be an excellent source of information to graduate students in the medical sciences. It should prove useful also to practicing chemists or biochemists interested in learning the contemporary status of the biochemistry of cancer.

FELS RESEARCH INSTITUTE
TEMPLE UNIVERSITY
PHILADELPHIA 22, PA. SIDNEY WEINHOUSE

Introduction to Molecular Spectroscopy. By GORDON M. BARROW, Professor of Chemistry Case Institute of Technology. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. 1962. xiii + 318 pp. 17 × 24 cm. Price, $10.75.

As the author indicates in the preface, this book has been written principally to bridge the gap between the very cursory treatment of spectroscopy generally given in undergraduate textbooks and the detailed treatments written for the specialist and research worker. It could also be helpful to the non-specialist who makes use of applied spectroscopy and who wishes to acquire some theoretical background of the subject.

After an introduction to the theoretical treatment of molecular systems, the author considers the vibrational energies of diatomic molecules and the rotational energies of linear molecules from both the classical and quantum-mechanical points of view. A chapter on the absorption and emission of radiation is followed by treatments of rotational and vibrational spectra of polyatomic molecules. In succeeding chapters the concepts of molecular symmetry and group theory are introduced, and the calculation of vibrational frequencies and normal coördinates is discussed. The book concludes with chapters on electronic spectra of diatomic and polyatomic molecules. In a book that otherwise ranges over the whole field of molecular spectroscopy it is curious to find the Raman effect dismissed in a three line paragraph on page 2 and a short parenthetic mathematical statement on p. 198 in a section dealing with infrared active fundamentals.

In organizing the material the author has taken pains to present difficult topics to newcomers in an orderly fashion, and many of the diagrams are particularly to be commended for their clarity, which is aided by the use of a two-tone black and gray technique of reproduction.

Unfortunately, a closer study of the text reveals an inordinate number of typographical errors and editorial slips that largely defeat the purpose for which the book is intended. Though perhaps individually trivial and, for the most part, easily recognized by the expert, these errors and omissions can cause serious difficulty and frustration to the neophyte. There are far too many to list them in their entirety in this review. Some forty-five were noted in a single reading of the text and as representative examples the following may be cited. In equation 45 on page 39 the coefficients of four out of five functions are incorrect; in equation 3 on page 62 the second square bracket is misplaced; on page 187 there are errors in three of the list of twelve matrix product equations; on pages 221 and 224 confusion is introduced by failure in several places to distinguish correctly between x, y, z, R and $\dot{x}$, $\dot{y}$, $\dot{z}$, R. Careless mistakes are also present in some of the diagrams; particularly bad is the mistake in Fig. 10-3 on page 236 where the absorption band system of carbon monoxide has been reversed in transposition from Herzberg's monograph and does not conform with the accompanying lettering. In Fig. 7-4 on page 140 the transitions corresponding to the P branch of the spectrum are incorrectly represented, and in the center section of Fig. 10-16 on page 256 the diagram suggests that the u wave function is unsymmetric with respect to the left hand square well.

The references to further reading, given at the end of each chapter will usually be helpful to the newcomer in the field, but it is surprising at the end of Chapter 8 to see Bellamy's excellent but irrelevant book "The Infrared Spectra of Complex Molecules" cited as a reference to further reading on molecular symmetry and group theory, while no mention is made here of the monograph of Wilson, Decius and Cross.

To sum up this is a well planned book but one that cannot be recommended unless accompanied by an extensive list of textual corrections.

NATIONAL RESEARCH COUNCIL
DIVISION OF PURE CHEMISTRY
OTTAWA 2, CANADA G. A. A. NONNENMACHER

Molecular Structure and the Properties of Liquid Crystals. By G. W. GRAY, Department of Chemistry, The University of Hull, England. Academic Press Inc., (London), Ltd., Wing 1, 7th Floor, Berkeley Square House, Berkeley Square, London, W. 1, England. 1962. vii + 314 pp. 16 × 23.5 cm. Price, 63 s.

Although there have been several recent review articles on liquid crystals, this volume represents the first book in English on the subject and the only book in any language published in the past twenty years. It is sufficiently complete and critical that it would provide an excellent background for anybody wishing to embark upon either theoretical or experimental work in the field. The book is adequately indexed, and the individual sections and chapters are self-sufficient enough to make it possible for the interested reader to acquaint himself with isolated topics, be they organic chemistry, experimental identification techniques, physical properties or theory.

An interesting introductory chapter contains both the pertinent history and philology. This is followed by a chapter which develops in detail both the theoretical and operational distinctions between the three types of liquid crystals, or mesophases. The smetic and nematic mesophases are classified, respectively, as two-dimensional and one-dimensional crystals. The cholesteric mesophase represents a sufficiently different state of matter, particularly in the light-scattering characteristics, as to deserve a special designation. Experimental identification of these three different states of matter, particularly by observation of melting and freezing phenomena, is discussed in detail. This section is supplemented with sketches, diagrams and photographs in sufficient number to be extremely useful for the experimentalist.

The several theories of molecular arrangement and order in these mesophases are given critical consideration. This includes reasonably good reviews of X-ray diffraction, spectroscopic, proton resonance, refractive index, dielectric, thermodynamic and surface tension experiments, with some interpretation in terms of theory and models. A separate chapter is devoted to the behavior of liquid crystal mixtures. The book concludes with three chapters on the effect of chemical constitution on mesomorphic behavior, on the systematic trends in transition temperatures for homologous series of liquid crystals and on the effects of substituents and of steric factors on mesomorphic thermal stabilities.

The book is mechanically well produced. In spite of "anistropy" appearing on the first page of the text, the incidence of error seems to be small. Drawings, photographs and diagrams have been effectively used for illustration of molecular arrangement; the non-specialist in organic chemistry will particularly appreciate the liberal usage of diagrams of the chemical compounds. There are numerous citations to the literature, although only a sparse representation of work reported since 1958.

Gray makes the observation that approximately one out of every 200 organic substances could be expected to exhibit mesomorphic behavior. At the modest price involved, these are sufficiently good odds that every organic chemist concerned with the characterization of compounds by their melting behavior will need to have this useful volume available for reference in his library. The book can also be recommended to the physical chemist interested in intermolecular forces and configurations.

DEPARTMENT OF CHEMICAL ENGINEERING
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA C. J. PINGS