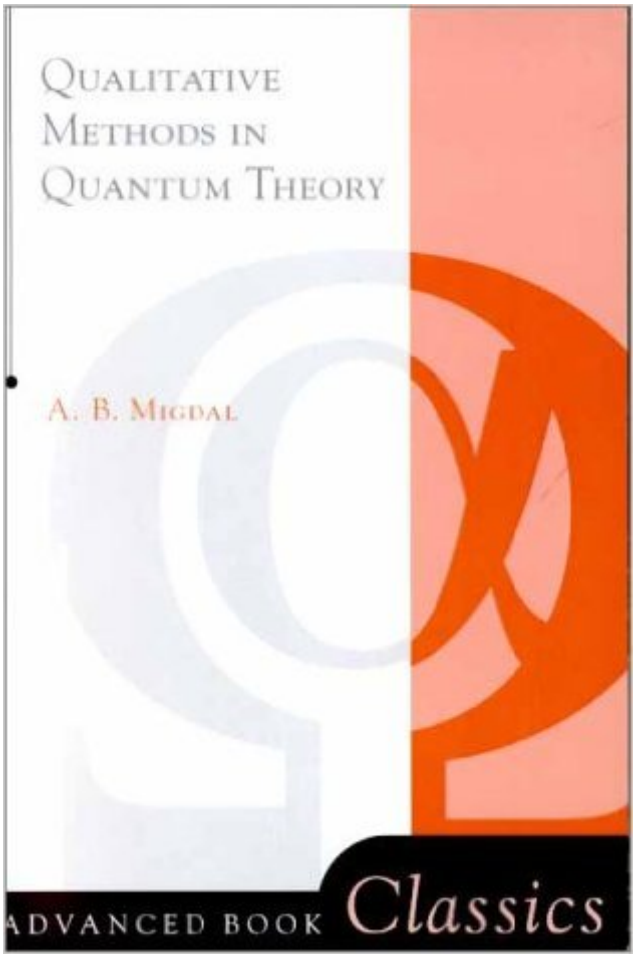
Qualitative Methods In Quantum Theory



Synopsis

This unique book, written by a leading Soviet theorist, is not a textbook of quantum mechanics but rather a compendium of the "tricks of the trade"-the methods that all practicing theoretical physicists use but few have set down in writing.

Book Information

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Customer Reviews

How many times in your life have you looked at the physical formula and thought perplexedly: "What does it mean?" Remember the first time you looked at the formula E=mc2? If you are a curious freshman or even a hoary professional the question, "How did he get this result?", comes up. Now you are close to looking on the other side of the coin, at something wonderful, something fascinating. You are about to reveal the workshop of the theoretical physicists! To be honest with you, I did not see the English translation of this book, but long time ago I read the original Russian book, "Qualitative Methods in Quantum Theory", by A. B. Migdal, and still keep it on my desk. There were about two dozen students during the semester who attended his lecture/seminar of similar name, "Qualitative Methods in Theoretical Physics." Those lecture/seminars were informal, quite unusual, unlike where lectures when a professor smoothly narrates a well-known subject. He worked on a blackboard before the audience. The subjects were the different aspects of quantum mechanics, statistical physics, and nuclear physics, with numerous examples from modern and classical physics and mathematics. We watched all movements of his mind when he discoursed some interesting problem and derived a result using several different methods. He told us, "Don’t be

afraid to make mistakes. The secret is to be able to find them." Sometimes he interrupted his work with a note about an analogy between an art and science: "In sculpture, as well as in theoretical physics, you have to know where you can disregard", or "Solving a real difficult problem is the rarest phenomenon, like falling in love". The book summarizes his experience as a practical physicist and is a great collection of treasures that you can not find anywhere else.

Nearly all physics texts will solve only models which produce closed-form answers. To be sure, this is not a fault: it is an important part of physics-training to be taught mathematical techniques. And perhaps it is obvious: real world problems are not immediately amenable to closed-form solutions. Real world physics problems demand both (1) sufficient mathematical training to avoid making mistakes, and (2) a "feel" (for lack of a mathematically-rigorous term) for how to "massage" various mathematical expressions to avoid throwing away physics. This book helps with (2); it presents various physical problems which _require_ that one make approximations to get to meaningful results. An example is the text's treatment of the Thomas-Fermi model of a Z-electron atom. This adds an extra "dimension" to one's mathematical training that is completely essential. True: one needs training to do algebra and calculus correctly [e.g., the content of (1)], but eventually, closed form algebra and calculus become a "box" that one must be trained to think outside of. This book tries to do that training.When writing a book that forays into new mathematical or physical territory, there is always the risk of that book being confusing. This text is anything but: the mathematical prose is crystal-clear (this seems to be a trend among Russian authors). The text manages to leave relatively little to the reader (with some exceptions), while at the same time managing to be concise. This text's mathematical prose, in my opinion, carries the crispness of the Landau/Lifshitz course of theoretical physics.The book's contents are rather ambitious as well. There are qualitative methods discussed in the context of many body physics and quantum field theory.

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