



# Introduction to Modern Physics: Theoretical Foundations

*John Dirk Walecka*

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## Introduction to Modern Physics: Theoretical Foundations John Dirk Walecka

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, presents the foundations and frontiers of today's physics. It focuses on the following topics: quantum mechanics; applications in atomic, nuclear, particle, and condensed-matter physics; special relativity; relativistic quantum mechanics, including the Dirac equation and Feynman diagrams; quantum fields; and general relativity. The aim is to cover these topics in sufficient depth such that things “make sense” to students and they can achieve an elementary working knowledge of them. Many problems are included, a great number of which take dedicated readers just as far as they want to go in modern physics. Although the book is designed so that one can, in principle, read and follow the text without doing any of the problems, the reader is urged to attempt as many of them as possible. Several appendices help bring the reader up to speed on any additional required mathematics. With very few exceptions, the reader should then find the text, together with the appendices and problems, to be self-contained.

### Contents:

- Classical Physics
- Some Contradictions
- Quantum Mechanics
- Atomic Physics
- Nuclear Physics
- Particle Physics
- Special Relativity
- Relativistic Quantum Mechanics
- General Relativity
- Quantum Fluids
- Quantum Fields
- Problems

**Readership:** Upper-level undergraduate physics or science students, research scientists and engineers.



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