a supplementary problem book as well.

Despite these problems, the book is a very comprehensive and authoritative account of the formalism of semiconductor physics and on an advanced level, the present state of experimental understanding. Viewed from this angle, it probably has no equal. Despite its shortcomings as a textbook, it is a reference volume that I will find invaluable, and that should be very frequently consulted by those who are doing any sort of research work in semiconductor physics.

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Transfer of Radiation in Spectral Lines

V. V. Ivanov
461 pp. US Dept. of Commerce, 1973.
(Available from US Government Printing Office, Washington, D.C.) $7.45

Much of our understanding of astrophysical plasmas is based on line spectra. Too often the assumption is made, for simplicity, that the emitting gas is optically thin, that is, thick enough to emit radiation but thin enough that one ignores the effect of successive absorption and emission of photons by the gas. Another frequent assumption is that the medium is optically thick but, for simplicity, in a state of local thermodynamic equilibrium. The general case of an optically thick non-equilibrium plasma is of greater intrinsic interest than either of these two approximations but is much more difficult to treat, so much so that progress in the field is now in the hands of a few determined specialists.

This book is concerned with the equilibrium state of an optically thick gas controlled by its own internally-generated radiation field. The book is a revised and extended version of *Radiative Transfer and the Spectra of Celestial Bodies*, by V. V. Ivanov (Moscow, 1969), and contains roughly 100 additional pages devoted to results published between 1968 and 1971.

The author treats in great analytical detail the transfer of line radiation through a gas composed of idealized two-level atoms. This idealized problem deserves attention because it is central to the mathematical theory of the transfer of radiation in spectral lines, and because it provides underpinning for current research carried out with the use of digital computers.

The development is based on the analytical methods of E. Hopf, V. A. Ambartsumian, S. Chandrasekhar and V.

V. Sobolev, although many of the results presented also can be obtained by Case's method (see K. M. Case and P. F. Zweifel, *Linear Transport Theory*, Addison-Wesley, 1967). Considerable space is given to research carried out in recent years at the University of Leningrad. The book stands as the definitive current reference for analytical line transfer solutions based on the two-level atomic model.

Similar problems are treated by computational methods in a recent book by R. G. Athay, *Radiation Transport in Spectral Lines* (Reidel, 1972). Related physical applications are discussed by J. T. Jefferies, *Spectral Line Formation* (Blaisdell, 1968) and D. Mihalas, *Stellar Atmospheres* (Freeman, 1970).

The translation by Eileen Weppner and D. G. Hummer is an excellent one, and reflects Hummer's complete knowledge of the subject and his familiarity with Ivanov's published work. The material should be of interest to those who study the theory of neutron diffusion as well as those who deal with radiative transfer theory.

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Astrophysical Concepts

Martin Harwit
561 pp. Wiley, New York, 1973. $14.95

This is a book I would like to have my students read, particularly those whose background in physics has been weak or highly specialized. It gives a broad panorama of what might be called the physics of modern astronomy. Martin Harwit treats topics from the point of view of the physical principles believed to be involved rather than according to conventional dichotomies as to subject matter. Hence surprising juxtapositions of topics, such as galaxies and molecules, sometimes appear.

Discussion of modern developments does not crowd out classical subjects. Harwit's style in dealing with physical principles is lucid and clear, and he is to be commended for patiently explaining steps in derivations that are often glossed over or regarded as patently obvious by less skilled teachers. A nice feature of this treatment is the excellent set of problems, the solutions of which are given in the text. The material will be of great help to the student who likes to dig things out on his own. To a large extent the basic physics so necessary to modern astronomy is developed *Ab initio*.

It is unfortunate that important topics like synchrotron radiation could not have been developed in a more thor-