tal facts and discussing the pros and cons of various interpretations. In this chapter, and in the following chapter on alternative theories of cuprate superconductivity, general themes are presented effectively, and the author guides us through alternative theories without becoming an advocate or outspoken critic. These sections will be particularly useful as an introduction to what is an enormous and very complicated literature, and they should be useful reading, even when some of the unresolved issues are settled.

Finally, the discussion of applications, although included for completeness, could have been omitted without serious loss. This area has also been a moving target, and the chapter is too brief to do the subject justice.

In examining any book on superconductivity, there are inevitable comparisons with the recently revised and updated modern classic in the field, *Introduction to Superconductivity* by Michael Tinkham (McGraw-Hill, 1996) (reviewed in PHYSICS TODAY, October 1996, page 74). I believe Tinkham's book is more accessible to readers who have less background in statistical and quantum physics and is much more detailed in its treatment of many general topics and of many issues that are the object of intense contemporary research. On the other hand, Waldram's book contains many profound physical insights and provides a comprehensive introduction to a wide variety of topics. It is also written from a different perspective, and it ventures more widely into questions that are not yet settled. It certainly should be read by serious students of the subject.

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The Origin of the Concept of Nuclear Forces

Laurie M. Brown
and Helmut Rechenberg
IOP, Philadelphia, 1996. 392 pp.
$79.50 hc ISBN 0-7503-0373-5

The Origin of the Concept of Nuclear Forces presents a detailed account of the evolution—between 1932 and 1950—of the understanding of nuclear forces. The prologue sets the stage: a historical account of the developments that led to the discovery of the neutron.

The real history begins with that discovery in 1932 and with various theories picturing the neutron as a composite object made of a proton and an electron. It continues with Enrico Fermi's theory of beta decay and Wolfgang Pauli's proposal of the neutrino. It then follows researchers' attempts to understand nuclear forces in terms of this new theory and of composite particles. The authors, Laurie Brown and Helmut Rechenberg, present the experimental results from 1930s cosmic-ray experiments and their applications to efforts to understand nuclear forces. Here, as throughout the book, the authors intersperse parts of letters and interviews with leading participants. There are also pictures of physicists who were part of the story and, sometimes, some fascinating comments on aspects of their lives.

The second and third parts of the book (parts B and C) detail the origin of Hideki Yukawa's meson theory of nuclear forces, its dissemination from Japan to the US and European communities, the subsequent erroneous identification of the muon as what was then called a "mesotron" and the attempts to create a convergent field theory of nuclear forces based on Yukawa's meson. The story includes the realization, as the properties of the cosmic-ray particle were studied, that the "mesotron" could not be Yukawa's particle. This period saw many advances in field theory, including the developments for spin 1 and spin ½ particles. The concept and generalization of what constitutes an elementary particle also date from this period.

Part D includes relevant developments in physics during the wartime years (1939–44) in both East and West. The period after World War II saw the resolution of the mesotron (muon) puzzle with the discovery of a second meson. Also, a neutral meson was very desirable for an understanding of the close equality of the strong proton–proton and neutron–proton forces. The discovery of the π^0 thus helped the charge independence, or isospin invariance, of nuclear forces. The discovery of V particles (strange hadrons) is detailed.

The story ends in 1950, since everything necessary to a concept of nuclear forces was then in place. However, in an epilogue, the authors trace, cursorily, developments after 1950, including quantum electrodynamics renormalization theory, the discovery of the "particle zoo," the importance of symmetries, quantum chromodynamics and the standard model of strong and electroweak forces.

The authors deliver on their promise to trace the origin and development (both experimental and theoretical) of the concept of nuclear forces up to 1950. The book not only describes theories that led to a better understanding of nuclear forces but also details the twists and wrong turns taken along the way, twists and turns that often led to conceptual developments useful in physics at a later time.

There are ample footnotes and references at the end of each chapter and at the end of the book. It would have been helpful to have the appropriate page numbers for the references listed at the end of the book. I found very few misprints and only one photograph where the subjects and names are mixed up. The book is well written and a pleasure to read. Although it obviously will be of most interest to physicists or historians of science—and thus there are some equations—most of the text would be easily understandable by a nonphysicist interested in a detailed history of our understanding of nuclear forces.

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