dates of state pharmaceutical associations and schools of pharmacy, the dates on which laws concerned with pharmacy were passed (in the U.S.), publications of the American Pharmaceutical Association, and museums of pharmacy throughout the world.

Hitherto the book has been useful in the classroom and in pharmaceutical and science libraries. This revision not only fills the same roles, but will also be useful in public libraries as a source of information on pharmacy for the layman and in high school libraries as a service to interested upperclassmen and their guidance counselors.

NORMAN H. FRANKE
Department of Pharmacy,
University of Kentucky

The Solvay Congresses

The Quantum Theory of Fields. Proceedings of the conference held at the University of Brussels, October 1961. Stoops, Brussels; Interscience, (Wiley), New York, 1963. 261 pp. Illus. $8.

This is the report on the 1961 Solvay Congress, the 50th anniversary of the first Solvay Congress. The subject of the conference was, perhaps, more general than those of the most recent Solvay congresses, and perhaps even more general than the title indicates: it encompassed the most important developments of the last few years on the frontiers of modern theoretical physics.

The outward organization of the congresses has changed little throughout the years: addresses by "rapporteurs" are followed by a general discussion. This conference had a galaxy of reporters—Bohr, Heitler, Feynman, Pais, Gell-Mann, Källén, Goldberger, Mandelstam, and Yukawa. The number of participants was also greater than usual, even though the increase in their number did not keep pace with the increase in the number of physicists throughout the world. In addition to the reporters, there were nine members from the United States, three from Great Britain, and one each from Denmark, Germany, Italy, Japan, Sweden, and Switzerland. Members of the secretarial staff and the official "auditeurs" participated in some of the discussions. Three Russians were invited but could not come.

If the outward form of the conference was very similar to that of the early congresses, the spirit of the conference did undergo radical changes. This fact emerged most clearly from Bohr's colorful introductory report in which he reviewed the earlier conferences in a somewhat nostalgic but most fascinating address. His report on the first few conferences, though he did not attend them, is just as vivid and charming as that of the later ones at which he had a leading part. At the early conferences, all participants were familiar with the work of all other participants—they formed a single family intellectually. At present, it is hard to find anyone who can fully appreciate all parts of all the reports, even though personal contact among participants is more frequent. However, this greater intellectual distance between participants made the conference more exciting and also made the report—this book—more useful. Earlier Solvay reports had as much human as scientific interest; the present one, while not diminished in human interest, is also scientifically a most useful volume, one that I have already seen in the hands of several colleagues.

The reports vary a great deal in character and sophistication, and it is not possible to review all of them. I particularly enjoyed reading the contributions of Feynman, Pais, and Gell-Mann—perhaps because I was more familiar with the subjects of the other contributions.

Feynman's contribution has two parts. The first is a sketchy but instructive description of the way concrete results are obtained from quantum electrodynamics. The results are compared with experiments in order to assess the validity of quantum electrodynamics. The possible deviations are expressed as modifications of the propagator, and it is concluded that such modifications, if any, are not appreciable below an energy of 600 Mev. The second part of Feynman's contribution is a stimulating analysis of the foundations of quantum electrodynamics and its conceptual limitations. This is the most interesting part of the review, and it also contains brief reference to dispersion theory. It is not everywhere easy to follow, and I also had my difficulties. The report is studded with delightful apercus, such as the following: "No problem can be solved without dragging in its wake new problems to be solved. But the incompleteness of our present view of quantum electrodynamics, although presenting us with the most interesting challenges, should not blind us to the enormous progress that has been made. With the exception of gravitation and radioactivity, all of the phenomena known to physicists and chemists in 1911 have their ultimate explanation in the laws of quantum electrodynamics."

Pais presents a splendid review of our state of knowledge concerning weak interactions, with particular emphasis on accurate and approximate invariances. He divides the processes induced by weak interactions into three groups. The processes of the first group result in a pair of *leptons*, that is electrons, neutrinos, or μ-mesons. The decays of the second category also result in a pair of leptons, but the decaying particle undergoes a greater change than in the processes of the first category: their "strangeness" changes. The processes of the third category do not produce a pair of leptons but a strongly interacting meson, such as a π. Pais discusses the experimental material concerned with each of the groups of processes and also the validity of the various invariance principles for them. Although his report reaches the boundaries of our knowledge, it could also serve as an introduction for the less initiated.

Symmetries are the theme of Gell-Mann's discussion. He mentions all the precise symmetries that we know, as well as charge, baryon (that is, heavy particle), and lepton conservation. He considers the approximate conservation laws as implying particularly simple equal time commutation relations—a view that surely needs further elaboration but one which will be most fruitful if confirmed.

In summary, this book reports on a very stimulating conference in a most stimulating fashion. It is a pleasure to read, and I enjoyed virtually all parts of it—but at times it was a strenuous pleasure.

EUGENE P. WIGNER
Department of Physics,
Princeton University

Principles and Applications

Mass Spectrometry. Charles A. McDowell, Ed. McGraw-Hill, New York, 1963. xii + 639 pp. Illus. $20.

As science continues to become more specialized, it is increasingly more common and understandable that books are "edited by" rather than written by one