titles contain large amounts of elementary descriptive material. There are also discussions of immunology, of allosterism, and of mechanochemical processes (for example, muscle and mitosis).

It is interesting that molecular biology seen through Russian eyes looks much the same as it does in the West, except for some pointed mentions of Russian priority ("In 1892, the Russian botanist, Ivanovskii, observed that the juice of a tobacco plant that was diseased with the mosaic disease . . . could infect healthy plants even after this juice had been passed through the finest filters"), and for some lingering echoes of the Lysenko controversy.

Covering such a vast range, the discussion is necessarily compressed, and the author seldom allows himself the leisure to explore points of interest in detail, even in those areas in which he himself has contributed greatly. Oppressed by such discipline, much of the "life" in the title seems to have escaped from the text. One can only hope that next time Vol'kenshtein will devote his admirable talents to a deeper-going, even if narrower, treatment.

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Polymer Formation

Principles of Polymerization. GEORGE ODIAN. McGraw-Hill, New York, 1970. xviii, 652 pp., illus. $18.50.

Principles of Polymerization is a comprehensive treatise on the kinetics and mechanisms of polymer-forming reactions. It begins with the classical kinetic and statistical treatment of step polymerization and continues with a similar discussion of radical chain polymerization. The presentation of subsequent topics follows the regular pattern of polymer chemistry texts—anionic, cationic, and ring-opening polymerization, and so on.

The uniqueness of Odian's approach —that which gives this volume a distinct "personality"—is in its emphasis on the use of different polymerization techniques to reach specific end-product objectives. Included in the discussion of each polymerization method is a concise description of the advantages and flexibility it offers the chemist. This is of particular value for students because it makes clear the latitude afforded by intelligent use of polymerization variables. The numerous alternatives for synthesizing macromolecules become valuable means for meeting one's objectives rather than a morass of facts that must be mastered.

The problems at the conclusion of each section warrant special comment. They were thoughtfully written and cover key points raised in the text. The reader's mastery of the subject matter will be not only tested but increased by diligent attention to these exercises. As is stated in the preface to the book, a solutions manual for the problems is available from the author.

Odian has presented each subject in its proper perspective. Books on polymerization often overemphasize given aspects of the subject (usually the authors' own research interests); this text presents a balanced description of the different branches of polymerization chemistry—a treatment that is consistent with the degree of importance of and state of knowledge in each area. Fact and theory also are presented in a well-ordered, complementary fashion.

The one exception to the generalization made above is the discussion of stereo-specific polymerizations, which jumps from broad speculation to simple presentation of empirical facts with little in between. This, however, is a reflection of the state of knowledge in this area.

In summary, to the expert the text will serve as a clear, orderly review of polymerization chemistry; to the student it will be of value as a good introductory text—assuming that supplementary material (or a complementary course) in polymer physics and characterization is available.

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The Magnetization Process

Magnetic Domains. R. S. TEBBLE. Methuen, London, 1969 (U.S. distributor, Barnes and Noble, New York). xii, 100 pp. + plates. $4. Methuen's Monographs on Physical Subjects.

Magnetic Domains is a descriptive primer for people who are not students of solid state physics but who may, for one reason or another, have a need to understand the basic phenomena of the formation and changes of magnetic domains and the corresponding impact on magnetization curves. A brief chapter on techniques for domain observation is included which is admirably simplified for an audience that will not need to produce domain photographs but may wish to interpret them. Chapter 1 attempts, in 13 pages, to ascribe the magnetic moment to spins, and the cooperative phenomena are explained in terms of a Weiss internal field. At most a sophomore-level course in electromagnetism and a corresponding laboratory familiarity are assumed in the presentation.

Chapters 3 through 6 of the book contain the heart of the matter, discussing the energetics of domains, their resulting shapes and configurations, and how they change in applied magnetic fields to yield the observed magnetization curves. It may be fair to say that these chapters are an attempt to cover at a lower level the excellent work of Kittel and Galt in the Seitz-Turnbull series (which is of course intended for physicists). Although one can always suggest minor changes in the topics covered and the order of presentation, the book as a whole accomplishes this objective. Many excellent figures and micrographs complement the presentation.

The book will certainly prove valuable to nonphysicists in need of a framework of understanding of magnetic domain phenomena.

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Nuclear Events

Excitation Mechanisms of the Nucleus. Electromagnetic and Weak Interactions. JUDAH M. EISENBERG and WALTER GREINER. North-Holland, Amsterdam, and Elsevier, New York, 1970. xii, 372 pp., illus. $19.25. Nuclear Theory, vol. 2.

This book is volume 2 of a series of three books, Nuclear Theory, by the authors. It covers a fairly wide range of topics, some of which are not adequately discussed in other currently available books. As the authors write in their preface (with slight changes added by the reviewer): "The job of finding out how the basic theoretical concepts of nuclear structure physics were welded into detailed quantitative predictions about nuclear properties is becoming increasingly difficult. This is so because the vast and indigestible literature of nuclear physics is being

augmented at a frightening rate, while some of the very fundamental concepts in this area continue to be found only in the rather sketchy original accounts of the research journals. It appeared to us that the time was ripe to attempt a consolidation of this material."

In general, the book is not difficult to follow, provided the reader has a background in quantum mechanics and introductory nuclear physics.

The first part, Radiation Theory and Nuclear Photoexcitation, is mainly a review. Though a good part of this material is available in other books, part 1 still is a very useful starting point and reference.

The next part, Electroexcitation of Nuclei, is quite comprehensive, covering electron scattering, both elastic and inelastic, Coulomb excitation, muonic atoms. Much of this is not available in book form. Part 3 deals with weak interactions in nuclei, in particular nuclear beta decay and muon capture. This part is less comprehensive than the first two, but it might still be useful as a reference.

The appendices should be of considerable help to readers who want to study the book in detail. This is especially true for appendix A—"The quantum theory of angular momentum." Even though this material is available elsewhere, its inclusion makes the book more self-contained.

Altogether this book should be useful to both graduate students as a textbook and to nuclear physicists as a reference. In this reviewer's opinion, Eisenberg and Greiner have succeeded very well in their stated goal.

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Electronic Phenomenon

Electron Paramagnetic Resonance of Transition Ions. A. ABRAGAM and B. BLEANEY. Clarendon (Oxford University Press), New York, 1970. xvi, 912 pp., illus. $41.50. International Series of Monographs on Physics.

About 25 years ago Zavoisky discovered electron paramagnetic resonance in solids. Today paramagnetic resonance is not only a subject of study in itself but also a tool used in many fields of investigation. It is one of the important tools in the investigation of the electronic properties of the ground state of magnetic centers, and its applications are found in physics, chemistry, biology, metallurgy, and geology.

The authors of *Electron Paramagnetic Resonance of Transition Ions* are among the first pioneers in this field. Abragam, together with Pryce, while working in Oxford, provided the main theoretical framework for the understanding of the properties of transition ions in single crystals. The initial important experimental work was done by Bleaney in the early '50's and was extended by his students and co-workers. The Oxford school consisted of scientists such as Stevens, Elliott, Judd, Ingram, Baker, Hayes, Griffiths, and Owen, each of whom has significantly enlarged the scope and importance of this field.

This monumental book is the outcome of the research of this group and bears the imprint of their knowledge and philosophy. It is a very large book, even within the restriction of dealing only with transition ions. Among the best chapters are the beautiful preliminary survey, a discussion of the implication of the spin Hamiltonian, and (in chapters 5 through 8) a detailed discussion of the ground state of the energy levels of transition ions. The theoretical survey (chapters 11 through 16) deals lucidly with aspects of crystal field theory and group theory. There are many standard textbooks dealing with these subjects, however, and these chapters, which, though clearly written, are not directly related to the main body of the book, are somewhat superfluous. In addition, the transition from the group theoretical calculations to the spin Hamiltonian is not clearly indicated. On the other hand, the theoretical discussion contains probably the finest descriptions available of time reversal and Kramers degeneracy, and of the Jahn-Teller effect in paramagnetic substances.

The book before us is the most authoritative book in this field. It will be used both as a reference book by the expert and as a book of study by the graduate student beginning to work in the field.

The reviewer does not do himself justice without a few words of criticism. There is no discussion of the paramagnetic resonance spectra of transition elements in organic biological materials or in metals; the authors deal nearly exclusively with transition ions in inorganic salts and should have indicated this in the title of the book. (On the other hand, in the discussion of the electron nuclear double resonance, or ENDOR, the authors illustrate the ENDOR effect mainly through spectra of donors in silicon where the paramagnetic center is not a transition ion and the host not an inorganic salt.) Reference should also have been made to paramagnetic resonance of transition elements of optically excited states. This field is probably going to become more important in the future and may provide some additional tests of various fine points of the theory of spin resonance in solids.

This volume is a worthy companion to Abragam's classic *Principles of Nuclear Magnetism.*

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Volcanic Chain

Volcanism and the Upper Mantle. Investigations in the Kurile Island Arc. GEORGII S. GORSHKOV. Translated from the Russian edition (Moscow, 1967) by Charles P. Thornton. Plenum, New York, 1970. xvi, 385 pp., illus. $35. Monographs in Geoscience.

Gorshkov's original Russian text was entitled "Volcanism: Kurile Island Arc." The change of title to emphasize the nature of the upper mantle as understood from studies of the products and roots of Kurile volcanoes was not done entirely to generate wider interest in this important book. This emphasis is the message, and it comes through loud and clear.

Deep seismic soundings by refracted explosion waves clearly show that the relatively simple Kurile island arc is underlain by three distinct types of crust: in the north by a continental crust of 30 kilometers' thickness; in the center by an oceanic crust 10 to 15 kilometers thick; and in the south by a 30-kilometer-thick "suboceanic" crust composed of a "basaltic" lower sequence overlain by up to 7 kilometers of volcanic rocks. In effect, the arc has roots at the northern and southern ends, but with different seismic velocity layers; these are separated by a 200-to-300-kilometer-long central gap with little or no crustal root.

The surprising thing is that the chemistry of the volcanic rocks along the arc shows almost no relationship to this major difference in basement rocks. The north and central Kurile Islands have identical calc-alkaline lavas, and the southern Kurile lavas are similar