4 Relativistic Mechanics Home Springer

Since the discovery of the corpuscular nature of radiation by Planck more than fifty years ago the quantum theory of radiation has gone through many stages of development which seemed to alternate between spectacular success and hopeless frustration. The most recent phase started in 1947 with the discovery of the electromagnetic level shifts and the realization that the exist ing theory, when properly interpreted, was perfectly adequate to explain these effects to an apparently unlimited degree of accuracy. This phase has now reached a certain conclusion: for the first time in the checkered history of this field of research it has become possible to give a unified and consistent presen tation of radiation theory in full conformity with the principles of relativity and quantum mechanics. To this task the present book is devoted. The plan for a book of this type was conceived during the year 1951 while the first-named author (J. M. J.) held a Fulbright research scholarship at Cambridge University. During this year of freedom from teaching and other duties he had the opportunity of conferring with physicists in many different countries on the recent developments in radiation theory. The comments seemed to be almost unanimous that a book on quantum electrodynamics at the present time would be of inestimable value to physicists in many parts of the world. However, it was not until the spring of 1952 that work on the book began in earnest.

A funny, insightful, and self-contained guide to Einstein's relativity theory and classical field theories--including electromagnetism Physicist Leonard Susskind and data engineer Art Friedman are back. This time, they introduce readers to Einstein's special relativity and Maxwell's classical field theory. Using their typical brand of real math, enlightening drawings, and humor, Susskind and Friedman walk us through the complexities of waves, forces, and particles by exploring special relativity and electromagnetism. It's a must-read for both devotees of the series and any armchair physicist who wants to improve their knowledge of physics' deepest truths.

Here is a modern introduction to the theory of tensor algebra and tensor analysis. It discusses tensor algebra and introduces differential manifold. Coverage also details tensor analysis, differential forms, connection forms, and curvature tensor. In addition, the book investigates Riemannian and pseudo-Riemannian manifolds in great detail. Throughout, examples and problems are furnished from the theory of relativity and continuum mechanics.

A whole decades research collated, organised and synthesised into one single book! Following a 60-page review of the seminal treatises of Misner, Thorne, Wheeler and Weinberg on general relativity, Glendenning goes on to explore the internal structure of compact stars, white dwarfs, neutron stars, hybrids, strange quark stars, both the counterparts of neutron stars as well as of dwarfs. This is a self-contained treatment and will be of interest to graduate students in physics and astrophysics as well as others entering the field.

Der Grundkurs Theoretische Physik deckt in 7 Bänden alle für das Diplom und für Bachelor/Master-Studiengänge maßgeblichen Gebiete ab. Jeder Band vermittelt das im jeweiligen Semester notwendige theoretisch-physikalische Rüstzeug. Übungsaufgaben mit ausführlichen Lösungen dienen der Vertiefung des Stoffs. Der 4. Band behandelt die Gebiete Thermodynamik und Relativitätstheorie. Für die Neuauflage wurde er grundlegend überarbeitet und um 24 Aufgaben ergänzt. Durch die zweifarbige Gestaltung ist der Stoff jetzt noch übersichtlicher gegliedert.

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.

The aim of this book is to demonstrate to a wider audience, as well as to a more skilled audience, the many fascinating aspects of modern celestial mechanics. It sets out to do this without the use of mathematics. After giving the reader the technical tools needed for a basic understanding of the underlying physical phenomena (using only elementary mathematics), facts and figures are provided on historical events, modern discoveries and future applications. Contents are divided into major topics where the three "souls" of modern celestial mechanics (dynamical systems, Solar System and stellar systems, spaceflight dynamics) play a major role.

When one approaches the study of the quantal relativistic theory of the electron, one may be surprised by the gap which lies between the frame of the experiments, i.e. the real geometry of the space and time, and the abstraction of the complex matrices and spinors formalism employed in the presentation of the theory. This book uses a theory of the electron, introduced by David Hestenes, in which the mathematical language is the same as the one of the geometry of the space and time. Such a language not only allows one to find again the well known results concerning the one-electron atoms theory but furthermore leads easily to the resolution of problems considered for a long time without solution.

Special relativity is the basis of many fields in modern physics: particle physics, quantum field theory, high-energy astrophysics, etc. This theory is presented here by adopting a four-dimensional point of view from the start. An outstanding feature of the book is that it doesn’t restrict itself to inertial frames but considers accelerated and rotating observers. It is thus possible to treat physical effects such as the Thomas precession or the Sagnac effect in a simple yet precise manner. In the final chapters, more advanced topics like tensorial fields in spacetime, exterior calculus and relativistic hydrodynamics are addressed. In the last, brief chapter the author gives a preview of gravity and shows where it becomes incompatible with Minkowsky spacetime. Well illustrated and enriched by many historical notes, this book also presents many applications of special relativity, ranging from particle physics (accelerators, particle collisions, quark-gluon plasma) to astrophysics (relativistic jets, active galactic nuclei), and including practical applications (Sagnac gyrometers, synchrotron radiation, GPS). In addition, the book provides some mathematical developments, such as the detailed analysis of the Lorentz group and its Lie algebra. The book is suitable for students in the third year of a physics degree or on a masters course, as well as researchers and any reader interested in relativity. Thanks to the geometric approach adopted, this book should also be beneficial for the study of general relativity. “A modern presentation of special relativity must put forward its essential structures, before illustrating them using concrete applications to specific dynamical problems. Such is the challenge (so successfully met!) of the beautiful book by Éric Gourgoulhon.” (excerpt from the Foreword by Thibault Damour)

Intended for advanced undergraduates and beginning graduate students, this text is based on the highly successful course given by Walter Greiner at the University of Frankfurt, Germany. The two volumes on classical mechanics provide not only a complete survey of the topic but also an enormous number of worked examples and problems to show students clearly how to apply the abstract principles to realistic problems.

This book presents Special Relativity in a language accessible to students while avoiding the burdens of geometry, tensor calculus, space-time symmetries, and the introduction of four vectors. The search for clarity in the fundamental questions about Relativity, the discussion of historical developments before and after 1905, the strong connection to current research topics, many solved examples and problems, and illustrations of the material in colloquial discussions are the most significant and original assets of this book. Importantly for first-time students, Special Relativity is presented such that nothing needs to be called paradoxical or apparent; everything is explained. The content of this volume develops and builds on the book Relativity Matters (Springer, 2017). However, this presentation of Special Relativity does not require 4-vector tools. The relevant material has been extended and reformulated, with additional examples and clarifications. This introduction of Special Relativity offers conceptual insights reaching well beyond the usual method of teaching relativity. It considers relevant developments after the discovery of General Relativity (which itself is not presented), and advances the reader into contemporary research fields. This presentation of Special Relativity is connected to present day research topics in particle, nuclear, and high intensity pulsed laser physics and is complemented by the current cosmological perspective. The conceptual reach of Special Relativity today extends significantly further compared even to a few decades ago. As the book progresses, the qualitative and historical introduction turns into a textbook-style presentation with many detailed results derived in an explicit manner. The reader reaching the end of this text needs knowledge of classical mechanics, a good command of elementary algebra, basic knowledge of calculus, and introductory know-how of electromagnetism.

An explanation of how quantum processes may be visualised without ambiguity, in terms of a simple physical model.

The material contained in this work concerns relativistic quantum mechanics, and as such pertains to classical fields. On the one hand it is meant to serve as a text on the subject, a desire stemming from the author's fruitless searches for an adequate, up-to-date reference when lecturing on these topics. At times the supplementary material was found to exceed by far that in the assigned text. On the other hand, there is some flavor of a monograph to what follows, most particularly in the later chapters, for a major goal is to demonstrate just how far we can advance our understanding of the behavior of stable particles and their interactions without introducing quantized fields. Those wishing to describe the world in this way may view the result as a point of departure, despite the fact that their wish remains unfulfilled. Confirmed quantum-field theorists, however, will doubtless view it as a summary of just why they feel compelled to quantize the fields. Approximately half the book is devoted to the single-particle Dirac equation and its solutions. A great deal of detail is provided in this respect, and the discus sion is reasonably comprehensive. The Dirac equation is extraordinarily important in its own right, particularly as a basis for quantum electrodynamics (QED), and is thus worthy of extensive study.

Theoretical physics has become a many-faceted science. For the young stu dent it is difficult enough to cope with the overwhelming amount of new scientific material that has to be learned, let alone obtain an overview of the entire field, which ranges from mechanics through electrodynamics, quantum mechanics, field theory, nuclear and heavy-ion science, statistical mechanics, thermodynamics, and solid-state theory to elementary-particle physics. And this knowledge should be acquired in just 8-10 semesters, during which, in addition, a Diploma or Master's thesis has to be worked on or examinations prepared for. All this can be achieved only if the university teachers help to introduce the student to the new disciplines as early on as possible, in order to create interest and excitement that in turn set free essential new energy. At the Johann Wolfgang Goethe University in Frankfurt we therefore con front the student with theoretical physics immediately, in the first semester. Theoretical Mechanics I and II, Electrodynamics, and Quantum Mechanics I - An Introduction are the basic courses during the first two years. These lectures are supplemented with many mathematical explanations and much support material. After the fourth semester of studies, graduate work begins, and Quantum Mechanics II - Symmetries, Statistical Mechanics and Ther modynamics, Relativistic Quantum Mechanics, Quantum Electrodynamics, the Gauge Theory of Weak Interactions, and Quantum Chromo dynamics are obligatory.

This book provides readers with the tools needed to understand the physical basis of special relativity and will enable a confident mathematical understanding of Minkowski's picture of space-time. It features a large number of examples and exercises, ranging from the rather simple through to the more involved and challenging. Coverage includes acceleration and tensors and has an emphasis on space-time diagrams.

This monograph is a sequel to my earlier work, General Relativity and Matter [1], which will be referred to henceforth as GRM. The monograph, GRM, focuses on the full set of implications of General Relativity Theory, as a fundamental theory of matter in all domains, from elementary particle physics to cosmology. It is shown there to exhibit an explicit unification of the gravitational and electromagnetic fields of force with the inertial manifestations of matter, expressing the latter explicitly in terms of a covariant field theory within the structure of this general theory. This monograph will focus, primarily, on the special relativistic limit of the part of this general field theory of matter that deals with inertia, in the domain where quantum mechanics has been evoked in contemporary physics as a funda mental explanation for the behavior of elementary matter. Many of the results presented in this book are based on earlier published works in the journals, which will be listed in the Bibliography. These results will be presented here in an expanded form, with more discussion on the motivation and explanation for the theoretical development of the subject than space would allow in normal journal articles, and they will be presented in one place where there would then be a more unified and coherent explication of the subject.

This book introduces the current understanding of the fundamentals of nuclear physics by referring to key experimental data and by providing a theoretical understanding of principal nuclear properties. It primarily covers the structure of nuclei at low excitation in detail. It also examines nuclear forces and decay properties. In addition to fundamentals, the book treats several new research areas such as non-relativistic as well as relativistic Hartree–Fock calculations, the synthesis of super-heavy elements, the quantum chromodynamics phase diagram, and nucleosynthesis in stars, to convey to readers the flavor of current research frontiers in nuclear physics. The authors explain semi-classical arguments and derivation of its formulae. In these ways an intuitive understanding of complex nuclear phenomena is provided. The book is aimed at graduate school students as well as junior and senior undergraduate students and postdoctoral fellows. It is also useful for researchers to update their knowledge of diverse fields of nuclear structure. The book explains how basic physics such as quantum mechanics and statistical physics, as well as basic physical mathematics, is used to describe nuclear phenomena. A number of questions are given from place to place as supplements to the text.

This textbook provides an introduction to gravitational lensing, which has become an invaluable tool in modern astrophysics, with applications that range from finding planets orbiting distant stars to understanding how dark matter and dark energy conspired to form the cosmic structures we see today. Principles of Gravitational Lensing begins with Einstein’s prediction that gravity bends light, and shows how that fundamental idea has spawned a rich field of study over the past century. The gravitational deflection of light was first detected by Eddington during a solar eclipse in May 1919, launching Einstein and his theory of relativity into public view. Yet the possibility of using the phenomenon to unlock mysteries of the Universe seemed remote, given the technology of the day. Theoretical work was carried out sporadically over the next six decades, but only with the discovery of the system Q0957+561 in 1979 was gravitational lensing transformed from a curiosity of general relativity into a practical observational tool. This book describes how the three subfields known as strong lensing, weak lensing, and microlensing have grown independently but become increasingly intertwined. Drawing on their research experience, Congdon and Keeton begin with the basic physics of light bending, then present the mathematical foundations of gravitational lensing, building up to current research topics in a clear and systematic way. Relevant background material from physics and mathematics is included, making the book self-contained. The derivations and explanations are supplemented by exercises designed to help students master the theoretical concepts as well as the methods that drive current research. An extensive bibliography guides those wishing to delve more deeply into particular areas of interest. Principles of Gravitational Lensing is ideal for advanced students and seasoned researchers looking to penetrate this thriving subject and even contribute research of their own.

This book presents concepts of theoretical physics with engineering applications. The topics are of an intense mathematical nature involving tools like probability and random processes, ordinary and partial differential equations, linear algebra and infinite-dimensional operator theory, perturbation theory, stochastic differential equations, and Riemannian geometry. These mathematical tools have been applied to study problems in mechanics, fluid dynamics, quantum mechanics and quantum field theory, nonlinear dynamical systems, general relativity, cosmology, and electrodynamics. A particularly interesting topic of research interest developed in this book is the design of quantum unitary gates of large size using the Feynman diagrammatic approach to quantum field theory. Through this book, the reader will be able to observe how basic physics can revolutionize technology and also how diverse branches of mathematical physics like large deviation theory, quantum field theory, general relativity, and electrodynamics have many common issues that provide the starting point for unifying the whole of physics, namely in the formulation of Grand Unified Theories (GUTS).

Thi's book collects the contributions to the NATO Advanced Research WJrkshop on "FundaIrental Aspects of Quantum 'Iheory," held at the Centro di Cultura Scientifica "Alessandro Volta," Villa Olma, Carro, Italy, 2-7 September 1985. The rreeting was dedicated to the rremory of the late pro fessor Piero Caldirola, a prominent member of the Physics Departrrent of the University of r1ilan and a native of Como. The aim of the workshop has been to present several recent experi rrental results and theoretical developrrents concerning the various fa cets of quantum physics. The breadth of scope of the rreeting was in accordance with Professor Caldirola's vast scientific interests, and fostered communication among experirrental physicists, theoretical and mathematical physicists, and nEthematicians, working in different but related fields. Indeed, lectu rers endeavoured to make their contributions understandable to people acquainted with the problem but not necessarily familiar with the tech nical details; and these efforts were successful, as indicated by the frequent private discussions which took place among participants belon ging to different breeds and brands. 1ne rreeting was made up of six one-day sessions, each of them addres sing to a specific aspect of quantum theory: 1. General Problems and Crucial Experinents; with emphasis on sin gle-particle interference eh rirrents of neutrons and of photons, and on the rreasurerrent problem. 2. Quantization and Stochastic Processes; including stochastic quan tization of gauge fields, stochastic description of supersyrnmetric fields, quantum stochastic calculus and stochastic mechanics."

Pulsars are rapidly spinning neutron stars, the collapsed cores of once massive stars that ended their lives as supernova explosions. In this book, Geoff McNamara explores the history, subsequent discovery and contemporary research into pulsar astronomy. The story of pulsars is brought right up to date with the announcement in 2006 of a new breed of pulsar, Rotating Radio Transients (RRATs), which emit short bursts of radio signals separated by long pauses. These may outnumber conventional radio pulsars by a ratio of four to one. Geoff McNamara ends by pointing out that, despite the enormous success of pulsar research in the second half of the twentieth century, the real discoveries are yet to be made including, perhaps, the detection of the hypothetical pulsar black hole binary system by the proposed Square Kilometre Array - the largest single radio telescope in the world.

In this book, quantum mechanics is developed from the outset on a relativistic basis, using the superposition principle, Lorentz invariance and gauge invariance. Nonrelativistic quantum mechanics appears as a special case, and classical relativistic mechanics as another one. These special cases are important for giving plausible names to operators, for example "orbital angular momentum", "spin" or "magnetic moment". A subject which is treated for the first time in this book is the theory of binaries in terms of differential equations which have the mathematical structure of the corresponding one-body equations (Klein--Gordon for two spin- less particles, Dirac for two spinor particles).

R. Shankar has introduced major additions and updated key presentations in this second edition of Principles of Quantum Mechanics. New features of this innovative text include an entirely rewritten mathematical introduction, a discussion of Time-reversal invariance, and extensive coverage of a variety of path integrals and their applications. Additional highlights include: - Clear, accessible treatment of underlying mathematics - A review of Newtonian, Lagrangian, and Hamiltonian mechanics - Student understanding of quantum theory is enhanced by separate treatment of mathematical theorems and physical postulates - Unsurpassed coverage of path integrals and their relevance in contemporary physics The requisite text for advanced undergraduate- and graduate-level students, Principles of Quantum Mechanics, Second Edition is fully referenced and is supported by many exercises and solutions. The book’s self-contained chapters also make it suitable for independent study as well as for courses in applied disciplines.

Supplementing "Quantum Mechanics. An Introduction" and "Quantum Mechanics. Symmetries", this book covers an important additional course on quantum mechanics, including an introduction to quantum statistics, the structure of atoms and molecules, and the Schrödinger wave equation. 72 fully worked examples and problems consolidate the material.

This textbook bridges the gap between the level of introductory courses on mechanics and electrodynamics and the level of application in high energy physics and quantum field theory. After explaining the postulates that lead to the Lorentz transformation and after going through the main points special relativity has to make in classical mechanics and electrodynamics, the authors gradually lead the reader up to a more abstract point of view on relativistic symmetry - illustrated by physical examples - until finally motivating and developing Wigner's classification of the unitary irreducible representations of the inhomogeneous Lorentz group. Numerous historical and mathematical asides contribute to the conceptual clarification.

This advanced textbook supplies graduate students with a primer in quantum theory. A variety of processes are discussed with concepts such as potentials, classical current distributions, prescribed external fields dealt with in the framework of relativistic quantum mechanics. Then, in an introduction to field theory, the author emphasizes the deduction of the said potentials or currents. A modern presentation of the subject together with many exercises, unique in its unusual underlying concept of combining relativistic quantum mechanics with basic quantum field theory.

This is a fascinating account of two great scientists of the 20th century: Einstein and Heisenberg, discoverers, respectively, of the theory of relativity and quantum mechanics. It connects the history of modern physics to the life stories of these two extraordinary physicists.These discoveries laid the foundation of modern physics, without which our digitized world of computers, satellites, and innovative materials would not be possible. This book also describes in comprehensible terms the complicated science underlying the two discoveries.The twin biography highlights the parallels and differences of these two luminaries, showing how their work shaped the 20th century into the century of physics.

This mathematically-oriented introduction takes the point of view that students should become familiar, at an early stage, with the physics of relativistic continua and thermodynamics within the framework of special relativity. Therefore, in addition to standard textbook topics such as relativistic kinematics and vacuum electrodynamics, the reader will be thoroughly introduced to relativistic continuum and fluid mechanics. There is emphasis on the 3+1 splitting technique.

This book unies the common tensor analytical aspects in engineering and physics. Using tensor analysis enables the reader to understand complex physical phenomena from the basic principles in continuum mechanics including the turbulence, its correlations and modeling to the complex Einstein' tensor equation. The development of General Theory of Relativity and the introduction of spacetime geometry would not have been possible without the use of tensor analysis. This textbook is primarily aimed at students of mechanical, electrical, aerospace, civil and other engineering disciplines as well as of theoretical physics. It also covers the special needs of practicing professionals who perform CFD-simulation on a routine basis and would like to know more about the underlying physics of the commercial codes they use. Furthermore, it is suitable for self-study, provided that the reader has a sufficient knowledge of differential and integral calculus. Particular attention was paid to selecting the application examples. The transformation of Cartesian coordinate system into curvilinear one and the subsequent applications to conservation laws of continuum mechanics and the turbulence physics prepares the reader for fully understanding the Einstein tensor equations, which exhibits one of the most complex tensor equation in theoretical physics.

Following the approach of Lev Landau and Evgenii Lifshitz, this book introduces the theory of special and general relativity with the Lagrangian formalism and the principle of least action. This method allows the complete theory to be constructed starting from a small number of assumptions, and is the most natural approach in modern theoretical physics. The book begins by reviewing Newtonian mechanics and Newtonian gravity with the Lagrangian formalism and the principle of least action, and then moves to special and general relativity. Most calculations are presented step by step, as is done on the board in class. The book covers recent advances in gravitational wave astronomy and provides a general overview of current lines of research in gravity. It also includes numerous examples and problems in each chapter.

This book covers advanced topics in quantum mechanics, including nonrelativistic multi-particle systems, relativistic wave equations, and relativistic fields. Numerous examples for application help readers gain a thorough understanding of the subject. The presentation of relativistic wave equations and their symmetries, and the fundamentals of quantum field theory lay the foundations for advanced studies in solid-state physics, nuclear, and elementary particle physics. The authors earlier book, Quantum Mechanics, was praised for its unsurpassed clarity.

Writing a new book on the classic subject of Special Relativity, on which numerous important physicists have contributed and many books have already been written, can be like adding another epicycle to the Ptolemaic cosmology. Furthermore, it is our belief that if a book has no new elements, but simply repeats what is written in the existing literature, perhaps with a different style, then this is not enough to justify its publication. However, after having spent a number of years, both in class and research with relativity, I have come to the conclusion that there exists a place for a new book. Since it appears that somewhere along the way, mathem- ics may have obscured and prevailed to the degree that we tend to teach relativity (and I believe, theoretical physics) simply using “heavier” mathematics without the inspiration and the mastery of the classic physicists of the last century. Moreover current trends encourage the application of techniques in producing quick results and not tedious conceptual approaches resulting in long-lasting reasoning. On the other hand, physics cannot be done a ? la carte stripped from philosophy, or, to put it in a simple but dramatic context A building is not an accumulation of stones! As a result of the above, a major aim in the writing of this book has been the distinction between the mathematics of Minkowski space and the physics of r- ativity.

I.E. Tamm is one of the great figures of 20th century physics and the mentor of the late A.D. Sakharov. Together with I.M. Frank, he received the Nobel Prize in 1958 for the explanation of the Cherenkov effect. This book contains a commented selection of his most important contributions to the physical literature and essays on his contemporaries - Mandelstam, Einstein, Landau, and Bohr - as well as his contributions to Pugwash conferences. About a third of the selections originally appeared in Russian and are, to our knowledge, for the first time now available to Western readers. This volume includes a preface by Sir Rudolf Peierls, a biography compiled by Tamm's former students, V.Ya. Frenkel and B.M. Bolotovskii, and a complete bibliography.

With the aid of entertaining short stories, anecdotes, lucid explanations and straight-forward figures, this book challenges the perception that the world of physics is inaccessible to the non-expert. Beginning with Neanderthal man, it traces the evolution of human reason and understanding from paradoxes and optical illusions to gravitational waves, black holes and dark energy. On the way, it provides insights into the mind-boggling advances at the frontiers of physics and cosmology. Unsolved problems and contradictions are highlighted, and contentious issues in modern physics are discussed in a non-dogmatic way in a language comprehensible to the non-scientist. It has something for everyone.

"The standard work in the fundamental principles of quantum mechanics, indispensable both to the advanced student and to the mature research worker, who will always find it a fresh source of knowledge and stimulation." --Nature "This is the classic text on quantum mechanics. No graduate student of quantum theory should leave it unread"--W.C Schieve, University of Texas

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This book provides an in-depth and accessible description of special relativity and quantum mechanics which together form the foundation of 21st century physics. A novel aspect is that symmetry is given its rightful prominence as an integral part of this foundation. The book offers not only a conceptual understanding of symmetry, but also the mathematical tools necessary for quantitative analysis. As such, it provides a valuable precursor to more focused, advanced books on special relativity or quantum mechanics. Students are introduced to several topics not typically covered until much later in their education.These include space-time diagrams, the action principle, a proof of Noether's theorem, Lorentz vectors and tensors, symmetry breaking and general relativity. The book also provides extensive descriptions on topics of current general interest such as gravitational waves, cosmology, Bell's theorem, entanglement and quantum computing. Throughout the text, every opportunity is taken to emphasize the intimate connection between physics, symmetry and mathematics.The style remains light despite the rigorous and intensive content. The book is intended as a stand-alone or supplementary physics text for a one or two semester course for students who have completed an introductory calculus course and a first-year physics course that includes Newtonian mechanics and some electrostatics. Basic knowledge of linear algebra is useful but not essential, as all requisite mathematical background is provided either in the body of the text or in the Appendices. Interspersed through the text are well over a hundred worked examples and unsolved exercises for the student.

More than a generation of Gennan-speaking students around the world have worked their way to an understanding and appreciation of the power and beauty of modern theoretical physics - with mathematics, the most fundamental of sciences - using Walter Greiner's textbooks as their guide. The idea of developing a coherent, complete presentation of an entire field of science in a series of closely related textbooks is not a new one. Many older physicists remember with real pleasure their sense of adventure and discovery as they worked their ways through the classic series by Sommerfeld, by Planck and by Landau and Lifshitz. From the students' viewpoint, there are a great many obvious advantages to be gained through use of consistent notation, logical ordering of topics and coherence of presentation; beyond this, the complete coverage of the science provides a unique opportunity for the author to convey his personal enthusiasm and love for his subject. The present five volume set, Theoretical Physics, is in fact only that part of the complete set of textbooks developed by Greiner and his students that presents the quantum theory. I have long urged him to make the remaining volumes on classical mechanics and dynamics, on electromagnetism, on nuclear and particle physics, and on special topics available to an English-speaking audience as well, and we can hope for these companion volumes covering all of theoretical physics some time in the future.