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# A Quantum Groups Primer

Shahn Majid



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# Quantum Groups Primer

**Jean-Pierre Francoise, Gregory L.  
Naber, Sheung Tsun Tsou**



## Quantum Groups Primer:

**A Quantum Groups Primer** Shahn Majid, 2002-04-04 This book provides a self contained introduction to quantum groups as algebraic objects Based on the author's lecture notes for the Part III pure mathematics course at Cambridge University it is suitable for use as a textbook for graduate courses in quantum groups or as supplement to modern courses in advanced algebra The book assumes a background knowledge of basic algebra and linear algebra Some familiarity with semisimple Lie algebras would also be helpful The book is aimed as a primer for mathematicians but will also be useful for mathematical physicists

**Quantum Groups and Their Representations** Anatoli Klimyk, Konrad Schmüdgen, 2012-12-06 This book starts with an introduction to quantum groups for the beginner and continues as a textbook for graduate students in physics and in mathematics It can also be used as a reference by more advanced readers The authors cover a large but well chosen variety of subjects from the theory of quantum groups quantized universal enveloping algebras quantized algebras of functions and  $q$  deformed algebras  $q$  oscillator algebras their representations and corepresentations and noncommutative differential calculus The book is written with potential applications in physics and mathematics in mind The basic quantum groups and quantum algebras and their representations are given in detail and accompanied by explicit formulas A number of topics and results from the more advanced general theory are developed and discussed

Introduction to Quantum Groups George Lusztig, 2010-10-27 The quantum groups discussed in this book are the quantized enveloping algebras introduced by Drinfeld and Jimbo in 1985 or variations thereof The theory of quantum groups has led to a new extremely rigid structure in which the objects of the theory are provided with canonical basis with rather remarkable properties This book will be of interest to mathematicians working in the representation theory of Lie groups and Lie algebras knot theorists and to theoretical physicists and graduate students Since large parts of the book are independent of the theory of perverse sheaves the book could also be used as a text book

*Lectures on Quantum Groups* Jens Carsten Jantzen, 1996 The material is very well motivated Of the various monographs available on quantum groups this one seems the most suitable for most mathematicians new to the subject will also be appreciated by a lot of those with considerably more experience Bulletin of the London Mathematical Society Since its origin the theory of quantum groups has become one of the most fascinating topics of modern mathematics with numerous applications to several sometimes rather disparate areas including low dimensional topology and mathematical physics This book is one of the first expositions that is specifically directed to students who have no previous knowledge of the subject The only prerequisite in addition to standard linear algebra is some acquaintance with the classical theory of complex semisimple Lie algebras Starting with the quantum analog of  $\mathfrak{sl}_2$  the author carefully leads the reader through all the details necessary for full understanding of the subject particularly emphasizing similarities and differences with the classical theory The final chapters of the book describe the Kashiwara Lusztig theory of so called crystal or canonical bases in representations of complex semisimple Lie algebras The choice of the

topics and the style of exposition make Jantzen's book an excellent textbook for a one semester course on quantum groups

**Quantum Groups** Christian Kassel, 2012-12-06 Here is an introduction to the theory of quantum groups with emphasis on the spectacular connections with knot theory and Drinfeld's recent fundamental contributions. It presents the quantum groups attached to  $SL_2$  as well as the basic concepts of the theory of Hopf algebras. Coverage also focuses on Hopf algebras that produce solutions of the Yang-Baxter equation and provides an account of Drinfeld's elegant treatment of the monodromy of the Knizhnik-Zamolodchikov equations

**Introduction to Quantum Groups and Crystal Bases** Jin Hong, Seok-Jin Kang, 2002 The purpose of this book is to provide an elementary introduction to the theory of quantum groups and crystal bases focusing on the combinatorial aspects of the theory

Foundations of Quantum Group Theory Shahn Majid, 2000 A graduate level text which systematically lays out the foundations of Quantum Groups

*Introduction to Quantum Groups* Masud Chaichian, Andrei Pavlovich Demichev, 1996 In the past decade there has been an extremely rapid growth in the interest and development of quantum group theory. This book provides students and researchers with a practical introduction to the principal ideas of quantum groups theory and its applications to quantum mechanical and modern field theory problems. It begins with a review of and introduction to the mathematical aspects of quantum deformation of classical groups, Lie algebras and related objects, algebras of functions on spaces, differential and integral calculi. In the subsequent chapters the richness of mathematical structure and power of the quantum deformation methods and non-commutative geometry is illustrated on the different examples starting from the simplest quantum mechanical system harmonic oscillator and ending with actual problems of modern field theory such as the attempts to construct lattice-like regularization consistent with space-time Poincaré symmetry and to incorporate Higgs fields in the general geometrical frame of gauge theories. Graduate students and researchers studying the problems of quantum field theory, particle physics and mathematical aspects of quantum symmetries will find the book of interest

*Quantum Groups and Their Applications in Physics* Leonardo Castellani, Julius Wess, Società italiana di fisica, 1996 This book focuses on quantum groups, i.e. continuous deformations of Lie groups and their applications in physics. These algebraic structures have been studied in the last decade by a growing number of mathematicians and physicists and are found to underlie many physical systems of interest. They do provide in fact a sort of common algebraic ground for seemingly very different physical problems. As it has happened for supersymmetry, the  $q$ -group symmetries are bound to play a vital role in physics even in fundamental theories like gauge theory or gravity. In fact  $q$ -symmetry can be considered itself as a generalization of supersymmetry evident in the  $q$ -commutator formulation. The hope that field theories on  $q$ -groups are naturally regularized begins to appear founded and opens new perspectives for quantum gravity. The topics covered in this book include conformal field theories and quantum groups, gauge theories of quantum groups, anyons, differential calculus on quantum groups and non-commutative geometry, Poisson algebras, 2-dimensional statistical models, 2+1 quantum gravity, quantum groups and lattice physics, inhomogeneous  $q$

groups  $q$  Poincaregroup and deformed gravity and gauging of  $W$  algebras      The Princeton Companion to Mathematics  
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Caenepeel,2019-05-07 This comprehensive reference summarizes the proceedings and keynote presentations from a recent conference held in Brussels Belgium Offering 1155 display equations this volume contains original research and survey papers as well as contributions from world renowned algebraists It focuses on new results in classical Hopf algebras as well as the     *Quantum Groups* Benjamin Enriquez,2008 The volume starts with a lecture course by P Etingof on tensor categories notes by D Calaque This course is an introduction to tensor categories leading to topics of recent research such as realizability of fusion rings Ocneanu rigidity module categories weak Hopf algebras Morita theory for tensor categories lifting theory categorical dimensions Frobenius Perron dimensions and the classification of tensor categories The remainder of the book consists of three detailed expositions on associators and the Vassiliev invariants of knots classical and quantum integrable systems and elliptic algebras and the groups of algebra automorphisms of quantum groups The preface puts the results presented in perspective Directed at research mathematicians and theoretical physicists as well as graduate students the volume gives an overview of the ongoing research in the domain of quantum groups an important subject of current mathematical physics     Superstrings, P-branes and M-theory ,     Introduction To Quantum Groups Masud

Chaichian,Andrei Demichev,1996-11-22 In the past decade there has been an extremely rapid growth in the interest and development of quantum group theory This book provides students and researchers with a practical introduction to the principal ideas of quantum groups theory and its applications to quantum mechanical and modern field theory problems It begins with a review of and introduction to the mathematical aspects of quantum deformation of classical groups Lie algebras and related objects algebras of functions on spaces differential and integral calculi In the subsequent chapters the richness of mathematical structure and power of the quantum deformation methods and non commutative geometry is illustrated on the different examples starting from the simplest quantum mechanical system harmonic oscillator and ending with actual problems of modern field theory such as the attempts to construct lattice like regularization consistent with space time Poincar symmetry and to incorporate Higgs fields in the general geometrical frame of gauge theories Graduate students and researchers studying the problems of quantum field theory particle physics and mathematical aspects of quantum symmetries will find the book of interest     **Introduction to Quantum Groups** Teo Banica,2023-01-01 This book introduces the reader to quantum groups focusing on the simplest ones namely the closed subgroups of the free unitary group Although such quantum groups are quite easy to understand mathematically interesting examples abound including all classical Lie groups their free versions half liberations other intermediate liberations anticommutation twists the duals of

finitely generated discrete groups quantum permutation groups quantum reflection groups quantum symmetry groups of finite graphs and more The book is written in textbook style with its contents roughly covering a one year graduate course Besides exercises the author has included many remarks comments and pieces of advice with the lone reader in mind The prerequisites are basic algebra analysis and probability and a certain familiarity with complex analysis and measure theory Organized in four parts the book begins with the foundations of the theory due to Woronowicz comprising axioms Haar measure Peter Weyl theory Tannakian duality and basic Brauer theorems The core of the book its second and third parts focus on the main examples first in the continuous case and then in the discrete case The fourth and last part is an introduction to selected research topics such as toral subgroups homogeneous spaces and matrix models Introduction to Quantum Groups offers a compelling introduction to quantum groups from the simplest examples to research level topics

**Hopf Algebras and Tensor Categories** Nicolás Andruskiewitsch, Juan Cuadra, Blas Torrecillas, 2013-02-21 This volume contains the proceedings of the Conference on Hopf Algebras and Tensor Categories held July 4-8 2011 at the University of Almeria Almeria Spain The articles in this volume cover a wide variety of topics related to the theory of Hopf algebras and its connections to other areas of mathematics In particular this volume contains a survey covering aspects of the classification of fusion categories using Morita equivalence methods a long comprehensive introduction to Hopf algebras in the category of species and a summary of the status to date of the classification of Hopf algebras of dimensions up to 100 Among other topics discussed in this volume are a study of normalized class sum and generalized character table for semisimple Hopf algebras a contribution to the classification program of finite dimensional pointed Hopf algebras relations to the conjecture of De Concini Kac and Procesi on representations of quantum groups at roots of unity a categorical approach to the Drinfeld double of a braided Hopf algebra via Hopf monads an overview of Hom Hopf algebras and several discussions on the crossed product construction in different settings

**Quantum Groups** Pavel Etingof, Steven Shnider, Gelaki Sholomo, 2007 A *Guide to Quantum Groups* Vjayanthi 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

*Quantum Groups* Vladimir K. Dobrev, 2017-07-10 With applications in quantum field theory general relativity and elementary particle physics this three volume work studies the invariance of differential operators under Lie algebras quantum groups and superalgebras This second volume covers

quantum groups in their two main manifestations quantum algebras and matrix quantum groups The exposition covers both the general aspects of these and a great variety of concrete explicitly presented examples The invariant  $q$  difference operators are introduced mainly using representations of quantum algebras on their dual matrix quantum groups as carrier spaces This is the first book that covers the title matter applied to quantum groups Contents Quantum Groups and Quantum Algebras Highest Weight Modules over Quantum Algebras Positive Energy Representations of Noncompact Quantum Algebras Duality for Quantum Groups Invariant  $q$  Difference Operators Invariant  $q$  Difference Operators Related to  $GL_q(n, q)$  Maxwell Equations Hierarchies

**Encyclopedia of Mathematical Physics** Jean-Pierre Francoise, Gregory L. Naber, Sheung Tsun Tsou, 2006 The Encyclopedia of Mathematical Physics provides a complete resource for researchers students and lecturers with an interest in mathematical physics It enables readers to access basic information on topics peripheral to their own areas to provide a repository of the core information in the area that can be used to refresh the researcher's own memory banks and aid teachers in directing students to entries relevant to their course work The Encyclopedia does contain information that has been distilled organised and presented as a complete reference tool to the user and a landmark to the body of knowledge that has accumulated in this domain It also is a stimulus for new researchers working in mathematical physics or in areas using the methods originating from work in mathematical physics by providing them with focused high quality background information Editorial Board Jean Pierre Fran oise Universit Pierre et Marie Curie Paris France Gregory L Naber Drexel University Philadelphia PA USA Tsou Sheung Tsun University of Oxford UK Also available online via ScienceDirect 2006 featuring extensive browsing searching and internal cross referencing between articles in the work plus dynamic linking to journal articles and abstract databases making navigation flexible and easy

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