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INIS Atomindex - 1988

Quantum String Theory - Noboru Kawamoto 1988

M-Theory and Quantum Geometry - Lárus Thorlacius 2000-09-30
Papers from an August 1999 NATO Advanced Study Institute held in Iceland report on recent advances in superstring theory, which is the leading candidate for a unified description of all known elementary particles and interactions. Chapters examine D-branes in string theory, moduli spaces of Calaba-Yau compactifications, the matrix model of M-theory, the holographic principle, Born-Infeld actions and D-brane physics, superconformal quantum mechanics and multi-black hole moduli spaces, large-N gauge theories, random surfaces, and Lorentzian and Euclidean quantum gravity. The editors are affiliated with the Science Institute of the University of Iceland. Annotation copyrighted by Book News, Inc., Portland, OR
New Spaces in Physics - Mathieu Anel 2021-04
In this graduate-level book, leading researchers explore various new notions of 'space' in mathematical physics.
Topological Quantum Computation - Zhenghan Wang 2010
Topological quantum computation is a computational paradigm based on topological phases of matter, which are governed by topological quantum field theories. In this approach, information is stored in the lowest energy states of many-anyon systems and processed by braiding non-abelian anyons. The computational answer is accessed by bringing anyons together and observing the result. Besides its theoretical esthetic appeal, the practical merit of the topological approach lies in its error-minimizing hypothetical hardware: topological phases of matter are fault-avoiding or deaf to most local noises, and unitary gates are implemented with exponential accuracy. Experimental realizations are pursued in systems such as fractional quantum Hall liquids and topological insulators. This book expands on the author's CBMS lectures on knots and topological quantum computing and is intended as a primer for mathematically inclined graduate students. With an emphasis on introducing basic notions and current research, this book gives the first coherent account of the field, covering a wide range of topics: Temperley-Lieb-Jones theory, the quantum circuit model, ribbon fusion category theory, topological quantum field theory, anyon theory, additive approximation of the Jones polynomial, anyonic quantum computing models, and mathematical models of topological phases of matter.
New Symmetry Principles in Quantum Field Theory - J. Frölich 2012-12-06
Soon after the discovery of quantum mechanics, group theoretical methods were used extensively in order to exploit rotational symmetry and classify atomic spectra. And until recently it was thought that symmetries in quantum mechanics should be groups. But it is not so. There are more general algebras, equipped with suitable structure, which admit a perfectly conventional interpretation as a symmetry of a quantum mechanical system. In any case, a "trivial representation" of the algebra is defined, and a tensor product of representations. But in contrast with groups, this tensor product needs to be neither commutative nor associative. Quantum groups are special cases, in which associativity is preserved. The exploitation of such "Quantum Symmetries" was a central theme at the Ad vanced Study Institute. Introductory lectures were presented to familiarize the participants with the al gebras which can appear as symmetries and with their properties. Some models of local field theories were discussed in detail which have some such symmetries, in par ticular conformal field theories and their perturbations. Lattice models provide many examples of quantum theories with quantum symmetries. They were also covered at the school. Finally, the symmetries which are the cause of the solubility of inte grable models are also quantum symmetries of this kind. Some such models and their nonlocal conserved currents were discussed.
Enumerative Geometry and String Theory - Sheldon Katz 2006
Perhaps the most famous example of how ideas from modern physics have revolutionized mathematics is the way string theory has led to an overhaul of enumerative geometry, an area of mathematics that started in the eighteen hundreds. Century-old problems of enumerating geometric configurations have now been solved using new and deep mathematical techniques inspired by physics!The book begins with an insightful introduction to enumerative geometry. From there, the goal becomes explaining the more advanced elements of enumerative algebraic geometry. Along the way, there are some crash courses on intermediate topics which are essential tools for the student of modern mathematics, such as cohomology and other topics in geometry. The physics content assumes nothing beyond a first undergraduate course. The focus is on explaining the action principle in physics, the idea of string theory, and how these directly lead to questions in geometry. Once these topics are in place, the connection between physics and enumerative geometry is made with the introduction of topological quantum field theory and quantum cohomology.
Mathematical Reviews - 2008

Lectures on Mathematical Physics - Y. M. Cho 1989

Mirror Symmetry and Algebraic Geometry - David A. Cox 1999
Mathematicians wanting to get into the field ... will find a very well written and encyclopaedic account of the mathematics which was needed in, and was developed from, what now might be termed classical mirror symmetry. --Bulletin of the LMS The book is highly recommended for everyone who wants to learn about the fascinating recent interplay between physics and mathematics. --Mathematical Reviews Mirror symmetry began when theoretical physicists made some astonishing predictions about rational curves on quintic hypersurfaces in four-dimensional projective space. Understanding the mathematics behind these predictions has been a substantial challenge. This book is a completely comprehensive monograph on mirror symmetry, covering the original observations by the physicists through the most recent progress made to date. Subjects discussed include toric varieties, Hodge theory, Kahler geometry, moduli of stable maps, Calabi-Yau manifolds, quantum cohomology, Gromov-Witten invariants, and the mirror theorem.
Diagrammatic Morphisms and Applications - Robert N Plato 2003
The technique of diagrammatic morphisms is an important ingredient in comprehending and visualizing certain types of categories with structure. It was widely used in this capacity in many areas of algebra, low-dimensional topology and physics. It was also applied to problems in classical and quantum information

processing and logic. This volume contains articles based on talks at the Special Session, ``Diagrammatic Morphisms in Algebra, Category Theory, and Topology'', at the AMS Sectional Meeting in San Francisco. The articles describe recent achievements in several aspects of diagrammatic morphisms and their applications. Some of them contain detailed expositions on various diagrammatic techniques. The introductory article by D. Yetter is a thorough account of the subject in a historical perspective.

String-Math 2016 - Amir-Kian Kashani-Poor 2018-06-06

This volume contains the proceedings of the conference String-Math 2016, which was held from June 27–July 2, 2016, at Collége de France, Paris, France. String-Math is an annual conference covering the most significant progress at the interface of string theory and mathematics. The two fields have had a very fruitful dialogue over the last thirty years, with string theory contributing key ideas which have opened entirely new areas of mathematics and modern mathematics providing powerful concepts and tools to deal with the intricacies of string and quantum field theory. The papers in this volume cover topics ranging from supersymmetric quantum field theories, topological strings, and conformal nets to moduli spaces of curves, representations, instantons, and harmonic maps, with applications to spectral theory and to the geometric Langlands program.

Surveys in Differential Geometry - Chuan-Chih Hsiung 1991

Contains papers presented at a conference organized by the editors of the ""Journal of Differential Geometry"" which featured speakers representing algebraic geometry and mathematical physics, among other areas.

Energy Research Abstracts - 1995

Applications of Random Matrices in Physics - Édouard Brezin 2006-07-03

Random matrices are widely and successfully used in physics for almost 60-70 years, beginning with the works of Dyson and Wigner. Although it is an old subject, it is constantly developing into new areas of physics and mathematics. It constitutes now a part of the general culture of a theoretical physicist. Mathematical methods inspired by random matrix theory become more powerful, sophisticated and enjoy rapidly growing applications in physics. Recent examples include the calculation of universal correlations in the mesoscopic system, new applications in disordered and quantum chaotic systems, in combinatorial and growth models, as well as the recent breakthrough, due to the matrix models, in two dimensional gravity and string theory and the non-abelian gauge theories. The book consists of the lectures of the leading specialists and covers rather systematically many of these topics. It can be useful to the specialists in various subjects using random matrices, from PhD students to confirmed scientists.

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 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 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.

Quantum Invariants of Knots and 3-Manifolds - Vladimir G. Turaev 2016-07-11

Due to the strong appeal and wide use of this monograph, it is now available in its third revised edition. The monograph gives a systematic treatment of 3-dimensional topological quantum field theories (TQFTs) based on the work of the author with N. Reshetikhin and O. Viro. This subject was inspired by the discovery of the Jones polynomial of knots and the Witten-Chern-Simons field theory. On the algebraic side, the study of 3-dimensional TQFTs has been influenced by the theory of braided categories and the theory of quantum groups.The book is divided into three parts. Part I presents a construction of 3-dimensional TQFTs and 2-dimensional modular functors from so-called modular categories. This gives a vast class of knot invariants and 3-manifold invariants as well as a class of linear representations of the mapping class groups of surfaces. In Part II the technique of 6j-symbols is used to define state sum invariants of 3-manifolds. Their relation to the TQFTs constructed in Part I is established via the theory of shadows. Part III provides constructions of modular categories, based on quantum groups and skein modules of tangles in the 3-space.This fundamental contribution to topological quantum field theory is accessible to graduate students in mathematics and physics with knowledge of basic algebra and topology. It is an indispensable source for everyone who wishes to enter the forefront of this fascinating area at the borderline of mathematics and physics. Contents:Invariants of graphs in Euclidean 3-space and of closed 3-manifoldsFoundations of topological quantum field theoryThree-dimensional topological quantum field theoryTwo-dimensional modular functors6j-symbolsSimplicial state sums on 3-manifoldsShadows of manifolds and state sums on shadowsConstructions of modular categories

Lattice - 1997

30 Years of the Landau Institute — Selected Papers - Isaak M Khalatnikov 1996-04-19

The Landau Institute for Theoretical Physics was created in 1965 by a group of LD Landau's pupils. Very soon, it was widely recognized as one of the world's leading centers in theoretical physics. According to Science Magazine, the Institute in the eighties had the highest citation index among all the scientific organizations in the former Soviet Union. This collection of the best papers of the Institute reflects the development of the many directions in the exact sciences during the last 30 years. The reader can find the original formulations of well-known notions in condensed matter theory, quantum field theory, mathematical physics and astrophysics, which were introduced by members of the Landau Institute. The following are some of the achievements described in this book: monopoles (A Polyakov), instantons (A Belavin et al.), weak crystallization (S Brazovskii), spin superfluidity (I Fomin), finite band potentials (S Novikov) and paraconductivity (A Larkin, L Aslamasov). Contents:Condensed Matter:Phase Transition in Uniaxial Ferroelectrics (A I Larkin & D E Khmel'nitskii)Contribution to the Theory of Domain Structures (I A Privorotskii)Correlation Functions of a One-Dimensional Fermi System with Long-Range Interaction (Tomonaga Model) (I E Dzyaloshinskii & A I Larkin)Investigation of Singularities in Superfluid He3 in Liquid Crystals by the Homotopic Topology Methods (G E Volovik & V P Mineev)Towards an Exact Solution of the Anderson Model (P B Wiegmann)Long Wavelength Dynamics of Free Smectic Films (E I Kats & V V Lebedev)The Augmented Models of Associative Memory Asymmetric Interaction and Hierarchy of Patterns (M V Feigelman & L B Ioffe)Superconductivity Transition Temperature in Amorphous Film (A M Finkel'shtein)Mathematical Physics:A Scheme for Integration the Nonlinear Equations of Mathematical Physics by the Method of the Inverse Scattering Problem (V E Zakharov & A B Shabat)Note on the Integration of Euler's Equations of the Dynamics of an n-Dimensional Rigid Body (S V Manakov)Extension of the Module of Invertible Transformations. Classification of Integrable Systems (A V Mikhailov et al.)Field Theory and Nuclear Physics:Particle Spectrum in Quantum Field Theory (A M Polyakov)Pseudoparticle Solutions of the Yang-Mills Equations (A A Belavin et al.)Infinite Conformal Symmetry in Two-Dimensional Quantum Field Theory (A A Belavin et al.)Conformal Algebra and Multipoint Correlation Functions in 2d

Statistical Models (V Dotsenko & V A Fateev)Higgs and Top Quark Masses in the Standard Model without Elementary Higgs Boson (V N Gribov)Astrophysics:Spectrum of Relict Gravitational Radiation and the Early State of the Universe (A A Starobinskii)and other papers Readership: Graduates and researchers in theoretical physics. keywords: “The articles reprinted in this volume are impressive. Many of these articles are still referenced, and even more are the basis for experimental and theoretical studies today.” Mathematical Reviews “This collection of the best papers of the Institute reflects the development of the many directions in the exact sciences during the last 30 years. The reader can find the original formulations of well-known notions in condensed matter theory, quantum field theory, mathematical physics and astrophysics, which were introduced by members of the Landau Institute.” Mathematics Abstracts

High Energy Physics Index - 1994

Strings, Conformal Fields, and M-Theory - Michio Kaku 2012-12-06

Building on the foundations laid in his Introduction to Superstrings and M Theory, Professor Kaku discusses such topics as the classification of conformal string theories, knot theory, the Yang-Baxter relation, quantum groups, and the insights into 11-dimensional strings recently obtained from M-theory. New chapters discuss such topics as Seiberg-Witten theory, M theory and duality, and D-branes. Throughout, the author conveys the vitality of the current research and places readers at its forefront. Several chapters reviewing the fundamentals of string theory, making the presentation of the material self-contained while keeping overlap with the earlier book to a minimum.

The Birth of String Theory - Andrea Cappelli 2012-04-12

Explores the early stages of the development of string theory; essential reading for physicists, historians and philosophers of science.

Quantum Field Theory - Michio Kaku 1993

Provides a comprehensive discussion of the gauge revolution and the theoretical and experimental evidence which makes the Standard Model the leading theory of subatomic phenomena.

Physics Briefs - 1994

New Trends in Quantum Field Theory - A. Ganchev 1996

The scope of the workshop held in Razlog in August to September 1995 encompassed quantum groups and noncommutative geometry (e.g. Grosse), classical and quantum integrable models (Nissimov), 2-dimensional conformal field theory (Fuchs), duality in gauge and string theory (Gomez), and differential geometric methods (Yazadjiev). Containing workshop lectures as well as concise research articles, the volume is divided into two parts: a lengthy first part on the forenamed subjects, and a more concise portion on vertex algebras (Kac). Distributed in the US by International Scholars Publishers. Annotation copyrighted by Book News, Inc., Portland, OR

The Floer Memorial Volume - Helmut Hofer 2012-12-06

Andreas Floer died on May 15, 1991 an untimely and tragic death. His visions and far-reaching contributions have significantly influenced the developments of mathematics. His main interests centered on the fields of dynamical systems, symplectic geometry, Yang-Mills theory and low dimensional topology. Motivated by the global existence problem of periodic solutions for Hamiltonian systems and starting from ideas of Conley, Gromov and Witten, he developed his Floer homology, providing new, powerful methods which can be applied to problems inaccessible only a few years ago. This volume opens with a short biography and three hitherto unpublished papers of Andreas Floer. It then presents a collection of invited contributions, and survey articles as well as research papers on his fields of interest, bearing testimony of the high esteem and appreciation this brilliant mathematician enjoyed among his colleagues. Authors include: A. Floer, V.I. Arnold, M. Atiyah, M. Audin, D.M. Austin, S.M. Bates, P.J. Braam, M. Chaperon, R.L. Cohen, G. Dell' Antonio, S.K. Donaldson, B. D'Onofrio, I. Ekeland, Y. Eliashberg, K.D. Ernst, R. Finthushel, A.B. Givental, H. Hofer, J.D.S. Jones, I. McAllister, D. McDuff, Y.-G. Oh, L. Polterovich, D.A. Salamon, G.B. Segal, R. Stern, C.H. Taubes, C. Viterbo, A. Weinstein, E. Witten, E. Zehnder.

Lattice 91 - M. Fukugita 2016-06-03

Lattice 91 covers the proceedings of the International Symposium on Lattice Field Theory held in Tsukuba, Japan on 5-9 November 1991. The book focuses on quantum chromodynamics, Higgs-fermion theories, QED, lattice quantum gravity and random surfaces, spin systems related to field theory, simulation algorithms, and dedicated computers. The selection first offers information on the QCD spectrum and phase diagram on the lattice and QCD at finite density, including phase structure of QCD, Monte-Carlo simulations with dynamical fermions, and quenched approximation. The book then tackles weak matrix elements, simulation of heavy quarks, and sphaleron induced baryon number non-conservation. The text reviews quantum gravity and random surfaces, recent analytic progress in finite size effects, and parallel QCD machines. Discussions focus on two-dimensional quantum gravity, signatures of resonance in finite volume, first order transitions, and determination of the running coupling. The publication also ponders on hadronic forces from the lattice, universality of the confinement string in multiple potentials, and confinement and saddle-point configurations. The selection is highly recommended for readers interested in the lattice field theory.

Quantum Triangulations - Mauro Carfora 2017-11-27

This book discusses key conceptual aspects and explores the connection between triangulated manifolds and quantum physics, using a set of case studies ranging from moduli space theory to quantum computing to provide an accessible introduction to this topic. Research on polyhedral manifolds often reveals unexpected connections between very distinct aspects of mathematics and physics. In particular, triangulated manifolds play an important role in settings such as Riemann moduli space theory, strings and quantum gravity, topological quantum field theory, condensed matter physics, critical phenomena and complex systems. Not only do they provide a natural discrete analogue to the smooth manifolds on which physical theories are typically formulated, but their appearance is also often a consequence of an underlying structure that naturally calls into play non-trivial aspects of representation theory, complex analysis and topology in a way that makes the basic geometric structures of the physical interactions involved clear. This second edition further emphasizes the essential role that triangulations play in modern mathematical physics, with a new and highly detailed chapter on the geometry of the dilatonic non-linear sigma model and its subtle and many-faceted connection with Ricci flow theory. This connection is treated in depth, pinpointing both the mathematical and physical aspects of the perturbative embedding of the Ricci flow in the renormalization group flow of non-linear sigma models. The geometry of the dilaton field is discussed from a novel standpoint by using polyhedral manifolds and Riemannian metric measure spaces, emphasizing their role in connecting non-linear sigma models’ effective action to Perelman’s energy-functional. No other published account of this matter is so detailed and informative. This new edition also features an expanded appendix on Riemannian geometry, and a rich set of new illustrations to help the reader grasp the more difficult points of the theory. The book offers a valuable guide for all mathematicians and theoretical physicists working in the field of quantum geometry and its applications.

The Grothendieck Theory of Dessins D'Enfants - Leila Schneps 1994-07-28

The various articles here unite all of the basics of the study of dessins d'enfants as well as the most recent advances.

Quantum Gravity in 2+1 Dimensions - Steven Carlip 2003-12-04

The first comprehensive survey of (2+1)-dimensional quantum gravity - for graduate students and researchers.

Lectures on Field Theory and Topology - Daniel S. Freed 2019-08-23

These lectures recount an application of stable homotopy theory to a concrete problem in low energy physics: the classification of special phases of matter. While the joint work of the author and Michael Hopkins is a focal point, a general geometric frame of reference on quantum field theory is emphasized. Early lectures describe the geometric axiom systems introduced by Graeme Segal and Michael Atiyah in the late 1980s, as well as subsequent extensions. This material provides an entry point for mathematicians to delve into quantum field theory. Classification theorems in low dimensions are proved to illustrate the framework. The later lectures turn to more specialized topics in field theory, including the relationship between invertible field theories and stable homotopy theory, extended unitarity, anomalies, and relativistic free fermion systems. The accompanying mathematical explanations touch upon (higher) category theory, duals to the sphere spectrum, equivariant spectra, differential cohomology, and Dirac operators. The

outcome of computations made using the Adams spectral sequence is presented and compared to results in the condensed matter literature obtained by very different means. The general perspectives and specific applications fuse into a compelling story at the interface of contemporary mathematics and theoretical physics.

String-Math 2015 - Si Li 2017-11-28

This volume contains the proceedings of the conference String-Math 2015, which was held from December 31, 2015–January 4, 2016, at Tsinghua Sanya International Mathematics Forum in Sanya, China. Two of the main themes of this volume are frontier research on Calabi-Yau manifolds and mirror symmetry and the development of non-perturbative methods in supersymmetric gauge theories. The articles present state-of-the-art developments in these topics. String theory is a broad subject, which has profound connections with broad branches of modern mathematics. In the last decades, the prosperous interaction built upon the joint efforts from both mathematicians and physicists has given rise to marvelous deep results in supersymmetric gauge theory, topological string, M-theory and duality on the physics side, as well as in algebraic geometry, differential geometry, algebraic topology, representation theory and number theory on the mathematics side.

Quantum Triangulations - Mauro Carfora 2012-01-14

Research on polyhedral manifolds often points to unexpected connections between very distinct aspects of Mathematics and Physics. In particular triangulated manifolds play quite a distinguished role in such settings as Riemann moduli space theory, strings and quantum gravity, topological quantum field theory, condensed matter physics, and critical phenomena. Not only do they provide a natural discrete analogue to the smooth manifolds on which physical theories are typically formulated, but their appearance is rather often a consequence of an underlying structure which naturally calls into play non-trivial aspects of representation theory, of complex analysis and topology in a way which makes manifest the basic geometric structures of the physical interactions involved. Yet, in most of the existing literature, triangulated manifolds are still merely viewed as a convenient discretization of a given physical theory to make it more amenable for numerical treatment. The motivation for these lectures notes is thus to provide an approachable introduction to this topic, emphasizing the conceptual aspects, and probing, through a set of cases studies, the connection between triangulated manifolds and quantum physics to the deepest. This volume addresses applied mathematicians and theoretical physicists working in the field of quantum geometry and its applications.

Low-Dimensional Topology and Quantum Field Theory - Hugh Osborn 1993-10-31

Mathematicians and theoretical physicists don't generally speak to each other, because they don't have to. But now and then a discovery is made in one field that can be of use in the other. Some of the interesting topics currently at the interface of the two disciplines are discussed in 29 papers from a workshop in Cambridge, England, September 1992. Among them are observables in the Kontsevich model, physical states in topological coset models, and the existence of pointlike localized fields in conformally invariant quantum physics. Annotation copyright by Book News, Inc., Portland, OR

Progress in String Theory - Juan M Maldacena 2005-07-12

Intended mainly for advanced graduate students in theoretical physics, this comprehensive volume covers recent advances in string theory and field theory dualities. It is based on the annual lectures given at the School of the Theoretical Advanced Study Institute (2003) a traditional event that brings together graduate students in high energy physics for an intensive course given by leaders in their fields. The first lecture by Paul Aspinwall is a description of branes in Calabi–Yau manifolds, which includes an introduction to the modern ideas of derived categories and their relation to D-branes. Juan Maldacena's second lecture is a short introduction to the AdS/CFT correspondence with a short discussion on its plane wave limit. Tachyon condensation for open strings is discussed in the third lecture by Ashoke Sen while Eva Silverstein provides a useful summary of the various attempts to produce four-dimensional physics out of string theory and M-theory in the fourth lecture. Matthew Strassler's fifth lecture is a careful discussion of a theory that has played a very important role in recent developments in string theory — a quantum field theory that produces a duality cascade which also has a large N gravity description. The sixth lecture by Washington Taylor explains how to perform perturbative computations using string field theory. The written presentation of these lectures is detailed yet straightforward, and they will be of great use to both students and experienced researchers in high energy theoretical physics. Contents:D-Branes on Calabi-Yau Manifolds (P S Aspinwall)Lectures on AdS/CFT (J M Maldacena)Tachyon Dynamics in Open String Theory (A Sen)TASI/PITP/ISS Lectures on Moduli and Microphysics (E Silverstein)The Duality Cascade (M J Strassler)Perturbative Computations in String Field Theory (W Taylor) Readership: Graduates, academics and researchers in high energy, particle, theoretical and mathematical physics. Keywords:String Theory;M-Theory;Supersymmetry;Field Theory;AdS/CFTKey Features:An ongoing series of lecture notes featuring an intensive course of advanced learning in high energy physics

Lie Theory and Its Applications in Physics - Vladimir Dobrev 2020-10-15

This volume presents modern trends in the area of symmetries and their applications based on contributions to the workshop "Lie Theory and Its Applications in Physics" held near Varna (Bulgaria) in June 2019. Traditionally, Lie theory is a tool to build mathematical models for physical systems. Recently, the trend is towards geometrization of the mathematical description of physical systems and objects. A geometric approach to a system yields in general some notion of symmetry, which is very helpful in understanding its structure. Geometrization and symmetries are meant in their widest sense, i.e., representation theory, algebraic geometry, number theory, infinite-dimensional Lie algebras and groups, superalgebras and supergroups, groups and quantum groups, noncommutative geometry, symmetries of linear and nonlinear partial differential operators, special functions, and others. Furthermore, the necessary tools from functional analysis are included. This is a large interdisciplinary and interrelated field. The topics covered in this volume from the workshop represent the most modern trends in the field : Representation Theory, Symmetries in String Theories, Symmetries in Gravity Theories, Supergravity, Conformal Field Theory, Integrable Systems, Polylogarithms, and Supersymmetry. They also include Supersymmetric Calogero-type models, Quantum Groups, Deformations, Quantum Computing and Deep Learning, Entanglement, Applications to Quantum Theory, and Exceptional Quantum Algebra for the standard model of particle physics This book is suitable for a broad audience of mathematicians, mathematical physicists, and theoretical physicists, including researchers and graduate students interested in Lie Theory.

Topology And Physics - Chen Ning Yang 2019-01-09

'The book is an engaging and influential collection of significant contributions from an assembly of world expert leaders and pioneers from different fields, working at the interface between topology and physics or applications of topology to physical systems ... The book explores many interesting and novel topics that lie at the intersection between gravity, quantum fields, condensed matter, physical cosmology and topology ... A rich, well-organized, and comprehensive overview of remarkable and insightful connections between physics and topology is here made available to the physics reader.'Contemporary PhysicsSince its birth in Poincaré's seminal 1894 'Analysis Situs', topology has become a cornerstone of mathematics. As with all beautiful mathematical concepts, topology inevitably — resonating with that Wignerian principle of the effectiveness of mathematics in the natural sciences — finds its prominent role in physics. From Chern-Simons theory to topological quantum field theory, from knot invariants to Calabi-Yau compactification in string theory, from spacetime topology in cosmology to the recent Nobel Prize winning work on topological insulators, the interactions between topology and physics have been a triumph over the past few decades.In this eponymous volume, we are honoured to have contributions from an assembly of grand masters of the field, guiding us with their world-renowned expertise on the subject of the interplay between 'Topology' and 'Physics'. Beginning with a preface by Chen Ning Yang on his recollections of the early days, we proceed to a novel view of nuclei from the perspective of complex geometry by Sir Michael Atiyah and Nick Manton, followed by an entrée toward recent developments in two-dimensional gravity and intersection theory on the moduli space of Riemann surfaces by Robbert Dijkgraaf and Edward Witten; a study of Majorana fermions and relations to the Braid group by Louis H Kauffman; a pioneering investigation on arithmetic gauge theory by Minhyong Kim; an anecdote-enriched review of singularity theorems in black-hole physics by Sir Roger Penrose; an adventure beyond anyons by Zhenghan Wang; an aperçu on topological insulators from first-principle calculations by Haijun Zhang and Shou-Cheng Zhang; finishing with synopsis on quantum information theory as one of the four revolutions in physics and the second quantum revolution by

Xiao-Gang Wen. We hope that this book will serve to inspire the research community.
Abstracts of Papers Presented to the American Mathematical Society - American Mathematical Society 2006

Gravitation Et Quantifications - Université Joseph Fourier 1995
This work combines the work of field theorists and general relativists. It features traditional domains of interaction such as perturbation theory, and explores future topics such as measurement theory, string field theory and hidden symmetries for extended objects.
Counting Surfaces - Bertrand Eynard 2016-03-21
The problem of enumerating maps (a map is a set of polygonal "countries" on a world of a certain topology, not necessarily the plane or the sphere) is an important problem in mathematics and physics, and it has many applications ranging from statistical physics, geometry, particle physics, telecommunications, biology, ... etc. This problem has been studied by many communities of researchers, mostly combinatorists, probabilists, and physicists. Since 1978, physicists have invented a method called "matrix models" to address that problem, and many results have been obtained. Besides, another important problem in mathematics and physics (in particular string theory), is to count Riemann surfaces. Riemann surfaces of a given topology are parametrized by a finite number of real parameters (called moduli), and the moduli space is a finite dimensional compact manifold or orbifold of complicated topology. The number of Riemann surfaces is the volume of that moduli space. Mor e generally, an important problem in algebraic geometry is to characterize the moduli spaces, by computing not only their volumes, but also other characteristic numbers called intersection numbers. Witten's conjecture (which was first proved by Kontsevich), was the assertion that Riemann surfaces can be obtained as limits of polygonal surfaces (maps), made of a very large number of very small polygons. In other words, the number of maps in a certain limit, should give the intersection numbers of moduli spaces. In this book, we show how that limit takes place. The goal of this book is to explain the "matrix model" method, to show the main results obtained with it, and to compare it with methods used in combinatorics (bijective proofs, Tutte's equations), or algebraic geometry (Mirzakhani's recursions). The book intends to be self-contained and accessible to graduate students, and provides comprehensive proofs, several examples, and give s the general formula for the enumeration of maps on surfaces of any topology. In the end, the link with more general topics such as algebraic geometry, string theory, is discussed, and in particular a proof of the Witten-Kontsevich conjecture is provided.