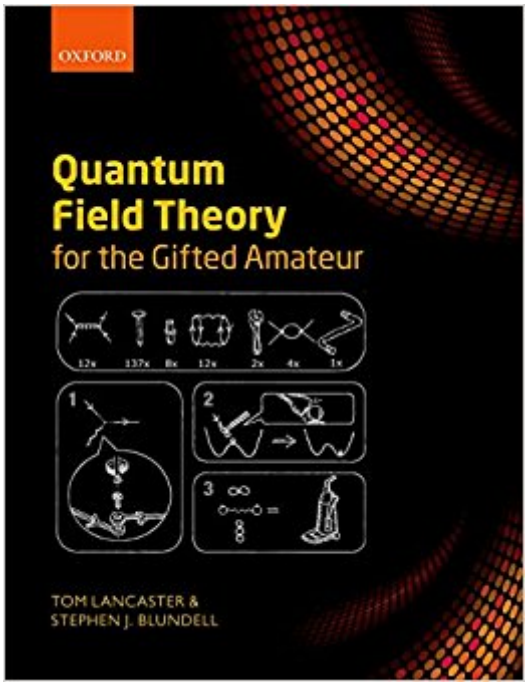
Quantum Field Theory For The Gifted Amateur



Synopsis

Quantum field theory is arguably the most far-reaching and beautiful physical theory ever constructed, with aspects more stringently tested and verified to greater precision than any other theory in physics. Unfortunately, the subject has gained a notorious reputation for difficulty, with forbidding looking mathematics and a peculiar diagrammatic language described in an array of unforgiving, weighty textbooks aimed firmly at aspiring professionals. However, quantumfield theory is too important, too beautiful, and too engaging to be restricted to the professionals. This book on quantum field theory is designed to be different. It is written by experimental physicists and aims to provide the interested amateur with a bridge from undergraduate physics to quantumfield theory. The imagined reader is a gifted amateur, possessing a curious and adaptable mind, looking to be told an entertaining and intellectually stimulating story, but who will not feel patronised if a few mathematical niceties are spelled out in detail. Using numerous worked examples, diagrams, and careful physically motivated explanations, this book will smooth the path towards understanding the radically different and revolutionary view of the physical world that quantum field theoryprovides, and which all physicists should have the opportunity to experience.

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Customer Reviews

I divide "popular science" books into four categories:1. The kind you can read on a plane, by itself, and enjoy the ride.2. The kind you need to read with Wikipedia or a math encyclopedia (or "maths" as these British authors would say) handy.3. The kind you need to read with at least two other major books, and possibly more. (The authors agree with me here, saying most good books require at least one other to augment them).4. The kind you can't read at all-- it has to be STUDIED, with painstaking work.I'd classify this gem as between 3 and 4. You really do have to know Fourier transforms, and a high level of undergrad relativity, or you'll miss a lot. That said, how can this be for an "amateur" at all? Well, the authors use an ingenious trick: they put the easier and more popular intuitive concepts in bigger type, and numerous smaller worked, mathematical examples in smaller type. So, you can, in a sense, read/study at your own level.I also find that ethical authors and publishers, especially with a book of this high cost, are generous with the look inside feature, because they care more about you not being disappointed than making an inappropriate sale. Hats off, the look inside is excellent, please do peruse it carefully before deciding.Since any one aspect (eg. gauge theory) can occupy a dozen texts on its own, how do the authors cover the entire field? Again, VERY WELL DONE-- they give a concept, a little diagram in the margin, an easy example, a hard example, an exercise, and very detailed further reading, with references that are up to date. This makes this wonderful text an awesome "reference guide" to further study, especially for those going on in physics.Now for the bad part. This book "really" isn't for amateurs in the way most of us mortals think of them. An amateur can fix your railing with a 2 x 4 but can't build you a cabinet. In the authors' minds, an amateur can build you the cabinet, but not the entire study/library. In other words, "amateurs" are pretty mature physicists, with at least undergrad and IMO grad level math and physics, who haven't yet tackled the toughest subject, mathematically, at all. I frankly believe the target IS GIFTED undergrads, and if you are rusty on your math, or haven't taken recent advanced linear algebra and calculus, you'll get lost quickly.On the "amateur" side of instant confusion, physicists are NOTORIOUS for "leaving out" variables like Planck's constant, the speed of light, certain duals and inversions/ inverses of transforms, etc. They justify this by setting them to 1 anyway, so they are close in value, or drop out. Doing so will confuse anyone without the "insider" knowledge of what they are doing. These authors do the same thing, but have the courtesy to show us when, where, why and how, which is helpful in reading ANY other book, bravo!There are many other, particularly Dover books that are a better "intro," to QFT, but they are not up to date and not nearly as advanced as this wonderful new option. This book fills an absolutely unmet need-- requiring an intro or companion below, yet mapping those above in ways not yet done by any other

text. So, here is the bottom line: worth it IF: a. You've finished the intro and are ready for the next step, or b. You're into the advanced and flailing, or c. You are willing to do the hard work of reading other books along with this, to study it rather than just read it. Even with rusty math ("maths"), you'll get a LOT that way. (I'm not teasing the British as one of their more successful colonies, but I am American, and do say math!).If you're a new grad or undergrad IN the field, it is a must! Otherwise, please do check out the look inside feature before committing-- I believe it is clearly worth the price, but it also is not cheap, and times are tough for many of us, particularly students. BTW, speaking of cost, I found many of the question sets similar to the exercises here free on Preptorial dot org, which offers free exercises in many fields of Physics, in preparation for tests and exams. Enjoy!Highly recommended for the right level reader.

The authors of this book should be congratulated for bringing to the masses the difficult field of quantum field theory (QFT). QFT is a notoriously difficult subject to learn from well established books and hence a modern exposition that introduces the concepts in a step-by-step fashion is certainly welcome. As written in the preface, the readers that the authors have in mind are either scientists that do not intend to become QFT professionals or students of theoretical physics which should consult more than one source in their long pilgrimage toward enlightenment (and tenure). In short, QFT has to do with the nature of things that surround us. Things (I should not call them things but fields) like electrons or photons are characterized by the so called particle-wave duality, they behave like particles in some situations and like waves in others. QFT, however, overcomes such duality of conventional (one-particle) quantum mechanics by mathematically describing them as "excitations of the quantum field". By reading the book one is gradually taken to a trip through Lagrangians, harmonic oscillators, the formalism of the second quantization, path integrals, Wick and Noether theorems, Feynman diagrams, broken symmetry, and quasi-particles such as bogolons (Bogoliubov quasi-particles), Majorana and Dirac fermions. All these fancy names given to different theoretical concepts are often represented by nice sketches printed near the text with an entertaining approach as that in Mattuck's book "A Guide to Feynman Diagrams in the Many-Body Problem" (Dover, 1992).One thing that I would suggest the authors to include in a future edition is a final chapter about the position of QFT with respect to other theories (eg. string theory) as well as other scientific fields such as chemistry and biology. For instance, double-slit experiments on fullerenes and other large molecules suggest that they too behave like electrons or photons and hence, is the molecule a field? How do you describe the field of a composite particle such as an atom or molecule? If QFT can be applied to condensed matter physics, how could it be applied to

molecular biology? Well, there is a lot of interesting stuff inside this book, why not giving it a try?

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