some statistical connections) based, in part, upon the topology of thermodynamic phase space. The arguments are clearly put and examples are plentiful. The book is hard to read, but the reward is worthy of the effort.

In reviewing a work of this type, it is difficult to praise or criticize isolated points. Nevertheless, I think the author should be commended for the inclusion of such interesting sidelights as entropy in its information-theory context and nonblack-body radiation. The tenor of the text would not have been impaired, however, if a few more physical comments had been made explicitly rather than implicitly, e.g., that the sign of the temperature function is chosen by the criterion that dissipation of mechanical energy produces positive (or zero) change in the temperature in a suitably enclosed system. A discussion of temperature statistically in terms of the central limit theorem (see Bergmann, *Heat and Quanta*) would have been desirable and still within the spirit of the text. These are minor criticisms of an excellent book.

Landsberg's book is not intended as a first exposure to thermodynamics and probably not even suitable as a second. Despite this, a good student will gain much by reading it. Indeed, so will every physical chemist and physicist, to whom I strongly recommend this monograph.

Stellar Atmospheres. Jesse L. Greenstein, ed. Vol. 6 of Stars and Stellar Systems, edited by Gerard P. Kuiper and Barbara M. Middlehurst. 724 pp. U. of Chicago Press, Chicago, Ill., 1960. $17.50. *Reviewed by Rolf Landshoff, Lockheed Missiles and Space Division.*

WITHIN a star, photons are continuously being emitted and absorbed by the stellar material. Only a very small fraction of all the photons created actually leave the star, and it can be assumed that these all come from the outer layers of the star, its so-called atmosphere. Clearly, the physical condition of these layers determines the character of the emerging radiation and it should be possible to deduce the structure of this atmosphere from observed details of that radiation. This book applies itself to such a program.

Many important clues are revealed by the shapes, intensities, and displacements of spectral lines which may appear either in emission or absorption. Other information can be obtained from the intensity distribution of the continuous spectrum. To interpret the absorbed spectra, one investigates model atmospheres which are characterized by the particle density and by the temperature or some other measure of the energy density. In addition, stars all have an internal motion which for ordinary stars consists of a simple rotation. More exotic stars, such as variables or novas, undergo much more complicated motions. The models must be consistent with fundamental physical laws such as the conservation theorems, thermodynamics, quantum theory, etc. A very important branch of

theory to be considered deals with the interaction between matter and radiation and with the resulting radiative transfer of energy.

The book starts with the standard methods used in the theoretical analysis and continues with a discussion of special problems which arise because of turbulence, magnetic fields, stellar rotation, and associated nonthermal phenomena. The remainder of the book is devoted to a discussion of the various types of stars, and covers typical features of the observed spectra and model ideas which have been suggested for their interpretation.

The major aspects of the problem of interpreting stellar spectra were formulated in 1929 by Milne but radiative properties were then not known sufficiently well for a successful application of the theory. In recent years, the advances made in understanding the interactions between photons and stellar matter have triggered a renewed effort, and some successes have been achieved. There are, however, still many unanswered questions, and in the latter half of the book one is introduced to these questions and to the data from which they arise.

The book consists of 19 chapters which have been written by 20 contributors. To the reviewer, the more general, early chapters of the book were of greater interest than the ones dealing with specific types of stars. For someone working in the field of astrophysics this could easily be the reverse. I expect that this book will be a standard reference work for quite a few years.

Wave Propagation in a Turbulent Medium. By V. I. Tatarski. Transl. from Russian by R. A. Silverman. 285 pp. McGraw-Hill Book Co., Inc., New York, 1961. $9.75. *Reviewed by Nicholas Chako, Queens College.*

ONE could hardly overestimate the present-day importance of studying the problem of wave propagation in a turbulent medium, since the phenomena associated with acoustic-, light-, and radio-wave propagation and scattering are dependent to a great extent on the irregularities and fluctuations of the refractive index of the atmosphere caused by the state of turbulence of the air. These irregularities in the refractive index arise from temperature, humidity, and wind-velocity fluctuation, and, in general, also depend on the state of ionization and magnetic field of the medium. Therefore a knowledge of the basic laws governing the structure and behavior of these factors is necessary in any attempt to construct a theory which would explain in a quantitative way such phenomena as anomalous propagation and scattering of waves by the actual atmosphere, the quivering and twinkling of stellar images in telescopes, scintillation from radio stars and terrestrial sources, frequency fluctuation, and a multitude of other phenomena in this, as well as in related fields.

Such a comprehensive theory is still far away. How-