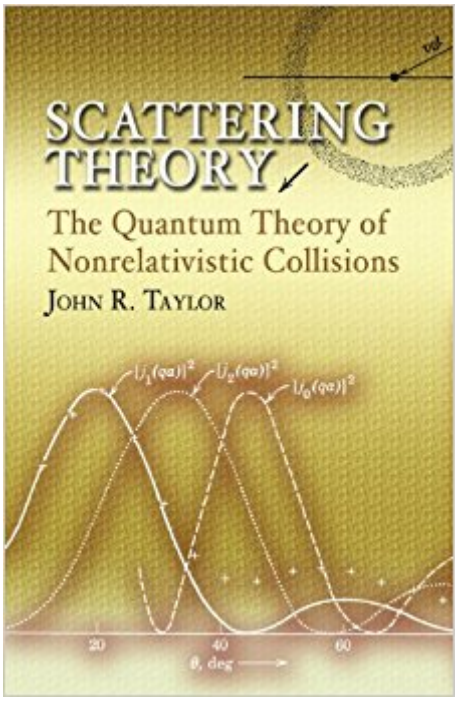
Scattering Theory: The Quantum Theory Of Nonrelativistic Collisions (Dover Books On Engineering)



Synopsis

This graduate-level text is intended for any student of physics who requires a thorough grounding in the quantum theory of nonrelativistic scattering. It is designed for readers who are already familiar with the general principles of quantum mechanics and who have some small acquaintance with scattering theory. Study of this text will allow students of atomic or nuclear physics to begin reading the literature and tackling real problems, with a complete grasp of the underlying principles. For students of high-energy physics, it provides the necessary background for later study of relativistic problems.Topics are presented in terms of the simplest relevant example, so that scattering theory can be learned by becoming familiar with all of the basic concepts â " the S operator, cross sections, the T matrix, and so forth â " in their simplest context. The time-dependent approach to the subject is emphasized, starting with the use of time-dependent formalism to define all of the basic concepts and the subsequent introduction of the time-independent theory as a tool for computation and for establishing certain general properties. Problems at the end of each chapter improve and supplement readers' grasp of the material.

Book Information

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Customer Reviews

Scattering theory is a notoriously difficult area in quantum mechanics. After looking several classics, I borrowed a copy of this book, then out of print, and found immediately it was at the right level. The exposition is always to the point, never overloaded with side issues or minor details, yet very clear and precise, a pleasure to read. It leaves the nice feeling of understanding exactly everything the

author explains.So I immediately photocopied the book, and I am very pleased of it being back in print thanks to Dover, and got already a new copy.Despite the book being over 30 years old, the presentation is still fresh, the hallmark of a classic. The only complain, is that me too would like more topics, and the coverage of some important progress, which is apparently available only in mathematical physics text, pretty hard for the average physicist. But this calls for a second volume, nothing to be changed on the present one.

Were you ever left with the feeling that the definition of the scattering cross section is everywhere given in a strange and haphazard way? If so, you really should see how Taylor deals with that. It's really great.Scattering theory is a topic that, in modern Physics programs, is typically covered in a cursory fashion somewhere in between graduate QM and QFT courses. For that reason most people (especially away from nuclear physics) tend to dislike the topic and cringe when hearing the words "scattering theory", or "phase shifts".Reality hits the students and postdocs later on, when they want to do a real calculation and find that there is considerable background that they are missing. Taylor's book is really what they should be studying at the advanced QM level in order to understand the connection between the formalism and the experiments.This book will take you through the basic and more advanced aspects of scattering theory in an extremely clear and readable fashion that is nonetheless rigorous enough to make everyone happy, whether you are a student or a researcher.

I did my PhD dissertation in (non-relativistic) mathematical quantum scattering theory, and *the* text for important results in that field is Reed and Simon, Vol. 3. However, I quickly learned that trying to get a grip on what was actually going *on* in quantum scattering theory from that book was a lost cause: the focus is on the rigorous mathematical results, and the appropriate physical interpretation of, and motivation for, these results is taken more or less for granted. Anyone hoping to develop an intuition for the subject from Reed and Simon might as well hope in one hand and...cry into the other. I spent months pouring over Vol. 3 and gained a modicum of enlightenment, but I couldn't shake the feeling that there were a bunch of disparate parts of the theory swimming around in my brain, desperately crashing into one another in the hopes they'd stick and assemble themselves into a cohesive and coherent picture of the theory. Sadly, Reed and Simon had painted these pieces with a very weak glue.After searching far and wide for an alternate source that would help me put everything together, I came across Taylor's marvelous little book. It strikes me as the perfect text for smoothly transitioning an enterprising undergraduate into a graduate-level appreciation for

scattering theory, a topic about which Sakurai simply said: "It is impossible to overstate the importance of this subject." To put it simply, Taylor gave me the glue - he takes nothing for granted and provides clear, complete explanations that are a pleasure to read. He clearly cares most about the physics, but he give the mathematics its due (to the extent possible). He talks about both the time-dependent and time-independent formulations of scattering theory. The former is the focus of Reed and Simon, of much of the mathematical literature on scattering theory, and of my dissertation; the latter is the focus of most undergraduate treatments of quantum scattering theory (see, e.g., Griffiths) and is the tool most often exploited in, say, the chemistry literature. The time-dependent formulation is often avoided because it requires coming to grips with some 'nasty' advanced math concepts (such as the strong operator limit), but it allows for a much cleaner expression of the theory. Still, the most complete picture is given by treating both formulations in detail, and that's what Taylor does. He truly has one of the best pedagogical minds I've ever encountered, and this is probably the best investment I've ever made in a Dover book. And I was pleased to cite it multiple times in my (destined-to-be-forgotten) dissertation!

The best book on scattering theory. As a grad student I didn't buy the explanations in QFT books and went to one of the profs seeking help. He reached to his shelf and recommended this book. Clear and rigorous without overloading with formalism (like many rigorous advance physics texts). I was delighted to see it back in print at Dover prices.

Ad the title says, the book covers non-relativistic scattering theory. It covers the expected topics of partial wave expansions, Born approximation, single and multi-channel scattering. I used this book when I was learning scattering theory during graduate school at U. of Colorado. It is a good introduction to scattering theory. My only reservation is that the book is general. People looking for scattering theory book specific to say, nuclear physics, might be better off with McCarthy's book (old one) or Feshbach's.

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