

Marco Polini
Mario Tosi**Many-body
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Many-body physics in condensed matter systems

Series: Lecture Notes (Scuola Normale Superiore)

This volume collects the lecture notes of an introductory course on the theory of many-body systems, held at the Scuola Normale Superiore di Pisa. It is mainly addressed to fourth and fifth-year undergraduates and to first-year graduates in physics and chemistry. The book is also suitable for researchers in the field wanting to gain a general introductory overview on its modern focal points. Starting from a set of notes first prepared in 1994, which were mainly focused on conduction electrons in metals and semiconductors, these lecture notes are now being reprinted with some major changes and additions in order to provide the reader with an overview of recent developments in the understanding of low-dimensional electron fluids and of confined quantum gases made from bosonic and fermionic atoms and molecules. The book is divided into seven chapters and includes 18 appendices on specialized topics. The introductory chapter illustrates some of the longstanding problems in many-body physics. Chapters 2, 3 and 4 are mainly devoted to topics concerning electron fluids. A formal presentation of the theory of Green's functions and linear response functions for fermions in chapter 2 is followed by a chapter on electron liquids in the normal state and by a further chapter on the magnetism of conduction electrons and strongly correlated electron fluids. Chapter 5 turns to the formal theory of Green's functions and linear response functions for bosons. And finally, Chapters 6 and 7 are on trapped boson gases and on confined fermion gases and gaseous boson-fermion mixtures.

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