# Introduction to **Many-Body Physics**

**"Coleman begins with the basics of quantum mechanics, but manages to engagingly and deftly introduce the reader to the important ideas of many-body physics within a few chapters. [His] expert guidance then helps make a seemingly effortless step to the physics of modern correlated electron compounds. I enthusiastically recommend this book to all graduate students in physics."**
*Subir Sachdev, Harvard University*

**"This book offers the chance to learn from an accomplished expert and, just as important, from an enthusiast for quantum many-body physics. It will be essential reading for graduate students entering the rich universe of quantum many-particle phenomena [and] a chance to learn from a master. The easy-going style, the historical context and, critically, the worked examples and exercises make this book one that both novice and expert will come back to again and again."**
*Andrew Schofield, University of Birmingham*

**"This is a carefully planned and well-written book on modern physics of correlated electrons from one of the internationally recognized leaders in the field. Coleman manages to combine rigorous mathematical analysis with qualitative physics reasoning."**
*Andrey Chubukov, University of Wisconsin*

A modern, graduate-level introduction to many-body physics in condensed matter, this textbook explains the tools and concepts needed for a research-level understanding of the correlated behavior of quantum fluids. Starting with an operator-based introduction to the quantum field theory of many-body physics, this textbook presents the Feynman diagram approach, Green's functions, and finite-temperature many-body physics before developing the path integral approach to interacting systems. Special chapters are devoted to the concepts of Landau–Fermi liquid theory, broken symmetry, conduction in disordered systems, superconductivity, local moments and the Kondo effect, and the physics of heavy-fermion metals and Kondo insulators. A strong emphasis on concepts and numerous exercises make this an invaluable course book for graduate students in condensed matter physics. It will also interest students in nuclear, atomic, and particle physics.

**Piers Coleman** is a Professor at the Center for Materials Theory at the Serin Physics Laboratory at Rutgers, State University of New Jersey. He invented the slave boson approach to strongly correlated electron systems and is fascinated by the emergent properties of quantum matter. Piers Coleman is also interested in science outreach and co-produced *Music of the Quantum* with his brother, the musician Jaz Coleman.

CAMBRIDGE
UNIVERSITY PRESS
www.cambridge.org

Cover illustration: "Big Bang Theory No. 2"
courtesy of Swarez Modern Art Ltd.

ISBN 978-0-521-86488-6

**Cover designed by Hart McLeod Ltd**