmetry and localization in loop spaces, and supersymmetric derivation of the Atiyah-Singer formula for the index of the Dirac operator. Prior to this book, mathematicians could find these topics only in physics textbooks and in specialized literature. This book is written in a concise style with careful attention to precise mathematics formulation of methods and results. Numerous problems, from routine to advanced, help the reader to master the subject. In addition to providing a fundamental knowledge of quantum mechanics, this book could also serve as a bridge for studying more advanced topics in quantum physics, among them quantum field theory. Prerequisites include standard first-year graduate courses covering

linear and abstract algebra, topology and geometry, and real and complex analysis. *Schrödinger Operators* - Hans L. Cycon 1987 Are you looking for a concise summary of the theory of Schrödinger operators? Here it is. Emphasizing the progress made in the last decade by Lieb, Enss, Witten and others, the three authors don't just cover general properties, but also detail multiparticle quantum mechanics - including bound states of Coulomb systems and scattering theory. This corrected and extended reprint contains updated references as well as notes on the development in the field over the past twenty years.

Geometric Phases in Classical and Quantum Mechanics - Dariusz Chruscinski 2012-12-06

Several well-established geometric and topological methods are used in this work in an application to a beautiful physical phenomenon known as the geometric phase. This book examines the geometric phase, bringing together different physical phenomena under a

unified mathematical scheme. The material is presented so that graduate students and researchers in applied mathematics and physics with an understanding of classical and quantum mechanics can handle the text.

Foundations of Quantum Theory - Klaas Landsman 2017-05-11

This book studies the foundations of quantum theory through its relationship to classical physics. This idea goes back to the Copenhagen Interpretation (in the original version due to Bohr and Heisenberg), which the author relates to the mathematical formalism of operator algebras originally created by von Neumann. The book therefore includes comprehensive appendices on functional analysis and C^* -algebras, as well as a briefer one on logic, category theory, and topos theory. Matters of foundational as well as mathematical interest that are covered in detail include symmetry (and its "spontaneous" breaking), the measurement problem, the Kochen-Specker, Free Will, and

Bell Theorems, the Kadison-Singer conjecture, quantization, indistinguishable particles, the quantum theory of large systems, and quantum logic, the latter in connection with the topos approach to quantum theory. This book is Open Access under a CC BY licence.

Geometry of Quantum States - Ingemar Bengtsson 2017-08-18

This new edition describes the space of quantum states and the theory of quantum entanglement from a geometric perspective.

Quantum Riemannian Geometry - Edwin J. Beggs 2020-01-31

This book provides a comprehensive account of a modern generalisation of differential geometry in which coordinates need not commute. This requires a reinvention of differential geometry that refers only to the coordinate algebra, now possibly noncommutative, rather than to actual points. Such a theory is needed for the geometry of Hopf algebras or quantum groups, which provide key examples, as well as in physics to

model quantum gravity effects in the form of quantum spacetime. The mathematical formalism can be applied to any algebra and includes graph geometry and a Lie theory of finite groups. Even the algebra of 2×2 matrices turns out to admit a rich moduli of quantum Riemannian geometries. The approach taken is a 'bottom up' one in which the different layers of geometry are built up in succession, starting from differential forms and proceeding up to the notion of a quantum 'Levi-Civita' bimodule connection, geometric Laplacians and, in some cases, Dirac operators. The book also covers elements of Connes' approach to the subject coming from cyclic cohomology and spectral triples. Other topics include various other cohomology theories, holomorphic structures and noncommutative D-modules. A unique feature of the book is its constructive approach and its wealth of examples drawn from a large body of literature in mathematical physics, now put on a firm algebraic footing. Including

exercises with solutions, it can be used as a textbook for advanced courses as well as a reference for researchers.

Geometry of Time-spaces - Olav Arnfinn Laudal
2011

This is a monograph about non-commutative algebraic geometry, and its application to physics. The main mathematical inputs are the non-commutative deformation theory, moduli theory of representations of associative algebras, a new non-commutative theory of phase spaces, and its canonical Dirac derivation. The book starts with a new definition of time, relative to which the set of mathematical velocities form a compact set, implying special and general relativity. With this model in mind, a general Quantum Theory is developed and shown to fit with the classical theory. In particular the 'toy'-model used as example, contains, as part of the structure, the classical gauge groups $u(1)$, $su(2)$ and $su(3)$, and therefore also the theory of spin and quarks, etc.

Quantum Mechanics, Quantum Field Theory

- R. Mirman 2004-12

The author does not want a book description on the back cover.

Geometry of Quantum Theory - V. S.

Varadarajan 1968

The present work is the first volume of a substantially enlarged version of the mimeographed notes of a course of lectures first given by me in the Indian Statistical Institute, Calcutta, India, during 1964-65. When it was suggested that these lectures be developed into a book, I readily agreed and took the opportunity to extend the scope of the material covered. No background in physics is in principle necessary for understanding the essential ideas in this work. However, a high degree of mathematical maturity is certainly indispensable. It is safe to say that I aim at an audience composed of professional mathematicians, advanced graduate students, and, hopefully, the rapidly increasing group of mathematical physicists who are

attracted to fundamental mathematical questions. Over the years, the mathematics of quantum theory has become more abstract and, consequently, simpler. Hilbert spaces have been used from the very beginning and, after Weyl and Wigner, group representations have come in conclusively. Recent discoveries seem to indicate that the role of group representations is destined for further expansion, not to speak of the impact of the theory of several complex variables and function-space analysis. But all of this pertains to the world of interacting subatomic particles; the more modest view of the microscopic world presented in this book requires somewhat less. The reader with a knowledge of abstract integration, Hilbert space theory, and topological groups will find the going easy.

Geometry of Quantum States - Ingemar

Bengtsson 2017-08-18

Quantum information theory is a branch of science at the frontier of physics, mathematics,

and information science, and offers a variety of solutions that are impossible using classical theory. This book provides a detailed introduction to the key concepts used in processing quantum information and reveals that quantum mechanics is a generalisation of classical probability theory. The second edition contains new sections and entirely new chapters: the hot topic of multipartite entanglement; in-depth discussion of the discrete structures in finite dimensional Hilbert space, including unitary operator bases, mutually unbiased bases, symmetric informationally complete generalized measurements, discrete Wigner function, and unitary designs; the Gleason and Kochen-Specker theorems; the proof of the Lieb conjecture; the measure concentration phenomenon; and the Hastings' non-additivity theorem. This richly-illustrated book will be useful to a broad audience of graduates and researchers interested in quantum information

theory. Exercises follow each chapter, with hints and answers supplied.

Quantum Theory and geometry - Mário Schenberg 1959

Non-relativistic Quantum Theory - Kai Shue Lam 2009

This textbook is mainly for physics students at the advanced undergraduate and beginning graduate levels, especially those with a theoretical inclination. Its chief purpose is to give a systematic introduction to the main ingredients of the fundamentals of quantum theory, with special emphasis on those aspects of group theory (spacetime and permutational symmetries and group representations) and differential geometry (geometrical phases, topological quantum numbers, and Chern-Simons Theory) that are relevant in modern developments of the subject. It will provide students with an overview of key elements of the theory, as well as a solid

preparation in calculational techniques.

Quantum Theory, Deformation and Integrability -

R. Carroll 2000-11-09

About four years ago a prominent string theorist was quoted as saying that it might be possible to understand quantum mechanics by the year 2000. Sometimes new mathematical developments make such understanding appear possible and even close, but on the other hand, increasing lack of experimental verification make it seem to be further distant. In any event one seems to arrive at new revolutions in physics and mathematics every year. This book hopes to convey some of the excitement of this period, but will adopt a relatively pedestrian approach designed to illuminate the relations between quantum and classical. There will be some discussion of philosophical matters such as measurement, uncertainty, decoherence, etc. but philosophy will not be emphasized; generally we want to enjoy the fruits of computation based on the operator formulation of QM and quantum

field theory. In Chapter 1 connections of QM to deterministic behavior are exhibited in the trajectory representations of Faraggi-Matone. Chapter 1 also includes a review of KP theory and some preliminary remarks on coherent states, density matrices, etc. and more on deterministic theory. We develop in Chapter 4 relations between quantization and integrability based on Moyal brackets, discretizations, KP, strings and Hirota formulas, and in Chapter 2 we study the QM of embedded curves and surfaces illustrating some QM effects of geometry. Chapter 3 is on quantum integrable systems, quantum groups, and modern deformation quantization. Chapter 5 involves the Whitham equations in various roles mediating between QM and classical behavior. In particular, connections to Seiberg-Witten theory (arising in $N = 2$ supersymmetric (susy) Yang-Mills (YM) theory) are discussed and we would still like to understand more deeply what is going on. Thus in Chapter 5 we will try to give some conceptual

background for susy, gauge theories, renormalization, etc. from both a physical and mathematical point of view. In Chapter 6 we continue the deformation quantization then by exhibiting material based on and related to noncommutative geometry and gauge theory.

Geometry, Topology and Physics - Mikio

Nakahara 2018-10-03

Differential geometry and topology have become essential tools for many theoretical physicists. In particular, they are indispensable in theoretical studies of condensed matter physics, gravity, and particle physics. Geometry, Topology and Physics, Second Edition introduces the ideas and techniques of differential geometry and topology at a level suitable for postgraduate students and researchers in these fields. The second edition of this popular and established text incorporates a number of changes designed to meet the needs of the reader and reflect the development of the subject. The book features a considerably expanded first chapter, reviewing aspects of

path integral quantization and gauge theories. Chapter 2 introduces the mathematical concepts of maps, vector spaces, and topology. The following chapters focus on more elaborate concepts in geometry and topology and discuss the application of these concepts to liquid crystals, superfluid helium, general relativity, and bosonic string theory. Later chapters unify geometry and topology, exploring fiber bundles, characteristic classes, and index theorems. New to this second edition is the proof of the index theorem in terms of supersymmetric quantum mechanics. The final two chapters are devoted to the most fascinating applications of geometry and topology in contemporary physics, namely the study of anomalies in gauge field theories and the analysis of Polakov's bosonic string theory from the geometrical point of view. Geometry, Topology and Physics, Second Edition is an ideal introduction to differential geometry and topology for postgraduate students and researchers in theoretical and mathematical

physics.

Noncommutative Geometry, Quantum Fields and Motives - Alain Connes 2019-03-13

The unifying theme of this book is the interplay among noncommutative geometry, physics, and number theory. The two main objects of investigation are spaces where both the noncommutative and the motivic aspects come to play a role: space-time, where the guiding principle is the problem of developing a quantum theory of gravity, and the space of primes, where one can regard the Riemann Hypothesis as a long-standing problem motivating the development of new geometric tools. The book stresses the relevance of noncommutative geometry in dealing with these two spaces. The first part of the book deals with quantum field theory and the geometric structure of renormalization as a Riemann-Hilbert correspondence. It also presents a model of elementary particle physics based on noncommutative geometry. The main result is a

complete derivation of the full Standard Model Lagrangian from a very simple mathematical input. Other topics covered in the first part of the book are a noncommutative geometry model of dimensional regularization and its role in anomaly computations, and a brief introduction to motives and their conjectural relation to quantum field theory. The second part of the book gives an interpretation of the Weil explicit formula as a trace formula and a spectral realization of the zeros of the Riemann zeta function. This is based on the noncommutative geometry of the adèle class space, which is also described as the space of commensurability classes of \mathbb{Q} -lattices, and is dual to a noncommutative motive (endomotive) whose cyclic homology provides a general setting for spectral realizations of zeros of L-functions. The quantum statistical mechanics of the space of \mathbb{Q} -lattices, in one and two dimensions, exhibits spontaneous symmetry breaking. In the low-temperature regime, the equilibrium states of

the corresponding systems are related to points of classical moduli spaces and the symmetries to the class field theory of the field of rational numbers and of imaginary quadratic fields, as well as to the automorphisms of the field of modular functions. The book ends with a set of analogies between the noncommutative geometries underlying the mathematical formulation of the Standard Model minimally coupled to gravity and the moduli spaces of Q-lattices used in the study of the zeta function.

Mathematical Foundations of Quantum Theory - A. R. Marlow 1978

Mathematical Foundations of Quantum Theory is a collection of papers presented at the 1977 conference on the Mathematical Foundations of Quantum Theory, held in New Orleans. The contributors present their topics from a wide variety of backgrounds and specialization, but all shared a common interest in answering quantum issues. Organized into 20 chapters, this book's opening chapters establish a sound

mathematical basis for quantum theory and a mode of observation in the double slit experiment. This book then describes the Lorentz particle system and other mathematical structures with which fun ...

Geometric and Topological Methods for Quantum Field Theory - Hernan Ocampo
2010-04-29

Aimed at graduate students in physics and mathematics, this book provides an introduction to recent developments in several active topics at the interface between algebra, geometry, topology and quantum field theory. The first part of the book begins with an account of important results in geometric topology. It investigates the differential equation aspects of quantum cohomology, before moving on to noncommutative geometry. This is followed by a further exploration of quantum field theory and gauge theory, describing AdS/CFT correspondence, and the functional renormalization group approach to quantum

gravity. The second part covers a wide spectrum of topics on the borderline of mathematics and physics, ranging from orbifolds to quantum indistinguishability and involving a manifold of mathematical tools borrowed from geometry, algebra and analysis. Each chapter presents introductory material before moving on to more advanced results. The chapters are self-contained and can be read independently of the rest.

The Theory of Quantum Torus Knots - Michael Unger 2009-11-06

A detailed mathematical derivation of space curves is presented that links the diverse fields of superfluids, quantum mechanics, and hydrodynamics by a common foundation. The basic mathematical building block is called the theory of quantum torus knots (QTK).

Geometric and Algebraic Topological Methods in Quantum Mechanics - G. Giacchetta 2005

In the last decade, the development of new ideas in quantum theory, including geometric and

deformation quantization, the non-Abelian Berry's geometric factor, super- and BRST symmetries, non-commutativity, has called into play the geometric techniques based on the deep interplay between algebra, differential geometry and topology. The book aims at being a guide to advanced differential geometric and topological methods in quantum mechanics. Their main peculiarity lies in the fact that geometry in quantum theory speaks mainly the algebraic language of rings, modules, sheaves and categories. Geometry is by no means the primary scope of the book, but it underlies many ideas in modern quantum physics and provides the most advanced schemes of quantization.

Classical and Quantum Physics - G. Marmo 2019-10-26

This proceedings is based on the interdisciplinary workshop held in Madrid, 5-9 March 2018, dedicated to Alberto Ibort on his 60th birthday. Alberto has great and significantly contributed to many fields of

mathematics and physics, always with highly original and innovative ideas. Most of Alberto's scientific activity has been motivated by geometric ideas, concepts and tools that are deeply related to the framework of classical dynamics and quantum mechanics. Let us mention some of the fields of expertise of Alberto Ibrort: Geometric Mechanics; Constrained Systems; Variational Principles; Multisymplectic structures for field theories; Super manifolds; Inverse problem for Bosonic and Fermionic systems; Quantum Groups, Integrable systems, BRST Symmetries; Implicit differential equations; Yang-Mills Theories; BiHamiltonian Systems; Topology Change and Quantum Boundary Conditions; Classical and Quantum Control; Orthogonal Polynomials; Quantum Field Theory and Noncommutative Spaces; Classical and Quantum Tomography; Quantum Mechanics on phase space; Wigner-Weyl formalism; Lie-Jordan Algebras, Classical and Quantum; Quantum-to-Classical transition; Contraction of

Associative Algebras; contact geometry, among many others. In each contribution, one may find not only technical novelties but also completely new way of looking at the considered problems. Even an experienced reader, reading Alberto's contributions on his field of expertise, will find new perspectives on the considered topic. His enthusiasm is happily contagious, for this reason he has had, and still has, very bright students wishing to elaborate their PhD thesis under his guidance. What is more impressive, is the broad list of rather different topics on which he has contributed.

Topology, Geometry and Quantum Field Theory - GEOMETRY SYMPOSIUM ON TOPOLOGY (AND QUANTUM FIELD THEORY (2002 : OXFORD, ENGLAND) AUTOR) 2004-06-28

Visionary articles explaining approaches to important problems on the interface of pure mathematics and mathematical physics. *Mathematical Topics Between Classical and Quantum Mechanics* - Nicholas P. Landsman

2012-12-06

This monograph draws on two traditions: the algebraic formulation of quantum mechanics as well as quantum field theory, and the geometric theory of classical mechanics. These are combined in a unified treatment of the theory of Poisson algebras of observables and pure state spaces with a transition probability, which leads on to a discussion of the theory of quantization and the classical limit from this perspective. A prototype of quantization comes from the analogy between the C^* - algebra of a Lie groupoid and the Poisson algebra of the corresponding Lie algebroid. The parallel between reduction of symplectic manifolds in classical mechanics and induced representations of groups and C^* - algebras in quantum mechanics plays an equally important role. Examples from physics include constrained quantization, curved spaces, magnetic monopoles, gauge theories, massless particles, and θ - vacua. Accessible to

mathematicians with some prior knowledge of classical and quantum mechanics, and to mathematical physicists and theoretical physicists with some background in functional analysis.

Massless Representations of the Poincaré Group

- R. Mirman 2005-05

Preface 1 The Physical Meaning of Poincare Massless Representations 1 2 Massless Representations 12 3 Massless Fields are Different 32 4 How to Couple Massless and Massive Matter 56 5 The Behavior of Matter in Fields 73 6 Geometrical Reasons for the Poincare Group 95 7 Description of the Electromagnetic Field 123 8 The Equations Governing Free Gravitation 135 9 How Matter Determines Gravitational Fields 150 10 Nonlinearity and Geometry 165 11 Quantum Gravity 183 References 201 Index 207.

Quantum Mechanics Built on Algebraic Geometry - Akihito Kikuchi 2021-01-04

This book presents a novel standpoint

concerning contemporary physics, namely, quantum mechanics with a view toward algebraic geometry. As is well-known, algebraic geometry is the study of geometric objects delineated by polynomials, and the polynomial representations are ubiquitous in physics. For this reason, quantum mechanics is also an object of algebraic geometry. An example is the eigenvalue problem. It is a set of polynomial equations and has traditionally been the question of linear algebra. However, the modern method of computational algebraic geometry accurately unravels the information encapsulated in the polynomials. This approach shall not remain as a plaything. It has betokened an innovative style of electronic structure computation. The objects of this new method include the simultaneous determination of the wave-functions and the movements of nuclei, or the prediction of the required structure that shall show the desired property. Accordingly, this book explains the basic ideas of

computational algebraic geometry and related topics, such as Groebner bases, primary ideal decomposition, Dmodules, Galois, class field theory, etc. The intention of the author is, nevertheless, not to give an irksome list of abstract concepts. He hopes that the readers shall use algebraic geometry as the active tool of the computations. For this reason, this book abundantly presents the model computations, by which the readers shall learn how to apply algebraic geometry toward quantum mechanics. The readers shall also see the modern computer algebra could facilitate the study when you would like to apply abstract mathematical ideas to definite physical problems.

Quantum Theory, Groups and

Representations - Peter Woit 2017-11-01

This text systematically presents the basics of quantum mechanics, emphasizing the role of Lie groups, Lie algebras, and their unitary representations. The mathematical structure of the subject is brought to the fore, intentionally

avoiding significant overlap with material from standard physics courses in quantum mechanics and quantum field theory. The level of presentation is attractive to mathematics students looking to learn about both quantum mechanics and representation theory, while also appealing to physics students who would like to know more about the mathematics underlying the subject. This text showcases the numerous differences between typical mathematical and physical treatments of the subject. The latter portions of the book focus on central mathematical objects that occur in the Standard Model of particle physics, underlining the deep and intimate connections between mathematics and the physical world. While an elementary physics course of some kind would be helpful to the reader, no specific background in physics is assumed, making this book accessible to students with a grounding in multivariable calculus and linear algebra. Many exercises are provided to develop the reader's understanding

of and facility in quantum-theoretical concepts and calculations.

Geometric Formulation of Classical and Quantum Mechanics - G. Giachetta 2011

The geometric formulation of autonomous Hamiltonian mechanics in the terms of symplectic and Poisson manifolds is generally accepted. This book provides the geometric formulation of non-autonomous mechanics in a general setting of time-dependent coordinate and reference frame transformations.

From Geometry to Quantum Mechanics - Yoshiaki Maeda 2007-04-22

* Invited articles in differential geometry and mathematical physics in honor of Hideki Omori * Focus on recent trends and future directions in symplectic and Poisson geometry, global analysis, Lie group theory, quantizations and noncommutative geometry, as well as applications of PDEs and variational methods to geometry * Will appeal to graduate students in mathematics and quantum mechanics; also a

reference

Quantum Geometry - Jan Ambjørn 1997-06-19
Describes random geometry and applications to strings, quantum gravity, topological field theory and membrane physics.

Geometry of Quantum Theory - Veeravalli S. Varadarajan 1970

Geometric Phases in Classical and Quantum Mechanics - Dariusz Chruscinski 2004-06-15
Several well-established geometric and topological methods are used in this work in an application to a beautiful physical phenomenon known as the geometric phase. This book examines the geometric phase, bringing together different physical phenomena under a unified mathematical scheme. The material is presented so that graduate students and researchers in applied mathematics and physics with an understanding of classical and quantum mechanics can handle the text.

Geometric Approaches to Quantum Field

Theory - Kieran Finn 2021-10-07

The ancient Greeks believed that everything in the Universe should be describable in terms of geometry. This thesis takes several steps towards realising this goal by introducing geometric descriptions of systems such as quantum gravity, fermionic particles and the origins of the Universe itself. The author extends the applicability of previous work by Vilkovisky, DeWitt and others to include theories with spin $1/2$ and spin 2 degrees of freedom. In addition, he introduces a geometric description of the potential term in a quantum field theory through a process known as the Eisenhart lift. Finally, the methods are applied to the theory of inflation, where they show how geometry can help answer a long-standing question about the initial conditions of the Universe. This publication is aimed at graduate and advanced undergraduate students and provides a pedagogical introduction to the exciting topic of field space covariance and the complete

geometrization of quantum field theory.

Symplectic Geometry and Quantum

Mechanics - Maurice A. de Gosson 2006-05-18

This book offers a complete discussion of techniques and topics intervening in the mathematical treatment of quantum and semi-classical mechanics. It starts with a very readable introduction to symplectic geometry. Many topics are also of genuine interest for pure mathematicians working in geometry and topology.

Geometry and Quantum Field Theory - Daniel S. Freed 1995

Exploring topics from classical and quantum mechanics and field theory, this book is based on lectures presented in the Graduate Summer School at the Regional Geometry Institute in Park City, Utah, in 1991. The chapter by Bryant treats Lie groups and symplectic geometry, examining not only the connection with mechanics but also the application to differential equations and the recent work of the Gromov

school. Rabin's discussion of quantum mechanics and field theory is specifically aimed at mathematicians. Alvarez describes the application of supersymmetry to prove the Atiyah-Singer index theorem, touching on ideas that also underlie more complicated applications of supersymmetry. Quinn's account of the topological quantum field theory captures the formal aspects of the path integral and shows how these ideas can influence branches of mathematics which at first glance may not seem connected. Presenting material at a level between that of textbooks and research papers, much of the book would provide excellent material for graduate courses. The book provides an entree into a field that promises to remain exciting and important for years to come. *Geometry of Quantum Theory* - V.S. Varadarajan 2007-12-03

Available for the first time in soft cover, this book is a classic on the foundations of quantum theory. It examines the subject from a point of

view that goes back to Heisenberg and Dirac and whose definitive mathematical formulation is due to von Neumann. This view leads most naturally to the fundamental questions that are at the basis of all attempts to understand the world of atomic and subatomic particles.

Quantum Physics and Geometry - Edoardo Ballico 2019-03-13

This book collects independent contributions on current developments in quantum information theory, a very interdisciplinary field at the intersection of physics, computer science and mathematics. Making intense use of the most advanced concepts from each discipline, the authors give in each contribution pedagogical introductions to the main concepts underlying their present research and present a personal perspective on some of the most exciting open problems. Keeping this diverse audience in mind, special efforts have been made to ensure that the basic concepts underlying quantum information are covered in an understandable

way for mathematical readers, who can find there new open challenges for their research. At the same time, the volume can also be of use to physicists wishing to learn advanced mathematical tools, especially of differential and algebraic geometric nature.

Geometry and Quantum Field Theory - Daniel S. Freed 1995

The first title in a new series, this book explores topics from classical and quantum mechanics and field theory. The material is presented at a level between that of a textbook and research papers making it ideal for graduate students. The book provides an entree into a field that promises to remain exciting and important for years to come.

Quantum Geometry - Margaret Prugovecki 2013-03-14

This monograph presents a review and analysis of the main mathematical, physical and epistemological difficulties encountered at the foundational level by all the conventional

formulations of relativistic quantum theories, ranging from relativistic quantum mechanics and quantum field theory in Minkowski space, to the various canonical and covariant approaches to quantum gravity. It is, however, primarily devoted to the systematic presentation of a quantum framework meant to deal effectively with these difficulties by reconsidering the foundations of these subjects, analyzing their epistemic nature, and then developing mathematical tools which are specifically designed for the elimination of all the basic

inconsistencies. A carefully documented historical survey is included, and additional extensive notes containing quotations from original sources are incorporated at the end of each chapter, so that the reader will be brought up-to-date with the very latest developments in quantum field theory in curved spacetime, quantum gravity and quantum cosmology. The survey further provides a backdrop against which the new foundational and mathematical ideas of the present approach to these subjects can be brought out in sharper relief.