unification and confinement.

Altogether, this is a very welcome addition to the *Graduate Student Series in Physics*, published by Hilger. It will surely achieve the authors' intention of providing a relatively painless approach to the understanding of gauge theories for many students, whether they be experimentalists or theorists!

Leptons and Quarks

L. B. Okun
361 pp. North-Holland, New York, 1982. $70.25

Weak-interaction physics has undergone a revolution: The theory is now unified with electromagnetism via the Weinberg–Salam model. The resulting electroweak theory has passed all experimental tests, including the crucial observation of weak neutral current effects in neutrino interactions, atomic parity violation, and electron–deuterium scattering. Of course, its crowning glory was the recent discovery of the $W^{\pm}$ and Z^0 intermediate vector bosons at CERN. Initial values for their masses and other properties, although still somewhat preliminary due to poor statistics, are in good agreement with theoretical expectations. Future precise measurements will test the electroweak model at the level of its quantum loop corrections.

In *Leptons and Quarks*, L. B. Okun, a recognized expert on weak interactions, has provided a nice primer for the new electroweak theory. This book grew out of lecture notes for graduate students in high-energy experimental physics. It emphasizes phenomenology and aims to develop basic calculational skills through concrete examples. Formal field theory techniques and subtleties such as quantization, path integrals, and renormalization are either omitted or only briefly mentioned. The author's goal (which is accomplished) is to provide an easily read, up-to-date overview of contemporary weak-interaction physics. The book consists of short sections devoted to numerous decay rates and scattering cross sections involving weak currents of leptons and quarks. Although details are scarce, the essentials are covered and well supplemented by an extensive set of references.

I liked Okun's choice of topics. Not only does he treat the traditional weak processes such as muon, beta, pion and kaon decays, but in addition, he discusses the more recent physics of tau lepton decays as well as b and t quark mixing effects and decays. He also presents in some detail other particularly relevant examples, such as neutrino scattering and electron–positron annihilation. These provide good exercises in relativistic kinematics for students. Perhaps the best chapters are those devoted to K-mesons and CP violation. Okun's expertise and long involvement with that subject allow him to present an easy-to-follow discussion of what is often a confusing topic. It is up to date and complete.

Although this book was completed around 1980, well before the discovery of the $W^{\pm}$ and Z^0, it is by no means obsolete. Okun discusses their anticipated production and basic properties. He clearly shows how they fit into the scheme of weak interactions. Students will better appreciate these recent discoveries after reading the introduction provided by this book. He also covers other contemporary topics, such as grand unification, proton decay and the Higgs scalar, albeit in an introductory manner.

A novel feature of this book is contained in its last 100 pages. There, besides including standard appendices, Okun categorizes research and review articles, monographs and conference proceedings according to topic. In some cases, their chronological ordering combined with his comments provide a nice historical perspective on the development of the field. In addition, he reproduces particle data tables there by handy reference.

For whom is this book suitable? Students familiar with advanced quantum mechanics should be able to follow and profit from the discussions in this book. An instructor teaching an introductory course on elementary-particle physics might use it as an outline for lectures. Supplemented by derivations, background and more details, it could make a very nice course text. Unfortunately, the cost is probably prohibitively high for students.

Overall this is a good introductory text. Translation from Russian does not impede the reading at all. Okun demonstrates not only his expertise in weak interactions, but also his rare ability to communicate that knowledge at a basic level.

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Theory of Laser–Atom Interactions

M. H. Mittleman
Plenum, New York, 1982. $35.00

How well are the compromises made? That is the question for the evaluation of a textbook. Is it authoritative and complete? That is the question for a research monograph. For books between textbooks and monographs there is no easy question, and no single answer is completely satisfactory. Nevertheless, when physicists become authors, they have a strong inclination to try the middle ground, to write books accessible to students but at the same time containing all the most important results in their own fields.

This reviewer, as an author, is not an exception to this pattern, and the present book demonstrates that Marvin Mittleman is not either. Mittleman has aimed for a book that will explain, at the level of first-year graduate quantum mechanics, in one semester how atoms are modified by lasers.

It is an impossible task, of course, but an important one. Atomic physicists deserve to have what doesn't exist yet, an incisive analysis of the most important properties of atoms in laser fields. A book that provides it will be a feast for the reader. It will have to deal with fields largely kept, up to now, safely distinct: optical pumping, free-electron dressed states, photon statistics, multiphoton dynamics, ponderomotive effects, saturation spectroscopy, and atom–atom scattering, to name a few.

Mittleman's book does not attempt more than a few courses from such a feast. Probably it is all we should expect from any physicist with an active research program and classes to meet. The courses that he serves to the reader are determined by several limitations he has adopted. These define the book much more precisely than does the title, and can be described as follows:

Lasers modify atoms in many ways, some of them quite complex, and not all of them yet understood. Many different probes of laser-modified atoms have therefore been proposed and used in the last twenty years, each appropriate in its own domain: magnetic–optical double resonance, electron scattering, fluorescence, far-wing light scattering, multiphoton ionization, resonance Raman scattering, and many others. Mittleman achieves coherence in a short space by ignoring most of these, concentrating almost exclusively on probe interactions involving free charged particles. The major part of the book (Chapters 6–9) is devoted to this limited subject in several important manifestations: potential scattering in laser fields, ionization, electron–atom scattering and atom–atom scattering. These are also areas where Mittleman has concentrated his own research.

The focus provided by this concentration is the book's principal strength. Furthermore, the limitation to free charges as probes justifies another limitation, the neglect of dynamics in favor of scattering. That is, the interaction of an atom with a charged particle can be so brief that time-dependent electron rearrangement within the atom by the laser (sensitively probed by other methods) is safely neglected. Mittleman is able to treat the laser interaction as a static "dress-