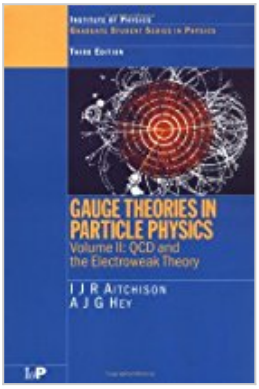

Gauge Theories in Particle Physics, Vol. 2: Non-Abelian Gauge Theories: QCD and the Electroweak Theory (Volume 1)

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

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This is the second volume of the third edition of a successful text, now substantially enlarged and updated to reflect developments over the last decade in the curricula of university courses and in particle physics research. Volume I covered relativistic quantum mechanics, electromagnetism as a gauge theory, and introductory quantum field theory, and ended with the formulation and application of quantum electrodynamics (QED), including renormalization. Building on these foundations, this second volume provides a complete, accessible, and self-contained introduction to the remaining two gauge theories of the standard model of particle physics: quantum chromodynamics (QCD) and the electroweak theory.

The treatment significantly extends that of the second edition in several important respects. Simple ideas of group theory are now incorporated into the discussion of non-Abelian symmetries. Two new chapters have been added on QCD, one devoted to the renormalization group and scaling violations in deep inelastic scattering and the other to non-perturbative aspects of QCD using the lattice (path-integral) formulation of quantum field theory; the latter is also used to illuminate various aspects of renormalization theory, via analogies with condensed matter systems. Three chapters treat the fundamental topic of spontaneous symmetry breaking: the (Bogoliubov) superfluid and the (BCS) superconductor are studied in some detail; one chapter is devoted to the implications of global chiral symmetry breaking in QCD; and one to the breaking of local SU(2)xU(1) symmetry in the electroweak theory. Weak interaction phenomenology is extended to include discussion of discrete symmetries and of the possibility that neutrinos are Majorana (rather than Dirac) particles.

Most of these topics are normally found only in more advanced texts, and this is the first book to treat them in a manner accessible to the wide readership that the previous editions have attracted.

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