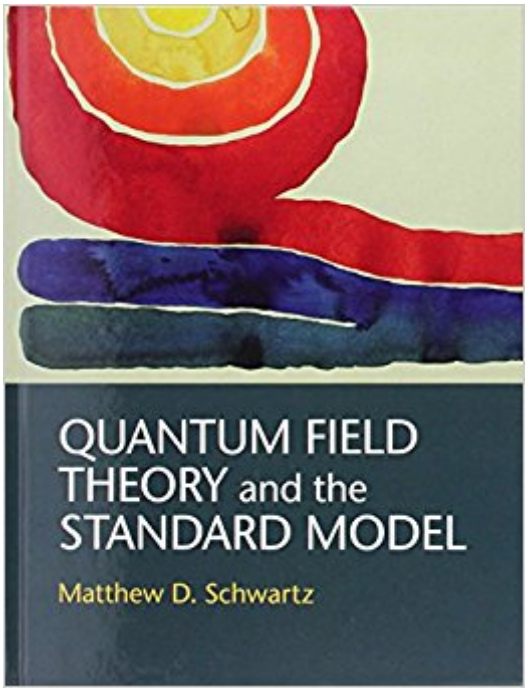
Quantum Field Theory And The Standard Model



Synopsis

Providing a comprehensive introduction to quantum field theory, this textbook covers the development of particle physics from its foundations to the discovery of the Higgs boson. Its combination of clear physical explanations, with direct connections to experimental data, and mathematical rigor make the subject accessible to students with a wide variety of backgrounds and interests. Assuming only an undergraduate-level understanding of quantum mechanics, the book steadily develops the Standard Model and state-of-the art calculation techniques. It includes multiple derivations of many important results, with modern methods such as effective field theory and the renormalization group playing a prominent role. Numerous worked examples and end-of-chapter problems enable students to reproduce classic results and to master quantum field theory as it is used today. Based on a course taught by the author over many years, this book is ideal for an introductory to advanced quantum field theory sequence or for independent study.

Book Information

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Customer Reviews

"This is an excellent graduate-level relativistic quantum field theory text, covering an impressive amount of material often with a very novel presentation. It would be ideal either for courses on relativistic quantum field theory or for courses on the Standard Model of elementary particle interactions. The book provides interesting insights and covers many modern topics not usually presented in current texts such as spinor-helicity methods and on-shell recursion relations, heavy quark effective theory and soft-collinear effective field theory. It is nice to see the modern point of view on the predictive power of non-renormalizable theories discussed. Once in a generation

particle physicists elevate a quantum field theory text to the rank of classic. Two such classics are the texts by Bjorken and Drell and Peskin and Schroeder; it wouldn't surprise me if this new book by Schwartz joins this illustrious group." Mark Wise, California Institute of Technology"A wonderful tour of quantum field theory from the modern perspective, filled with insights on both the conceptual underpinnings and the concrete, elegant calculational tools of the subject." Nima Arkani-Hamed, Institute for Advanced Study, PrincetonMatthew Schwartz has produced a new and valuable introduction to quantum field theory. He has rethought the whole presentation of the subject, from the introductory and foundational concepts to new developments such as effective field theory descriptions of quark dynamics. Students will enjoy viewing quantum field theory from his perspective." Michael E. Peskin, SLAC National Accelerator Laboratory"Schwartz's book grew out of a popular year long course in quantum field theory at Harvard. Designed primarily for graduate students, this course also attracts and inspires a number of undergraduates each year. The book is unique in its combination of breadth, depth and readability. Schwartz starts at the beginning of the subject and brings us right up to the present. That the book is neither superficial nor impossibly dense is rather remarkable and makes it easy to understand the course's success." Howard Georgi, Harvard University"In this book, Schwartz gives a thoughtful and modern treatment of many classical and contemporary topics. Students and experienced researchers will find much here of value." Edward Witten, Institute for Advanced Study, Princeton

Matthew D. Schwartz is a Professor of Physics at Harvard University. He is one of the world's leading experts on quantum field theory and its applications to the Standard Model.

Out of an extensive catalogue of field theory textbooks and review articles I consider this the most valuable text I own. Schwartz excels at clear exposition that imparts both intuition and a strong mathematical grasp of quantum field theory. After using it almost exclusively during my QFT and particle physics courses where Peskin fell short I continue to use the book in my research as a "bible" of the subject. It is truly a remarkable accomplishment to combine an excellent pedagogical treatment with clear, usable, and well-indexed reference material. Whether I'm calculating Feynman diagrams, building extended gauge symmetry models, or flipping through review articles Schwartz replaces Peskin, Weinberg, and Zee in my backpack and on my desk. Even if your class doesn't use it, or if you've finished taking courses and are doing research exclusively, you should buy this book.

The QFT perspective of this book is very much in line with Peskin & Schroeder, which is to say:1. Make sure you know how to calculate lots and lots of feynman diagrams as early as possible2. Teach you to get experimental numbers, sometimes using sketchy methods.This is great if you need to solve some problem set problems, because a lot of the calculations presented here are very explicit.There's a few complaint though:1. Schwartz is pretty sketchy with his notation.2. The emphasis is very much QFT for high energy (phenomology), aka teaching you how to be a feynman diagrammatist. QFT is a much more general subject than a theory of relativistic collider physics. In particular, it is the quantum mechanics of a continuum of particles, or the statistical theory of a continuum of particles. This is a much more intuitive perspective, and a lot of aspects about renormalization etc... do not need to involve ad hoc counterterm technologies.For books that adopt the opposite perspective, I recommend Zinn Justin's Phase Transition and the Renormalization Group, or Quantum Field theory and Critical Phenomena.

Can't recommend a better book for qft. Schwartz really lays out ideas behind qft that most other books take for granted. Srednicki is great for the details of path integral calculations, but doesn't offer the same level of pedagogy as schwartz. Zee has some quick tricks and insight that rivals schwartz but doesn't compare in terms of depth. I haven't read much from peskin and Schroeder but schwartz appears to be similar in concept, with more modern ideas, and a clearer exposition. This should be your main qft book.

The best QFT textbook I have ever read. This should be the new standard QFT textbook.

This book is absolutely great and is written by a fantastic professor whom I was very fortunate to have as my instructor. It takes all the strongest points of other Classic QFT texts like Weinberg and Peskin and Schroeder and makes them even better. The discussion of the little group is absolutely great. I could barely find any coherent sections about it in P & S and Weinberg is way too abstruse for a first read. Part two is great for learning QED and is very helpful for learning how to do calculations.

Overall, the product is brand new and of great quality, though there was a little scrape on the cover and the package was broken.

up-to-date QFT text

Short version: overall, this is the best QFT textbook available right now. It succeeds in covering a lot of ground without sacrificing accessibility. It is up to date and has some great exercises. It is also rare in that many derivations are worked out explicitly. If you are (relatively) new to the subject and want to start learning QFT, this book is probably your best bet.Longer version:About the author: Matt Schwartz is a professor at Harvard, where he has taught a very popular introductory QFT course several times over the last few years. The first half of the book (Parts I through III) arose from lecture notes that he prepared for the class, and whose contents have therefore been thoroughly student-tested (full disclosure: I was one of the students who pored over every equation in those notes). The result is the most pedagogical introduction to QFT to date. With the new material in Parts IV and V, it presents all the topics covered in an intensive year-long course.The exercises at the end of every chapter have also been student-tested and are for the most part very illuminating: youÃƒÂ¢Ã â ¬Ã â„¢ll be asked to perform illustrative calculations (the bread and butter of the subject), to explicitly derive relations from the chapter (to test your understanding) or to get some extra practice by expounding on some side topic. Either way, these exercises are a valuable resource and provide additional insight into the material (though beware: in the later chapters, some problems can be fiendishly difficult). Remember: as with any advanced subject, it is crucial that you work through some of the details on your own!The strength of the presentation lies in the authorÃƒÂ¢Ã â ¬Ã â„¢s style: Matt Schwartz is not afraid to walk you through derivations step by step and point out common misunderstandings. As a result the book often adopts a chatty style, more akin to a teacher talking to his students than to a dry and terse summary. At 900 pages, it is therefore longer than its competition, but for beginners I see this as a feature rather than a bug!Some other great features: the book does not assume much in the way of prerequisites (aside from quantum mechanics and special relativity) and even includes a chapter on classical field theory. The explanation of Feynman diagrams is really clear and many examples are provided (the diagrams are numerous and beautifully typeset). The author introduces QED gradually by working his way through scalar QED first, which allows him to focus on some important points without the complications of spinors. Below are some comparisons to similar books out there:- Peskin & Schroder: the standard QFT textbook (up to now!). The chapters are quite uneven in quality: though some are excellently written (e.g. the discussion on non-abelian gauge theory), others are quite obscure. The going is especially rough in the beginning: for instance, I remember trying to understand the discussion of LSZ in P&S and being completely lost before turning to Matt SchwartzÃƒÂ¢Ã â ¬Ã â„¢s much clearer explanation.Some discussions in P&S have also become

somewhat dated, while SchwartzÃƒÂ¢Ã â ¬Ã â„¢ book is completely up to date. It even includes a chapter on the spinor helicity formalism, the framework in which the recent work on scattering amplitudes is couched!- A. Zee's QFT in a Nutshell: this is another favorite of mine, and a great read once you've learned the basics of the subject and are looking for a different viewpoint. ItÃƒÂ¢Ã â ¬Ã â„¢s also useful for beginners who want to get to know the lay of the land. While this book offers good insights into the subject, it only works through a single computation in detail! A good companion to SchwartzÃƒÂ¢Ã â ¬Ã â„¢s book, then, but not a viable alternative.- Tom BanksÃƒÂ¢Ã â ¬Ã â„¢s book: a very concise overview of the subject, but definitely inaccessible to beginners. Banks uses the Schwinger-Dyson equation from the start, but never really explains it. Head over to Chapter 14 of Matt SchwartzÃƒÂ¢Ã â ¬Ã â„¢s book to learn about it before even thinking about attacking Banks.- Mark SrednickiÃƒÂ¢Ã â ¬Ã â„¢s book: this book starts at a higher level of abstraction and is great for a second look at QFT. SchwartzÃƒÂ¢Ã â ¬Ã â„¢s book is definitely better suited to the novice, however, as it offers a gentler introduction and is more hands on in its approach.- Weinberg's 3 volumes: notoriously difficult to learn from, but still *the* reference for certain topics. Volume 1, in particular, does the best job of explaining the structure of QFT and why most of it was inevitable. Again, not the place to learn how to compute from, but a pleasure to read after having absorbed SchwartzÃƒÂ¢Ã â ¬Ã â„¢s treatment.In summary, there are now quite a few QFT books available on the market, each with their own niche. Matt SchwartzÃƒÂ¢Ã â ¬Ã â„¢ book offers the best compromise in terms of accessibility vs completeness, and should therefore have the widest appeal.

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