now being published in this field are evidence of the change that has occurred as the result of vastly improved modern methods of separation and purification of these elements, and new subjects have been created for investigation by both the old standard techniques and the most recently developed research methods.

The 30 papers, which follow the introduction, range from the highly practical one entitled "Fabrication of yttrium metal" to the theoretical one entitled "The electronic structure of the rare-earth metals." Many metallurgical grams are established, and lattice spacings are determined with great precision.

The reader will find much good inorganic and physical chemistry and solid-state physics. Some papers review a considerable amount of background information in covering their subject. The book will bring inorganic chemists up-to-date on some very interesting problems, such as the nonstoichiometric hydrides of the rare earths, but it is intended primarily for specialists in the field of rare earth research—to them it will bring new and valuable contributions in their field.

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Components of Matter

Theory of Elementary Particles. Paul Roman. North-Holland, Amsterdam; Interscience, New York, ed. 2, 1962. xvi + 580 pp. Illus. $12.75.

This book is described on its title page as a "second improved and revised edition" of a work first published in 1960 [reviewed in *Science* **132**, 1391 (1960)].

In his preface to this edition, Roman states that he has "endeavored to keep intact the structure and character of the book." On perusal, I find that this is a very accurate statement. No extensive revisions have been made in either the subject matter or its treatment. Apart from a little up-dating of the material at the end of the book and correction of errors, the present edition is essentially the same as the first, with its good and bad points.

The reader who is familiar with the first edition will know that the book is divided into three roughly equal parts of approximately 200 pages each. The first covers the four-dimensional orthogonal group, field equations, and field quantization. The second deals with symmetries, conservation laws, and selection rules, while the last, somewhat shorter, section treats isospin and classification schemes for the fundamental particles.

I find no real fault with the first two-thirds of the book. The author's treatment of the group-theoretic and algebraic structure of relativistic fields is clear and elegant. His discussion of invariances and selection rules is generally good, with many examples drawn from particle-antiparticle systems and weak interactions.

The last section is the least useful. The dangers of an extensive presentation of the "geometry" of quantum numbers, as it existed three or more years ago, are evident when one considers current concepts in this area. The existence of multiboson resonances (ρ, ω, η, K*, and the like) and meson-baryon resonances of various sorts has stimulated many new and evolving theories of symmetries based on SU_3 and other groups. At the present time the situation is so fluid that it seems unwise to devote a large amount of space in a self-styled introductory book to a discussion which is so readily outmoded. Even the few pages of new material at the end of the book are now superseded.

What the author chose to cover in the first parts of the book, he treated extremely well. But I object to the book's title, for it does not present an accurate description of the contents. The study of elementary particles, whether theoretically or experimentally, involves intimate consideration of transitions of quantum-mechanical systems from one state to another. Consequently, when the author states in his preface, "I never attempted in the book to actually calculate a transition probability or a lifetime. I did not even mention the 'classical' tool of the S-matrix method," I can but reply that he is not presenting the theory of elementary particles, but only a very restricted part of that theory. The student who seeks to learn about the theory of elementary particles will find much of value in this book, but he will be forced to go elsewhere to complete, even partially, his education in the field.

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Notes

Commercial Alloys

This fourth edition of the well-known **Engineering Alloys** by Norman E. Woldman (Reinhold, New York; Chapman and Hall, London, 1962. 1363 pp. $29.50) lists 35,000 commercial alloys together with their composition, their uses, and the names of the companies that manufacture them. The new edition contains information on 15,000 more alloys than its predecessor (1952) and represents a major revision. Woldman is to be congratulated for his careful effort to list alloys manufactured throughout the world. An alphabetical index of engineering alloys together with an alphabetical list of manufacturers (totalling 1536) provides ready identification of most important engineering alloys. The book should be very useful to those who deal extensively with commercial alloys. A minor deficiency is that to find the manufacturer of a pure metal one must know the trade name of the specific pure metal desired. The descriptions of foreign alloys are not as accurate as those of domestic alloys (for example, S.A.P., Hiduminium 100, and Sendust are incorrectly described for composition).

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Recent Research

Parts 1 and 2 of volume 15 of **Fortschritte der Zoologie** (Fischer, Stuttgart, 1962. 164 pp. and 172 pp.), which is edited by Hans Bauer, contain the same sort of excellent reviews as the earlier volumes in the series. W. Hasselbach (Heidelberg) gives an extensive summary, including a substantial bibliography, of recent work concerned with the coupling of chemical and mechanical reactions during contraction and relaxation of skeletal, heart, and smooth muscles; he places special emphasis on the various reactions of the isolated contractile proteins and on the role of the physiological relaxation factor. H. Lüttgau (Bern) summarizes, under the somewhat misleading title "Physiology of nerves," the most recent findings about ion movements on the excitable membranes of vertebrates and invertebrates, their electrical characteristics

and potentials, and the conduction of excitations through synapses and motor end plates. In the last paper of part 1, G. Osche (Erlangen) reports newer aspects of some general principles of the ecology of parasitism and of symbiosis, including the problems of phoresy and commensalism.

F. Huber's (Tübingen) paper (in part 2) is entitled "Comparative physiology of the nervous system of invertebrates" and deals mainly with the more recent work on the nerve nets of coelenterates, the heart ganglia of crustaceae, and the neurons and physiology of the central nervous system of the main groups of arthropods as well as of the cephalopods. Huber's extensive biography is subdivided according to the subchapters of his paper. The other paper in this part, by J. Schwartzkopff (Munich), is a comprehensive review of the comparative physiology of hearing and of vocalization in invertebrates and vertebrates, which covers mainly the progress made during the last 5 years. Echo orientation by birds, whales, and bats is included. Although the bibliography cannot be considered complete, it does cover the field rather evenly.

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Paleontology

Beginning students of paleontology and amateurs should find use for this small handbook, **British Mesozoic Fossils** [British Museum (Natural History), London, 1962. 210 pp. 12s. 6d.]. The handbook, which was prepared by C. P. Costell, L. R. Cox, H. M. Murwood, and others on the museum staff, includes a generalized geologic map, a general discussion of the Mesozoic stratigraphy and paleogeography of Great Britain, stratigraphic tables, a stratigraphically arranged list of species, hundreds of excellent drawings of the species listed, and a simple discussion of the scientific names of fossils. The volume will be most useful, of course, in Great Britain and adjoining parts of northwestern Europe, but people living elsewhere will find that the marine Mesozoic rocks in their countries contain closely related species and a similar faunal succession.

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Ornithology

In this new edition of **A Field Guide to Western Birds** (Houghton-Mifflin, Boston, 1961. 393 pp. $4.95), Roger Tory Peterson has refined his own technique of field identification to a point that is an artistic achievement as well as a scientific contribution. The present guide excels its predecessor in several ways. There are more color plates, arranged and drawn for easier comparison, with legend pages facing almost all of them. In the text, there are more precise and consistent descriptions of habitats, sections on similar species have been added, and the list of subspecies, not usually applicable in field identification, has been eliminated.

In addition to these improvements geographical scope has been added. All species found in North America, west of the 100th meridian, and a section on the birds of the Hawaiian Islands are now included. In contrast, the earlier edition covered only the western United States. With this new scope the cast of characters has been upped to a grand total of 747 species, presented on 366 pages. Thus, the addition of 126 pages has made room for well over 250 more species.

Although organization and skill have kept the book to the proportions of a field guide, the problems of dealing with so wide a geographical range are apparent. The hummingbird plate (p. 166) illustrates this. Eight of the 15 birds pictured there have ranges so limited that 99.9 percent of those who use the guide will not be within these areas, but no indication of this is given on either the plate or the legend page.

We feel that a key or list of restricted ranges on the legend pages would greatly simplify the use of plates where a substantial number of the birds have a limited distribution (hummingbirds, smaller auks, and flycatchers).

Perhaps the most significant addition to the guide is its companion, **A Field Guide to Western Bird Songs** (Houghton-Mifflin, Boston, 1962. $12.95), an album of three 12-inch records with the songs and calls of more than 500 species. The album and records are keyed to the pages of the book. The records will be helpful not only to observers in the western United States but to Easterners who use them to compare the variant songs of the same species in the East and the West. The recordings, which are well chosen from the standpoint of their typical nature, were produced by the Laboratory of Ornithology at Cornell University.

Certainly the book and recordings are a necessary part of any specialized collection; they are also essential for both amateur and professional ornithologists in western North America.

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New Books

Mathematics, Physical Sciences, and Engineering

Active and Passive Earth Pressure Coefficient Tables. Alfreds R. Jumikis. College of Engineering, Rutgers Univ., New Brunswick, N.J., 1962. 371 pp. Illus. $10.

Angular Momentum. D. M. Brink and G. R. Satchler. Oxford Univ. Press, New York, 1962. 142 pp. Illus. $2.40.

Annual Review of Nuclear Science. vol. 12. Emilio Segrè, Gerhart Friedlander, and Walter E. Meyerhof. Annual Reviews, Palo Alto, Calif., 1962. 633 pp. Illus. $8.50.

Basic Theories of Physics. *Heat and Quanta* (© 1951, 310 pp.); *Mechanics and Electrodynamics* (© 1949, 288 pp.). Peter Gabriel Bergmann, Dover, New York, 1962. Paper, $1.75 each.

The Challenges of Space. Hugh Odishaw, Ed. Univ. of Chicago Press, Chicago, 1962. 397 pp. Illus. $6.95. Revised and expanded version of papers published in the May–June 1961 *Bulletin of the Atomic Scientists.*

Developments in Applied Spectroscopy. Proceedings of the 12th annual symposium (Chicago, Ill.), May 1961. vol. 1. W. D. Ashby. Plenum Press, New York, 1962. 270 pp. Illus. $9.

Gas Chromatography. Howard Purnell. Wiley, New York, 1962. 448 pp. Illus. $12.

Zur Geochemie und Lagerstättenkunde des Urans. Josef Dybek. Borntraeger, Berlin, Germany, 1962. 163 pp. Paper.

Physique Solaire et Géophysique. A Dauvillier. Masson, Paris, 1962. 361 pp. Illus. NF. 72.

Principles of Applied Geophysics. D. S. Parasnis. Methuen, London; Wiley, New York, 1962. 183 pp. Illus. $4.50.

Principles of Mechanics and Dynamics. pts. 1 and 2. Sir William Thomson and Peter Guthrie Tait. Dover, New York, 1962 (reprint of 1912 ed.). pt. 1, 525 pp.; pt. 2, 552 pp. Illus. Paper, $2.35 each; $4.70 per set.

Progress in Infrared Spectroscopy. Proceedings of the fifth annual spectroscopy institute (Buffalo, N.Y.), August 1961. vol. 1. Herman A. Szymanski, Ed. Plenum Press, New York, 1962. 452 pp. Illus. $16.

Stars and Galaxies. Birth, ageing, and death in the universe. Thornton Page, Ed. Prentice-Hall, Englewood Cliffs, N.J., 1962. 176 pp. Illus. Paper, $1.95; cloth, $3.95.