textbooks of the same level. Examples are Chapter IX on measurements with interferometers and Chapter IV on wave trains of finite length. Appropriate figures and five plates accompany and elucidate the text.

The next four chapters treat the classical electromagnetic theory, including the theory of absorption, dispersion, and anisotropic media. A chapter on "Interaction of radiation and matter" makes the student familiar with quantum effects and leads naturally to the last chapter on "Quantum theory of radiation." The space allotted to the treatment of these two chapters is definitely too limited, and therefore the presentation contrasts unfavorably with that of the earlier chapters. However, it must be admitted that this shortcoming is partly due to the topic itself. The student must have made considerable progress in mathematics during the advance of this course in order to be able to grasp the content of this last part. But even when the student is not able to absorb all the details presented, he will definitely profit from reading the sections of more general content, which give a clear picture of the trend of the modern theory.

It can hardly be avoided that such a comprehensive treatment as this is not free from occasional defects. One misses the names of Franck and Hertz in section 17.11 on critical potentials. One of the weakest parts is section 17.5, which deals with the regularities in line spectra of atoms. This brief section needs considerable extension and clarification. Ritz's combination principle is of such fundamental importance that its mention in one obscure sentence is not sufficient. Furthermore, it may be mentioned that Fig. 19.2 does not represent the rosette orbit of a simple harmonic oscillator in a magnetic field (as claimed in the text) but that of a precessing Kepler-ellipse. It should be replaced by another one. However, these minor defects cannot affect the otherwise excellent impression of the book, which in general is characterized by clarity, detailed treatment, and a high degree of completeness.

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Nature and Structure of Collagen. Papers presented for a discussion convened by the Colloid and Biophysics Committee of the Faraday Society at King's College, London, 26–27 Mar. 1953. J. T. Randall, Ed. Academic Press, New York; Butterworths, London, 1953. 269 pp. Illus. $6.50.

The problem of the structure of collagen is as yet unsolved. At the suggestion of J. T. Randall, an informal discussion of the properties of collagen in relation to its structure was held recently. Many of the principal workers in the field contributed papers, dealing with the histology and nature of connective tissue, the metabolism of collagen, the properties of collagen solution, the chromatography of amino acids in collagen, the precursors of skin collagen, the x-ray diffraction pattern of collagen fibers, the structure of collagenous tissue and collagen preparations as shown by electron micrographs, and a number of other subjects. The book containing these papers and the discussion that was given them by participants in the meeting can be recommended to everyone interested in collagen and connective tissue.

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The Physical Chemistry of the Silicates. Wilhelm Eitel. Univ. of Chicago Press, Chicago, 1954. xvii + 1592 pp. Illus. $30.

The author, director of the Institute of Silicate Research, University of Toledo, presents a most complete encyclopedia of the silicates. This book is an extended, up-to-date English version of the well-known German standard work on silicates, which Eitel wrote while he still was director of the Kaiser Wilhelm Institut für Silikatforschung in Berlin. The work is far more comprehensive than the title indicates. On account of the excellent general review of reactions in the solid state and the detailed description of the mechanism and kinetics of sintering, it not only is of interest to ceramists and silicate chemists but is also fascinating for metallurgists and solid state physicists.

The book consists of five parts. Part I, which is the most comprehensive, with more than 500 pages, describes the crystalline state in general, the special structures in silicates, such as isolated, chain, layer, and framework structures. It further contains a complete analysis of the fused and glassy states, the constitution and physicochemical properties of melts and glasses. The colloids also are described in this part, and attention is especially called to the systematic discussion of the clay-water system as colloidal phenomena in silicate systems and to the intimate relationship of changes in fired clays with reactions in the solid state.

Part II is concerned with the fusion and polymorphic equilibria in dry silicate systems. A description of the various methods for the determination of fusion points introduces this part, which contains interesting details on the correlation between undercooling and crystallization and on polymorphic inversions. A brief discussion on the effects of pressure on inversion equilibria, with references to the work by Bridgman, Tammann, and Sosman, is of great actuality with respect to some recently described effects of pressure in metallurgical diffusion work. More than 200 pages, containing 150 phase diagrams, are devoted to special silicate systems such as alkali-, aluminum-, heavy metal-, and the presently much-discussed borosilicate systems.

Part III covers the silicate systems with volatile components and silicate hydrates. The gas absorption phenomena in fused silicates are described in detail. Many readers will be especially interested in the discussion of hydrothermal mineral synthesis. This remarkable synthesis of clay minerals, and others, by hydrothermal reactions of different minerals of the

feldspar group under high simultaneous pressures of water and carbon dioxide at elevated temperatures, is described extensively under consideration of the latest developments in this field. A detailed analysis of the silicate hydrates of the Zeolite and Permutit group also covers the dehydration of silicate hydrates and the various types of water binding.

Part IV, entitled "Solid state reactions and their ceramic use," considers the mechanism of sintering and correlation between structural defects and their reactions in the solid state, with special emphasis on the work by Hedvall. The material migration on the contact between reacting solids and systematic investigations on reactions in the solid state for silicate synthesis are some of the high lights of this general review of the present status of solid state research and development. This part further contains a description and discussion of the reactions in ceramic bodies and in hydraulic cements, with accent on the hydration of cements, including valuable comments on the colloidal theories of cement hardening.

The last part of this standard work is concerned with the silicate melts and industrial glasses and slags and describes the reactions in glass melting and the highly complex constitution of slags.

This monumental encyclopedia is characterized by an especially careful system of indexing. A 72-page subject index is followed by an index to minerals and rock species, a systematic index of the special silicate melt equilibria, an index of chemical compounds, and a 44-page author index for references. Each paragraph of the book is numbered, which permits quick reference and cross-reference. Clearly and systematically written and well printed, this will be used as a standard work for many years.

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Fundamentals of Ecology. Eugene P. Odum. Saunders, Philadelphia, 1953. xii + 384 pp. Illus. $6.50.

This is the first introductory textbook in ecology since the publication of "that noteworthy milestone" by Allee *et al.* in 1949. Where the trees were obscured by the forest, so to speak, here they are neatly arranged and the forest appears as an orderly grove; in short, Odum has done an excellent job in conciseness, and his title is fully justified. This is also the first effort to summarize the ecosystem or trophodynamic approach (characteristic of the Yale or Hutchinson school) to ecology, but adequate consideration is also given to the traditional habitat approach. Since the author is a terrestrial ecologist, it is natural that most of his examples and illustrations should be drawn from terrestrial studies and that marine ecology should be slighted somewhat (at least from the viewpoint of a marine ecologist). Almost six pages in the chapter on marine ecology are devoted to a series of figures from a standard textbook; these pages might better have been used for fuller discussion of some points. The section on commensalism is too short to be of real value. On the whole, however, the book presents a well-balanced view of the broad field of ecology, drawn from practical teaching experience.

The writing is clear, concise, and for the most part free from specialized terminology. The author's recommendation that *littoral* be abandoned as a term in marine ecology will not be well received, and his use of *biogenic* for "dissolved salts vital to life" will startle marine ecologists, who have used "nutrient salts" in this meaning and adhere to the long-established meaning of *biogenic* in its geologic sense as applying to inorganic materials or structures formed by biological agency. There are few such slips, however, aside from the author's apparent inability to spell people's names correctly, and these can be corrected in a new edition. The illustrations are clear and well chosen, and there is a good bibliography and index.

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Nuclear Moments. Norman F. Ramsey. Reprinted in part from ***Experimental Nuclear Physics,*** vol. I, E. Segrè, Ed. Wiley, New York; Chapman & Hall, London, 1953. 169 pp. Illus. $5.

Since World War II, a large number of papers have appeared in the literature on research in radio- and microwave-frequency resonance phenomena. *Nuclear Moments* by Norman F. Ramsey performs a service, which has long been in demand, of describing the basic achievements of various resonance experiments dealing with the magnetic dipole and electric quadrupole moments of stable nuclei. Along with liberal references, complete tables of nuclear moments and related properties, an appendix on nuclear shell structure, and a review of the theory of nuclear moments as applicable to any experiment, the author devotes the main discussion to a correlation of various experimental results obtained by different workers. In short order the reader is given an excellent survey and a pertinent description of topics of current interest that will serve as a useful guide in seeking further details in the scattered literature.

The book is written in five parts. Particular emphasis is placed on resonance studies of chemical structure and the solid state, in the interest of many who are currently engaged in such work. Two introductory chapters present the fundamental definitions and properties of nuclear moments. A precise formulation is given of the types of interactions between the nucleus and surrounding atomic and molecular fields. The next chapter opens the topic on experimental methods by a review of molecular-beam nonresonance experiments, followed by a discussion of present-day molecular beam and neutron beam resonance techniques. The next part outlines the techniques and