Low-Dimensional Topology and Quantum Field Theory

Edited by
Hugh Osborn

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Low Dimensional Topology And Quantum Field Theory Nato Science Series B:

    Low-Dimensional Topology and Quantum Field Theory Hugh Osborn,2013-11-11 The motivations goals and general culture of theoretical physics and mathematics are different Most practitioners of either discipline have no necessity for most of the time to keep abreast of the latest developments in the other However on occasion newly developed mathematical concepts become relevant in theoretical physics and the less rigorous theoretical physics framework may prove valuable in understanding and suggesting new theorems and approaches in pure mathematics Such interdis ciplinary successes invariably cause much rejoicing as over a prodigal son returned In recent years the framework provided by quantum field theory and functional in tegrals developed over half a century in theoretical physics have proved a fertile soil for developments in low dimensional topology and especially knot theory Given this background it was particularly pleasing that NATO was able to generously sup port an Advanced Research Workshop to be held in Cambridge England from 6th to 12th September 1992 with the title Low Dimensional Topology and Quantum Field Theory Although independently organised this overlapped as far as some speak ers were concerned with a longer term programme with the same title organised by Professor M Green Professor E Corrigan and Dr R Lickorish The contents of this proceedings of the workshop demonstrate the breadth of topics now of interest on the interface between theoretical physics and mathematics as well as the sophistication of the mathematical tools required in current theoretical physics   A Guide to Quantum Groups Vyjayanthi Chari,Andrew N. Pressley,1995-07-27 Since they first arose in the 1970s and early 1980s quantum groups have proved to be of great interest to mathematicians and theoretical physicists The theory of quantum groups is now well established as a fascinating chapter of representation theory and has thrown new light on many different topics notably low dimensional topology and conformal field theory The goal of this book is to give a comprehensive view of quantum groups and their applications The authors build on a self contained account of the foundations of the subject and go on to treat the more advanced aspects concisely and with detailed references to the literature Thus this book can serve both as an introduction for the newcomer and as a guide for the more experienced reader All who have an interest in the subject will welcome this unique treatment of quantum groups   **Partition Functions and Automorphic Forms** Valery A. Gritsenko,Vyacheslav P. Spiridonov,2020-07-09 This book offers an introduction to the research in several recently discovered and actively developing mathematical and mathematical physics areas It focuses on 1 Feynman integrals and modular functions 2 hyperbolic and Lorentzian Kac Moody algebras related automorphic forms and applications to quantum gravity 3 superconformal indices and elliptic hypergeometric integrals related instanton partition functions 4 moonshine its arithmetic aspects Jacobi forms elliptic genus and string theory and 5 theory and applications of the elliptic Painleve equation and aspects of Painleve equations in quantum field theories All the topics covered are related to various partition functions emerging in different supersymmetric and ordinary quantum field theories in curved space times of different d 2 3 6 dimensions Presenting multidisciplinary

methods localization Borcherds products theory of special functions Cremona maps etc for treating a range of partition functions the book is intended for graduate students and young postdocs interested in the interaction between quantum field theory and mathematics related to automorphic forms representation theory number theory and geometry and mirror symmetry *Super-Intense Laser—Atom Physics* A. L'Huillier,Bernard Piraux,Kazimierz Rzazewski,2012-12-06 The rapid development of powerful pulsed lasers is at the origin of a conside rable interest in studying the response of an atom a molecule or a solid to a strong electromagnetic field It is now possible to produce at the laboratory scale ultra short 13 pulses with a duration of 100 femtoseconds 10 second and a power of the order 12 of 1 terawatt 10 Watt Under these conditions very high peak intensities may be obtained and electric fields exceeding typical electron binding fields in atoms are generated The interaction of an atom or a molecule with such electromagnetic fields has a highly non linear character which leads to unexpected phenomena Amongst them above threshold ionization ATI i e the absorption of additional photons in excess of the minimal number necessary to overcome the ionization potential and its molecular counterpart above threshold dissociation ATD generation of very high harmonics of the driving field stabilization of one electron systems in strong fields These processes were the main topics of two international meetings which were held in 1989 and 1991 in the United States under the common name SILAP Super Intense Laser Atom Physics Ultrashort Processes in Condensed Matter Walter E. Bron,2012-12-06 The Advanced Study Institute AS considered a number offacets of the very rapidly advancing field of theoretical and experimental aspects of ultrashort processes in condensed matter Common threads exist between a series of example cases One major subgroup of topics involves the ultrashort dynamics of excitations of various particles produced through the interactions of condensed matter with ultrashort duration laser light Examples ofthe excitations include electronic and hole carriers electron hole plasma phonons vibrons and rotons two phonon states and excitons Experimentation on the dynamics of such excitations are carried out in the bulk at surfaces in thin films and in quantum wells The dynamical steps which the excitations usually undergo include photo excitation local thermalization particle particle interaction particle phonon interactions and eventual return to true thermal equilibrium This ASI was organized to benefit particularly advanced graduate students specifically those near the end of their Ph D thesis projects and also for postdoctoral scholars already active in the field The overall organizational goal was centered around a set oftutorially based lectures intermingled with full scale discussion periods of equal time and importance as the lectures The general discussion periods were designed to offer to the participants ample time to ask detailed questions and to make comments and contributions of their own In order to complete the involvement of the participants a full length poster session was also held A representative set of abstracts of these posters appear as an Appendix to the lectures **Solid State Lasers** Massimo Inguscio,Richard Wallenstein,2012-12-06 This volume contains the lectures and seminars presented at the NATO Ad vanced Study Institute on Solid State Lasers New Developments and Appli cations the fifteenth course of the Europhysics School of Quantum

Electronics held under the supervision of the Quantum Electronics Division of the European Physical Society The Institute was held at Elba International Physics Center Marciana Marina Elba Island Tuscany Italy August 31 September 11 1992 The Europhysics School of Quantum Electronics was started in 1970 with the aim of providing instruction for young researchers and advanced students al ready engaged in the area of quantum electronics or wishing to switch to this area from a different background Presently the school is under the direction of Professors F T Arecchi and M Inguscio University of Florence and Prof H Walther University of Munich and has its headquarters at the National Insti tute of Optics INO Florence Italy Each time the directors choose a subject of particular interest alternating fundamental topics with technological ones and ask colleagues specifically competent in a given area to take the scientific responsibility for that course 　　　　　　　　　　　　　　　　　　　　 ,1997 　　　 *Advances in Topological Quantum Field Theory* John M. Bryden,2007-09-27 This volume is the conference proceedings of the NATO ARW during August 2001 at Kananaskis Village Canada on New Techniques in Topological Quantum Field Theory This conference brought together specialists from a number of different fields all related to Topological Quantum Field Theory The theme of this conference was to attempt to find new methods in quantum topology from the interaction with specialists in these other fields The featured articles include papers by V Vassiliev on combinatorial formulas for cohomology of spaces of Knots the computation of Ohtsuki series by N Jacoby and R Lawrence and a paper by M Asaeda and J Przytycki on the torsion conjecture for Khovanov homology by Shumakovitch Moreover there are articles on more classical topics related to manifolds and braid groups by such well known authors as D Rolfsen H Zieschang and F Cohen 　　　 <u>Kokuritsu Kokkai Toshokan shozō kagaku gijutsu kankei Ōbun kaigiroku mokuroku</u> Kokuritsu Kokkai Toshokan (Japan),1997 　　　 <u>Quantum Invariants of Knots and 3-Manifolds</u> 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 manifolds Foundations of topological quantum field theory Three dimensional topological quantum field theory Two dimensional modular functors 6j symbols Simplicial state sums on 3 manifolds Shadows of manifolds and state sums on shadows Constructions of modular categories   **Directory of Published Proceedings** ,1995   **Graphs on Surfaces** Joanna A. Ellis-Monaghan,Iain Moffatt,2013-06-28 Graphs on Surfaces Dualities Polynomials and Knots offers an accessible and comprehensive treatment of recent developments on generalized duals of graphs on surfaces and their applications The authors illustrate the interdependency between duality medial graphs and knots how this interdependency is reflected in algebraic invariants of graphs and knots and how it can be exploited to solve problems in graph and knot theory Taking a constructive approach the authors emphasize how generalized duals and related ideas arise by localizing classical constructions such as geometric duals and Tait graphs and then removing artificial restrictions in these constructions to obtain full extensions of them to embedded graphs The authors demonstrate the benefits of these generalizations to embedded graphs in chapters describing their applications to graph polynomials and knots Graphs on Surfaces Dualities Polynomials and Knots also provides a self contained introduction to graphs on surfaces generalized duals topological graph polynomials and knot polynomials that is accessible both to graph theorists and to knot theorists Directed at those with some familiarity with basic graph theory and knot theory this book is appropriate for graduate students and researchers in either area Because the area is advancing so rapidly the authors give a comprehensive overview of the topic and include a robust bibliography aiming to provide the reader with the necessary foundations to stay abreast of the field The reader will come away from the text convinced of advantages of considering these higher genus analogues of constructions of plane and abstract graphs and with a good understanding of how they arise   **Whitaker's Books in Print** ,1998   **Series Associated With the Zeta and Related Functions** Hari M. Srivastava,Junesang Choi,2001 In recent years there has been an increasing interest in problems involving closed form evaluations of and representations of the Riemann Zeta function at positive integer arguments as various families of series associated with the Riemann Zeta function s the Hurwitz Zeta function s a and their such extensions and generalizations as for example Lerch s transcendent or the Hurwitz Lerch Zeta function iI z s a Some of these developments have apparently stemmed from an over two century old theorem of Christian Goldbach 1690 1764 which was stated in a letter dated 1729 from Goldbach to Daniel Bernoulli 1700 1782 from recent rediscoveries of a fairly rapidly convergent series representation for 3 which is actually contained in a 1772 paper by Leonhard Euler 1707 1783 and from another known series representation for 3 which was used by Roger Apery 1916 1994 in 1978 in his celebrated proof of the irrationality of 3 This book is motivated essentially by the fact that the theories and applications of the various methods and techniques used in dealing with many different families of series associated with the Riemann Zeta function and its aforementioned relatives are to be found so far onlyin widely scattered journal articles Thus our systematic and unified presentation of these results on the evaluation and representation of the Zeta and related

functions is expected to fill a conspicuous gap in the existing books dealing exclusively with these Zeta functions *Books in Print* ,1991   **A Survey of Knot Theory** Akio Kawauchi,2012-12-06 Knot theory is a rapidly developing field of research with many applications not only for mathematics The present volume written by a well known specialist gives a complete survey of knot theory from its very beginnings to today s most recent research results The topics include Alexander polynomials Jones type polynomials and Vassiliev invariants With its appendix containing many useful tables and an extended list of references with over 3 500 entries it is an indispensable book for everyone concerned with knot theory The book can serve as an introduction to the field for advanced undergraduate and graduate students Also researchers working in outside areas such as theoretical physics or molecular biology will benefit from this thorough study which is complemented by many exercises and examples   **Aslib Book Guide** ,1994   **Subject Guide to Books in Print** ,1993   **The British National Bibliography** Arthur James Wells,1993   The Cumulative Book Index ,1995 A world list of books in the English language

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