

World Scientific Lecture Notes in Physics – Vol. 78

FOUNDATIONS OF QUANTUM CHROMODYNAMICS

Third Edition

**An Introduction to Perturbative Methods
in Gauge Theories**

T. Muta

World Scientific



Foundations Of Quantum Chromodynamics An Introduction To Perturbative Methods In Gau World Scienti

A. H. Mueller



Foundations Of Quantum Chromodynamics An Introduction To Perturbative Methods In Gau World Scienti:

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topics This is an ideal textbook on the subject of quantum chromodynamics and is essential for researchers and graduate students in high energy physics nuclear physics and mathematical physics **Whitaker's Book List** ,1988

Quantenfeldtheorie für Fußgänger: Von Teilchen zur Feldtheorie Vafa Ziaei, Quantenfeldtheorie QFT ist zweifellos eine der wichtigsten Errungenschaften der modernen Physik denn die Theorie liefert eine präzise Beschreibung aller bekannten Elementarteilchen für Energien bis hin zu Planck Skala 10^{19} GeV Ab dieser Energie wird erwartet dass QFT in sich zusammenbricht und Quantengravitation einsetzt Quantenfeldtheorie vereinheitlicht klassische Feldtheorie Spezielle Relativitätstheorie und Quantenmechanik Sie umfasst eine Reihe von Theorien die sich mit unterschiedlichsten Wechselwirkungen wie die elektromagnetische schwache und starke Wechselwirkung im subatomaren Bereich im Rahmen von quantisierten Feldern beschreiben Quantenfeldtheorie gibt eine fundamentale Antwort auf alte Fragen wie z.B. was Teilchen sind oder im Speziellen was genau Licht ist Licht ist im Rahmen der QFT weder eine Welle noch ein Teilchen es ist etwas das sowohl komplizierter aber auch viel einfacher und eleganter ist Licht ist die Manifestation elementarer Anregungen Quanten eines zugrundeliegenden Quantenfeldes des elektromagnetischen Feldes Physiker nennen diese elementaren Anregungen Photonen Diese Anregungen sind weder Wellen noch klassische Teilchen sondern eine völlig eigene Kategorie von Raumzeit Eigenschaften Die Feldanregungen zeigen manchmal ein Verhalten das entweder mit Wellen oder Teilchen in Verbindung gebracht werden können und je nach Umständen können sie sich eher wie das eine oder das andere verhalten Dieses Beispiel zeigt bereits warum wir eine viel tiefere Theorie wie QFT brauchen Subject Guide to Books in Print ,1991 **Whitaker's Books in Print** ,1990 Scientific and Technical Books and Serials in Print ,1989 **Physics Briefs** ,1982 *Forthcoming Books* Rose Army,1984-03 **Lectures on Quantum Chromodynamics** A. V. Smilga,2001

Quantum chromodynamics is the fundamental theory of strong interactions It is a physical theory describing Nature Lectures on Quantum Chromodynamics concentrates however not on the phenomenological aspect of QCD books with comprehensive coverage of phenomenological issues have been written What the reader will find in this book is a profound discussion on the theoretical foundations of QCD with emphasis on the nonperturbative formulation of the theory What is gauge symmetry on the classical and on the quantum level What is the path integral in field theory How to define the path integral on the lattice keeping intact as many symmetries of the continuum theory as possible What is the QCD vacuum state What is the effective low energy dynamics of QCD How do the ITEP sum rules work What happens if we heat and or squeeze hadronic matter Perturbative issues are also discussed How to calculate Feynman graphs What is the BRST symmetry What is the meaning of the renormalization procedure How to resum infrared and collinear singularities And so on The book is an outgrowth of the course of lectures given by the author for graduate students at ITEP in Moscow Much extra material has been added Sample Chapter s Introduction Some History 331 KB Lecture 1 1 Path Ordered Exponentials Invariant Actions 624 KB Lecture 1 2 Classical Solutions 266 KB Lecture 2 1 Topological Charge 329 KB Lecture 2 2 Explicit Solutions 338 KB Lecture 3 1

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Perturbative Quantum Chromodynamics A. H. Mueller, 1989 This book will be of great interest to advanced students and researchers in the area of high energy theoretical physics Being the most complete and updated review volume on Perturbative QCD it serves as an extremely useful textbook or reference book Some of the reviews in this volume are the best that have been written on the subject anywhere *Quantum Chromodynamics - Proceedings Of The Fifth Workshop* Herbert Martin Fried, Yves Gabellini, Berndt Muller, 2000-11-21 Contents Basic Concepts and Consequences of Stochastic Vacuum Model H G Dosch Variational Approximations for Correlation Functions in Quantum Field Theories C Martin SU 2 Gauge Theory in Covariant Maximal Abelian Gauges M Schaden The Vacuum Wave Function in Supersymmetric Matrix Theory C M Sommerfield HERA Results on Elastic Hadronic and Sub Hadronic Diffraction G Knies Deriving Effective Transport Equations for Non Abelian Plasmas D F Litim Aspects of Non Commutativity in ADS CFT A Jevicki Thermal Field Theory in Equilibrium J O Andersen Puzzling Aspects of Hot Quantum Fields T Grandou DIS Results from HERA C M Ginsburg Electroproduction of Vector Mesons T Teubner New Developments in Cosmology J W Moffat Heavy Light Physics from Lattice NRQCD T Onogi Non Relativistic Effective Theory for Perturbative Heavy Quark Antiquark Systems A H Hoang The Spin Dependence of Swift Proton Collisions N H Buttimore Numerical Investigation of Domain Wall QCD on CP PACS S Aoki When is It Possible to Use Perturbation Technique in Field Theory T N Truong and other papers Readership Researchers in high energy physics

Keywords **Quantum Chromodynamics** B. L. Ioffe, V. S. Fadin, L. N. Lipatov, 2010-01-21 Aimed at graduate students and researchers in theoretical physics this book presents the modern theory of strong interaction quantum chromodynamics QCD The book exposes various perturbative and nonperturbative approaches to the theory including chiral effective theory the problems of anomalies vacuum tunnel transitions and the problem of divergence of the perturbative series The QCD sum rules approach is exposed in detail A great variety of hadronic properties masses of mesons and baryons magnetic moments form factors quark distributions in hadrons etc have been found using this method The evolution of hadronic structure functions is presented in detail together with polarization phenomena The problem of jets in QCD is treated through

theoretical description and experimental observation The connection with Regge theory is emphasized The book covers many aspects of theory which are not discussed in other books such as CET QCD sum rules and BFKL

The Black Book of Quantum Chromodynamics John Campbell,Joey Huston,Frank Krauss,2018 The Black Book of Quantum Chromodynamics is an in depth introduction to the particle physics of current and future experiments at particle accelerators The book offers the reader an overview of practically all aspects of the strong interaction necessary to understand and appreciate modern particle phenomenology at the energy frontier It assumes a working knowledge of quantum field theory at the level of introductory textbooks used for advanced undergraduate or in standard postgraduate lectures The book expands this knowledge with an intuitive understanding of relevant physical concepts an introduction to modern techniques and their application to the phenomenology of the strong interaction at the highest energies Aimed at graduate students and researchers it also serves as a comprehensive reference for LHC experimenters and theorists This book offers an exhaustive presentation of the technologies developed and used by practitioners in the field of fixed order perturbation theory and an overview of results relevant for the ongoing research programme at the LHC It includes an in depth description of various analytic resummation techniques which form the basis for our understanding of the QCD radiation pattern and how strong production processes manifest themselves in data and a concise discussion of numerical resummation through parton showers which form the basis of event generators for the simulation of LHC physics and their matching and merging with fixed order matrix elements It also gives a detailed presentation of the physics behind the parton distribution functions which are a necessary ingredient for every calculation relevant for physics at hadron colliders such as the LHC and an introduction to non perturbative aspects of the strong interaction including inclusive observables such as total and elastic cross sections and non trivial effects such as multiple parton interactions and hadronization The book concludes with a useful overview contextualising data from previous experiments such as the Tevatron and the Run I of the LHC which have shaped our understanding of QCD at hadron colliders

Quantum Chromodynamics on the Lattice Christof Gatttringer,Christian Lang,2009-10-16 This introduction to quantum chromodynamics presents the basic concepts and calculations in a clear and didactic style accessible to those new to the field Readers will find useful methods for obtaining numerical results including pure gauge theory and quenched spectroscopy

Quantum Chromodynamics Walter Greiner,Stefan Schramm,Eckart Stein,2007-04-17 The third edition of this outstanding volume has been extensively revised and enlarged to cover all new aspects in Quantum chromodynamics It first reviews relativistic quantum field theory and details scattering theory in the framework of scalar quantum electrodynamics The book then introduces the gauge theory of quarks and gluons In addition more advanced chapters present a through discussion of perturbative and nonperturbative techniques in state of the art QCD Throughout worked out examples provide hands on experience for students in theoretical physics Research scientists will also find the book an ideal reference

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