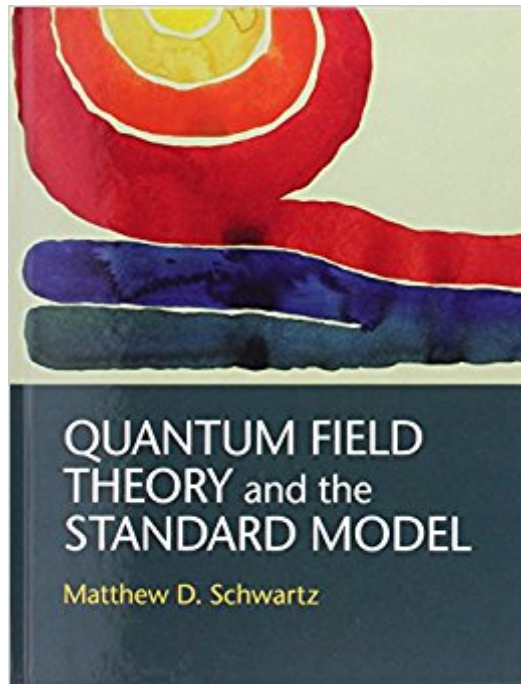


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Quantum Field Theory And The Standard Model



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

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: youâ€™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!

I was always interested in learning QFT but none of the available books (P&S, Srednicki, Zee's Nutshell) could offer me a clear understanding of the logic and reasoning behind QFT's esoteric formalism. That all changed after taking on Matthew Schwartz's book. There is so much to tell about this marvelous book, therefore I have thematically split my review into 5 sections below.

Style of presentation: This is by far the most *congenial* (not for a lack of adjective) physics book I have taken on so far! The book adopts a refreshingly friendly and colloquial writing style (much like a tutor), calling out the big picture and emphasizing the important points in every discussion. It not only explains how the theory should work, but also how it should not, by pointing out the possible naive interpretations that a novice might make; Along the same line, the author keeps comparing the new topics with previous ones, in a non-repetitive way, each time shedding more light from a different angle, which helps bolster the core ideas in the reader's mind without overwhelming him/her, allowing the reader to make some profound conceptual connections.

Intuition and depth: This is the most intuitive QFT book I have seen. Ideas that previously were merely mathematical equations became commonsense after being exposed to this book. Matthew Schwartz transcends the math beyond what is offered by the classic references in the field by adding his well-worded intuition, targeted at a graduate student.

There are so many QFT books out there that it can be hard to single one out to try to study and learn something on the subject. However, I can honestly say that this one is by far my favorite in terms of a comprehensive introduction and overview of the subject. It seems to really combine most of the advantages of other QFT books, while avoiding most of their setbacks. Like Peskin and Schroeder, it has lots of explicit examples worked out that shows you how to do the computations,

which is definitely a nontrivial part of learning QFT. On the other hand, I found this book much more organized and logically cohesive than Peskin. Peskin can at times go into long, drawn out explanations of a topic without really informing the reader why they are doing it, which can make it hard to navigate at times. Schwartz's book has no such problem; explanations are clear and logical. Perhaps one of the greatest strengths of this book is the clear and concise description it gives of how all the pieces of the standard model fit together. This book was the first one I used to read about the standard model, and I found the explanations accessible and enlightening. I also found that this book has a very good focus on conceptual issues in QFT, which again are quite significant when learning the subject. Here I would say this book is just as successful as Zee's QFT book in explaining the challenging ideas of regularization and renormalization, renormalization group, LSZ reduction and its application to amplitudes, and a gamut of other complications that come up in QFT. But this book has the advantage of connecting these conceptual ideas to explicit calculations, which are somewhat scarce in Zee's book. Finally, this book also is very rigorous in its approach to the subject.

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