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These notes deal with an area that lies at the crossroads of mathematics and physics and rest primarily on the pioneering work of Vaughan Jones and Edward Witten, who related polynomial invariants of knots to a topological quantum field theory in 2+1 dimensions. 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 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 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. 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"". Over the last fifteen years, the face of knot theory has changed due to various new theories and invariants coming from physics, topology, combinatorics and alge-bra. It suffices to mention the great progress in knot homology theory (Khovanov homology and Ozsvath-Szabo Heegaard-Floer homology), the A-polynomial which give rise to strong invariants of knots and 3-manifolds, in particular, many new unknot detectors. New to this Edition is a discussion of Heegaard-Floer homology theory and A-polynomial of classical links, as well as updates throughout the text. Knot Theory, Second Edition is notable not only for its expert presentation of knot theory’s state of the art but also for its accessibility. It is valuable as a profes-sional reference and will serve equally well as a text for a course on knot theory. 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. 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. 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. Those with an interest in knots, both young and old, will enjoy reading Why Knot? An Introduction to the Mathematical Theory of Knots. Colin Adams, well-known for his advanced research in topology and knot theory, is the author of this new book that brings his findings and his passion for the subject to a more general audience. Adams also presents a history of knot theory from its early role in chemistry to modern applications such as DNA research, dynamical systems, and fluid mechanics. Real math, unreal fun! Each copy of Why Knot? is packaged with a plastic manipulative called the Tangle®. Adams uses the Tangle because “you can open it up, tie it in a knot and then close it up again.” The Tangle is the ultimate tool for knot theory because knots are defined in mathematics as being closed on a loop. Readers use the Tangle to complete the experiments throughout the brief volume. This proceedings volume presents a diverse collection of high-quality, state-of-the-art research and survey articles written by top experts in low-dimensional topology and its applications. The focal topics include the wide range of historical and contemporary invariants of knots and links and related topics such as three- and four-dimensional manifolds, braids, virtual knot theory, quantum invariants, braids, skein modules and knot algebras, link homology, quandles and their homology; hyperbolic knots and geometric structures of three-dimensional manifolds; the mechanism of topological surgery in physical processes, knots in Nature in the sense of physical knots with applications to polymers, DNA enzyme mechanisms, and protein structure and function. The contents is based on contributions presented at the International Conference on Knots, Low-Dimensional Topology and Applications – Knots in Hellas 2016, which was held at the International Olympic Academy in Greece in July 2016. The goal of the international conference was to promote the exchange of methods and ideas across disciplines and generations, from graduate students to senior researchers, and to explore fundamental research problems in the broad fields of knot theory and low-dimensional topology. This book will benefit all researchers who wish to take their research in new directions, to learn about new tools and methods, and to discover relevant and recent literature for future study. 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. "Knot theory is a fascinating mathematical subject, with multiple links to theoretical physics. This enyclopedia is filled with valuable information on a rich and fascinating subject." – Ed Witten, Recipient of the Fields Medal "I spent a pleasant afternoon perusing the Encyclopedia of Knot Theory. It's a comprehensive compilation of clear introductions to both classical and very modern developments in the field. It will be a terrific resource for the accomplished researcher, and will also be an excellent way to lure students, both graduate and undergraduate, into the field." – Abigail Thompson, Distinguished Professor of Mathematics at University of California, Davis Knot theory has proven to be a fascinating area of mathematical research, dating back about 150 years. Encyclopedia of Knot Theory provides short, interconnected articles on a variety of active areas in knot theory, and includes beautiful pictures, deep mathematical connections, and critical applications. Many of the articles in this book are accessible to undergraduates who are working on research or taking an advanced undergraduate course in knot theory. More advanced articles will be useful to graduate students working on a related thesis topic, to researchers in another area of topology who are interested in current results in knot theory, and to scientists who study the topology and geometry of biopolymers. Features Provides material that is useful and accessible to undergraduates, postgraduates, and full-time researchers Topics discussed provide an excellent catalyst for students to explore meaningful research and gain confidence and commitment to pursuing advanced degrees Edited and contributed by top researchers in the field of knot theory Almost since the advent of skein-theoretic invariants of knots and links (the Jones, HOMFLY, and Kauffman polynomials), the important role of categories of tangles in the connection between low-dimensional topology and quantum-group theory has been recognized. The rich categorical structures naturally arising from the considerations of cobordisms have suggested functorial views of topological field theory. This book begins with a detailed exposition of the key ideas in the discovery of monoidal categories of tangles as central objects of study in low-dimensional topology. The focus then turns to the deformation theory of monoidal categories and the related deformation theory of monoidal functors, which is a proper generalization of Gerstenhaber''s deformation theory of associative algebras. These serve as the building blocks for a deformation theory of braided monoidal categories which gives rise to sequences of Vassiliev invariants of framed links, and clarify their interrelations. Contents: Knots and Categories: Monoidal Categories, Functors and Natural Transformations; A Digression on Algebras; Knot Polynomials; Smooth Tangles and PL Tangles; A Little Enriched Category Theory; Deformations: Deformation Complexes of Semigroupal Categories and Functors; First Order Deformations; Units; Extrinsic Deformations of Monoidal Categories; Categorical Deformations as Proper Generalizations of Classical Notions; and other papers. Readership: Mathematicians and theoretical physicists. Since discovery of the Jones polynomial, knot theory has enjoyed a virtual explosion of important results and now plays a significant role in modern mathematics. In a unique presentation with contents not found in any other monograph, Knot Theory describes, with full proofs, the main concepts and the latest investigations in the field. The book is divided into six thematic sections. The first part discusses "pre-Vassiliev" knot theory, from knot arithmetics through the Jones polynomial and the famous Kauffman-Murasugi theorem. The second part explores braid theory, including braids in different spaces and simple word recognition algorithms. A section devoted to the Vassiliev knot invariants follows, wherein the author proves that Vassiliev invariants are stronger than all polynomial invariants and introduces Bar-Natan's theory on Lie algebra respresentations and knots. The fourth part describes a new way, proposed by the author, to encode knots by d-diagrams. This method allows the encoding of topological objects by words in a finite alphabet. Part Five delves into virtual knot theory and virtualizations of knot and link invariants. This section includes the author's own important results regarding new invariants of virtual knots. The book concludes with an introduction to knots in 3-manifolds and Legendrian knots and links, including Chekanov's differential graded algebra (DGA) construction. Knot Theory is notable not only for its expert presentation of knot theory's state of the art but also for its accessibility. It is valuable as a professional reference and will serve equally well as a text for a course on knot theory. 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 The interface between Physics and Mathematics has been increasingly spotlighted by the discovery of algebraic, geometric, and topological properties in physical phenomena. A profound example is the relation of noncommutative geometry, arising from algebras in mathematics, to the so-called quantum groups in the physical viewpoint. Two apparently unrelated puzzles — the solubility of some lattice models in statistical mechanics and the integrability of differential equations for special problems — are encoded in a common algebraic condition, the Yang-Baxter equation. This backdrop motivates the subject of this book, which reveals Knot Theory as a highly intuitive formalism that is intimately connected to Quantum Field Theory and serves as a basis to String Theory.This book presents a didactic approach to knots, braids, links, and polynomial invariants which are powerful and developing techniques that rise up to the challenges in String Theory, Quantum Field Theory, and Statistical Physics. It introduces readers to Knot Theory and its applications through formal and practical (computational) methods, with clarity, completeness, and minimal demand of requisite knowledge on the subject. As a result, advanced undergraduates in Physics, Mathematics, or Engineering, will find this book an excellent and self-contained guide to the algebraic, geometric, and topological tools for advanced studies in theoretical physics and mathematics. Knots are familiar objects. Yet the mathematical theory of knots quickly leads to deep results in topology and geometry. This work offers an introduction to this theory, starting with our understanding of knots. It presents the applications of knot theory to modern chemistry, biology and physics. Topics in Knot Theory is a state of the art volume which presents surveys of the field by the most famous knot theorists in the world. It also includes the most recent research work by graduate and postgraduate students. The new ideas presented cover racks, imitations, welded braids, wild braids, surgery, computer calculations and plottings, presentations of knot groups and representations of knot and link groups in permutation groups, the complex plane and/or groups of motions. For mathematicians, graduate students and scientists interested in knot theory. 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. Based upon courses taught by the author in 1985, this text introduces knot and link invariants as generalized amplitudes for a quasi- physical process. Kauffman (affiliation not cited) takes a combinatorial stance toward knot theory and related topics in topology and mathematical physics. Coverage includes, for example, the frictional properties of knots, relations with combinatorics, and knots in dynamical systems. The volume is not indexed. Annotation copyrighted by Book News Inc., Portland, OR. Exercises in each chapter This exploration of combinatorics and knot theory is geared toward advanced undergraduates and graduate students. The author, Louis H. Kauffman, is a professor in the Department of Mathematics, Statistics, and Computer Science at the University of Illinois at Chicago. Kauffman draws upon his work as a topologist to illustrate the relationships between knot theory and statistical mechanics, quantum theory, and algebra, as well as the role of knot theory in combinatorics. Featured topics include state, trails, and the clock theorem; state polynomials and the duality conjecture; knots and links; axiomatic link calculations; spanning surfaces; the genus of alternative links; and ribbon knots and the Arf invariant. Key concepts are related in easy-to-remember terms, and numerous helpful diagrams appear throughout the text. The author has provided a new supplement, entitled "Remarks on Formal Knot Theory," as well as his article, "New Invariants in the Theory of Knots," first published in The American Mathematical Monthly, March 1988. More recently, Khovanov introduced link homology as a generalization of the Jones polynomial to homology of chain complexes and Ozsvath and Szabo developed Heegaard-Floer homology, that lifts the Alexander polynomial. These two significantly different theories are closely related and the dependencies are the object of intensive study. These ideas mark the beginning of a new era in knot theory that includes relationships with four-dimensional problems and the creation of new forms of algebraic topology relevant to knot theory. The theory of skein modules is an older development also having its roots in Jones discovery. Another significant and related development is the theory of virtual knots originated independently by Kauffman and by Goussarov Polyak and Viro in the '90s. All these topics and their relationships are the subject of the survey papers in this book. There have been exciting developments in the area of knot theory in recent years. They include Thurston's work on geometric structures on 3-manifolds (e.g. knot complements), Gordon–Luecke work on surgeries on knots, Jones' work on invariants of links in S3, and advances in the theory of invariants of 3-manifolds based on Jones- and Vassiliev-type invariants of links. Jones ideas and Thurston's idea are connected by the following path: hyperbolic structures, PSL(2, C) representations, character varieties, quantization of the coordinate ring of the variety to skein modules (i.e. Kauffman, bracket skein module), and finally quantum invariants of 3-manifolds. This proceedings volume covers all those exciting topics. The physical properties of knotted and linked configurations in space have long been of interest to mathematicians. More recently, these properties have become significant to biologists, physicists, and engineers among others. Their depth of importance and breadth of application are now widely appreciated and valuable progress continues to be made each year.This volume presents several contributions from researchers using computers to study problems that would otherwise be intractable. While computations have long been used to analyze problems, formulate conjectures, and search for special structures in knot theory, increased computational power has made them a staple in many facets of the field. The volume also includes contributions concentrating on models researchers use to understand knotting, linking, and entanglement in physical and biological systems. Topics include properties of knot invariants, knot tabulation, studies of hyperbolic structures, knot energies, the exploration of spaces of knots, knotted umbilical cords, studies of knots in DNA and proteins, and the structure of tight knots. Together, the chapters explore four major themes: physical knot theory, knot theory in the life sciences, computational knot theory, and geometric knot theory. 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. Colin Adams, well-known for his advanced research in topology and knot theory, is the author of this exciting new book that brings his findings and his passion for the subject to a more general audience. This beautifully illustrated comic book is appropriate for many mathematics courses at the undergraduate level such as liberal arts math, and topology. Additionally, the book could easily challenge high school students in math clubs or honors math courses and is perfect for the lay math enthusiast. Each copy of Why Knot? is packaged with a plastic manipulative called the Tangle R. Adams uses the Tangle because "you can open it up, tie it in a knot and then close it up again." The Tangle is the ultimate tool for knot theory because knots are defined in mathematics as being closed on a loop. Readers use the Tangle to complete the experiments throughout the brief volume. Adams also presents a illustrative and engaging history of knot theory from its early role in chemistry to modern applications such as DNA research, dynamical systems, and fluid mechanics. Real math, unreal fun! Completely up-to-date, illustrated throughout, and written in an accessible style, Knots and Surfaces is an account of the mathematical theory of knots and its interaction with related fields. This is an area of intense research activity, and this text provides the advanced undergraduate with a superb introduction to this exciting field. Beginning with a simple diagrammatic approach, the book proceeds through recent advances to areas of current research. Topics including topological spaces, surfaces, the fundamental group, graphs, free groups, and group presentations combine to form a coherent and highly developed theory with which to explore and explain the accessible and intuitive problems of knots and surfaces. - ;The main theme of this book is the mathematical theory of knots and its interaction with the theory of surfaces and of group presentations. Beginning with a simple diagrammatic approach to the study of knots, reflecting the artistic and geometric appeal of interlaced forms, Knots and Surfaces takes the reader through recent advances in our understanding to areas of current research. Topics included are straightforward introductions to topological spaces, surfaces, the fundamental group, graphs, free groups, and group presentations. These topics combine into a coherent and highly developed theory to explore and explain the accessible and intuitive problems of knots and surfaces. Both as an introduction to several areas of prime importance to the development of pure mathematics today, and as an account of pure mathematics in action in an unusual context, this book presents novel challenges to students and other interested readers. - This is an introduction to the basic tools of mathematics needed to understand the relation between knot theory and quantum gravity. The book begins with a rapid course on manifolds and differential forms, emphasizing how these provide a proper language for formulating Maxwell's equations on arbitrary spacetimes. The authors then introduce vector bundles, connections and curvature in order to generalize Maxwell theory to the Yang-Mills equations. The relation of gauge theory to the newly discovered knot invariants such as the Jones polynomial is sketched. Riemannian geometry is then introduced in order to describe Einstein's equations of general relativity and show how an attempt to quantize gravity leads to interesting applications of knot theory. This reprint volume focuses on recent developments in knot theory arising from mathematical physics, especially solvable lattice models, Yang-Baxter equation, quantum group and two dimensional conformal field theory. This volume is helpful to topologists and mathematical physicists because existing articles are scattered in journals of many different domains including Mathematics and Physics. This volume will give an excellent perspective on these new developments in Topology inspired by mathematical physics. This is a foundation for arithmetic topology - a new branch of mathematics which is focused upon the analogy between knot theory and number theory. Starting with an informative introduction to its origins, namely Gauss, this text provides a background on knots, three manifolds and number fields. Common aspects of both knot theory and number theory, for instance knots in three manifolds versus primes in a number field, are compared throughout the book. These comparisons begin at an elementary level, slowly building up to advanced theories in later chapters. Definitions are carefully formulated and proofs are largely self-contained. When necessary, background information is provided and theory is accompanied with a number of useful examples and illustrations, making this a useful text for both undergraduates and graduates in the field of knot theory, number theory and geometry. The book is the first systematic research completely devoted to a comprehensive study of virtual knots and classical knots as its integral part. The book is self-contained and contains up-to-date exposition of the key aspects of virtual (and classical) knot theory. Virtual knots were discovered by Louis Kauffman in 1996. When virtual knot theory arose, it became clear that classical knot theory was a small integral part of a larger theory, and studying properties of virtual knots helped one understand better some aspects of classical knot theory and encouraged the study of further problems. Virtual knot theory finds its applications in classical knot theory. Virtual knot theory occupies an intermediate position between the theory of knots in arbitrary three-manifold and classical knot theory. In this book we present the latest achievements in virtual knot theory including Khovanov homology theory and parity theory due to V O Manturov and graph-link theory due to both authors. By means of parity, one can construct functorial mappings from knots to knots, filtrations on the space of knots, refine many invariants and prove minimality of many series of knot diagrams. Graph-links can be treated as "diagramless knot theory": such "links" have crossings, but they do not have arcs connecting these crossings. It turns out, however, that to graph-links one can extend many methods of classical and virtual knot theories, in particular, the Khovanov homology and the parity theory. One of the most significant unsolved problems in mathematics is the complete classification of knots. The main purpose of this book is to introduce the reader to the use of computer programming to obtain the table of knots. The author presents this problem as clearly and methodically as possible, starting from the very basics. Mathematical ideas and concepts are extensively discussed, and no advanced background is required. This 3. edition is an introduction to classical knot theory. It contains many figures and some tables of invariants of knots. This comprehensive account is an indispensable reference source for anyone interested in both classical and modern knot theory. Most of the topics considered in the book are developed in detail; only the main properties of fundamental groups and some basic results of combinatorial group theory are assumed to be known. 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. There have been exciting developments in the area of knot theory in recent years. They include Thurston's work on geometric structures on 3-manifolds (e.g. knot complements), Gordon?Luecke work on surgeries on knots, Jones' work on invariants of links in S3, and advances in the theory of invariants of 3-manifolds based on Jones- and Vassiliev-type invariants of links. Jones ideas and Thurston's idea are connected by the following path:

hyperbolic structures, PSL(2, C) representations, character varieties, quantization of the coordinate ring of the variety to skein modules (i.e. Kauffman, bracket skein module), and finally quantum invariants of 3-manifolds. This proceedings volume covers all those exciting topics. LinKnot - Knot Theory by Computer provides a unique view of selected topics in knot theory suitable for students, research mathematicians, and readers with backgrounds in other exact sciences, including chemistry, molecular biology and physics. The book covers basic notions in knot theory, as well as new methods for handling open problems such as unknotting number, braid family representatives, invertibility, amphicheirality, undetectability, non-algebraic tangles, polyhedral links, and (2,2)-moves. Conjectures discussed in the book are explained at length. The beauty, universality and diversity of knot theory is illuminated through various non-standard applications: mirror curves, fullerens, self-referential systems, and KL automata. 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.