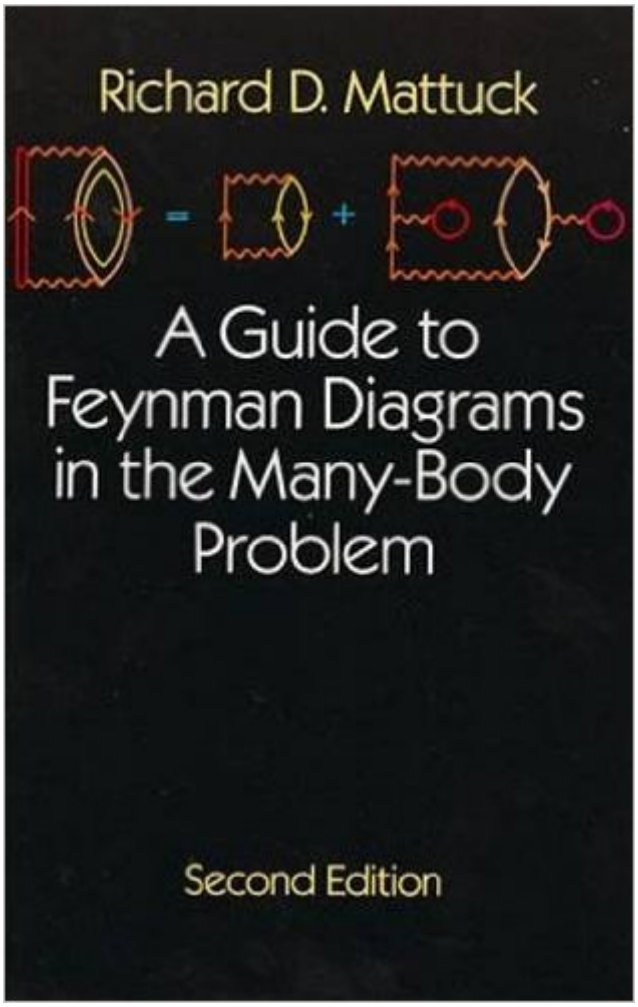
A Guide To Feynman Diagrams In The Many-Body Problem: Second Edition (Dover Books On Physics)



Synopsis

"A great delight to read." â ” Physics TodayAmong the most fertile areas of modern physics, many-body theory has produced a wealth of fundamental results in all areas of the discipline. Unfortunately the subject is notoriously difficult and, until the publication of this book, most treatments of the topic were inaccessible to the average experimenter or non-specialist theoretician.The present work, by contrast, is well within the grasp of the nonexpert. It is intended primarily as a "self-study" book that introduces one aspect of many-body theory, i.e. the method of Feynman diagrams. The book also lends itself to use as a reference in courses on solid state and nuclear physics which make some use of the many-body techniques. And, finally, it can be used as a supplementary reference in a many-body course.Chapters 1 through 6 provide an introduction to the major concepts of the field, among them Feynman diagrams, quasi-particles and vacuum amplitudes. Chapters 7 through 16 give basic coverage to topics ranging from Dyson’s equation and the ladder approximation to Fermi systems at finite temperature and superconductivity. Appendixes summarize the Dirac formalism and include a rigorous derivation of the rules for diagrams. Problems are provided at the end of each chapter and solutions are given at the back of the book.For this second edition, Dr. Mattuck, formerly of the H. C. Orsted Institute and the University of Copenhagen, added to many chapters a new section showing in mathematical detail how typical many-body calculations with Feynman diagrams are carried out. In addition, new exercises were included, some of which gave the reader the opportunity to carry out simpler many-body calculations himself.Â new chapter on the quantum field theory of phase transitions rounds out this unusually clear, helpful and informative guide to the physics of the many-body problem.

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Customer Reviews

This book is a counterexample to the idea that one cannot write a book on quantum field theory and keep a sense of humour. Quantum field theory of course is notoriously difficult, both in terms of its conceptual foundations and in calculating meaningful answers from its formalism. Perturbation theory has been the most succesful of the methods of calculation in quantum field theory, and the visualization of the terms of the perturbation series is greatly assisted by the use of Feynman diagrams. The author has done a great job in the elucidation of these diagrams, and readers will not only have fun reading this book but will also take away needed expertise in moving on to more advanced presentations of quantum field theory. Some readers may object to the pictorial, playful way in which the author explains some of the concepts, but he does not depart from the essential physics. Mathematicians who want to understand quantum field theory can also gain much from the reading of this book. Although not rigorous from a mathematical standpoint, the presentation will given them sorely needed intuition. Quantum field theory has resulted in an explosion of very interesting results in mathematics, particularly in the field of differential topology, and mathematicians need this kind of a presentation to assist them in the understanding of quantum field theory and how to apply it to mathematics (and the other way around). In addition, readers intending to enter the field of condensed matter physics will appreciate the clarity of the author's treatment, drawing as it does on many examples from that field. This includes a brief introduction to finite temperature quantum field theory. The use of mnemonics, pictures, and hand-waving arguments may be frowned upon by some, but as long as their use is supported by solid science, their didactic power is formidable. Arguments by analogy, and by appeals to common-sense objects are of great utility in explaining the intricacies of a subject as abtruse as quantum field theory. The author for example uses a pin-ball game, with its many scatterings, as a tool for introducing the quantum propagator, even though paths of a (classical) pin-ball are not really meaningful in the quantum realm. Once done though, he proceeds to derive the perturbation series, and as an example computes the energy and lifetime of an electron in an impure metal. The concept of a quasi-particle is exploited fully in this book to illustrate just how one can do calculations in quantum many-body theory. The reader will find ample discussion of Dyson's equation, the random phase approximation, phase transitions in Fermi systems, the Kondo problem, and the renormalization group in this book. Happy reading.....(and teaching).....

This is indeed an excellent book. Witty and insightful, but sometimes the ease, with which you're lead through it, is in the way of stressing the really important stuff. If you are learning diagrams for the first time, and intend to do some serious research using the technique, I believe this book is just not enough: it will leave you unprepared to do much beyond the problems in the book. You might want to consult a more rigorous book, like that of Abrikosov et al., but the style may be a bit of a shock to those not used to the Russian "condensed writing". As an introduction that is less painful, and more of a textbook, I suggest Fetter and Walecka's book, though it's out of print.

It is really a very good book, and even if I agree with the definition of "pedagogical jewel" given to the quantum pinball example, I would not define this textbook an introductory one, even if a non-specialist can read it without many difficulties. I read it several years after my studies, and it represented to me a good and amusing opportunity to refresh or to learn subjects I didn't remember any more or I didn't meet in university course. And taking into account its low price, it is really worth purchasing this book.

I can hardly add anything to the praise given to this book by other reviewers. Though one should, undoubtedly, get acquainted with more serious books on the subject, I have to confess that I am still unaware of the book that presents the material together with the terms used in the scientific papers.For example, I greatly admire the book by Abrikosov's et al. (AGD), and I completely agree that after reading it (and Keldysh paper) one is completely prepared to using Green's functions in serious research. But the terms like "rainbow", "bubble", "particle-particle" and "particle-hole" propagatprs, though widely used and simetimes semi-obvious, are not discussed systematically in any of the celebrated AGD, Mahan, Fetter&Walecka, Negele&Orland etc.Thus, the Mattuck's book appear to be not only funny, useful, and explaining a lot of physics (where its value can be compared with the quantum mechanical parts of the Feynman Lectures on Physics), but it also briges a gap in terminology between the basic text and the scientific slang.In conclusion, I deeply regret that there is no similar book on Schwingers approach to the many-body physics.

In physics. the solutions to problems can frequently become obscured by long chains an series of terms and operators found in the formalization. The power of Feynman's technique is that it provides a simplified notation to groom and order those terms and operators, so that errors and simplifications can be more easily identified.The author successfully injects some humor into a great

introduction to a solution technique for the many body problem. This is a graduate level text, so familiarity with mathematical notation for differentiation, integration and matrix algebra is required as the objectives of the book is to show you how to convert to and from Feynman's pictograms to the traditional formulation.

I wont take lots of words. I want to say first that it is very good book for self studying so no more requesting and begging here and there for few hints. Very friendly language just like Griffiths.Fun to read and guys .....look at the price. Use it for QFT as well as Condensed matter. I am sure that if you buy it you wont regret it and that you wont ever depart it, return it or whatever.Go for it. I am still in doubt.....if I tell you guys about it then who is going to come and ask me about those sneaky questions and all that confusions. Those who want to act as if they know everything and are superior than others then please stay away from my review, go impress someone else.

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