

ADVANCED Modern Physics Theoretical Foundations

by **John Dirk Walecka** (*College of William and Mary, USA*)

Our understanding of the physical world was revolutionized in the twentieth century — the era of “modern physics”. This book, aimed at the very best students, extends the coverage of the theoretical groundwork of today’s physics presented in the previous volume: *Introduction to Modern Physics: Theoretical Foundations* (Vol. I). Typically, students have to wade through several courses to see many of these topics. The goal is to give them some idea of where they are going, and how things fit together, as they go along.

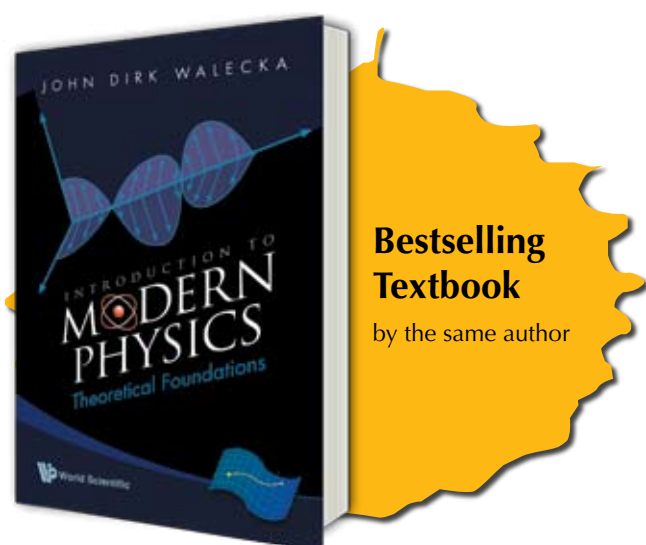
The present book focuses on the following topics: reformulation of quantum mechanics, angular momentum, scattering theory, lagrangian field theory, symmetries, Feynman rules, quantum electrodynamics, including higher-order contributions, path integrals, and canonical transformations for quantum systems. Many problems are included that enhance and extend the coverage. The book assumes a mastery of the material in Vol. I, and the continued development of mathematical skills, including multivariable calculus and linear algebra. Several appendices provide important details, and any additional required mathematics. The reader should then find the text, together with the appendices and problems, to be self-contained.

The aim is to cover the framework of modern theoretical physics in sufficient depth that things “make sense” to students, and, when finished, the reader should have an elementary working knowledge in the principal areas of theoretical physics of the twentieth century.

Contents: Quantum Mechanics (Revisited); Angular Momentum; Scattering Theory; Lagrangian Field Theory; Symmetries; Feynman Rules; Quantum Electrodynamics (QED); High-Order Processes; Path Integrals; Canonical Transformations for Quantum Systems; Appendices: Multipole Analysis of the Radiation Field; Functions of a Complex Variable; Electromagnetic Field; Irreducible Representations of $SU(n)$; Lorentz Transformations in Quantum Field Theory; Green’s Functions and Other Singular Functions; Dimensional Regularization; Path Integrals and the Electromagnetic Field.

Readership: Upper level undergraduate and graduate students, researchers in physics.

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Professor Walecka is Governor’s Distinguished CEBAF Professor of Physics, Professor Emeritus at Stanford University and Professor of Physics at the College of William and Mary. He was the Scientific Director of the Continuous Electron Beam Accelerator Facility (CEBAF) in its initial stage (from 1986 to 1992). He was awarded the Bonner Prize for Nuclear Physics by the American Physical Society and was a Distinguished Schiff Lecturer and Primakoff Lecturer. For his many contributions to research, administration, and teaching, he was awarded the Virginia Lifetime Achievement in Science.

*Please refer to the second page for more details.

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