Dynamics Of The Standard Model Cambridge Monographs On Particle Physics Nuclear Physics And Cosmology

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Dynamics of the Standard Model Princeton University Press
Exploring the phenomenology of the Large Hadron Collider (LHC) at CERN, LHC Physics focuses on the first years of data collected at the LHC as well as the experimental and theoretical tools involved. It discusses a broad spectrum of experimental and theoretical activity in particle physics, from the searches for the Higgs boson and physics beyond the Standard Model to studies of quantum chromodynamics, the B-physics sector, and the properties of dense hadronic matter in heavy-ion collisions. Covering the topics in a pedagogical manner, the book introduces the theoretical and phenomenological framework of hadron collisions and presents the current theoretical models of frontier physics. It offers overviews of the main detector components, the initial calibration procedures, and search strategies. The authors also provide explicit examples of physics analyses drawn from the recently shut down Tevatron. In the coming years, or perhaps even sooner, the LHC experiments may reveal the Higgs boson and offer insight beyond the Standard Model. Written by some of the most prominent and active researchers in particle physics, this volume equips new physicists with the theory and tools needed to understand the various LHC experiments and prepares them to make future contributions to the field.
Dynamical Symmetry Breaking In Quantum Field Theories Morgan & Claypool Publishers
Providing a complete foundation to comprehend the physics of the microworld, Advanced Particle Physics, Two-Volume Set develops the models, theoretical framework, and mathematical tools to understand current experiments and make predictions for future experiments. The set brings together a vast array of topics in modern particle physics and distill
A Prelude to Quantum Field Theory Cambridge University Press
Dynamics of the Standard ModelCambridge University Press
From Current Algebra to Quantum Chromodynamics Cambridge University Press
We examine the potential for the Large Hadron Collider to discover new physics related to strong dynamics, both within the non-perturbative regime of QCD and also due to possible extensions of the Standard Model involving new QCD-charged particles or new strong gauge groups. We first examine a phenomenological model of the QCD static potential, and determine that it predicts the existence of a bbbb tetraquark state with a narrow resonance in the four lepton channel at the LHC. We next examine a class of models where scalar dark matter couples to the Standard Model via QCD gluons and explore the signatures of QCD-charged mediators of such interactions. We conclude that mediator-specific searches can greatly improve the sensitivity of the LHC to this class of models. Next, we explore a model of new strong dynamics by introducing an additional SU(N) x U(1) gauge symmetry under which SU(5) GUT-embedded matter content is charged. We explore the discovery potential of such a model as well as the features that distinguish it from other vector-like SU(N) theories. Finally, we present an improved search method for discovering heavy supersymmetric top partners at the 13 TeV LHC in the kinematic regime with merged top jets.
Dynamical Stabilization of the Fermi Scale Cambridge University Press
How can fundamental particles exist as waves in the vacuum? How can such waves have particle properties such as inertia? What is behind the notion of “virtual” particles? Why and how do particles exert forces on one another? Not least: What are forces anyway? These are some of the central questions that have intriguing answers in Quantum Field Theory and the Standard Model of Particle Physics. Unfortunately, these theories are highly mathematical, so that most people - even many scientists - are not able to fully grasp their meaning. This book unravels these theories in a conceptual manner, using more than 180 figures and extensive explanations and will provide the nonspecialist with great insights that are not to be found in the popular science literature.
Essays to Celebrate CERN's 60th Anniversary World Scientific
Modern introduction to quantum field theory for graduates, providing intuitive, physical explanations supported by real-world applications and homework problems.
Introduction to Elementary Particle Physics Cambridge University Press
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.
An Introduction to Nuclear Physics Springer Science & Business Media
The book begins with a brief review of supersymmetry, and the construction of the minimal supersymmetric standard model and approaches to supersymmetry breaking. General non-perturbative methods are also reviewed leading to the development of holomorphy and the Affleck-Dine-Seiberg superpotential as powerful tools for analysing supersymmetric theories. Seiberg duality is discussed in detail, with many example applications provided, with special attention paid to its use in understanding dynamical supersysmmetry breaking. The Seiberg-Witten theory of monopoles is introduced through the analysis of simpler N=1 analogues. Superconformal field theories are described along with the most recent development known as "amaximization". Supergravity theories are examined in 4, 10, and 11 dimensions, allowing for a discussion of anomaly and gaugino mediation, and setting the stage for the anti- de Sitter/conformal field theory correspondence. This book is unique in containing an overview of the important developments in supersymmetry since the publication of "Suppersymmetry and Supergravity" by Wess and Bagger. It also strives to cover topics that are of interest to both formal and phenomenological theorists.
Gauge Theories of Weak Decays Springer
This first open access volume of the handbook series contains articles on the standard model of particle physics, both from the theoretical and experimental perspective. It also covers related topics, such as heavy-ion physics, neutrino physics and searches for new physics beyond the standard model. A joint CERN-Springer initiative, the "Particle Physics Reference Library" provides revised and updated contributions based on previously published material in the well-known Landolt-Boernstein series on particle physics, accelerators and detectors (volumes 21A,B1,B2,C), which took stock of the field approximately one decade ago. Central to this new initiative is publication under full open access.
Assessing the Milgromian Research Program in Cosmology World Scientific Publishing Company
A concise introduction to the cutting-edge science of particle physics The standard model of particle physics describes our current understanding of nature's fundamental particles and their interactions, yet gaps remain. For example, it does not include a quantum theory of gravity, nor does it explain the existence of dark matter. Once complete, however, the standard model could provide a unified description of the very building blocks of the

universe. Researchers have been chasing this dream for decades, and many wonder whether such a dream can ever be made a reality. Can the Laws of Physics Be Unified? is a short introduction to this exciting frontier of physics. The book is accessibly written for students and researchers across the sciences, and for scientifically minded general readers. Paul Langacker begins with an overview of the key breakthroughs that have shaped the standard model, and then describes the fundamental particles, their interactions, and their role in cosmology. He goes on to explain field theory, internal symmetries, Yang-Mills theories, strong and electroweak interactions, the Higgs boson discovery, and neutrino physics. Langacker then looks at the questions that are still unanswered: What is the nature of the mysterious dark matter and dark energy that make up roughly 95 percent of the universe? Why is there more matter than antimatter? How can we reconcile quantum mechanics and general relativity? Can the Laws of Physics Be Unified? describes the promising theoretical ideas and new experiments that could provide answers and weighs our prospects for establishing a truly unified theory of the smallest constituents of nature and their interactions.

Particles, Fields and Forces Cambridge University Press

Describing the fundamental theory of particle physics and its applications, this book provides a detailed account of the Standard Model, focusing on techniques that can produce information about real observed phenomena. The book begins with a pedagogic account of the Standard Model, introducing essential techniques such as effective field theory and path integral methods. It then focuses on the use of the Standard Model in the calculation of physical properties of particles. Rigorous methods are emphasized, but other useful models are also described. This second edition has been updated to include recent theoretical and experimental advances, such as the discovery of the Higgs boson. A new chapter is devoted to the theoretical and experimental understanding of neutrinos, and major advances in CP violation and electroweak physics have been given a modern treatment. This book is valuable to graduate students and researchers in particle physics, nuclear physics and related fields.

Your Guide to Regents Physics Essentials Princeton University Press

This is an in-depth look at baryon number violation in the Standard Model including the necessary background in finite temperature field theory, plasma dynamics and how to calculate the out of equilibrium evolution of particle number densities throughout a phase transition. It is a self-contained pedagogical review of the theoretical background to electroweak baryogenesis as well as a summary of the other prevailing mechanisms for producing the asymmetry between matter and antimatter using the Minimal Supersymmetric Standard Model as a pedagogical tool whenever appropriate.

The Theory of Almost Everything Cambridge University Press

The book gives a quite complete and up-to-date picture of the Standard Theory with an historical perspective, with a collection of articles written by some of the protagonists of present particle physics. The theoretical developments are described together with the most up-to-date experimental tests, including the discovery of the Higgs Boson and the measurement of its mass as well as the most precise measurements of the top mass, giving the reader a complete description of our present understanding of particle physics.

Particles, Fields, Quanta Cambridge University Press

This book contains a systematic and pedagogical exposition of recent developments in particle physics and cosmology. It starts with two introductory chapters on group theory and the Dirac theory. Then it proceeds with the formulation of the Standard Model (SM) of Particle Physics, particle content and symmetries, fully exploiting the material of the first two chapters. It discusses the concept of gauge symmetries and emphasizes their role in particle physics. It then analyses the Higgs mechanism and the spontaneous symmetry breaking (SSB). It explains how the particles (gauge bosons and fermions) after the SSB acquire a mass and get admixed. The various forms of the charged currents are discussed in detail as well as how the parameters of the SM, which cannot be determined by the theory, are fixed by experiment, including the recent LHC data and the Higgs discovery. Quantum chromodynamics is discussed and various low energy approximations to it are presented. The Feynman diagrams are introduced and applied, at the level of first year graduate students.Examples are the evaluation of the decay widths of the gauge bosons and some cross sections for interesting processes such as Rutherford scattering, electron-proton scattering (elementary proton or described by a form factor, and inelastic scattering) and Compton scattering.After that the classic topics like the role of C, P, CP symmetries and the experimental methods needed to verify their conservation or violation are discussed in some detail. Topics beyond the standard model, like supersymmetry for pedestrians and grand unification, are discussed.To this end neutrino oscillations, dark matter and baryon asymmetry are also briefly discussed at the first year graduate level. Finally, the book contains an exhibition of recent developments in cosmology, especially from the elementary particle point of view.

The Standard Model Cambridge University Press

This is the first quantitative treatment of elementary particle theory that is accessible to undergraduates. Using a lively, informal writing style, the author strikes a balance between quantitative rigor and intuitive understanding. The first chapter provides a detailed historical introduction to the subject. Subsequent chapters offer a consistent and modern presentation, covering the quark model, Feynman diagrams, quantum electrodynamics, and gauge theories. A clear introduction to the Feynman rules, using a simple model, helps readers learn the calculational techniques without the complications of spin. And an accessible treatment of QED shows how to evaluate tree-level diagrams. Contains an abundance of worked examples and many end-of-chapter problems.

A History of Particle Physics from 1964 to 1979 Springer Nature

University Physics is designed for the two- or three-semester calculus-based physics course. The text has been developed to meet the scope and sequence of most university physics courses and provides a foundation for a career in mathematics, science, or engineering. The book provides an important opportunity for students to learn the core concepts of physics and understand how those concepts apply to their lives and to the world around them. Due to the comprehensive nature of the material, we are offering the book in three volumes for flexibility and efficiency. Coverage and Scope Our University Physics textbook adheres to the scope and sequence of most two- and three-semester physics courses nationwide. We have worked to make physics interesting and accessible to students while maintaining the mathematical rigor inherent in the subject. With this objective in mind, the content of this textbook has been developed and arranged to provide a logical progression from fundamental to more advanced concepts, building upon what students have already learned and emphasizing connections between topics and between theory and applications. The goal of each section is to enable students not just to recognize concepts, but to work with them in ways that will be useful in later courses and future careers. The organization and pedagogical features were developed and vetted with feedback from science educators dedicated to the project. VOLUME III Unit 1: Optics Chapter 1: The Nature of Light Chapter 2: Geometric Optics and Image Formation Chapter 3: Interference Chapter 4: Diffraction Unit 2: Modern Physics Chapter 5: Relativity Chapter 6: Photons and Matter Waves Chapter 7: Quantum Mechanics Chapter 8: Atomic Structure Chapter 9: Condensed Matter Physics Chapter 10: Nuclear Physics Chapter 11: Particle Physics and Cosmology

Topics in Strong Dynamics of the Standard Model and Beyond John Wiley & Sons

The phenomenon of dynamical symmetry breaking (DSB) in quantum field theory is discussed in a detailed and comprehensive way. The deep connection between this phenomenon in condensed matter physics and particle physics is emphasized. The realizations of DSB in such realistic theories as quantum chromodynamics and electroweak theory are considered. Issues intimately connected with DSB such as critical phenomenona and effective lagrangian approach are also discussed.

A Philosophical Approach to MOND Springer

This book provides an introduction to the current state of our knowledge about the structure of matter. Gerhard Ecker describes the development of modern physics from the beginning of the quantum age to the standard model of particle physics, the fundamental theory of interactions of the microcosm. The focus lies on the most important discoveries and developments, e.g. of quantum field theory, gauge theories and the future of particle physics. The author also emphasizes the interplay between theory and experiment, which helps us to explore the deepest mysteries of nature. "Particles, Fields, Quanta" is written for everyone who enjoys physics. It offers high school graduates and students of physics in the first semesters an encouragement to understand physics more deeply. Teachers and others interested in physics will find useful insights into the world of particle physics. For advanced students, the book can serve as a comprehensive preparation for lectures on particle physics and quantum field theory. A brief outline of the mathematical structures, an index of persons with research focuses and a glossary for quick reference of important terms such as gauge theory, spin and symmetry complete the book. From the foreword by Michael Springer: “The great successes and the many open questions this book describes illustrate how immensely complicated nature is and nevertheless how much we already understand of it.” The author Gerhard Ecker studied theoretical physics with Walter Thirring at the University of Vienna. His research focus has been on theoretical particle physics, in particular during several long-term visits at CERN, the European Organisation for Nuclear Research in Geneva. In 1986 he was promoted to Professor of Theoretical Physics at the University of Vienna. Since 1977 he has given both basic lectures in theoretical physics and advanced courses on different topics in particle physics, e.g., quantum field theory, symmetry groups in particle physics and renormalisation in quantum field theory.

University Physics Oxford Master Series in Physic

There are two scientific theories that, taken together, explain the entire universe. The first, which describes the force of gravity, is widely known: Einstein’s General Theory of Relativity. But the theory that explains everything else—the Standard Model of Elementary Particles—is virtually unknown among the general public. In The Theory of Almost Everything, Robert Oerter shows how what were once thought to be separate forces of nature were combined into a single theory by some of the most brilliant minds of the twentieth century. Rich with accessible analogies and lucid prose, The Theory of Almost Everything celebrates a heretofore unsung achievement in human knowledge—and reveals the sublime structure that underlies the world as we know it.

Introduction to Elementary Particles Cambridge University Press

This clear and concise introduction to nuclear physics provides an excellent basis for a core undergraduate course in this area. The book opens by setting nuclear physics in the context of elementary particle physics and then shows how simple models can provide an understanding of the properties of nuclei, both in their ground states and excited states, and also of the nature of nuclear reactions. The book also includes chapters on nuclear fission, its application in nuclear power reactors, the role of nuclear physics in energy production and nucleosynthesis in stars. This second edition contains several additional topics: muon-catalysed fusion, the nuclear and neutrino physics of supernovae, neutrino mass and neutrino oscillations, and the biological effects of radiation. A knowledge of basic quantum mechanics and special relativity is assumed. Appendices deal with other more specialized topics. Each chapter ends with a set of problems for which outline solutions are provided.