

<<夸克、轻子和规范场>>

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## 前言

According to the current view, the basic building blocks of matter are quarks and leptons, which interact with one another through the intermediaries of Yang-Mills gauge fields (gravity being ignored in this context). This means that the forms of the interactions are completely determined by the algebraic structure of certain internal symmetry groups. Thus, the strong interactions are associated with the group  $SU(3)$ , and is described by a gauge theory called quantum chromodynamics. The electro-weak interactions, as described by the now standard Weinberg-Salam model, is associated with the group  $su(2) \times U(1)$ . This book is a concise introduction to the physical motivation behind these ideas, and precise mathematical formulation thereof. The goal of the book is to explain why and how the mathematical formalism helps us to understand the relevant observed phenomena. The audience for which this book is written are graduate students in physics who have some knowledge of the experimental parts of particle physics, and an acquaintance with quantum field theory, including Feynman graphs and the notion of renormalization. This book might serve as a text for a one-semester course beyond quantum field theory. The first edition of this book, which came out in 1982, was based on a course I gave at M.I.T., and on lectures I gave in Santiago, Chile, in 1977, and in Beijing, China, in 1979. I am indebted to I. Saavedra for the opportunity to lecture in Chile, to Chang Wen-yu and S.C.C. Ting for the inducement to give the Beijing lecture, and to M. Jacob and K.K. Phua for the encouragement to bring out the first edition. The main addition to the second edition are Wilson's approach to renormalization, lattice gauge theory, and quark confinement. I am grateful to the many readers who have pointed out errors in the first edition, which I hope have been corrected in this edition. I owe special thanks to my colleagues at M.I.T., especially A. Guth, R. Jackiw, K. Johnson, and J. Polonyi, from whom I have learned much that is being passed along in this book.

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### 内容概要

依据通行的观点，物质的基本砌块是夸克与轻子，它们通过杨-米尔斯规范场的媒介相互作用(在这种情况下引力被忽略了)。

这就意味着相互作用的形式是完全由某些内部对称群的代数结构所决定的。

于是强相互作用是与SU(3)群相关联的，它是由叫做量子色动力学的规范场理论所描述的。

而电-弱相互作用则是与SU(2)XU(1)群相关联的，现在它是由标准的温伯格-萨拉姆模型来描述的。

本书简明地介绍了在这些思想背后的动力，以及由此而来的严谨的数学系统表述。

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