

Ultracold Atomic Physics

The field of ultracold atomic physics has developed rapidly during the last two decades. It currently encompasses a broad range of topics in physics, with a variety of important applications in topics ranging from quantum computing and simulation to quantum metrology, and can be used to probe fundamental many-body effects, such as superconductivity and superfluidity. Beginning with the underlying and including the most cutting-edge experimental developments, this textbook covers essential topics, such as Bose–Einstein condensation of alkali atoms, studies of BEC-BCS crossover in degenerate Fermi gas, synthetic gauge fields and Hubbard models, and many-body localization and dynamical gauge fields. Key physical concepts, such as symmetry and universality, highlight the connections between different systems, and theory is developed with plain derivations supported by experimental results. This self-contained and modern text will be invaluable for researchers, graduate students, and advanced undergraduates studying cold atom physics, from both a theoretical and experimental perspective.

Hui Zhai is Changjiang Chair Professor of Physics at the Institute for Advanced Study, Tsinghua University, and his research is focused on ultracold atomic physics, condensed matter physics, and machine learning. He was awarded a National Natural Science Foundation of China (NSFC) award for distinguished young scholars and the Rao Yutai Prize by the Chinese Physical Society.

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