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For a book of its genre our previous book An introduction to gauge theories and the "new physics" (1982) was a great success. It was not alas sold in airport lounges but it did run to two additional printings (1983 1985) and to extensively revised editions in Russian (1990) and in Polish (1991). More importantly it seemed to achieve the principal goal which we had set ourselves namely to present a pedagogical account of modern particle physics with a balance of theory and experiment which would be intelligible and stimulating for both theoretical and experimental graduate students. We did not try to write a profound book on field theory nor a treatise on sophisticated experimental techniques. But we did wish to stress the deep intimate and fruitful interaction between theoretical ideas and experimental results. Indeed for us it is just this aspect of physics which makes it seem so much more exciting than say pure mathematics. Our greatest pleasure came from the favourable reaction of students who were working through the book and from those reviewers who caught what we hoped was its essential flavour——the writing creates the feeling of an active progression of ideas arising from the repeated interaction of theoretical prejudice with experimental observation unlike most textbooks it is highly readable and makes everything appear simple and obvious. Well the last comment is surely an exaggeration but that was our aim. In thinking about a second edition we were faced with a serious conceptual problem. Ten years ago we were in a state of excited expectation. A beautiful theory had been created and led via the simplest of calculations to absolutely dramatic experimental predictions; principally the existence and basic properties of the heavy vector bosons $W+$ and $Z0$. A host of interesting new phenomena could be studied with no more elfort than the calculation of a lowest order Born diagram. Much of the new physics could be discussed and understood from rather qualitative arguments. That idyllic situation is much changed now. After the few years during which the experimentalists were struggling to demonstrate the very existence of these new phenomena when the world of physics was electrified by the discovery of one single W or Z event we have moved into an era when LEP is mass-producing millions of $Z0$s!

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CP "" "

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Kobayashi-Maskawa CP

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Preface Acknowledgements Notational conventions Note added in proof: the discovery of the top quark (?) Note added in proof: the demise of the SSC 18 Determination of the Kobayashi-Maskawa matrix 19 Mixing and CP violation 20 Regularization, renormalization and introduction to the renormalization group 21 Gauge theories, QCD and the renormalization group 22 Applications of the QCD renormalization group 23 The parton model in QCD 24 Large Pr phenomena and jets in hadronic reactions 25 Jets and hadrons in e+ e- physics 26 Low Pr or 'soft' hadronic physics 27 Some non-perturbative aspects of gauge theories 28 Beyond the standard model Appendix 1: Elements of field theory Appendix 2: Feynman rules for QED, QCD and the SM Appendix 3: Conserved vector currents and their charges Appendix 4: Operator form of Feynman amplitudes and effective Hamiltonians Appendix 5: S-matrix, T-matrix and Feynman amplitude Appendix 6: Consequences of CPT invariance for matrix elements Appendix 7: Formulae for the basic partonic 2 → 2 processes Appendix 8: Euclidean space conventions References Analytic subject index for vols. 1 and 2.

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