

dynamics is governed by a Lagrangian that is invariant under a non-abelian gauge symmetry. QCD exhibits behavior that makes it an unquestionable success in describing nature's strong force; but unlike the theory of electroweak interactions, it is a remarkably difficult theory from which to make predictions.

Nevertheless, 30 years after its inception, QCD has become a mature theory. Research in the field has evolved from, at the early stages, basic understanding and confirmation of the theory, to the development of tools for precise tests of the theory and accurate determination of its parameters, and finally to a standard ingredient necessary for interpretation of experiments, particularly in the search for new phenomena.

This is not to say there are no open questions left in QCD. Some of the deepest issues, such as the permanent confinement of quarks in hadrons, remain unexplained from first principles. Rather, in the realm of very high-energy collisions, the theory has evolved to the point that it plays the role of "engineering physics," thus allowing us to interpret unequivocally the output of collider experiments designed to search for new fundamental forces and particles. Graduate students and other newcomers to the field face a monumental task in learning both experimental and theoretical aspects of QCD. Traditionally, the source of their learning has been a combination of texts and review articles that mostly discuss either the theory or experimental aspects of the strong interactions and frequently only offer a restricted selection of topics.

Quantum Chromodynamics: High Energy Experiments and Theory is the first monograph that comprehensively addresses both aspects of QCD in one place. The first two chapters of the text contain preliminaries. Chapter 3 is devoted to theory; chapters 5–13, experiment. However, because the theory and many advanced applications are developed in an earlier chapter of the book, those on experiment freely invoke sophisticated results from theory. With its combination of topics, this book, in principle, ought to be a good resource for graduate students interested in QCD theory or experiment, and the book is intended for that audience. In fact, given its comprehensive nature, this monograph ought to be a good reference volume for practitioners, too.

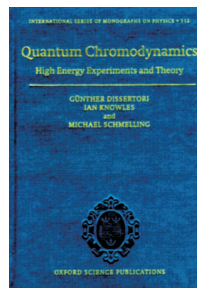
The prerequisite for reading the

book is a working knowledge of relativistic QFT. Regrettably, the quality of the presentation of theory is subpar. The problem is not just the presence of mistakes, both conceptual and algebraic. The authors' presentation all too often fails to explain the underlying physics and methodology, and arguments are often poorly justified, if at all. A number of other excellent texts on QFT cover many—but not all—of the QCD theory topics that are in this monograph. For example, Michael E. Peskin and Daniel V. Schroeder's *An Introduction to Quantum Field Theory* (Addison Wesley, 1995) beautifully succeeds in explaining asymptotic freedom, IR divergences, and parton evolution.

On the bright side, the discussions in *Quantum Chromodynamics* on experiment and Monte Carlo models are well written and pedagogic, which is perhaps expected because the authors are renowned experts in experimental particle physics. And one of them, Knowles, is an expert on Monte Carlo models. Although two chapters concisely describe the experimental setup, the extended discussion is not focused on the technology of particle accelerators and many-component detectors for colliders but, rather, on the analysis and interpretation of experimental results. In describing the modern experimental tests of QCD, the authors collect, analyze, and very effectively present results from every possible source. For these reasons, the monograph is a valuable resource.

I recommend *Quantum Chromodynamics* to practitioners of QCD for its discussion of experiments. But I would direct graduate students to alternative sources for a presentation of QCD theory before consulting this book.

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