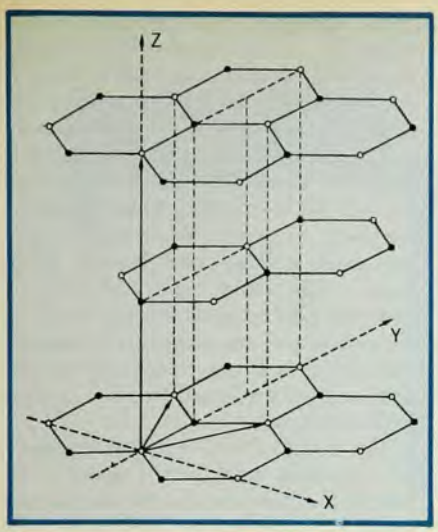

Three-dimensional form of graphite crystal

that no discussion of spatial dispersion effects is given. The treatment of second-class spectra in Cu_2O does not mention important anisotropy effects due to the quadrupole nature of the transitions analyzed by the late E. F. Gross and his Leningrad collaborators, S. Nikitine and his coworkers at Strassbourg and Roger J. Elliott, among others. The book concludes with a useful discussion of optical effects of impurity states and the effect of external perturbations.

In my opinion this monograph will be useful as an intermediate-level text for graduate students and research workers with an interest in symmetry and optical properties of crystals due to electronic transitions. The book provides a good overview, much detail and some theoretical framework, which permits fairly rapid access to the current literature.

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Infrared Detectors

R. D. Hudson, Sr, J. W. Hudson, eds.
392 pp. Halsted, New York, 1975. $26.00

This reprint book contains 43 papers, some dating as far back as 1946, others as recent as 1973. Some are review papers, others are research papers. Papers on infrared detectors fall into two broad categories: those concerned with the physics of the devices and those concerned with properties and characteristics, written for the detector user. Here there appears to be an emphasis on papers for the detector user, although there is a liberal sprinkling of papers on detector physics.

The editors have grouped the papers into several sections: characteristics of currently available detectors, fundamentals of infrared detection, photon detectors, thermal detectors, ultimate limit of detector performance and techniques for cooling detectors. Each section contains editorial comments that include some history as well as personal touches about the various authors. These comments help put the papers in their proper perspective. In addition, the editors add references—some as recent as 1975—which uptake the papers in each particular section.

While infrared detectors have been in use since the early 1800's when this part of the spectrum was discovered, most significant advances were made in the past 30 years. This recent growth was due to a realization that infrared detectors could prove useful for many military applications. Only during the past few years has their real potential been realized for medical, astronomical, geophysical and industrial use.

Most research workers in the field undoubtedly have reprints of many of the papers and others to fill their particular need. For them this book consolidates many reprints, but above all it provides an author index to the literature as well as a very complete list of references. For the person who is either entering the field or simply would like to know more about it, the book provides a valuable collection of carefully selected reprints and references that would be very cumbersome to compile. In addition it gives him an understanding of how this field has developed, and of many of the people who have been and are active—it gives him a "flavor" of the field he could not easily get any other way.

Perhaps one weakness of the book is inherent in the reproduction techniques. Some of the papers had to be reproduced from journals with larger pages; so the print for these papers becomes rather small. This situation could easily be improved, if a Fresnel lens were added to the jacket.

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Molecular Collision Theory

M. S. Child
300 pp. Academic, New York, 1974. $22.00

Molecular Collision Theory, which marks the extension of scattering theory to the inelastic and reactive molecular collisions of the semiclassical (short-wavelength) limiting theory so useful in atomic and nuclear physics, is itself a remarkable achievement: a book on scattering theory that is concise and well written. The new collision theory

is almost entirely the work of two men—W. H. Miller and R. A. Marcus—working independently and from complementary points of view. In numerical tests the new theory has acquitted itself remarkably and sometimes outrageously well; it is no trivial extension.

M. S. Child heads the theoretical-chemistry department at Oxford and is known for excellent work on the semiclassical analysis of curve-crossing problems. His book covers the standard material of quantum scattering theory—phase shifts, Green's functions, perturbation theory, and so on—succinctly and often with elegance, but the emphasis is on recent work by chemists with application to molecules, and particularly on the semiclassical limit. We find a very full discussion of semiclassical theory for the central field problem, for resonances, for curve-crossing and nonadiabatic transitions in general, and finally for inelastic and reactive molecular collisions according to the new work of Miller and Marcus.

One can get to the semiclassical theory of complex collisions in two ways: from the integral (Feynman) formulation of quantum mechanics, following Miller; or from the differential (Schrödinger) formulation of quantum mechanics, following Marcus. Each route has advantages. Child emphasizes the work of Marcus, since it starts on more familiar ground and proceeds, for a while, as ordinary WKB theory, but there is also a brief section on the Feynman formulation.

The book ends with a number of useful appendices, among them notable material on the theory of connection formulas and of curve crossing in the momentum representation.

This is a text in the recent history of theoretical chemistry, because chemists discovered and adapted scattering theory, and it is rich with detail and example. Child's *Molecular Collision Theory* is not a primer in scattering. Rather, it is an excellent book to which one turns after consulting the introductory chapter on collisions in any of the standard quantum-mechanics texts.

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Astronomy

F. M. Branley, M. R. Chartrand III, H. K. Wimmer
564 pp. Dun Donnelley Publishing Co., New York, 1975. $13.50

Since the launching of the Soviet satellite Sputnik I (1957) and the following massive efforts by the US and Russia to win the space race, there has been a great upsurge in the popularity of astronomy. In particular, introductory (descriptive-type) astronomy texts for courses usually offered as science electives have been published in increasing numbers. *Astronomy*, by Franklyn M. Branley, Mark R. Chartrand III and Helmut K. Wimmer, is aided in its presentation by superb illustrations, surely the most striking new feature in the book. The more than 150 paintings and 100 photographs convey much information and are thought-provoking in their design. It is a great pity, however, that only a very small fraction of them appear in color.

The material in the text is presented in somewhat unorthodox order. The first half of the text covers the essential topics on stars, the stellar energy cycle, galaxies and the universe (including black holes). The last half, on the solar system, is brought up to data with the inclusion of some of the latest NASA photographs and findings. A final chapter deals with the search for life, providing the student much food for thought.

The text is well written, and great care has gone into making it clear to the reader. Some nice analogies are introduced via the illustrations and text (for example, "an erg is about the energy of a mosquito flying full speed ahead"). Equations, as well as geometric drawings, have been kept to a minimum; in the section on optical telescopes, to mention one case, a geometric drawing of the light rays and focal point would have been welcome. The book uses ångstroms for wavelength measure; perhaps nanometers would have been better, in keeping with the modern trend. The captions for the figures are longer than in many texts and describe the illustrated ideas quite well. Some photographs of important current research are included, such as the neutrino experiment in a gold mine in South Dakota and the search for gravitational waves at the University of Maryland.

Chapter 14 covers the concepts of right ascension and declination, as well as a description of some seasonal constellations. Unfortunately, the figures on the seasonal constellations only stress certain individual stars. Because the study of constellations and their identification is so popular with students taking a course on this level, I feel that additional constellation figures with lines connecting the appropriate stars would greatly enhance the book. Alternatively, separate star charts could be added to the text as an appendix.

In chapter 16, information on the solar system's planets is well tabulated and brought up-to-date. It would be of great interest to include a tabulation of artificial-satellite data in this same chapter, thereby allowing one to compare such parameters as distance, orbit-