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Interpretive Introduction to Quantum Field Theory The Quantum Theory of Fields Advanced Concepts in Quantum Field Theory Statistical Field Theory Quantum Field Theory and the Standard Model

A thorough and pedagogical introduction to phase transitions and exactly solved models in statistical physics and quantum field theory. Quantum field theory is the basic mathematical framework that is used to describe elementary particles. This textbook provides a complete and essential introduction to the subject. Assuming only an undergraduate knowledge of quantum mechanics and special relativity, this book is ideal for graduate students beginning the study of elementary particles. The step-by-step presentation begins with basic concepts illustrated by simple examples, and proceeds through historically important results to thorough treatments of modern topics such as the renormalization group, spinor-helicity methods for quark and gluon scattering, magnetic monopoles, instantons, supersymmetry, and the unification of forces. The book is written in a modular format, with each chapter as self-contained as possible, and with the necessary prerequisite material clearly identified. It is based on a year-long course given by the author and contains extensive problems, with password protected solutions available to lecturers at www.cambridge.org/9780521864497. A modern introduction to quantum field theory for graduates, providing intuitive, physical explanations supported by real-world applications and homework problems. Introductory text for graduate students in physics taking a year-long course in quantum mechanics in which the third quarter is devoted to relativistic wave equations and field theory. Answers to selected problems. 1972 edition. In recent years topology has firmly established itself as an important part of the physicist's mathematical arsenal. It has many applications, first of all in quantum field theory, but increasingly also in other areas of physics. The main focus of this book is on the results of quantum field theory that are obtained by topological methods. Some aspects of the theory of condensed matter are also discussed. Part I is an introduction to quantum field theory: it discusses the basic Lagrangians used in the theory of elementary particles. Part II is devoted to the applications of topology to quantum field theory. Part III covers the necessary mathematical background in summary form. The book is aimed at physicists interested in applications of topology to physics and at mathematicians wishing to familiarize themselves with quantum field theory and the mathematical methods used in this field. It is accessible to graduate students in physics and mathematics. Comprehensive introduction to quantum field theory by Nobel Laureate Steven

Weinberg, now available in paperback. This monograph is devoted to monoidal categories and their connections with 3-dimensional topological field theories. Starting with basic definitions, it proceeds to the forefront of current research. Part 1 introduces monoidal categories and several of their classes, including rigid, pivotal, spherical, fusion, braided, and modular categories. It then presents deep theorems of Müger on the center of a pivotal fusion category. These theorems are proved in Part 2 using the theory of Hopf monads. In Part 3 the authors define the notion of a topological quantum field theory (TQFT) and construct a Turaev-Viro-type 3-dimensional state sum TQFT from a spherical fusion category. Lastly, in Part 4 this construction is extended to 3-manifolds with colored ribbon graphs, yielding a so-called graph TQFT (and, consequently, a 3-2-1 extended TQFT). The authors then prove the main result of the monograph: the state sum graph TQFT derived from any spherical fusion category is isomorphic to the Reshetikhin-Turaev surgery graph TQFT derived from the center of that category. The book is of interest to researchers and students studying topological field theory, monoidal categories, Hopf algebras and Hopf monads. This book is a modern introduction to the ideas and techniques of quantum field theory. After a brief overview of particle physics and a survey of relativistic wave equations and Lagrangian methods, the author develops the quantum theory of scalar and spinor fields, and then of gauge fields. The emphasis throughout is on functional methods, which have played a large part in modern field theory. The book concludes with a brief survey of "topological" objects in field theory and, new to this edition, a chapter devoted to supersymmetry. Graduate students in particle physics and high energy physics will benefit from this book. Following on from the successful first (1984) and revised (1993) editions, this extended and revised text is designed as a short and simple introduction to quantum field theory for final year physics students and for postgraduate students beginning research in theoretical and experimental particle physics. The three main objectives of the book are to: Explain the basic physics and formalism of quantum field theory To make the reader proficient in theory calculations using Feynman diagrams To introduce the reader to gauge theories, which play a central role in elementary particle physics. Thus, the first ten chapters deal with QED in the canonical formalism, and are little changed from the first edition. A brief introduction to gauge theories (Chapter 11) is then followed by two sections, which may be read independently of each other. They cover QCD and related topics (Chapters 12-15) and the unified electroweak theory (Chapters 16 - 19) respectively. Problems are provided at the end of each chapter. New to this edition: Five new chapters, giving an introduction to quantum chromodynamics and the methods used to understand it: in particular, path integrals and the renormalization group. The treatment of electroweak interactions has been revised and updated to take account of more recent experiments. This book provides an understanding of conformal field theory and its importance to both statistical mechanics and string theory. It introduces the Wess-Zumino-Novokov-Witten (WZNW) models and their current algebras, the affine Kac-Moody algebras. By incorporating extensive student input and innovative teaching methodologies, this book aims to make the process of learning quantum field theory easier, and thus more rapid, profound, and efficient, for both students and instructors. Comprehensive explanations are favored over conciseness, every step in derivations is included, and 'big picture' overviews are provided throughout. Typical student responses indicate how well the text achieves its aim. "[This] book ... makes quantum field theory much easier to understand!" "Thanks for ... making quantum field theory clearer!" "Awesome. .. approach and presentation .. just awesome !!! "Best presentation of QFT I have ever seen .... marvelous!!!. " transforms learning QFT from being a hazardous endeavor to actually being an enjoyable thing to do." "Great job .. extremely clear ... guided me through many ambiguities

.. I wasn't able to work out with any other book." .."truly special... extraordinary text. For me, ... a big relief .. finding [this] text." The book focuses on the canonical quantization approach, but also provides an introductory chapter on path integrals. It covers fundamental principles of quantum field theory, then develops quantum electrodynamics in depth. The second edition incorporates suggestions from readers to make certain sections even clearer and easier to understand. See the first few chapters at www.quantumfieldtheory.info. A fully updated edition of the classic text by acclaimed physicist A. Zee Since it was first published, Quantum Field Theory in a Nutshell has quickly established itself as the most accessible and comprehensive introduction to this profound and deeply fascinating area of theoretical physics. Now in this fully revised and expanded edition, A. Zee covers the latest advances while providing a solid conceptual foundation for students to build on, making this the most up-to-date and modern textbook on quantum field theory available. This expanded edition features several additional chapters, as well as an entirely new section describing recent developments in quantum field theory such as gravitational waves, the helicity spinor formalism, on-shell gluon scattering, recursion relations for amplitudes with complex momenta, and the hidden connection between Yang-Mills theory and Einstein gravity. Zee also provides added exercises, explanations, and examples, as well as detailed appendices, solutions to selected exercises, and suggestions for further reading. The most accessible and comprehensive introductory textbook available Features a fully revised, updated, and expanded text Covers the latest exciting advances in the field Includes new exercises Offers a one-of-a-kind resource for students and researchers Leading universities that have adopted this book include: Arizona State University Boston University Brandeis University Brown University California Institute of Technology Carnegie Mellon College of William & Mary Cornell Harvard University Massachusetts Institute of Technology Northwestern University Ohio State University Princeton University Purdue University - Main Campus Rensselaer Polytechnic Institute Rutgers University - New Brunswick Stanford University University of California - Berkeley University of Central Florida University of Chicago University of Michigan University of Montreal University of Notre Dame Vanderbilt University Virginia Tech University Intended for graduate courses or for independent study, this book presents the basic theory of fields. The first part begins with a discussion of polynomials over a ring, the division algorithm, irreducibility, field extensions, and embeddings. The second part is devoted to Galois theory. The third part of the book treats the theory of binomials. The book concludes with a chapter on families of binomials - the Kummer theory. Extensively classroom-tested, A Course in Field Theory provides material for an introductory course for advanced undergraduate and graduate students in physics. Based on the author's course that he has been teaching for more than 20 years, the text presents complete and detailed coverage of the core ideas and theories in quantum field theory. The Problem Book in Quantum Field Theory contains about 200 problems with solutions or hints that help students to improve their understanding and develop skills necessary for pursuing the subject. It deals with the Klein-Gordon and Dirac equations, classical field theory, canonical quantization of scalar, Dirac and electromagnetic fields, the processes in the lowest order of perturbation theory, renormalization and regularization. The solutions are presented in a systematic and complete manner. The material covered and the level of exposition make the book appropriate for graduate and undergraduate students in physics, as well as for teachers and researchers. An Introduction to Quantum Field Theory is a textbook intended for the graduate physics course covering relativistic quantum mechanics, quantum electrodynamics, and Feynman diagrams. The authors make these subjects accessible through carefully worked examples illustrating the technical aspects of the subject, and intuitive explanations of what is going on behind the mathematics. After presenting the basics of quantum electrodynamics, the authors discuss the theory of renormalization and its relation to statistical mechanics, and introduce the renormalization group. This discussion sets the stage for a discussion of the physical principles that underlie the fundamental interactions of elementary particle physics and their description by gauge field theories. This book develops quantum field theory starting from its foundation in quantum mechanics. Quantum field theory is the basic theory of elementary particle physics. In recent years, many techniques have been developed which extend and clarify this theory. This book incorporates these modern methods, giving a thoroughly modern pedagogic account which starts from first principles. The path integral formulation is introduced right at the beginning. The method of dimensional continuation is employed to regulate and renormalize the theory. This facilitates the introduction of the concepts of the renormalization group at an early stage. The notion of spontaneous symmetry breakdown is also introduced early on by the example of superfluid helium. Topics in quantum electrodynamics are described which have an analog in quantum chromodynamics. Some novel techniques are employed, such as the use of dimensional continuation to compute the Lamb shift. Many problems are included. In her third collection, Bashir (Gospel) displays an intriguingly multivalent approach to the objectivities and subjectivities of black experience reflected in her multimedia collaborations This book presents thermal field theory techniques, which can be applied in both cosmology and the theoretical description of the QCD plasma generated in heavy-ion collision experiments. It focuses on gauge interactions (whether weak or strong), which are essential in both contexts. As well as the many differences in the physics questions posed and in the microscopic forces playing a central role, the authors also explain the similarities and the techniques, such as the resummations, that are needed for developing a formally consistent perturbative expansion. The formalism is developed step by step, starting from quantum mechanics; introducing scalar, fermionic and gauge fields; describing the issues of infrared divergences; resummations and effective field theories; and incorporating systems with finite chemical potentials. With this machinery in place, the important class of real-time (dynamic) observables is treated in some detail. This is followed by an overview of a number of applications, ranging from the study of phase transitions and particle production rate computations, to the concept of transport and damping coefficients that play a ubiquitous role in current developments. The book serves as a self-contained textbook on relativistic thermal field theory for undergraduate and graduate students of theoretical high-energy physics. Modern experimental developments in condensed matter and ultracold atom physics present formidable challenges to theorists. This book provides a pedagogical introduction to quantum field theory in many-particle physics, emphasizing the applicability of the formalism to concrete problems. This second edition contains two new chapters developing path integral approaches to classical and quantum nonequilibrium phenomena. Other chapters cover a range of topics, from the introduction of many-body techniques and functional integration, to renormalization group methods, the theory of response functions, and topology. Conceptual aspects and formal methodology are emphasized, but the discussion focuses on practical experimental applications drawn largely from condensed matter physics and neighboring fields. Extended and challenging problems with fully worked solutions provide a bridge between formal manipulations and research-oriented thinking. Aimed at elevating graduate students to a level where they can engage in independent research, this book complements graduate level courses on many-particle theory. This book develops a novel approach to perturbative quantum field theory: starting with a perturbative formulation of classical field theory, quantization is achieved by means of deformation quantization of the underlying free theory and by applying the principle that as much of the classical structure as possible should be maintained. The resulting formulation of perturbative quantum field theory is a version of the Epstein-Glaser renormalization that is conceptually clear, mathematically rigorous and pragmatically useful for physicists. The connection to traditional formulations of perturbative quantum field theory is also elaborated on, and the formalism is illustrated in a wealth of examples and exercises. This book comprises the second half of a quantum field theory (QFT) course for graduate students. It gives a concise introduction to advanced concepts that are important for research in elementary particle theory. Topics include the path integral, loop expansion, Feynman rules, various regularization methods, renormalization, running couplings and the renormalization group, fixed points and asymptotic freedom, effective action, Coleman-Weinberg effective potential, fermions, the axial anomaly, QED, gauge fixing, nonabelian gauge theories, unitarity, optical theorem, Slavnov-Taylor identities, beta function of Yang-Mills theory, a heuristic derivation of asymptotic freedom, instantons in SU(N) gauge theory, theta vacua and the strong CP problem. Exercises are included and are intended for advanced graduate students or postdocs seeking to deepen their understanding of QFT. Quantum field theory, which started with Paul Dirac’s work shortly after the discovery of quantum mechanics, has produced an impressive and important array of results. Quantum electrodynamics, with its extremely accurate and well-tested predictions, and the standard model of electroweak and chromodynamic (nuclear) forces are examples of successful theories. Field theory has also been applied to a variety of phenomena in condensed matter physics, including superconductivity, superfluidity and the quantum Hall effect. The concept of the renormalization group has given us a new perspective on field theory in general and on critical phenomena in particular. At this stage, a strong case can be made that quantum field theory is the mathematical and intellectual framework for describing and understanding all physical phenomena, except possibly for a quantum theory of gravity. Quantum Field Theory: A Modern Perspective presents Professor Nair’s view of certain topics in field theory loosely knit together as it grew out of courses on field theory and particle physics taught at Columbia University and the City College of CUNY. The first few chapters, up to Chapter 12, contain material that generally goes into any course on quantum field theory, although there are a few nuances of presentation which readers may find to be different from other books. This first part of the book can be used for a general course on field theory, omitting, perhaps, the last three sections in

Chapter 3, the last two in Chapter 8 and sections 6 and 7 in Chapter 10. The remaining chapters cover some of the more modern developments over the last three decades, involving topological and geometrical features. The introduction given to the mathematical basis of this part of the discussion is necessarily brief and should be accompanied by books on the relevant mathematical topics as indicated in the bibliography. Professor Nair also concentrates on developments pertinent to a better understanding of the standard model. There is no discussion of supersymmetry, supergravity, developments in field theory inspired by string theory, etc. There is also no detailed discussion of the renormalization group. Each of these topics would require a book in its own right to do justice to the topic. Quantum Field Theory: A Modern Perspective serves as a portal to so many more topics of detailed and ongoing research, referring readers to more detailed treatments for many specific topics. The book also contains extensive references, providing readers a more comprehensive perspective on the literature and the historical development of the subject. V. Parameswaran Nair is Professor of Physics at City College of The City University of New York (CUNY). Professor Nair has held Visiting Professorships at The Abdus Salam International Center for Theoretical Physics, Rockefeller University, Institute for Advanced Study at Princeton, and Massachusetts Institute of Technology. Acclaimed by American Mathematical Monthly as "an excellent introduction,"this treatment ranges from basic definitions to important results and applications, introducing both the spirit and techniques of abstract algebra. It develops the elementary properties of rings and fields, explores extension fields and Galois theory, and examines numerous applications. 1982 edition. This advanced, accessible textbook on effective field theories uses worked examples to bring this important topic to a wider audience. These lectures recount an application of stable homotopy theory to a concrete problem in low energy physics: the classification of special phases of matter. While the joint work of the author and Michael Hopkins is a focal point, a general geometric frame of reference on quantum field theory is emphasized. Early lectures describe the geometric axiom systems introduced by Graeme Segal and Michael Atiyah in the late 1980s, as well as subsequent extensions. This material provides an entry point for mathematicians to delve into quantum field theory. Classification theorems in low dimensions are proved to illustrate the framework. The later lectures turn to more specialized topics in field theory, including the relationship between invertible field theories and stable homotopy theory, extended unitarity, anomalies, and relativistic free fermion systems. The accompanying mathematical explanations touch upon (higher) category theory, duals to the sphere spectrum, equivariant spectra, differential cohomology, and Dirac operators. The outcome of computations made using the Adams spectral sequence is presented and compared to results in the condensed matter literature obtained by very different means. The general perspectives and specific applications fuse into a compelling story at the interface of contemporary mathematics and theoretical physics. This book describes, in clear terms, the Why, What and the How of Quantum Field Theory. The raison d'etre of QFT is explained by starting from the dynamics of a relativistic particle and demonstrating how it leads to the notion of quantum fields. Non-perturbative aspects and the Wilsonian interpretation of field theory are emphasized right from the start. Several interesting topics such as the Schwinger effect, Davies-Unruh effect, Casimir effect and spontaneous symmetry breaking introduce the reader to the elegance and breadth of applicability of field theoretical concepts. Complementing the conceptual aspects, the book also develops all the relevant mathematical techniques in detail, leading e.g., to the computation of anomalous magnetic moment of the electron and the two-loop renormalisation of the self-interacting scalar field. It contains nearly a hundred problems, of varying degrees of difficulty, making it suitable for both self-study and classroom use. The rise of quantum electrodynamics

(QED) made possible a number of excellent textbooks on quantum field theory in the 1960s. However, the rise of quantum chromodynamics (QCD) and the Standard Model has made it urgent to have a fully modern textbook for the 1990s and beyond. Building on thefoundation of QED, Quantum Field Theory: A Modern Introduction presents a clear and comprehensive discussion of the gauge revolution and the theoretical and experimental evidence which makes the Standard Model the leading theory of subatomic phenomena. The book is divided into three parts: Part I,Fields and Renormalization, lays a solid foundation by presenting canonical quantization, Feynman rules and scattering matrices, and renormalization theory. Part II, Gauge Theory and the Standard Model, focuses on the Standard Model and discusses path integrals, gauge theory, spontaneous symmetrybreaking, the renormalization group, and BPHZ quantization. Part III, Non-perturbative Methods and Unification, discusses more advanced methods which now form an essential part of field theory, such as critical phenomena, lattice gauge theory, instantons, supersymmetry, quantum gravity,supergravity, and superstrings. A diagrammatic approach to introducing quantum field theory to graduate students in particle physics using Feynman diagrams. This new expanded second edition has been totally revised and corrected. The reader finds two complete new chapters. One covers the exact solution of the finite temperature Schwinger model with periodic boundary conditions. This simple model supports instanton solutions – similarly as QCD – and allows for a detailed discussion of topological sectors in gauge theories, the anomaly-induced breaking of chiral symmetry and the intriguing role of fermionic zero modes. The other new chapter is devoted to interacting fermions at finite fermion density and finite temperature. Such low-dimensional models are used to describe long-energy properties of Dirac-type materials in condensed matter physics. The large-N solutions of the Gross-Neveu, Nambu-Jona-Lasinio and Thirring models are presented in great detail, where N denotes the number of fermion flavors. Towards the end of the book corrections to the large-N solution and simulation results of a finite number of fermion flavors are presented. Further problems are added at the end of each chapter in order to guide the reader to a deeper understanding of the presented topics. This book is meant for advanced students and young researchers who want to acquire the necessary tools and experience to produce research results in the statistical approach to Quantum Field Theory. Presents recent advances of perturbative relativistic field theory in a pedagogical and straightforward way. For graduate students who intend to specialize in high-energy physics. The only graduate-level textbook on quantum field theory that fully integrates perspectives from high-energy, condensed-matter, and statistical physics Quantum field theory was originally developed to describe quantum electrodynamics and other fundamental problems in high-energy physics, but today has become an invaluable conceptual and mathematical framework for addressing problems across physics, including in condensed-matter and statistical physics. With this expansion of applications has come a new and deeper understanding of quantum field theory—yet this perspective is still rarely reflected in teaching and textbooks on the subject. Developed from a year-long graduate course Eduardo Fradkin has taught for years to students of high-energy, condensed-matter, and statistical physics, this comprehensive textbook provides a fully "multicultural" approach to quantum field theory, covering the full breadth of its applications in one volume. Brings together perspectives from high-energy, condensed-matter, and statistical physics in both the main text and exercises Takes students from basic techniques to the frontiers of physics Pays special attention to the relation between measurements and propagators and the computation of cross sections and response functions Focuses on renormalization and the renormalization group, with an emphasis on fixed points, scale invariance, and their role in quantum field theory and phase transitions Other topics include non-perturbative phenomena, anomalies, and conformal invariance Features numerous examples and extensive problem sets Also serves as an invaluable resource for researchers This comprehensive text begins with the standard quantization of electrodynamics and perturbative renormalization, advancing to functional methods, relativistic bound states, broken symmetries, nonabelian gauge fields, and asymptotic behavior. 1980 edition. Special relativity -- Point particle fields -- Field Lagrangians -- Gravity Quantum mechanics is a subject that has captured the imagination of a surprisingly broad range of thinkers, including many philosophers of science. Quantum field theory, however, is a subject that has been discussed mostly by physicists. This is the first book to present quantum field theory in a manner that makes it accessible to philosophers. Because it presents a lucid view of the theory and debates that surround the theory, An Interpretive Introduction to Quantum Field Theory will interest students of physics as well as students of philosophy. Paul Teller presents the basic ideas of quantum field theory in a way that is understandable to readers who are familiar with non-relativistic quantum mechanics. He provides information about the physics of the theory without calculational detail, and he enlightens readers on how to think about the theory physically. Along the way, he dismantles some popular myths and clarifies the novel ways in which quantum field theory is both a theory about fields and about particles. His goal is to raise questions about the philosophical implications of the theory and to offer some tentative interpretive views of his own. This provocative and thoughtful book challenges philosophers to extend their thinking beyond the realm of quantum mechanics and it challenges physicists to consider the philosophical issues that their explorations have encouraged. This volume contains a selection of expository articles on quantum field theory and statistical mechanics by James Glimm and Arthur Jaffe. They include a solution of the original interacting quantum field equations and a description of the physics which these equations contain. Quantum fields were proposed in the late 1920s as the natural framework which combines quantum theory with relativ ity. They have survived ever since. The mathematical description for quantum theory starts with a Hilbert space H of state vectors. Quantum fields are linear operators on this space, which satisfy nonlinear wave equations of fundamental physics, including coupled Dirac, Max well and Yang-Mills equations. The field operators are restricted to satisfy a "locality" requirement that they commute (or anti-commute in the case of fer mions) at space-like separated points. This condition is compatible with finite propagation speed, and hence with special relativity. Asymptotically, these fields converge for large time to linear fields describing free particles. Using these ideas a scattering theory had been developed, based on the existence of local quantum fields. A concise, beginner-friendly introduction to quantum field theory Quantum field theory is a powerful framework that extends quantum mechanics in ways that are essential in many modern applications. While it is the fundamental formalism for the study of many areas of physics, quantum field theory requires a different way of thinking, and many newcomers to the subject struggle with the transition from quantum mechanics. A Prelude to Quantum Field Theory introduces the key concepts of quantum field theory in a brief and accessible manner while never sacrificing mathematical rigor. The result is an easy-to-use textbook that distills the most general properties of the theory without overwhelming beginning students with more advanced applications. Bridges quantum mechanics and quantum field theory, emphasizing analogies and differences Emphasizes a “quantum field theoretical mindset” while maintaining mathematical rigor Obtains quantum fields as the continuum limit of a quantized system of many particles Highlights the correspondence between wave function—fundamental in quantum mechanics—and the formalism of second quantization used in quantum field theory Provides a step-by-step derivation of Feynman rules for the perturbative study of interacting theories

Introduces students to renormalization, path integrals techniques, and more Discusses more modern topics like effective field theories Ideal for both undergraduate and graduate students Proven in the classroom This text concerns continuum mechanics, electrodynamics and the mechanics of electrically polarized media, and gravity. Geared toward advanced undergraduates and graduate students, it offers an accessible approach that formulates theories according to the principle of least action. The chief advantage of this formulation is its simplicity and ease, making the physical content of classical subjects available to students of physics in a concise form. Author Davison E. Soper, a Professor of Physics at the University of Oregon, intended this treatment as a primary text for courses in classical field theory as well as a supplement for courses in classical mechanics or classical electrodynamics. Topics include fields and transformation laws, the principle of stationary action, general features of classical field theory, the mechanics of fluids and elastic solids, special types of solids, nonrelativistic approximations, and the electromagnetic field. Additional subjects include electromagnetically polarized materials, gravity, momentum conservation in general relativity, and dissipative processes. Filling an important gap in the literature, this comprehensive text develops conformal field theory from first principles. The treatment is self-contained, pedagogical, and exhaustive, and includes a great deal of background material on quantum field theory, statistical mechanics, Lie algebras and affine Lie algebras. The many exercises, with a wide spectrum of difficulty and subjects, complement and in many cases extend the text. The text is thus not only an excellent tool for classroom teaching but also for individual study. Intended primarily for graduate students and researchers in theoretical high-energy physics, mathematical physics, condensed matter theory, statistical physics, the book will also be of interest in other areas of theoretical physics and mathematics. It will prepare the reader for original research in this very active field of theoretical and mathematical physics. Introduction to Gauge Field Theory provides comprehensive coverage of modern relativistic quantum field theory, emphasizing the details of actual calculations rather than the phenomenology of the applications. Forming a foundation in the subject, the book assumes knowledge of relativistic quantum mechanics, but not of quantum field theory. The book is ideal for graduate students, advanced undergraduates, and researchers in the field of particle physics.