Theorien vom 'Ki' als Grundproblem der Natur-'Philosophie' in alten Japan," compares the original concept of *Ki* to the Greek *pneuma* and traces its development from the 6th century B.C. to its zenith in the 18th century. Saigusa tells us that, in the 1770's, the concept proved of great use to the first Japanese student of Newtonian gravitational theory, optics, and mathematics (the material was accessible in Dutch versions). Nakayama points out that academic freedom in Japan now permits objective discussion even of such problems as the historical astronomical evidence that contradicts some of the most cherished Japanese historical legends. Watanabe's article on Joule and the dynamic theory of heat invites and deserves careful and appreciative study. Sibuya reveals the extent to which the Japanese recognizes the great significance of the ecological aspects of Darwin's theories. Yajima sketches a survey of the widespread and productive activities of Japanese historians of science, in both teaching and research.

The volume is a laudable publication with which to celebrate the 21st anniversary of the History of Science Society of Japan.

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Introductory Textbooks

Spectroscopy. vol 1, *Atomic, Microwave, and Radio-frequency Spectroscopy* (287 pp. $9); vol. 2, *Ultraviolet, Visible, Infra-red, and Raman Spectroscopy* (412 pp. $12). S. Walker and H. Straw. Macmillan, New York, 1962. Illus.

Spectroscopy today covers a lot of territory. It includes the study by absorption and emission of radiation of intra- and interatomic and molecular interactions in gases, liquids, and solids. For reasons that are well known, each region of the electromagnetic spectrum has tended to become a separate specialty. Many texts and monographs are devoted to each spectral region. Whether or not spectroscopists continue to work exclusively in one region of the spectrum, they need to know and evaluate results from other spectral regions. Therefore students may profit from an exposure in their first spectroscopy course to the types of interactions and the experimental methods of study in nearly all branches of spectroscopy.

The volumes by Walker and Straw are designed to be such an introduction. Volume 1 deals with atomic, microwave, electron-spin resonance, and radio-frequency spectroscopy, including nuclear magnetic resonance and quadripole resonance. Volume 2 covers ultraviolet, visible, infrared, and Raman spectroscopy and includes a chapter on instrumentation and one on applications to astrophysics. The volumes are suitable for use as a textbook for a one-year introductory undergraduate course.

Essentially no quantum mechanics is employed in these volumes; instead, the vector model handling of angular momentum is heavily relied upon. For this reason only derivations that can be obtained by simple vector model reasoning are presented, although important formulas are usually given, even if they are not derived. The main advantage of the volumes is the clear physical descriptions of the essential physical interactions and processes in qualitative terms, which can be and have been studied spectroscopically. Since the number of pages is not excessively large and the topics treated are fairly numerous, the descriptions are brief and to the point, certainly not exhaustive. Thus, one who knows anything about any of the topics treated is not likely to find new material.

In fact, one of the stated purposes is to provide an introduction to the more specialized and advanced texts which treat an individual field of spectroscopy. The volumes cannot be considered as preparation for a book on the level of Condon and Shortley's *Theory of Atomic Spectra*, but they do provide an introduction to such texts as Ingram's *Spectroscopy at Radio and Microwave Frequencies* and Herzberg's two volumes on molecular spectra.

Walker and Straw's first volume strikes me as being more valuable than the second, because it is common and reasonable for students to learn about the vector model in connection with atomic spectra and structure, and then to go on to use similar methods in understanding electron and nuclear resonance. On the other hand, the need for an introductory book that is primarily devoted to molecular spectra is not clear to me. However, some of the features that are presented in volume 2 certainly have current interest —for example, the chapter on fluorescence and phosphorescence (largely devoted to the latter, in connection with studies of the triplet state) and the discussion of the spectra of free radicals and flash photolysis.

The material presented in the two volumes is of interest to both physicists and chemists, although the selection of some of the material presented, as well as that which is omitted, indicates that the authors intended it more for the chemist than for the physicist. Physicists might prefer to find more solid-state spectroscopy—excitons, ferromagnetic resonance, and far infrared spectroscopy, to mention a few.

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Steroid Chemistry

Steroid Reactions. An outline for organic chemists. Prepared by 16 graduate students under the editorship of Carl Djerassi. Holden-Day, San Francisco, Calif., 1963. 657 pp. Illus.

Carl Djerassi set for himself and his contributors a very desirable and demanding goal: to abstract the wealth of valuable synthetic chemistry available in the steroid literature and organize it in such a way that the material would be useful to the practicing "antisteroid" synthetic organic chemists. Given that this is a formidable task, the authors have succeeded remarkably well in producing a reference text that should find its way to the shelf of many practicing organic chemists.

One way to test the value of such a book is to search in it for reactions that will be useful in one's own research. The results of this test were very gratifying. In a number of instances, the volume provided leads to more selective reaction conditions, to different reagents to effect a given transformation, and to analogous reactions that have been accomplished. Several factors contributed to this success: the book's organization (according to synthetic reaction types) makes it easy to locate the pertinent chapter; the near absence of text and the use of many diagrams permits rapid scanning; the clarity of the structural formulas and the generally uncluttered appearance of the pages minimize the

chances of missing pertinent sections.

The results of a second test, a search for analogies to unusual reactions encountered or suspected in research, were less rewarding for the following reasons: (i) the lack of a reagent index made the search a little awkward and, probably, incomplete; and (ii) the organization of the chapters made it difficult to find reactions that gave rise to unexpected products, if, indeed, such reactions are provided in the book.

The value of the book to the "literature browser" is mixed. Although it is certainly less time consuming to browse through Djerassi's book than through the steroid literature in search of stimulating problems, some may prefer to spend their browsing time on something less rarefied than 600 pages of structural formulas. With respect to this, it should also be noted that much of the material seems to be trivial—for example, the multitude of nearly identical reactions of peracids with olefins. Djerassi commented on this intentional nonselectivity in his preface and suggested a more selective companion volume, with more discussion. I would welcome such a volume.

I noted a few misprints: for example, on page 464, structural formula 45 should be an epoxide, not a tetrahydrofuran; on the last two lines of page 539, the numbers 344, 345, 509, and 514 should be 347, 348, 512, and 517, respectively.

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Experimental Biology

Biological Receptor Mechanisms. Symposia of the Society for Experimental Biology, No. 16. J. W. L. Beament, Ed. Academic Press, New York, 1962. viii + 372 pp. Illus. $13.

This volume, a typical symposium publication, is composed of the papers presented at meetings held at Birmingham, England, in September 1961. An unusual feature is that the receptor mechanisms discussed include those of plants as well as those of animals, a welcome contribution toward reunion of fractionated biology.

The contributors were invited to deal with any "mechanisms whereby living organisms transform or transduce the information in their environment into that form to which they respond internally." Obviously, no single volume of this size could cover so vast a field; only scattered aspects are considered.

Papers on photoreception occupy about half of the book: functional anatomy of the vertebrate retina is considered in two papers (by W. A. H. Rushton and by G. Wald, P. K. Brown, and I. R. Gibbons); photoreception in arthropods, in three papers—electrophysiological explorations of the resolving power (by E. T. Burtt and W. T. Catton), spectral sensitivity of the compound eyes of three species of insects (by D. Burkhardt), and a study of the optical properties of the compound eyes of various arthropods (by J. W. Kuiper); and two papers deal with nonphotosynthetic effects of light—on higher plants (by O. V. S. Heath and D. Vince) and on fungi (by C. T. Ingold). The utilization of light in photosynthesis is considered by C. P. Whittingham.

There are only two papers on chemoreception: one presents a theory of olfaction (by J. T. Davies) and the other describes mostly electrophysiological studies on the chemoreception of flies (by V. G. Dethier). The papers that follow are on various subjects: gravity receptors of plants (by L. J. Audus); electrical receptors of fish (by K. E. Machin); temperature receptors of animals (by R. W. Murray); external and internal hearing in man (by G. v. Békésy); transduction in the vertebrate labyrinth (by D. E. W. Trincker); and mammalian mechanoreceptors (by D. R. Inman).

There is a short discussion of coding in receptor cells (by J. A. B. Gray), a prologue on the input element (by J. W. S. Pringle), and a brief epilogue (by O. Lowenstein). Each article has a bibliography; the author and subject indexes are adequate. The book is neatly produced, and the illustrations are excellent.

The papers, in most cases, are well-written reviews of recent work, usually with individual research results of variable novelty. In this volume, as in most symposium volumes, no integrated picture of the field emerges. If one is interested in the particular aspects covered, or is looking for short reviews of selected topics in the general field, this book should be stimulating and helpful.

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Desalinization

Saline Water Conversion–II. Based on symposia sponsored by the American Chemical Society. Robert F. Gould, Ed. American Chemical Society, Washington, D.C., 1963. x + 199 pp. Illus. Paper, $6.

The field of water desalinization is in a period of extremely rapid growth. Work is being carried out in diverse locations and under many different authorities. This situation creates a problem with respect to the effective dissemination of information; for example, it is unlikely that any one author could turn out a comprehensive textbook, and, in any event, such a book would soon be outdated. For this reason, publishing collections of papers accomplishes a twofold purpose—development and design information from different projects is made available for general consumption, and the group of papers serves to give a detailed overview of the present status of the field.

This volume contains 14 papers originally presented at meetings of the American Chemical Society—at St. Louis in 1961 and at Washington in 1962. Several of the papers are valuable reviews of specific desalinization techniques; most of the others are concerned with design and pilot plant data rather than with the results of more basic research. By far the most coverage is accorded to processes based on distillation and electrodialysis, the two schemes which are currently the most favored and for which the techniques are most developed. Eight papers deal with distillation; among these papers there is an excellent review of the field by B. F. Dodge, a series of four papers that deal directly with problems of scale formation, and discussions of newer techniques, such as thin-film distillation and the diffusion still. Electrodialysis is treated in four papers that deal primarily with plant design and economics. Still another paper covers osmotic membranes.

Unfortunately solidification processes (freezing and hydrate formation) are treated in only one paper—the paper that deals with thermodynamic properties of two fluorocarbon hydrating agents. Still, this compendium represents a valuable survey of the present status of the field of water desalinization.

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