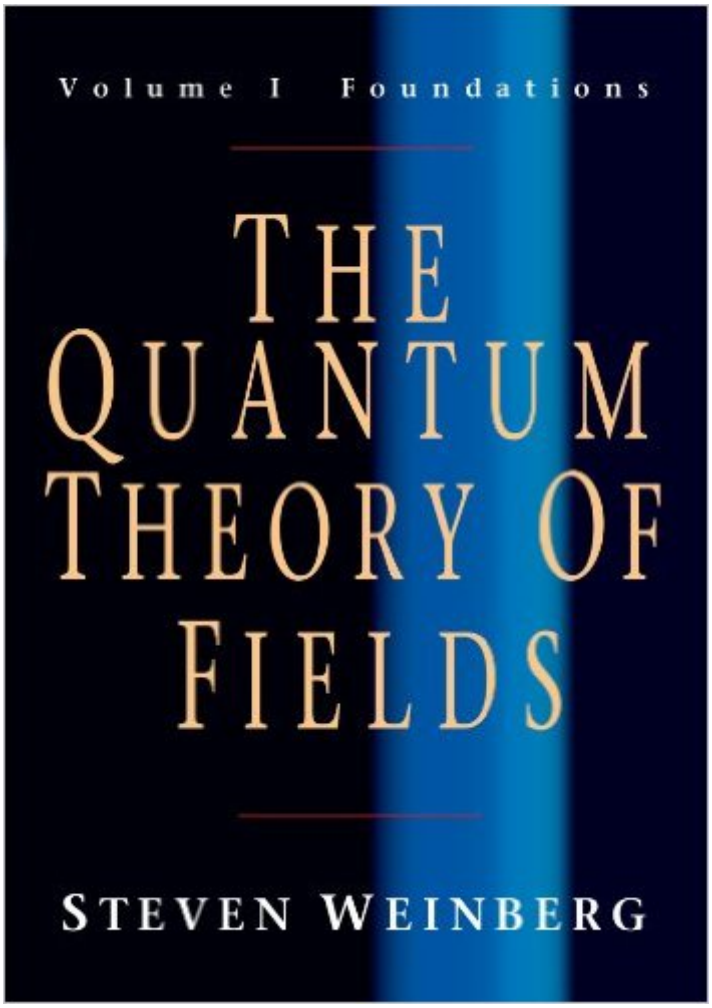
The Quantum Theory Of Fields, Volume 1: Foundations



Synopsis

In The Quantum Theory of Fields, Nobel Laureate Steven Weinberg combines his exceptional physical insight with his gift for clear exposition to provide a self-contained, comprehensive, and up-to-date introduction to quantum field theory. This is a two-volume work. Volume I introduces the foundations of quantum field theory. The development is fresh and logical throughout, with each step carefully motivated by what has gone before, and emphasizing the reasons why such a theory should describe nature. After a brief historical outline, the book begins anew with the principles about which we are most certain, relativity and quantum mechanics, and the properties of particles that follow from these principles. Quantum field theory emerges from this as a natural consequence. The author presents the classic calculations of quantum electrodynamics in a thoroughly modern way, showing the use of path integrals and dimensional regularization. His account of renormalization theory reflects the changes in our view of quantum field theory since the advent of effective field theories. The book's scope extends beyond quantum electrodynamics to elementary particle physics, and nuclear physics. It contains much original material, and is peppered with examples and insights drawn from the author's experience as a leader of elementary particle research. Problems are included at the end of each chapter. This work will be an invaluable reference for all physicists and mathematicians who use quantum field theory, and it is also appropriate as a textbook for graduate students in this area.

Book Information

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Customer Reviews

For those who are receptive to its charms, this book is simply indispensible to any high energy

physicist. This book is not terribly "intuitive"(in the sense that things are derived heuristically just to the point that the result seeems plausible), nor does it take a purely mathematical standpoint, emphasizing the unbending rigour of all proofs. Instead, it offers something far, far more valuable to any physicist; namely it offers truly profound physical insight into the fundamental principles of nature. This book is so chock full of brilliant profound ideas that it seems as if Weinberg put into this book almost all of the insights he has had over the course of his long, productive, and Nobel Prize winning career. He offers a truly logical presentation of particle physics, starting from the fundamental principles of quantum mechanics (superposition principle especially) and the principle of invariance under the Poincare group modulo time and spatial inversion, as well as the principle that distant measurements do not affect each other, and derives, with a minimum of simplifying assumption, the whole, wonderful edifice of quantum field theory. This set of volumes contains almost all that we know about QFT, but somehow, magically, it is not encyclopedic; it is instead refreshingly original and, as I have said before, truly profound. Also, unlike many other QFT texts, it very clearly points out how the assumptions of the theory could be weakened, and also gives an indication of what sorts of theories come from these modified assumptions. The whole book is simply fascinating, but I found the chapter on general renormalization theory particularly enlightening, especially the section on "nonrenormlizable" theories.

To put the review in perspective, My Background: I am a senior undergraduate engineering/physics student with an interest in mathematics and theoretical physics. This is my third QFT book.Things I liked about the book:- The book follows a very logical progression. I love how Weinberg presents a coherent argument based on simple physical principles (specifically Lorentz invariance and the cluster decomposition principle).- Weinberg takes painstaking effort to avoid hand-waving, and is very careful to enumerate (and make plausible) his assumptions. In so doing, he avoids the sort of black-magic feeling I got when reading some less well written QFT books (see for example: Peskin and Schroeder, which makes a mockery of logical progression in an effort to teach you how to calculate as soon as possible).- The book was very thorough, and often provided an original approach to the material. The coverage of renormalization seemed natural and coherent, and since the book is presented in a logical order (rather than a historical one) Weinberg avoids justifying renormalization as some mysterious subtraction of infinities, basing it instead on general non-perterbative methods (e.g. poles of the S-matrix, etc...)What I didn’t like about the book:- As a result of his unwavering emphasis on logical progression, and his inclusion of a vast amount of material (almost all of which is necessary to understand in order to progress through the book), the

book is somewhat painful to get through. Be prepared to re-read many of the sections a couple of times, and to make very slow progress.- Weinberg chooses to present QFT in a very general form (i.e. abstracting it from a particular field such as particle physics or condensed matter physics).

The Quantum Theory of Fields, Volume 1: Foundations Fields Virology (Knipe, Fields Virology)-2 Volume Set by Knipe, David M. Published by Lippincott Williams & Wilkins 6th (sixth), 2-volume set edition (2013) Hardcover The Quantum Theory of Fields, Volume 3: Supersymmetry The Quantum Theory of Fields, Vol. 2: Modern Applications Fields Virology (Knipe, Fields Virology) Nonmetalliferous Stratabound Ore Fields (Evolution of Ore Fields Series) Quantum Mechanics and Quantum Field Theory: A Mathematical Primer Foundations of Set Theory (Studies in Logic and the Foundations of Mathematics) The Classical Theory of Fields, Fourth Edition: Volume 2 (Course of Theoretical Physics Series) Towards Solid-State Quantum Repeaters: Ultrafast, Coherent Optical Control and Spin-Photon Entanglement in Charged InAs Quantum Dots (Springer Theses) Quantum Nanoelectronics: An introduction to electronic nanotechnology and quantum computing QUANTUM SELF HYPNOSIS STOP SMOKING NOW: Hypnosis Script & Inductions Included! (Quantum Self Hypnosis Singles Book 2) Quantum Runes: How to Create Your Perfect Reality Using Quantum Physics and Teutonic Rune Magic (Creating Magick with The Universal Laws of Attraction Book 1) Quantum Thermodynamics: Emergence of Thermodynamic Behavior Within Composite Quantum Systems (Lecture Notes in Physics) Quantum Computation and Quantum Information: 10th Anniversary Edition The God Theory: Universes, Zero-Point Fields, and What's Behind It All Introduction to Abstract Algebra: From Rings, Numbers, Groups, and Fields to Polynomials and Galois Theory Interactions Between Electromagnetic Fields and Cells (Applications of Communications Theory) Theory and Computation of Electromagnetic Fields Study Guide for Foundations of Maternal-Newborn and Women's Health Nursing, 6e (Murray, Study Guide for Foundations of Maternal-Newborn & Women's Health Nursing)