also reasonably constant. Thus the use of ΔR_M for characterization of a steroid in much the same manner as molecular rotation difference, ΔM_D, is very promising. However, the unwary should be warned that rigid and precise conditions must be employed to obtain the R_F value.

The book is interestingly written and very readable. The author makes critical evaluation of methods and techniques and, although everyone may not always agree with him, it is very useful to the investigators new in the field. The book is highly recommended to everyone actively engaged in steroid research and to investigators interested in the quantitative behavior of organic compounds in chromatographic systems.

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Wissenschaftliche Forschungsberichte. Naturwissenschaftliche Reihe. Band 70. Einführung in die Ramanspektroskopie. By Dr. JOSEF BRANDMÜLLER, Professor der Physik, Phil.-theol. Hochschule Bamberg, and Dr. HERIBERT MOSER, Privatdozent für Experimentalphysik, Universität Munchen. Dr. Dietrich Steinkopff Verlag, Holzhofallee 35, Darmstadt, Germany. 1962. xv + 515 pp. 15 × 21 cm. Price, Brosch., DM. 90.; geb., DM. 94.

The authors have succeeded in their principal objects: to present a clear introduction into the basic theory of Raman spectra and a detailed description of experimental techniques.

The theoretical part starts from the general properties of scattered radiation and furnishes a good presentation of Placzek's theory and his results regarding intensity, polarization and the influence of symmetry. The theory of rotational lines by Placzek and Teller is also discussed in some detail. Further theoretical results, including Volkenshtein's theory, are more briefly reported.

The experimental part is, quite naturally, a collection of rather disparate, but in general thorough and well substantiated reports and advice on specific experimental problems, ranging from mercury arcs and photomultiplier cells to the description of cells for liquids, crystals and gases and the measurement of frequency, intensity and degree of depolarization.

The last quarter of the text discusses applications and results. In the preface the authors point out that this part covers only a very small and, in addition, somewhat subjective selection. In fact, a number of useful discussions of several specific subjects (*e.g.*, analysis of organic compounds and mixtures) are presented in this part.

Since Herzberg's books furnish a rather complete systematic discussion of vibrations, the authors are justified in presenting only a few examples of vibration problems, but even in a brief discussion of specific applications (*e.g.*, H-bonding, dissociation of strong acids) a survey of concordant or discordant results obtained by other methods, or at least suitable references, would be desirable. Quoting old literature on a specific problem and at the same time omitting very important, more recent contributions (T. F. Young, J. Chédin and their co-workers on the structure of strong acids) is likely to mislead the reader.

On the whole, this book is an excellent aid for the active worker in the field of Raman spectroscopy.

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Molecular Structure. The Physical Approach. By J. C. D. BRAND and J. C. SPEAKMAN, University of Glasgow. St. Martin's Press, Inc., 175 Fifth Avenue, New York 10, N. Y. 1961. viii + 300 pp. 15 × 23.5 cm. Price, $6.00.

This book presents a broad coverage of physical methods useful in the determination of molecular structure, directed toward honors students in physical chemistry and research workers in other fields. In this country it should prove most useful to undergraduates in honors sections in physical chemistry, and to intermediate-level graduate students in all fields of chemistry.

The coverage provided is quite broad, and includes treatments of molecular rotation and vibration, dipole moments, nuclear magnetic resonance, nuclear quadrupole resonance, infrared and Raman spectra, Kerr effect, X-ray diffraction and crystal structure analysis and electron diffraction. Chapters are provided on symmetry (point-group and space-group), and on elementary quantum mechanics. The elements of group theory are treated in an appendix, as are the applications of the Wilson FG matrix method to normal coördinate calculations.

The presentations are clear and carefully prepared; the text appears to contain few errors. As was intended, the emphasis is on principles rather than on practice; the value of the book would be increased significantly by an increase in the number of references to articles illustrating applications of the principles discussed or extending the coverage to a more advanced level. In terms of current interest, the treatment of high resolution nuclear magnetic resonance spectroscopy is least satisfactory, as it does not properly reflect the state of the art even as of 1957.

The emphasis on symmetry considerations and applications of group theory should certainly be commended. The problem of providing coverage in such condensed form has led to some difficulties. For example, the definition on p. 25 specifies that "a representation Γ of a group is a set of *numbers* that multiply in accordance with the group multiplication table," and again (p. 256) "the *characters* of the matrices of a group of operations are said to form a representation Γ of the group." There should also be noted the statement (p. 78) that all asymmetric top molecules have a permanent dipole moment.

On the whole, this book can be highly recommended to its intended users. It has been carefully written and edited, and appears at a price which makes it an attractive investment.

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Werkstoffe des Reaktorbaues mit besonderer Berücksichtigung der Metalle. By KARL LINTNER, Dr. phil., a. o. Professor, II. Physikal. Institut der Universität Wien, and ERICH SCHMID, Dr. phil. Dr. mont, h.c., o. Professor, Ausw. wissensch. Mitglied d. Max Planck-Instituts für Metallforschung, Stuttgart, Vorstand d. II. Physikal. Instituts der Universität Wien. Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 1962. viii + 592 pp. 16.5 × 23.5 cm. Price, DM. 78.

As the title points out, the book deals with materials for nuclear reactors, with special consideration given to metals. In the two opening chapters the authors make a valiant effort to review the fundamentals of nuclear physics and of metallurgy. As is often the case, the value of such short reviews might be questioned. Those unfamiliar with this background are unlikely to grasp it in 40 pages; those most likely to find the book useful would be well grounded in these fundamentals.

Perhaps the most outstanding feature of the book is the extensive treatment of the influence of radiation on the properties of solids. The references in this section represent a very thorough coverage of the field and the review is well organized in a logical summary. Too often such reviews are limited to only one type of material with the effect of loosing the general features of radiation/lattice interactions. The authors in this case treat metals, oxides, semiconductors and hydrocarbons in the same chapter with pleasing results.

The greater part of the book deals with the metals used as reactor fuels: uranium, plutonium and thorium. The special technological problems involved in the use of these metals are not lost in the very successful discussion of fundamental properties. Ceramic fuels, by the authors' choice, were not given broad coverage. A more extended treatment of the ceramic fuels might have been desirable since the metallic fuels will probably be less and less important in future reactor developments.

The concluding chapters deal with materials for reactor application as moderators, coolants, control elements and structural materials. These final chapters are somewhat brief compared to the fine treatment of radiation effects and of the metallic fuels. Control materials, for example, are covered in only nine pages.

The book is generally thorough and well written. The extensive literature references constitute a required reading list for the materials scientist approaching reactor technology. As is typical of this publisher, the book is handsomely printed. The reviewers would rate the book as a valuable technical reference on nuclear reactor materials.

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Solvolytic Displacement Reactions. By ANDREW STREITWIESER, JR., Associate Professor of Chemistry, University of California, Berkeley, California. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. 1962. ix + 214 pp. 15.5 × 23.5 cm. Price, $5.00.

This book is a direct reprint of Prof. Streitwieser's well known article in *Chem. Rev.*, 56, 571(1956), with the addition of a 22-page Supplement covering selected topics since 1956.

A large amount of valuable information about non-solvolytic displacement reactions is presented first, followed by data on solvolytic reactions. Sections on the SN1 mechanism, mechanis-

tic postulates, special effects such as steric, isotopic and α-heteroatom, and intramolecular displacements are included. The effect of structure on reactivity is emphasized. In all, there are 811 references, of which about 100 pertain to the Supplement.

Theoretical interpretations in terms of rates, free energy diagrams, atomic orbital diagrams and other unifying concepts are a feature of the book. It is not simply a collection of data from the literature, but an attempt to interpret, as well.

The Supplement covers a range of topics, including recent work on ion pairs, solvation effects, transition state structure, isotope effects, structure–reactivity correlations and "non-classical" ions.

While the literature coverage is quite complete through 1955, the coverage from then on is relatively selective. This is by intention, as the author points out in his Preface. The demand for copies of the original article was such that, even though the author could not undertake a major revision, it was directly reprinted with the addition of the short Supplement.

Present-day opinion seems well represented in this concise book. Some "minority" opinions, such as the idea that "non-classical" structures may be confined to transition states and not appear in intermediates, are not mentioned. However, the *data* are presented, and the critical reader can decide for himself about the interpretation. If any objection were to be cited, it might be that the author does not always convey the distinction between mechanistic features which have been conclusively *proved* and concepts which are *consistent with* experiment.

The book will be useful to physical organic chemists, particularly as a reference work. In addition, it may well be used as a textbook, because the work on solvolysis since 1955 has not changed the basic concepts greatly. With extensive discussions of reaction mechanisms finding their way into courses in advanced organic chemistry, courses in physical organic chemistry frequently include a detailed discussion of solvolysis reactions.

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Advanced Inorganic Chemistry. A Comprehensive Text. By F. ALBERT COTTON, Professor of Chemistry, Massachusetts Institute of Technology, Cambridge, Massachusetts, and G. WILKINSON, Professor of Inorganic Chemistry, Imperial College of Science and Technology, London, England. Interscience Division, John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. xv + 959 pp. 16.5 × 23.5 cm. Price, $14.50.

The accelerating expansion of interest and research in both theoretical and descriptive aspects of inorganic chemistry that has taken place during the past fifteen years has undoubtedly created a need for a book which aims to incorporate recent advances in these areas into the previously accumulated body of chemical knowledge. The text under consideration constitutes an attempt, for the most part highly successful, to meet this need.

The book differs from most earlier textbooks of inorganic chemistry in that the theoretical material, instead of being concentrated entirely in the opening chapters, is skillfully integrated with the descriptive material which it is used to elucidate. Part 1 of the text, entitled "General Theory," begins with a clear and concise presentation of the basic principles of wave mechanics and their application to the electronic structure of atoms. This is followed by a general treatment of the nature of chemical bonding, both ionic and covalent, including brief outlines of both the valence bond and the molecular orbital theories, as well as such topics as bond energies, electronegativities, bond lengths, polarity and molecular vibrations.

Part 2, entitled "Chemistry of the Nontransitional Elements," is characterized by its unconventional arrangement. The first two chapters, on hydrogen and the inert gases, are followed by a thorough treatment of the elements of the first short period, lithium through fluorine, on the ground that "there are, in several cases, sufficiently striking differences between the first and succeeding members of a group to detract considerably from the usefulness of regarding these first members as prototypes for their *congeners*." The remaining non-transition elements (including those of the zinc family) are then taken up, by groups, in the conventional sequence. In this section much descriptive chemistry, both old and new, is interestingly presented, together with interpretations in terms of current theory.

Part 3, entitled "Chemistry of the Transition Elements," constitutes nearly half (435 pages) of the book. The exceptionally thorough treatment of these elements and their compounds is the most distinctive feature of the text. This part begins with a second extensive theoretical section which includes a brief treatment of magnetic properties, a general (and in part historical) discussion of coördination compounds and complex ions, and, most notably, an extensive presentation, in a semi-quantitative manner, of the crystal field and ligand field theories. The ideas here developed are then applied to the interpretation of the chemical and physical (including magnetic and optical) properties of compounds of the individual elements of the three transition series. It is in this section that the integration of theoretical and descriptive material is most conspicuously carried out. The final chapters deal with the lanthanides and actinides, and include a brief but thorough and up-to-date treatment of the chemistry of the transuranium elements.

The book is well written, in a fluent style with no obvious discrepancies resulting from joint authorship, and gives evidence of painstaking study of the vast amount of recent inorganic chemical literature.

As is almost inevitable in a volume of this magnitude, there are a considerable number of errors which the authors will wish to correct in a subsequent printing. Most of these are obviously typographical and unlikely seriously to disturb the reader. There are a few, however, that might well perplex or mislead the unwary student. Thus, for example, on page 22, in the sentence beginning "Now, if the two electrons differ in their m values, they need not differ in spin...," the clause "but in fact they do" should evidently be replaced by "and in fact they do not." The solubility order of the rubidium halides is nearly, and of the cesium halides exactly, the reverse of that indicated on page 452. On page 501, the configuration of the Fe^{III} ion is erroneously shown as including $4s^2$ electrons, with seven subshells occupied instead of six. On page 510, "if we... plot the reciprocals of the χ_M^{corr} values against T, we shall obtain a straight line"; true—not "of slope C," however, but of slope $1/C$. In the last compound listed on page 538, the omission of the subscript 3 after the formula for the cation is disturbing. Finally, it is surprising to read on page 909 that "Uranium is the densest of metals," in view of the fact that all of the elements of atomic number 74 through 79 (tungsten through gold) have higher densities.

Such minor flaws, however, detract little from the general excellence of the book, which constitutes a valuable contribution to the teaching of inorganic chemistry, and will undoubtedly serve as a stimulus to further research in this field.

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