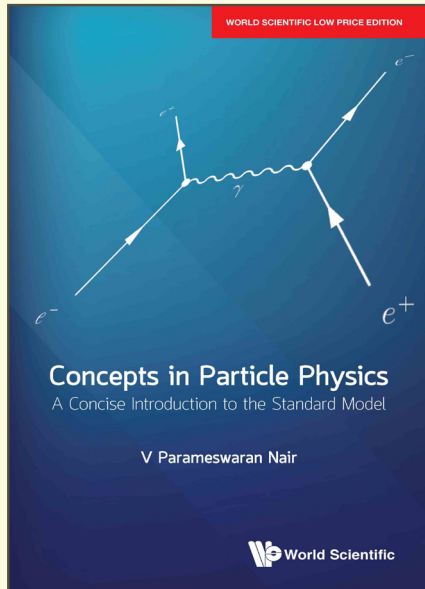


# Concepts in Particle Physics

## A Concise Introduction to the Standard Model



By **V Parameswaran Nair**

*(City College of the City University of New York, USA)*

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### ABOUT THE BOOK

The 2013 discovery of the Higgs boson posed a challenge to both physics undergraduates and their instructors. Since particle physics is seldom taught at the undergraduate level, the question “what is the Higgs and why does its discovery matter?” is a common question among undergraduates. Equally, answering this question is a problem for physics instructors.

This book is an attempt to put the key concepts of particle physics together in an appealing way, and yet give enough extra tidbits for students seriously considering graduate studies in particle physics. It starts with some recapitulation of relativity and quantum mechanics, and then builds on it to give both conceptual ideas regarding the Standard Model of particle physics as well as technical details. It is presented in an informal lecture style, and includes “remarks” sections where extra material, history, or technical details are presented for the interested student. The last lecture presents an assessment of the open questions, and where the future might take us.

### READERSHIP

Advanced undergraduates studying particle physics.

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- The Standard Model
- Review of Special Relativity
- Quantum Mechanics and the Propagator
- Scattering Processes and Feynman Diagrams
- Photons and the Electromagnetic Field
- Processes with Photons

- Cross Section and Dimensional Analysis
- More on the Dirac Equation
- Other Forces: Weak Interactions
- The Gauge Principle
- The Gauge Principle II
- Gauge Symmetry: The Matrix Generalization
- Gauge Symmetry: The Matrix Generalization II
- Back to Particles and The Strong Nuclear Force
- More on Quantum Chromodynamics (QCD)
- Mesons and Baryons
- Spontaneous Symmetry Breaking
- Superconductivity and Electroweak Interactions
- Electroweak Interactions and the Story of Mass
- CP-Violation and Matter vs Antimatter
- Many Big Questions Remain

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