stars and galaxies in the second part of the book. It is clear that chapters 3 through 7 were written between 1960 and 1965, and no references to major papers and books published since 1965 are found in the bibliography. Astronomy has moved so fast in recent years that much of Evans's story seems out of date in content and in emphasis. His treatment of the spiral structure of our Galaxy and of galactic rotation are off the beam. Horizontal branch stars are not even mentioned, and the description of stellar evolution and star formation is of early 1960 vintage. The sections on the Star Clouds of Magellan are scanty and incomplete, and some of the presentation is careless: plates 34a and 34b present the Large Magellanic Cloud in two different orientations, one with south at the top, the other with north at the top.

The strength of the Evans book—and its uniqueness—lies in the first chapters, where the author takes the young student step by step into the fascinating world of precision observation of the heavens by optical techniques. Evans is now permanently a professor of astronomy at the University of Texas; the Texas students have a master teacher to introduce them to the field of precision astronomical observations.

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Crystal Spectroscopy

Optical Properties and Band Structure of Semiconductors. DAVID L. GREENAWAY and GÜNTHER HARBEKE. Pergamon, New York, 1968. xii + 160 pp., illus. International Series of Monographs in the Science of the Solid State, vol. 1.

Optical spectroscopy and quantum theory have had a particularly close alliance in the development of modern physics, witness the early and productive partnership between atomic and molecular spectroscopy and the emerging quantum theory. The spectroscopy of crystals is a late bloomer in the family of spectroscopy. It suffices to say that it has now come of age, and, not surprisingly, the same close relationship to quantum theory characterizes the new field as well. The key elements in the growth of crystal spectroscopy have been the development of experimental techniques to measure optical constants over a broad range extending from the infrared to the far ultraviolet, the development of tractable theoretical techniques for calculating the band structure of crystals, and the development of the conceptual framework for relating the observed spectra to the calculated band structure. Needless to say, theory and experiment have leaned heavily on one another at various stages of this development.

Solid-state physicists will welcome this short and well-organized monograph as a convenient compendium of the spectroscopic results and analysis in terms of band structure for a large class of crystalline materials. Non-solid-state physicists and those who are entering the field will find this monograph a lucid introduction.

Readers who are familiar with Moss's *Optical Properties of Semiconductors* (Academic Press, 1959) will note a similarity in approach, level, and format. The two books complement one another nicely, since Moss treats mainly the optical effects arising from free carriers and band edges and the current book concentrates on the structure and analysis of the more complicated spectra arising from the higher bands. All of the machinery for producing and interpreting the spectra is described in concise and conceptually clear sections with a minimum of mathematical prolixity. Thus there is a chapter on the optical constants and dispersion relations and another on the experimental techniques for the visible and ultraviolet. There is a very short, in fact too short, chapter on the quantum theory of interband transitions, the classification of critical points, and applications of group theory with a slight reference to the theoretical methods for calculating band structures. The main body of the text, and the part most useful to workers in the field, is a compendium of the experimental results and analysis for a large class of materials including most of the well-known semiconductors and some of the insulators. The effects of deformation are discussed, as well as the contributions of excitons to the spectra. The authors conclude with discussions of other experimental techniques that have been applied to band structure analysis, such as the piezo- and electro-optical modulation techniques, the photoelectric effect, and energy-loss phenomena.

The authors might be criticized for trying to say too little about too much. In the eyes of the reviewer this is no fault. The monograph eminently succeeds in what it attempts: to serve as a compendium of the results scattered through the literature with a skeleton outline of this vital new field. For those who want more detail, ample references to the literature are included.

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Festschrift

New Pathways in Inorganic Chemistry. E. A. V. EBSWORTH, A. C. MADDOCK, and A. G. SHARPE, Eds. Cambridge University Press, New York, 1968. xxxiv + 392 pp., illus. $13.

This book has been prepared by a group of former students of H. J. Emeléus in honor of his 65th birthday. After a brief biographical preface and a complete list of Emeléus's scientific publications, each of the 14 authors describes the work he and his students and colleagues have done. The book is a fitting tribute to Emeléus, illustrating as it does the great influence he has had on inorganic chemistry.

One might suppose that since all of the authors were trained in the same school of chemistry, the subject matter of the various chapters would show a strong dependence upon the work done in the Cambridge laboratory. Such dependence, however, is not apparent. Even in the four chapters describing research on compounds of fluorine, it is evident that the authors have departed widely from the work they did as graduate students.

It is difficult to categorize the contents of the various chapters briefly, for some of them cover a fairly wide range of material. Suffice it to say that 4 of the 14 chapters are concerned chiefly with fluorine compounds, three specifically with coordination compounds, two with nonaqueous solvents, one and part of another with silicon compounds, and one each with organometallics, derivatives of gallium hydride, and the solid state. The chemistry of mercury, germanium, tin, lead, and several of the transition metals is the subject of extensive discussion. Aside from that in the chapters on metal-metal interactions in paramagnetic clusters and defect aggregation chemistry, the material discussed is largely descriptive rather than theo-