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Problem Book in Quantum Field Theory *Springer Science & Business Media* 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. **Quantum Field Theory** *John Wiley & Sons* A lucid, short introduction to quantum field theory that brings readers quickly to the point where they can study advanced treatises and original papers. The major areas of study include the basic formalism of quantum field theory; perturbation theory calculations using Feynman rules; and an introduction to gauge theories. Mathematical formalism is used only to clarify the material and is developed from first principles stressing physical interpretation and detailed applications. **An Introduction To Quantum Field Theory** *CRC Press* 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. **Quantum Field Theory Solutions Manual Quantum Field Theory** *John Wiley & Sons* 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. **Modern Quantum Field Theory A Concise Introduction** *Cambridge University Press* Presenting a variety of topics that are only briefly touched on in other texts, this book provides a thorough introduction to the techniques of field theory. Covering Feynman diagrams and path integrals, the author emphasizes the path integral approach, the Wilsonian approach to renormalization, and the physics of non-abelian gauge theory. It provides a thorough treatment of quark confinement and chiral symmetry breaking, topics not usually covered in other texts at this level. The Standard Model of particle physics is discussed in detail. Connections with condensed matter physics are explored, and there is a brief, but detailed, treatment of non-perturbative semi-classical methods. Ideal for graduate students in high energy physics and condensed matter physics, the book contains many problems,which help students practise the key techniques of quantum field theory. **Problems in Quantum Field Theory With Fully-Worked Solutions** *Cambridge University Press* A collection of problems in QFT, with complete solutions, for graduate students taking their first or second course. **Quantum Field Theory and the Standard Model** *Cambridge University Press* Modern introduction to quantum field theory for graduates, providing intuitive, physical explanations supported by real-world applications and homework problems. **Gauge Theory of Elementary Particle Physics** *Oxford University Press* **Quantum Field Theory** *Wiley* 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. **A First Book of Quantum Field Theory** *Taylor & Francis US* This book introduces QFT for readers with no prior knowledge of the subject. It is meant to be a textbook for advanced undergraduate or beginning postgraduate students. The book discusses quantization of fields, S-matrix theory, Feynman diagrams, calculation of decay rates and cross sections, renormalization, symmetries and symmetry breaking. Some background material on classical field theory and group theory, needed for the exposition, are also presented in the book. Detailed calculations of weak and electromagnetic processes are included. There are many exercise problems to help the students, instructors and beginning researchers in the field. The second edition improves upon some notations and explanations, and includes answers to selected exercises. **Quantum Field Theory in a Nutshell Second Edition** *Princeton University Press* 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 **Quantum Field Theory** *Cambridge University Press* 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. **Quantum Field Theory for the Gifted Amateur** *Oxford University Press* Quantum field theory provides the theoretical backbone to most modern physics. This book is designed to bring quantum field theory to a wider audience of physicists. It is packed with worked examples, witty diagrams, and applications intended to introduce a new audience to this revolutionary theory. **Statistical Approach to Quantum Field Theory An Introduction** *Springer Nature* **Physics from Symmetry** *Springer* This is a textbook that derives the fundamental theories of physics from symmetry. It starts by introducing, in a completely self-contained way, all mathematical tools needed to use symmetry ideas in physics. Thereafter, these tools are put into action and by using symmetry constraints, the fundamental equations of Quantum Mechanics, Quantum Field Theory, Electromagnetism, and Classical Mechanics are derived. As a result, the reader is able to understand the basic assumptions behind, and the connections between the modern theories of physics. The book concludes with first applications of the previously derived equations. Thanks to the input of readers from around the world, this second edition has been purged of typographical errors and also contains several revised sections with improved explanations. **Field Theory A Modern Primer** *Routledge* 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. **Nuclear and Particle Physics An Introduction** *John Wiley & Sons* An accessible introduction to nuclear and particle physics with equal coverage of both topics, this text covers all the standard topics in particle and nuclear physics thoroughly and provides a few extras, including chapters on experimental methods; applications of nuclear physics including fission, fusion and biomedical applications; and unsolved problems for the future. It includes basic concepts and theory combined with current and future applications. An excellent resource for physics and astronomy undergraduates in higher-level courses, this text also serves well as a general reference for graduate studies. **Quantum Field Theory for Mathematicians** *Cambridge University Press* This should be a useful reference for anybody with an interest in quantum theory. **Diagrammatica The Path to Feynman Diagrams** *Cambridge University Press* An easily accessible introduction to quantum field theory via Feynman rules in particle physics. **A Modern Introduction to Quantum Field Theory** *Oxford University Press* The importance and the beauty of modern quantum field theory resides in the power and variety of its methods and ideas, which find application in domains as different as particle physics, cosmology, condensed matter, statistical mechanics and critical phenomena. This book introduces the reader to the modern developments in a manner which assumes no previous knowledge of quantum field theory. Along with standard topics like Feynman diagrams, the book discusses effective lagrangians, renormalization group equations, the path integral formulation, spontaneous symmetry breaking and non-abelian gauge theories. The inclusion of more advanced topics will also make this a most useful book for graduate students and researchers. **Particles and Quantum Fields** *World Scientific* This is an introductory book on elementary particles and their interactions. It starts out with many-body Schrödinger theory and second quantization and leads, via its generalization, to relativistic fields of various spins and to gravity. The text begins with the best known quantum field theory so far, the quantum electrodynamics of photon and electrons (QED). It continues by developing the theory of strong interactions between the elementary constituents of matter (quarks). This is possible due to the property called asymptotic freedom. On the way one has to tackle the problem of removing various infinities by renormalization. The divergent sums of infinitely many diagrams are performed with the renormalization group or by variational perturbation theory (VPT). The latter is an outcome of the Feynman-Kleinert variational approach to path integrals discussed in two earlier books of the author, one representing a comprehensive treatise on path integrals, the other dealing with critial phenomena. Unlike ordinary perturbation theory, VPT produces uniformly convergent series which are valid from weak to strong couplings, where they describe critical phenomena. The present book develops the theory of effective actions which allow to treat quantum phenomena with classical formalism. For example, it derives the observed anomalous power laws of strongly interacting theories from an extremum of the action. Their fluctuations are not based on Gaussian distributions, as in the perturbative treatment of quantum field theories, or in asymptotically-free theories, but on deviations from the average which are much larger and which obey power-like distributions. Exactly solvable models are discussed and their physical properties are compared with those derived from general methods. In the last chapter we discuss the problem of quantizing the classical theory of gravity. Contents: FundamentalsField Formulation of Many-Body Quantum PhysicsInteracting NonrelativisticParticlesFree Relativistic Particles and FieldsClassical RadiationRelativistic Particles and Fields in External Electromagnetic PotentialQuantization of Relativistic Free FieldsContinuous Symmetries and Conservation Laws. Noether's TheoremScattering and

Decay of ParticlesQuantum Field Theoretic Perturbation TheoryExtracting Finite Results from Perturbation Series. Regularization, RenormalizationQuantum ElectrodynamicsFormal Properties of Perturbation TheoryFunctional-Integral Representation of Quantum Field TheorySystematic Graphical Construction of Feynman DiagramsSpontaneous Symmetry BreakdownScalar Quantum ElectrodynamicsExactly Solvable O(N)-Symmetric ϕ4-Theory for Large NNonlinear σ-ModelThe Renormalization GroupCritical Properties of Nonlinear σ-ModelFunctional-Integral Calculation of Effective Action. Loop ExpansionExactly Solvable O(N)-Symmetric Four-Fermion Theory in 2+ε Dimensions Internal Symmetries of Strong InteractionsSymmetries Linking Internal and Spacetime PropertiesHadronization of Quark TheoriesWeak InteractionsNonabelian Gauge Theory of Strong InteractionsCosmology with General Curvature-Dependent LagrangianEinstein Gravity from Fluctuating Conformal GravityPurely Geometric Part of Dark Matter Readership: Students and researchers in theoretical physics. **Atmospheric Electrodynamics** *Springer Science & Business Media* This book resulted from lectures which I gave at the Universities of Kyoto, Cologne, and Bonn. Its objective is to summarize in a unifying way two other wise rather separately treated subjects of atmospheric electrodynamics: elec tric fields of atmospheric origin, in particular thunderstorm phenomena and related problems on the one hand, and magnetic fields, in particular those which are associated with electric currents of upper atmospheric origin, on the other. Geoelectricity and geomagnetism were not always considered as be longing to quite different fields of geophysics. On the contrary, they were re cognized by the physicists of the 19th and the beginning of the 20th century as two manifestations of one and the same physical phenomenon, which we pre sently refer to as electromagnetic fields. This can still be visualized from the choice of names of scientific journals. For instance, there still exists the Japanese Journal of Geomagnetism and Geoelectricity, and the former name of the present American Journal of Geophysical Research was Terrestrial Magnetism and Atmospheric Electricity. Whereas geomagnetism became the root of modern magnetospheric phys ics culminating in the space age exploration of the earth's environment, geo electricity evolved as a step-child of meteorology. The reason for this is clear. The atmospheric electric field observed on the ground reflects merely the local weather with all its frustrating unpredictability. The variable part of the geomagnetic field, however, is a useful indicator of ionospheric and magneto spheric electric current systems. **Quantum Field Theory A Modern Introduction** *Oxford University Press on Demand* Provides a comprehensive discussion of the gauge revolution and the theoretical and experimental evidence which makes the Standard Model the leading theory of subatomic phenomena. **Quarks and Leptones An Introductory Course in Modern Particle Physics** *John Wiley & Sons Incorporated* This self-contained text describes breakthroughs in our understanding of the structure and interactions of elementary particles. It provides students of theoretical or experimental physics with the background material to grasp the significance of these developments. **String Theory and M-Theory A Modern Introduction** *Cambridge University Press* String theory is one of the most exciting and challenging areas of modern theoretical physics. This book guides the reader from the basics of string theory to recent developments. It introduces the basics of perturbative string theory, world-sheet supersymmetry, space-time supersymmetry, conformal field theory and the heterotic string, before describing modern developments, including D-branes, string dualities and M-theory. It then covers string geometry and flux compactifications, applications to cosmology and particle physics, black holes in string theory and M-theory, and the microscopic origin of black-hole entropy. It concludes with Matrix theory, the AdS/CFT duality and its generalizations. This book is ideal for graduate students and researchers in modern string theory, and will make an excellent textbook for a one-year course on string theory. It contains over 120 exercises with solutions, and over 200 homework problems with solutions available on a password protected website for lecturers at www.cambridge.org/9780521860697. **Symmetries and Group Theory in Particle Physics An Introduction to Space-Time and Internal Symmetries** *Springer* Symmetries, coupled with the mathematical concept of group theory, are an essential conceptual backbone in the formulation of quantum field theories capable of describing the world of elementary particles. This primer is an introduction to and survey of the underlying concepts and structures needed in order to understand and handle these powerful tools. Specifically, in Part I of the book the symmetries and related group theoretical structures of the Minkowskian space-time manifold are analyzed, while Part II examines the internal symmetries and their related unitary groups, where the interactions between fundamental particles are encoded as we know them from the present standard model of particle physics. This book, based on several courses given by the authors, addresses advanced graduate students and non-specialist researchers wishing to enter active research in the field, and having a working knowledge of classical field theory and relativistic quantum mechanics. Numerous end-of-chapter problems and their solutions will facilitate the use of this book as self-study guide or as course book for topical lectures. **An Introduction to Quantum Field Theory** An Introduction to Quantum Field TheoryBy Mrinal Dasgupta **Electromagnetic Phenomena in Matter Statistical and Quantum Approaches** *John Wiley & Sons* Modern electrodynamics in different media is a wide branch of electrodynamics which combines the exact theory of electromagnetic fields in the presence of electric charges and currents with statistical description of these fields in gases, plasmas, liquids and solids; dielectrics, conductors and superconductors. It is widely used in physics and in other natural sciences (such as astrophysics and geophysics, biophysics, ecology and evolution of terrestrial climate), and in various technological applications (radio electronics, technology of artificial materials, laser-based technological processes, propagation of bunches of charges particles, linear and nonlinear electromagnetic waves, etc.). Electrodynamics of matter is based on the exact fundamental (microscopic) electrodynamics but is supplemented with specific descriptions of electromagnetic fields in various media using the methods of statistical physics, quantum mechanics, physics of condensed matter (including theory of superconductivity), physical kinetics and plasma physics. This book presents in one unique volume a systematic description of the main electrodynamic phenomena in matter: - A large variety of theoretical approaches used in describing various media - Numerous important manifestations of electrodynamics in matter (magnetic materials, superconductivity, magnetic hydrodynamics, holography, radiation in crystals, solitons, etc.) - A description of the applications used in different branches of physics and many other fields of natural sciences - Describes the whole complexity of electrodynamics in matter including material at different levels. - Oriented towards 3-4 year bachelors, masters, and PhD students, as well as lectures, and engineers and scientists working in the field. - The reader will need a basic knowledge of general physics, higher mathematics, classical mechanics and microscopic (fundamental) electrodynamics at the standard university level - All examples and problems are described in detail in the text to help the reader learn how to solve problems - Advanced problems are marked with one asterisk, and the most advanced ones with two asterisks. Some problems are recommended to be solved first, and are are marked by filled dots; they are more general and important or contain results used in other problems. **INTRODUCTION TO QUANTUM FIELD THEORY Quantum Theory of Finite Systems** *Mit Press* This book provides a comprehensive and pedagogical account of the various methods used in the quantum theory of finite systems, including molecular, atomic, nuclear, and particle phenomena. Covering both background material and advanced topics and including nearly 200 problems, Quantum Theory of Finite Systems has been designed to serve primarily as a text and will also prove useful as a reference in research. The first of the book's four parts introduces the basic mathematical apparatus: second quantization, canonical transformations, Wick theorems and the resulting diagram expansions, and oscillator models. The second part presents mean field approximations and the recently developed path integral methods for the quantization of collective modes. Part three develops perturbation theory in terms of both time-dependent Feynman diagrams and time-independent Goldstone diagrams. A fourth part discusses variational methods based on correlated wavefunctions, including spin correlations. The approximation schemes are formulated for fermions and bosons at eigher zero or non-zero temperature. Although the formalism developed applies to both finite and infinite systems, the book stresses those aspects of the theory that are specific to the description of finite systems. Thus special attention is given to mean field approximations, the ensuing broken symmetries, and the associated collective motions such as rotations. Conversely, some specific features of systems with infinite numbers of degrees of freedom (such as the thermodynamic limit, critical phenomena, and the elimination of ultraviolet divergencies) are deliberately omitted. Jean-Paul Blaizot and Georges Ripka are associated with the Centre d'Etudes Nucleaires de Saclay. **Equilibrium and Non-Equilibrium Statistical Thermodynamics** *Cambridge University Press* Publisher Description **Introduction to Quantum Electrodynamics Collective Electrodynamics Quantum Foundations of Electromagnetism** *MIT Press* In this book Carver Mead offers a radically new approach to the standard problems of electromagnetic theory. Motivated by the belief that the goal of scientific research should be the simplification and unification of knowledge, he describes a new way of doing electrodynamics—collective electrodynamics—that does not rely on Maxwell's equations, but rather uses the quantum nature of matter as its sole basis. Collective electrodynamics is a way of looking at how electrons interact, based on experiments that tell us about the electrons directly. (As Mead points out, Maxwell had no access to these experiments.) The results Mead derives for standard electromagnetic problems are identical to those found in any text. Collective electrodynamics reveals, however, that quantities that we usually think of as being very different are, in fact, the same—that electromagnetic phenomena are simple and direct manifestations of quantum phenomena. Mead views his approach as a first step toward reformulating quantum concepts in a clear and comprehensible manner. The book is divided into five sections: magnetic interaction of steady currents, propagating waves, electromagnetic energy, radiation in free space, and electromagnetic interaction of atoms. In an engaging preface, Mead tells how his approach to electromagnetic theory was inspired by his interaction with Richard Feynman. **Contributions in Mathematical Physics A Tribute to Gerard G. Emch** *Springer* Professor Gerard G. Emch has been one of the pioneers of the C-algebraic approach to quantum and classical statistical mechanics. In a prolific scientific career, spanning nearly five decades, Professor Emch has been one of the creative influences in the general area of mathematical physics. The present volume is a collection of tributes, from former students, colleagues and friends of Professor Emch, on the occasion of his 70th birthday. The articles featured here are a small yet representative sample of the breadth and reach of some of the ideas from mathematical physics.It is also a testimony to the impact that Professor Emch's work has had on several generations of mathematical physicists as well as to the diversity of mathematical methods used to understand them. **Introduction to Quantum Mechanics** *Cambridge University Press* Changes and additions to the new edition of this classic textbook include a new chapter on symmetries, new problems and examples, improved explanations, more numerical problems to be worked on a computer, new applications to solid state physics, and consolidated treatment of time-dependent potentials. **Quantum Mechanics Via Lie Algebras Statistical Mechanics International Series of Monographs in Natural Philosophy** *Elsevier* Statistical Mechanics discusses the fundamental concepts involved in understanding the physical properties of matter in bulk on the basis of the dynamical behavior of its microscopic constituents. The book emphasizes the equilibrium states of physical systems. The text first details the statistical basis of thermodynamics, and then proceeds to discussing the elements of ensemble theory. The next two chapters cover the canonical and grand canonical ensemble. Chapter 5 deals with the formulation of quantum statistics, while Chapter 6 talks about the theory of simple gases. Chapters 7 and 8 examine the ideal Bose and Fermi systems. In the next three chapters, the book covers the statistical mechanics of interacting systems, which includes the method of cluster expansions, pseudopotentials, and quantized fields. Chapter 12 discusses the theory of phase transitions, while Chapter 13 discusses fluctuations. The book will be of great use to researchers and practitioners from wide array of disciplines, such as physics, chemistry, and engineering. **Quantum Mechanics** *Cambridge University Press* The important changes quantum mechanics has undergone in recent years are reflected in this approach for students. A strong narrative and over 300 worked problems lead the student from experiment, through general principles of the theory, to modern applications. Stepping through results allows students to gain a thorough understanding. Starting with basic quantum mechanics, the book moves on to more advanced theory, followed by applications, perturbation methods and special fields, and ending with developments in the field. Historical, mathematical and philosophical boxes guide the student through the theory. Unique to this textbook are chapters on measurement and quantum optics, both at the forefront of current research. Advanced undergraduate and graduate students will benefit from this perspective on the fundamental physical paradigm and its applications. Online resources including solutions to selected problems, and 200 figures, with colour versions of some figures, are available at www.cambridge.org/Auletta. **The Quantum Theory of Radiation** *Courier Corporation* The first comprehensive treatment of quantum physics in any language, this classic introduction to the basic theory remains highly recommended and in wide use, both as a text and as a reference. A unified and accurate guide to the application of radiative processes, it explores the mathematics and physics of quantum theory. 1954 edition.