

clusion of screening effects. The arguments advanced, although somewhat nonquantitative in character, are indicative both of Professor Weyl's depth of understanding of the glassy state and of the fact that the glassy state is one that really defies exact definition. It seems highly probable that both approaches have elements of correctness and that a complete understanding of the nature of glass will require a combination of these concepts.

The volume is rich in factual information about vitreous systems. Anyone seeking material relating to the properties of glasses will do well to consult this treatment. Many of the discussions are interpretative as well as factual and reflect Professor Weyl's wealth of knowledge about the subject and his substantial contributions to it. Unfortunately, from the point of view of the reader, information about a particular subject is often widely scattered and thus difficult to collect. Equally unfortunately, the discussions are often excessively repetitious. The styling is sometimes awkward and the explanations commonly circuitous. These difficulties and the unnecessarily brief subject index detract from the over-all utility of the book. The book is, however, a substantial contribution to an important subject.

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**Chemical Applications of Group Theory.** By F. A. COTTON. Interscience Publishers, Inc., 605 Third Avenue, New York 16, N. Y. 1963. ix + 295 pp. 15.5 × 23.5 cm. Price, \$12.50.

This book is perhaps the first to prove that there is a "king's road" to a subject which traditionally gets the esoteric treatment; it is probably the best introduction for the nonprofessional, as long as he has a fair imagination regarding molecules. Mathematical relevancies and conceptual motivations are lucidly communicated, definitions and relationships are clearly elaborated, and numerous molecular examples, many with illuminating figures, are used with skill to illustrate important points and generate in the reader a working knowledge.

The coverage is well chosen. A first chapter on basic principles deals with group theoretical fundamentals, molecular symmetry groups, representation theory, and the relation to quantum mechanics. Subsequently, four areas of application are discussed: hybrid atomic orbitals, molecular orbitals, ligand field theory, and molecular vibrations. The section on hybrid orbitals is particularly welcome since this subject is rarely elaborated. The section on molecular orbitals covers not only the standard  $\pi$ -systems, but deals also with less conventional cases such as three-center bonds, binding perpendicular to the  $\pi$ -orbital nodal plane, and sandwich compounds. The section on ligand field theory provides, in 60 pages, a complete introduction *in nuce* with an absolute minimum of quantum mathematical formalism. In the section on vibrations there are discussed not only the standard subjects of normal modes, selection rules, differences between infrared and Raman spectra, but also Fermi resonance and site symmetries.

A study of the book should give beginners basic insight as well as manipulative working ability and put them in an excellent position to absorb rigorous representations. In short, the book appears to be destined to become an eminently usable text for a first course.

The well-deserved praise notwithstanding, there are parts of the volume which will profit from improvements in future editions. First, the discussion of the basic relationship between

group theory and quantum mechanics is well below the general standard of the book. The fundamental equation (5.12) and the vanishing of the integral in Section 5.2 are inadequately derived. Sections 5, 7.1, 8.6, and a few other scattered items ought to be combined in a somewhat fuller chapter on these very fundamentals. Second, one might wish for a greater balance between the treatment of ligand field theory and that of the other fields. While the former is admirable and a pleasure to the initiated, the novice will be overwhelmed by the overcondensation. In the section on  $\pi$ -electrons, on the other hand, a somewhat more sophisticated approach might not have been out of place. Whereas the ligand field section requires a nonnegligible versatility in understanding configuration interactions, an analogous discussion is missing for the  $\pi$ -systems. Also, somewhat more explicit attention to molecular vibrations might be argued. Finally, there is no excuse for omitting the stereographic projections of at least the 32 crystallographic point symmetry groups.

The separate folder containing a complete collection of character tables of molecular groups is a very useful item indeed. In a future edition, these could perhaps be augmented by explicit matrices for the two and three dimensional representations. The author would do a great service to chemists by introducing the Hermann-Mauguin symbols for point groups and giving them at least as much weight as the Schoenflies symbols.

In conclusion, a highly welcome and recommendable text.

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## BOOKS RECEIVED

March, 1964

- WILLIAM L. JOLLY. "The Inorganic Chemistry of Nitrogen." W. A. Benjamin, Inc., 2465 Broadway, New York 25, N. Y. 1964. xi + 124 pp. \$5.75.
- DEAN F. MARTIN and BARBARA B. MARTIN. "Coordination Compounds." McGraw-Hill Book Company, Inc., 330 West 42nd St., New York, N. Y. 1964. vii + 99 pp. Cloth, \$4.95; paperback, \$1.95.
- ROSS STEWART. "Oxidation Mechanisms." W. A. Benjamin, Inc., 2465 Broadway, New York 25, N. Y. 1964. xi + 179 pp. \$7.50.
- H. J. EMELÉUS and A. G. SHARPE, Editors. "Advances in Inorganic Chemistry and Radiochemistry." Volume 5. Academic Press Inc., 111 Fifth Ave., New York 3, N. Y. 1963. ix + 429 pp. \$14.50.
- ANDERS RINGBOM. "Complexation in Analytical Chemistry." John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. x + 395 pp. \$15.
- A. N. FRUMKIN, Editor. "Surface Properties of Semiconductors." Consultants Bureau Enterprises, Inc., 227 W. 17th St., New York 11, N. Y. 1964. 171 pp. \$22.50.
- "IUPAC: 19th Congress On Pure and Applied Chemistry." Butterworth Inc., 7235 Wisconsin Ave., Washington 14, D. C. 1964. 374 pp. \$14.50.
- A. D. PETROV, V. F. MIRONOV, V. A. PONOMARENKO, and E. A. CHERNYSHCHEV. "Synthesis of Organosilicon Monomers." Consultants Bureau Enterprises, Inc., 227 W. 17th St., New York 11, N. Y. 1963. 492 pp. \$22.50.
- JURG WASER. "Quantitative Chemistry." W. A. Benjamin, Inc., 2465 Broadway, New York 25, N. Y. 1964. xiii + 432 pp. Cloth, \$6; paperback, \$3.95.