



# **Gauge Theories in Particle Physics: A Practical Introduction, Volume 2: Non-Abelian Gauge Theories: QCD and The Electroweak Theory, Fourth Edition**

*Ian J R Aitchison, Anthony J.G. Hey*

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**Volume 2** of this revised and updated edition provides an accessible and practical introduction to the two non-Abelian quantum gauge field theories of the Standard Model of particle physics: quantum chromodynamics (QCD) and the Glashow-Salam-Weinberg (GSW) electroweak theory.

This volume covers much of the experimental progress made in the last ten years. A new chapter on CP violation and oscillation phenomena describes CP violation in B-meson decays as well as the main experiments that have led to our current knowledge of mass-squared differences and mixing angles in neutrino physics. Exploring a new era in particle physics, this edition discusses one of the most recent and exciting breakthroughs—the discovery of a boson with properties consistent with those of the Standard Model Higgs boson. It also updates many other topics, including jet algorithms, lattice QCD, effective Lagrangians, and three-generation quark mixing and the CKM matrix.

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- Recent lattice QCD calculations with dynamical fermions
- New section on effective Lagrangians for spontaneously broken chiral symmetry, including the three-flavor extension, meson mass relations, and chiral perturbation theory
- Update of asymptotic freedom
- Discussion of the historic discovery of a Higgs-like boson

The authors discuss the main conceptual points of the theories, detail many practical calculations of physical quantities from first principles, and compare these quantitative predictions with experimental results, helping readers improve both their calculation skills and physical insight.

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