Knots Mathematics With A Twist

This practical, accessible resource will help future and practicing teachers integrate literature into their middle school or high school classrooms, while also addressing content area standards and improving the literacy skills of their students. Two introductory chapters are followed by five chapters that each cover a different genre: Chapter 3, Informational Books; Chapter 4, Fiction; Chapter 5, Biography, Autobiography, and Memoir; Chapter 6, Poetry; and Chapter 7, How-to and Hands-on Books. Each genre chapter consists of four parts: Part 1: Discusses the genre and how content area teachers can use books within that genre to further content learning and enhance literacy skills. Part 2: Offers hands-on instructional strategies and activities using literature, with activities for use in a variety of disciplines. Part 3: Presents individual author studies (three or four per chapter) with bibliographies and guidelines for using the authors' books in content area courses. Part 4: Features an annotated bibliography of specially selected children and young adult literature for that genre, organized by content area. The annotations provide information about the book, which can be used to prepare booktalks, and teaching ideas for using in a specific content area. Altogether these sections contain more than 600 annotated entries tabbed by subject area, including art, English/language arts, languages and culture, math and technology, music, PE/health, science, and social studies/history.

This book contains a collection of papers presented at the 2nd Tbilisi Salerno Workshop on Mathematical Modeling in March 2015. The focus is on applications of mathematics in physics, electromagnetics, biochemistry and botany, and covers such topics as multimodal logic, fractional calculus, special functions, Fourier-like solutions for PDE's, Rvachev-functions and linear dynamical systems. Special chapters focus on recent uniform analytic descriptions of natural and abstract shapes using the Gielis Formula. The book is intended for a wide audience with interest in application of mathematics to modeling in the natural sciences.

Mathematics is playing an increasingly important role in society and the sciences, enhancing our ability to use models and handle data. While pure mathematics is mostly interested in abstract structures, applied mathematics sits at the interface between this abstract world and the world in which we live. This area of mathematics takes its nourishment from society and science and, in turn, provides a unified way to understand problems arising in diverse fields. This Very Short Introduction presents a compact yet comprehensive view of the field of applied mathematics, and explores its relationships with (pure) mathematics, science, and engineering. Explaining the nature of applied mathematics, Alain Goriely discusses its early achievements in physics and engineering, and its development as a separate field after World War II. Using historical examples, current applications, and challenges, Goriely illustrates the particular role that mathematics plays in the modern sciences today and its far-reaching potential. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

Rolfsen's beautiful book on knots and links can be read by anyone, from beginner to expert, who wants to learn about knot theory. Beginners find an inviting introduction to the elements of topology, emphasizing the tools needed for understanding knots, the fundamental group and van Kampen's theorem, for example, which are then applied to concrete problems, such as computing knot groups. For experts, Rolfsen explains advanced topics, such as the connections between knot theory and surgery and how they are useful to understanding three-manifolds. Besides providing a guide to understanding knot theory, the book offers 'practical' training. After reading it, you will be able to do many things: compute presentations of knot groups, Alexander polynomials, and other invariants; perform surgery on three-manifolds; and visualize knots and their complements. It is characterized by its hands-on approach and emphasis on a visual, geometric understanding. Rolfsen offers invaluable insight and strikes a perfect balance between giving technical details and offering informal explanations. The illustrations are superb, and a wealth of examples are included. Now back in print by the AMS, the book is still a standard reference in knot theory. It is written in a remarkable style that makes it useful for both beginners and researchers. Particularly noteworthy is the table of knots and links at the end. This volume is an excellent introduction to the topic and is suitable as a textbook for a course in knot theory or 3-manifolds. Other key books of interest on this topic available from the AMS are ""The Shoelace Book: A Mathematical Guide to the Best (and Worst) Ways to Lace your Shoes"" and ""The Knot Book"".

This well-written and engaging volume, intended for undergraduates, introduces knot theory, an area of growing interest in contemporary mathematics. The hands-on approach features many exercises to be completed by readers. Prerequisites are only a basic familiarity with linear algebra and a willingness to explore the subject in a hands-on manner. The opening chapter offers activities that explore the world of knots and links — including games with knots — and invites the reader to generate their own questions in knot theory. Subsequent chapters guide the reader to discover the formal definition of a knot, families of knots and links, and various knot notations. Additional topics include combinatorial knot invariants, knot polynomials, unknotting operations, and virtual knots.

Shapiro argues that both realist and anti-realist accounts of mathematics are problematic. To resolve this dilemma, he articulates a "structuralist" approach, arguing that the subject matter of a mathematical theory is not a fixed domain of numbers that exist independent of each other, but rather is the natural structure, the pattern common to any system of objects that has an initial object and successor relation satisfying the induction principle.

The present volume grew out of the Heidelberg Knot Theory Semester, organized by the editors in winter 2008/09 at Heidelberg University. The contributed papers bring the reader up to date on the currently most actively pursued areas of mathematical knot theory and its applications in mathematical physics and cell biology. Both original research and survey articles are presented; numerous illustrations support the text. The book will be of great interest to researchers in topology, geometry, and mathematical physics, graduate students specializing in knot theory, and cell biologists interested in the topology of DNA strands.

This book, written by a mathematician known for his own work on knot theory, is a clear, concise, and engaging introduction to this complicated subject, and a guide to the basic ideas and applications of knot theory. 63 illustrations.

This book constitutes the refereed proceedings of the 30th International Symposium on Mathematical Foundations of Computer Science, MFCS 2005, held in Gdansk, Poland in August/September 2005. The 62 revised full papers presented together with full papers or abstracts of 7 invited talks were carefully reviewed and selected from 137 submissions. All current aspects in theoretical computer science are addressed, ranging from quantum computing, approximation, automata, circuits, scheduling, games, languages, discrete mathematics, combinatorial optimization, graph theory, networking, algorithms, and complexity to programming theory, formal methods, and mathematical logic.

?This book is the result of a joint venture between Professor Akio Kawauchi, Osaka City University, well-known for his research in knot theory, and the Osaka study group of mathematics education, founded by Professor Hirokazu Okamori and now chaired by his successor Professor Tomoko Yanagimoto, Osaka Kyoiku University. The seven chapters address the teaching and learning of knot theory from several perspectives. Readers will find an extremely clear and concise introduction to the fundamentals of knot theory, an overview of curricular developments in Japan, and in particular a series of teaching experiments at all levels which not only demonstrate the creativity and the professional expertise of the members of the study group, but also give a lively impression of students' learning processes. In addition the reports show that elementary knot theory is not just a preparation for advanced knot theory but also an excellent means to develop spatial thinking. The book can be highly recommended for several reasons: First of all, and that is the main intention of the book, it serves as a comprehensive text for teaching and learning knot theory. Moreover it provides a model for cooperation between mathematicians and mathematics educators based on substantial mathematics. And finally it is a thorough introduction to the Japanese art of lesson studies–again in the context of substantial mathematics.

A richly illustrated 2004 textbook on knot theory; minimal prerequisites but modern in style and content.

Bestselling author and astrophysicist Mario Livio examines the lives and theories of history's greatest mathematicians to ask how—if mathematics is an abstract construction of the human mind—it can so perfectly explain the physical world. Nobel Laureate Eugene Wigner once wondered about "the unreasonable effectiveness of mathematics" in the formulation of the laws of nature. Is God a Mathematician? investigates why mathematics is as powerful as it is. From ancient times to the present, scientists and philosophers have marveled at how such a seemingly abstract discipline could so perfectly explain the natural world. More than that—mathematics has often made predictions, for example, about subatomic particles or cosmic phenomena that were unknown at the time, but later were proven to be true. Is mathematics ultimately invented or discovered? If, as Einstein insisted, mathematics is "a product of human thought that is independent of experience," how can it so accurately describe and even predict the world around us? Physicist and author Mario Livio brilliantly explores mathematical ideas from Pythagoras to the present day as he shows us how intriguing questions and ingenious answers have led to ever deeper insights into our world. This fascinating book will interest anyone curious about the human mind, the scientific world, and the relationship between them.

Knot theory is a kind of geometry, and one whose appeal is very direct because the objects studied are perceivable and tangible in everyday physical space. It is a meeting ground of such diverse branches of mathematics as group theory, matrix theory, number theory, algebraic geometry, and differential geometry, to name some of the more prominent ones. It had its origins in the mathematical theory of electricity and in primitive atomic physics, and there are hints today of new applications in certain branches of chemistryJ The outlines of the modern topological theory were worked out by Dehn, Alexander, Reidemeister, and Seifert almost thirty years ago. As a subfield of topology, knot theory forms the core of a wide range of problems dealing with the position of one manifold imbedded within another. This book, which is an elaboration of a series of lectures given by Fox at Haverford College while a Philips Visitor there in the spring of 1956, is an attempt to make the subject accessible to everyone. Primarily it is a text book for a course at the junior-senior level, but we believe that it can be used with profit also by graduate students. Because the algebra required is not the familiar commutative algebra, a disproportionate amount of the book is given over to necessary algebraic preliminaries.

The original title for this work was "Mathematical Literacy, What Is It and Why You Need it". The current title reflects that there can be no real learning in any subject, unless questions of who, what, when, where, why and how are raised in the minds of the learners. The book is not a mathematical text, and there are no assigned exercises or exams. It is written for reasonably intelligent and curious individuals, both those who value mathematics, aware of its many important applications and others who have been inappropriately exposed to mathematics, leading to indifference to the subject, fear and even loathing. These feelings are all consequences of meaningless presentations, drill, rote learning and being lost as the purpose of what is being studied. Mathematics education needs a radical reform. There is more than one way to accomplish this. Here the author presents his approach of wrapping mathematical ideas in a story. To learn one first must develop an interest in a problem and the curiosity to find how masters of mathematics have solved them. What is necessary to be mathematically literate? It's not about solving algebraic equations or even making a geometric proof. These are valuable skills but not evidence of literacy. We often seek answers but learning to ask pertinent questions is the road to mathematical literacy. Here is the good news: new mathematical ideas have a way of finding applications. This is known as "the unreasonable effectiveness of mathematics."

Find new twists on knotted molecules, the hangman's paradox, cat's cradle, gambling, peg solitaire, pi and e in this book.

To attack certain problems in 4-dimensional knot theory the author draws on a variety of techniques, focusing on knots in S^T4, whose fundamental groups contain abelian normal subgroups. Their class contains the most geometrically appealing and best understood examples. Moreover, it is possible to apply work in algebraic methods to these problems. Work in four-dimensional topology is applied in later chapters to the problem of classifying 2-knots.

A student in class asks the math teacher: "Shouldn't minus times minus make minus?" Teachers soon convince most students that it does not. Yet the innocent question brings with it a germ of mathematical creativity. What happens if we encourage that thought, odd and ungrounded though it may seem? Few books in the field of mathematics encourage such creative thinking. Fewer still are engagingly written and fun to read. This book succeeds on both counts. Alberto Martinez shows us how many of the mathematical concepts that we take for granted were once considered contrived, imaginary, absurd, or just plain wrong. Even today, he writes, not all parts of math correspond to things, relations, or operations that we can actually observe or carry out in everyday life. Negative Math ponders such issues by exploring controversies in the history of numbers, especially the so-called negative and "impossible" numbers. It uses history, puzzles, and lively debates to demonstrate how it is still possible to devise new artificial systems of mathematical rules. In fact, the book contends, departures from traditional rules can even be the basis for new applications. For example, by using an algebra in which minus times minus makes minus, mathematicians can describe curves or trajectories that are not represented by traditional coordinate geometry. Clear and accessible, Negative Math expects from its readers only a passing acquaintance with basic high school algebra. It will prove pleasurable reading not only for those who enjoy popular math, but also for historians, philosophers, and educators. Key Features? Uses history, puzzles, and lively debates to devise new mathematical systems Shows how departures from rules can underlie new practical applications Clear and accessible Requires a background only in basic high school algebra

A selection of topics which graduate students have found to be a successful introduction to the field, employing three distinct techniques: geometric topology manoeuvres, combinatorics, and

algebraic topology. Each topic is developed until significant results are achieved and each chapter ends with exercises and brief accounts of the latest research. What may reasonably be referred to as knot theory has expanded enormously over the last decade and, while the author describes important discoveries throughout the twentieth century, the latest discoveries such as quantum invariants of 3-manifolds as well as generalisations and applications of the Jones polynomial are also included, presented in an easily intelligible style. Readers are assumed to have knowledge of the basic ideas of the fundamental group and simple homology theory, although explanations throughout the text are numerous and well-done. Written by an internationally known expert in the field, this will appeal to graduate students, mathematicians and physicists with a mathematical background wishing to gain new insights in this area.

This invaluable book is an introduction to knot and link invariants as generalised amplitudes for a quasi-physical process. The demands of knot theory, coupled with a quantum-statistical framework, create a context that naturally and powerfully includes a extraordinary range of interrelated topics in topology and mathematical physics. The author takes a primarily combinatorial stance toward knot theory and its relations with these subjects. This stance has the advantage of providing direct access to the algebra and to the combinatorial topology, as well as physical ideas. The book is divided into two parts: Part I is a systematic course on knots and physics starting from the ground up, and Part II is a set of lectures on various topics related to Part I. Part II includes topics such as frictional properties of knots, relations with combinatorics, and knots in dynamical systems. In this third edition, a paper by the author entitled "Functional Integration and Vassiliev invariants" has been added. This paper shows how the Kontsevich integral approach to the Vassiliev invariants is directly related to the perturbative expansion of Witten's functional integral. While the book supplies the background, this paper can be read independently as an introduction to quantum field theory and knot invariants and their relation to quantum gravity. As in the second edition, there is a selection of papers by the author at the end of the book. Numerous clarifying remarks have been added to the text.

Elementary particles in this book exist as Solitons in-and-of the fabric of spacetime itself. As such they are characterized by their geometry, that is their topology and configuration which lead directly to their physical attributes and behavior as well as to a simplification and reduction of assumptions and the importation of parameter values. The emphasis of the book is thus on that geometry, the algebraic geometry associated with taxonomical issues and the differential geometry that determines the physics as well as on simplifying the results. In itself, however, the process of assembling and developing what eventually went into the book has been a singularly rewarding journey. Along the way some fascinating insights and connections to known physical attributes and theories emerge, some predictable but others unbidden and even unanticipated. The book is intended to summarize that journey in a way that, readers with a range of backgrounds will find interesting and provocative. Connections to other physical theories and subjects are also discussed. A most gratifying development is the emergence of a unifying principle underlying the epistemological structure of not only the elementary particles but of such diverse fields as Radar, Quantum mechanics, Biology, Cosmology and the Philosophy of science.

Topology is a branch of mathematics packed with intriguing concepts, fascinating geometrical objects, and ingenious methods for studying them. The authors have written this textbook to make the material accessible to undergraduate students without requiring extensive prerequisites in upper-level mathematics. The approach is to cultivate the intuitive ideas of continuity, convergence, and connectedness so students can quickly delve into knot theory, the topology of surfaces and three-dimensional manifolds, fixed points and elementary homotopy theory. The fundamental concepts of point-set topology appear at the end of the book when students can see how this level of abstraction provides a sound logical basis for the geometrical ideas that have come before. This organization exposes students to the exciting world of topology now(!) rather than later. Students using this textbook should have some exposure to the geometry of objects in higher-dimensional Euclidean spaces together with an appreciation of precise mathematical definitions and proofs.

On Knots is a journey through the theory of knots, starting from the simplest combinatorial ideas--ideas arising from the representation of weaving patterns. From this beginning, topological invariants are constructed directly: first linking numbers, then the Conway polynomial and skein theory. This paves the way for later discussion of the recently discovered Jones and generalized polynomials. The central chapter, Chapter Six, is a miscellany of topics and recreations. Here the reader will find the quaternions and the belt trick, a devilish rope trick, Alhambra mosaics, Fibonacci trees, the topology of DNA, and the author's geometric interpretation of the generalized Jones Polynomial. Then come branched covering spaces, the Alexander polynomial, signature theorems, the work of Casson and Gordon on slice knots, and a chapter on knots and algebraic singularities. The book concludes with an appendix about generalized polynomials.

Knot theory is a classical area of low-dimensional topology, directly connected with the theory of three-manifolds and smooth four-manifold topology. In recent years, the subject has undergone transformative changes thanks to its connections with a number of other mathematical disciplines, including gauge theory; representation theory and categorification; contact geometry; and the theory of pseudo-holomorphic curves. Starting from the combinatorial point of view on knots using their grid diagrams, this book serves as an introduction to knot theory, specifically as it relates to some of the above developments. After a brief overview of the background material in the subject, the book gives a self-contained treatment of knot Floer homology from the point of view of grid diagrams. Applications include computations of the unknotting number and slice genus of torus knots (asked first in the 1960s and settled in the 1990s), and tools to study variants of knot theory in the presence of a contact structure. Additional topics are presented to prepare readers for further study in holomorphic methods in low-dimensional topology, especially Heegaard Floer homology. The book could serve as a textbook for an advanced undergraduate or part of a graduate course in knot theory. Standard background material is sketched in the text and the appendices.

In this second edition, the following recent papers have been added: "Gauss Codes, Quantum Groups and Ribbon Hopf Algebras", "Spin Networks, Topology and Discrete Physics", "Link Polynomials and a Graphical Calculus" and "Knots Tangles and Electrical Networks". An appendix with a discussion on invariants of embedded graphs and Vassiliev invariants has also been included. This book is an introduction to knot and link invariants as generalized amplitudes (vacuum–vacuum amplitudes) for a quasi-physical process. The demands of knot theory, coupled with a quantum statistical framework, create a context that naturally and powerfully includes an extraordinary range of interrelated topics in topology and mathematical physics. The author takes a primarily combinatorial stance toward knot theory and its relations with these subjects. This has the advantage of providing very direct access to the algebra and to the combinatorial

topology, as well as the physical ideas. This book is divided into 2 parts: Part I of the book is a systematic course in knots and physics starting from the ground up. Part II is a set of lectures on various topics related to and sometimes based on Part I. Part II also explores some side-topics such as frictional properties of knots, relations with combinatorics and knots in dynamical systems. Contents:Physical KnotsStates and the Bracket PolynomialThe Jones Polynomial and Its GeneralizationsBraids and the Jones PolynomialFormal Feynman Diagrams, Bracket as a Vacuum-Vacuum Expectation and the Quantum Group SL(2)qYang-Baxter Models for Specializations of the Homfly PolynomialThe Alexander PolynomialKnot-Crystals — Classical Knot Theory in Modern GuiseThe Kauffman PolynomialThree Manifold Invariants from the Jones PolynomialIntegral Heuristics and Witten' s InvariantsThe Chromatic PolynomialThe Potts Model and the Dichromatic PolynomialThe Penrose Theory of Spin NetworksKnots and Strings — Knotted StringsDNA and Quantum Field TheoryKnots in Dynamical Systems — The Lorenz Attractorand other papers Readership: Physicists, mathematical physicists and mathematicians. keywords: Reviews of the First Edition: "It is an attractive book for physicists with profuse and often entertaining illustrations … proofs … seldom heavy and nearly always well explained with pictures… succeeds in infusing his own excitement and enthusiasm for these discoveries and their potential implications." Physics Today "… here is a gold mine where, with care and patience, one should get acquainted with a beautiful subject under the guidance of a most original and imaginative mind." Mathematical Reviews

This volume is a collection of research papers devoted to the study of relationships between knot theory and the foundations of mathematics, physics, chemistry, biology and psychology. Included are reprints of the work of Lord Kelvin (Sir William Thomson) on the 19th century theory of vortex atoms, reprints of modern papers on knotted flux in physics and in fluid dynamics and knotted wormholes in general relativity. It also includes papers on Witten's approach to knots via quantum field theory and applications of this approach to quantum gravity and the Ising model in three dimensions. Other papers discuss the topology of RNA folding in relation to invariants of graphs and Vassiliev invariants, the entanglement structures of polymers, the synthesis of molecular Mobius strips and knotted molecules. The book begins with an article on the applications of knot theory to the foundations of mathematics and ends with an article on topology and visual perception. This volume will be of immense interest to all workers interested in new possibilities in the uses of knots and knot theory.

The Second Edition of this practical and comprehensive resource offers a multitude of ways to incorporate literature into teaching and learning across a range of disciplines. Future and practicing teachers, librarians, instructional coaches, and school leaders can implement the ideas within this text to improve the literacy skills and knowledge of students, while also addressing standards and curricular goals of various content areas. The new edition recognizes a paradigm shift from content areas to disciplines, reflecting the specific ways reading and writing are used in different fields of study. Updated with current research and practices, the volume recommends and evaluates books in different genres and categories, with chapters on informational books; fiction; biography and memoir; poetry; and hands-on and how-to books. For every category, Kane provides a rationale, instructional strategies, and author studies, as well as lists and descriptions of books related to curricular areas. With a wealth of activities and new BookTalks, this Second Edition is greatly revised and features expanded attention to technology, digital learning, diversity, and culture. Using this text will create opportunities for deep discussions and will stimulate students' interest and motivation to read and learn. Integrating Literature in the Disciplines helps educators identify books that fit with any subject to enhance the creative and affective dimensions of school life; encourages interdisciplinary connections; and increases the depth and relevance of lessons. It is ideal for professional development and serves as a tool for Readers' Advisory to match books with readers throughout the school day and beyond.

This book introduces the study of knots, providing insights into recent applications in DNA research and graph theory. It sets forth fundamental facts such as knot diagrams, braid representations, Seifert surfaces, tangles, and Alexander polynomials. It also covers more recent developments and special topics, such as chord diagrams and covering spaces. The author avoids advanced mathematical terminology and intricate techniques in algebraic topology and group theory. Numerous diagrams and exercises help readers understand and apply the theory. Each chapter includes a supplement with interesting historical and mathematical comments.

This book is a survey of current topics in the mathematical theory of knots. For a mathematician, a knot is a closed loop in 3-dimensional space: imagine knotting an extension cord and then closing it up by inserting its plug into its outlet. Knot theory is of central importance in pure and applied mathematics, as it stands at a crossroads of topology, combinatorics, algebra, mathematical physics and biochemistry. * Survey of mathematical knot theory * Articles by leading world authorities * Clear exposition, not over-technical * Accessible to readers with undergraduate background in mathematics

"A key aspect of DNA is its ability to form a variety of structures, this book explains the origins and importance of such structures"--Provided by publisher.

This book provides an introduction to hyperbolic geometry in dimension three, with motivation and applications arising from knot theory. Hyperbolic geometry was first used as a tool to study knots by Riley and then Thurston in the 1970s. By the 1980s, combining work of Mostow and Prasad with Gordon and Luecke, it was known that a hyperbolic structure on a knot complement in the 3-sphere gives a complete knot invariant. However, it remains a difficult problem to relate the hyperbolic geometry of a knot to other invariants arising from knot theory. In particular, it is difficult to determine hyperbolic geometric information from a knot diagram, which is classically used to describe a knot. This textbook provides background on these problems, and tools to determine hyperbolic information on knots. It also includes results and state-of-the art techniques on hyperbolic geometry and knot theory to date. The book was written to be interactive, with many examples and exercises. Some important results are left to guided exercises. The level is appropriate for graduate students with a basic background in algebraic topology, particularly fundamental groups and covering spaces. Some experience with some differential topology and Riemannian geometry will also be helpful.

Mathematical gauge theory studies connections on principal bundles, or, more precisely, the solution spaces of certain partial differential equations for such connections. Historically, these equations have come from mathematical physics, and play an important role in the description of the electro-weak and strong nuclear forces. The use of gauge theory as a tool for studying topological properties of four-manifolds was pioneered by the fundamental work of Simon Donaldson in the early 1980s, and was revolutionized by the introduction of the Seiberg-Witten equations in the mid-1990s. Since the birth of the subject, it has retained its close connection with symplectic topology. The analogy between these two fields of study was further underscored by Andreas Floer's construction of an infinite-dimensional variant of Morse theory that applies in two a priori different contexts: either to define symplectic invariants for pairs of Lagrangian submanifolds of a symplectic manifold, or to define topological invariants for three-manifolds, which fit into a framework for calculating invariants for smooth four-manifolds. ``Heegaard Floer homology'', the recently-discovered invariant for three- and four-manifolds, comes from an application of Lagrangian Floer homology to spaces associated to Heegaard diagrams. Although this theory is conjecturally isomorphic to Seiberg-Witten theory, it is more topological and combinatorial in flavor and thus easier to work with in certain contexts. The interaction between gauge theory, low-dimensional topology, and symplectic geometry has led to a number of striking new developments in these fields. The aim of this volume is to introduce graduate students and researchers in other fields to some of these exciting developments, with a special emphasis on the very fruitful interplay between

disciplines. This volume is based on lecture courses and advanced seminars given at the 2004 Clay Mathematics Institute Summer School at the Alfred Renyi Institute of Mathematics in Budapest, Hungary. Several of the authors have added a considerable amount of additional material to that presented at the school, and the resulting volume provides a state-of-the-art introduction to current research, covering material from Heegaard Floer homology, contact geometry, smooth four-manifold topology, and symplectic four-manifolds.

A long-overdue reassessment of one of the most important and influential woman artists working at midcentury Anni Albers (1899–1994) was a German textile designer, weaver, and printmaker, and among the leading pioneers of 20th-century modernism. Although she has heavily influenced generations of artists and designers, her contribution to modernist art history has been comparatively overlooked, especially in relation to that of her husband, Josef. In this groundbreaking and beautifully illustrated volume, Albers's most important works are examined to fully explore and redefine her contribution to 20th-century art and design and highlight her significance as an artist in her own right. Featured works—from her early activity at the Bauhaus as well as from her time at Black Mountain College, and spanning her entire fruitful career—include wall hangings, designs for commercial use, drawings and studies, jewelry, and prints. Essays by international experts focus on key works and themes, relate aspects of Albers's practice to her seminal texts On Designing and On Weaving, and identify broader contextual material, including examples of the Andean textiles that Albers collected and in which she found inspiration for her understanding of woven thread as a form of language. Illuminating Albers's skill as a weaver, her material awareness, and her deep understanding of art and design, this publication celebrates an artist of enormous importance and showcases the timeless nature of her creativity.

This book is an introduction to the remarkable work of Vaughan Jones and Victor Vassiliev on knot and link invariants and its recent modifications and generalizations, including a mathematical treatment of Jones-Witten invariants. It emphasizes the geometric aspects of the theory and treats topics such as braids, homeomorphisms of surfaces, surgery of 3-manifolds (Kirby calculus), and branched coverings. This attractive geometric material, interesting in itself yet not previously gathered in book form, constitutes the basis of the last two chapters, where the Jones-Witten invariants are constructed via the rigorous skein algebra approach (mainly due to the Saint Petersburg school). Unlike several recent monographs, where all of these invariants are introduced by using the sophisticated abstract algebra of quantum groups and representation theory, the mathematical prerequisites are minimal in this book. Numerous figures and problems make it suitable as a course text and for self-study.

In this book, experts in different fields of mathematics, physics, chemistry and biology present unique forms of knots which satisfy certain preassigned criteria relevant to a given field. They discuss the shapes of knotted magnetic flux lines, the forms of knotted arrangements of bistable chemical systems, the trajectories of knotted solitons, and the shapes of knots which can be tied using the shortest piece of elastic rope with a constant diameter.

Knots are familiar objects. We use them to moor our boats, to wrap our packages, to tie our shoes. Yet the mathematical theory of knots quickly leads to deep results in topology and geometry. The Knot Book is an introduction to this rich theory, starting from our familiar understanding of knots and a bit of college algebra and finishing with exciting topics of current research. The Knot Book is also about the excitement of doing mathematics. Colin Adams engages the reader with fascinating examples, superb figures, and thought-provoking ideas. He also presents the remarkable applications of knot theory to modern chemistry, biology, and physics. This is a compelling book that will comfortably escort you into the marvelous world of knot theory. Whether you are a mathematics student, someone working in a related field, or an amateur mathematician, you will find much of interest in The Knot Book.

The Only Undergraduate Textbook to Teach Both Classical and Virtual Knot Theory An Invitation to Knot Theory: Virtual and Classical gives advanced undergraduate students a gentle introduction to the field of virtual knot theory and mathematical research. It provides the foundation for students to research knot theory and read journal articles on their own. Each chapter includes numerous examples, problems, projects, and suggested readings from research papers. The proofs are written as simply as possible using combinatorial approaches, equivalence classes, and linear algebra. The text begins with an introduction to virtual knots and counted invariants. It then covers the normalized f-polynomial (Jones polynomial) and other skein invariants before discussing algebraic invariants, such as the quandle and biquandle. The book concludes with two applications of virtual knots: textiles and quantum computation.

These conference proceedings will be of interest to all accelerator scientists and engineers, as well as those concerned with the application of cyclotrons in various fields. The conference covers the latest developments in the science, technology and use of cyclotrons, and includes more than 25 invited talks by specialists in their respective fields. Contributions include papers on newly operating cyclotrons and facilities under construction, compact cyclotrons, cooler rings and post-accelerators, ion sources, beam dynamics, beam diagnostics, cyclotron components, systems and technologies, as well as medical applications — including radiotherapy and radioisotope production — non-medical applications, radioactive beam facilities and new projects and proposals.