



# Gauge Theories in Particle Physics, Vol. 1: From Relativistic Quantum Mechanics to QED, 3rd Edition

*By I.J.R. Aitchison, A.J.G. Hey*

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## **Gauge Theories in Particle Physics, Vol. 1: From Relativistic Quantum Mechanics to QED, 3rd Edition** By I.J.R. Aitchison, A.J.G. Hey

Gauge Theories in Particle Physics, Volume 1: From Relativistic Quantum Mechanics to QED, Third Edition presents an accessible, practical, and comprehensive introduction to the three gauge theories of the standard model of particle physics: quantum electrodynamics (QED), quantum chromodynamics (QCD), and the electroweak theory. For each of them, the authors provide a thorough discussion of the main conceptual points, a detailed exposition of many practical calculations of physical quantities, and a comparison of these quantitative predictions with experimental results.

For this two-volume third edition, much of the book has been rewritten to reflect developments over the last decade, both in the curricula of university courses and in particle physics research. Substantial new material has been introduced that is intended for use in undergraduate physics courses. New introductory chapters provide a precise historical account of the properties of quarks and leptons, and a qualitative overview of the quantum field description of their interactions, at a level appropriate to third year courses. The chapter on relativistic quantum mechanics has been enlarged and is supplemented by additional sections on scattering theory and Green functions, in a form appropriate to fourth year courses. Since precision experiments now test the theories beyond lowest order in perturbation theory, an understanding of the data requires a more sophisticated knowledge of quantum field theory, including ideas of renormalization. The treatment of quantum field theory has therefore been considerably extended so as to provide a uniquely accessible and self-contained introduction to quantum field dynamics, as described by Feynman graphs. The level is suitable for advanced fourth year undergraduates and first year graduates.

These developments are all contained in the first volume, which ends with a discussion of higher order corrections in QED; the second volume is devoted to the non-Abelian gauge theories of QCD and the electroweak theory. As in the first two editions, emphasis is placed throughout on developing realistic calculations from a secure physical and conceptual basis.

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### **Editorial Review**

#### **Review**

The third edition of volume 1 is a classic. All three editions are worth having ... There are things that change and develop, as well as the inclusion of new material, as the editions appear. The clarity of exposition and the language of explanation get even better, as the editions appear. The insights, some added in the later editions, broaden and challenge one's understanding. Above all, the excitement that one gets by being guided through the advanced theoretical concepts by the authors is unique... The book focuses much more of its attention on understanding. It is this feature that makes Gauge Theories in Particle Physics so invaluable.

- Professor John Dainton FRS, University of Liverpool, UK

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...the authors have substantially enlarged the text to reflect developments both in university curricula and the field of particle physics.

- CERN COURIER

Reading the book of Aitchison and Hey one can see that the authors have taken a lot of pains ... to be understandable by undergraduate students. We believe that the authors were successful in this aspect and their book is very suitable for later stages of undergraduate studies of students of theoretical physics with inclination to particle physics. However, it can still be useful also for graduate Ph.D. students and more educated scientists, who would like to be more familiar with some of the presented problems of particle physics.

- Stanislav Dubnicka, Acta Physica, Slovaca, 2003

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**Jennifer Williams:**

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