Book Reviews

Stellar Evolution: An Exploration from the Observatory. Otto Struve. Princeton, N. J.: Princeton Univ. Press, 1950. 266 pp. $4.00.

America's foremost observing astrophysicist here presents a most welcome book on his major field of activity over many years.

Presumably, the goal of astronomy is to understand the material universe well enough to describe its macroscopic state at any time in the past or future with a determined degree of uncertainty. Great progress toward this goal is being made by an increased understanding of the basic processes governing the evolution of stars. Some two decades ago, before the processes of nuclear transformations were delineated, many astronomers realized that certain extremely bright stars could not have persisted in their present condition for even the 3×10^9 years of the short time scale. The evolutionary sequence brilliantly suggested by H. N. Russell was beginning to show glaring weaknesses.

Otto Struve set himself the task of studying the particular stars that showed the greatest promise of clarifying the problem: the massive and intrinsically most brilliant O and B stars, many with extremely rapid rotation; stars with emission lines; stars whose light curves or spectra indicate binary systems with the two components nearly in contact; and stars whose light and spectral changes had presented baffling puzzles. To attain his objective, Struve planned and administered a new and well-equipped observatory, the W. J. McDonald Observatory of Texas, staffed by the University of Chicago through the Yerkes Observatory.

In *Stellar Evolution* the author presents his discoveries and his conclusions concerning the evolution of those types or groups of stars for which evolutionary trends can be deduced. He states that his "book is intended not so much for astronomers as for physicists, chemists and geologists." Since all astronomical knowledge and theory must be organized in such an attack, Struve gives a fundamental background for nonastronomers. The reviewer feels that because of the profuseness of detail few, other than astronomers, will read the book *in toto*; scientists in other fields, however, will find large sections of impelling interest. Any reader should be rewarded by an understanding of the subtlety of the problem, an appreciation of the judgment and ingenuity involved, and a realization of the need for more theoretical work, particularly in fields outside astronomy.

Struve's own direct contributions center around the measurements of rotations of stars, motions in their atmospheres, and the demonstration that moving shells of gas exist far from the "surfaces" of hot stars and close binaries. His indirect contributions, through guidance and suggestion to his colleagues and other astronomers, touch on most of modern astrophysics. His main thesis in *Stellar Evolution* concerns the loss of mass by the "shell" stars or binaries and the concomitant loss of angular momentum, so that the stars can evolve into less massive, fainter stars with slow rotation. He accepts the concept that stars are formed by concentration of the interstellar gas and dust, but is somewhat undecided as to whether the stars of small mass, including degenerate white-dwarf stars, were formed as they are or evolved from a more massive state.

The most serious criticism of *Stellar Evolution* concerns its lack of bibliography. There is no question but that the book will be read by every serious student of astronomy and will influence astronomical research of the next decade appreciably. The reviewer hopes that Struve can be induced to mimeograph a bibliography for limited circulation until a second edition can be prepared.

Probably a number of astronomers will criticize the author's hypothesis concerning the evolution of the W Ursae Majoris stars, sunlike binaries practically in contact. No quantitative evidence *proves* that these stars are losing material rapidly; perhaps they represent a much more stable configuration than Struve postulates. Even for the "shell" stars the quantitative losses of mass and angular momentum are poorly established.

Again, more space might well have been devoted to discussions of the two stellar families: one family concentrated to the galactic plane, representing an aggregate of new and old stars; the other family, typical of the globular clusters, representing early stellar formation. The golden key to stellar evolution may well lie in such studies.

No book, however, can be both finite and all-inclusive. *Stellar Evolution* is an important contribution—it must be read by all who wish to understand the known processes whereby stars can evolve.

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Electronic Mechanisms of Organic Reactions. Allan R. Day. New York: American Book Company, 1950. 314 pp. $3.50.

This book is one of several recent textbooks designed for introduction at the undergraduate level of some of the principles that have been successful in advancing theoretical organic chemistry over the past 25 years. The idea is an excellent one, although it would appear premature to believe that the theory has advanced sufficiently to justify Sir Robert Robinson's recent statement: "Gone are the days when organic chemistry could be stigmatized as memory work. . . ."

Unfortunately the present work follows a current trend toward overemphasis on *electronic* mechanisms. It is not made sufficiently clear in the book that there is an operational distinction between a reaction mechanism and

an electronic mechanism, the former dealing with experimentally inferred atomic and molecular motions, formation of intermediates, role of environment, etc., and the latter being concerned largely with experimentally unverifiable rationalizations of electronic motions during the reaction. The whole approach relies heavily on the notion that a reaction mechanism is "probably correct" if it involves some reasonable sequence of electronic shifts adaptable to expression in the recondite curved arrow symbolism. It is feared that this attitude may breed a superficiality which will cause the student to overestimate the power of current organic theory. Actually, the determination of the mechanism of even a simple organic reaction is ordinarily a difficult and complex physicochemical problem, and it will probably come as a shock to those educated with this book that relatively few of the mechanisms discussed are supported by compelling experimental evidence. All too often there is only a superficial reasonableness which, in the reviewer's experience, has a poor batting average when subjected to precise experimental test.

Some of the favored mechanisms are at variance with experiment or currently accepted interpretations. Examples are: the *n*-propylamine-nitrous acid reaction (p. 227), the reduction of aromatic diazonium compounds with ethanol (p. 234), the coupling of phenol with diazonium salts (p. 240), the addition of bromine to olefins (p. 265), and the decarboxylation of acetoacetic acid (p. 282).

Another criticism is the use of some unnecessary and misleading symbolisms, including cyclic structures for enolate anions and allyl cations.

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Manual of Standardized Procedures for Spectrophotometric Chemistry. Harold J. Fister. New York: Standard Scientific Supply, 1950. 500 pp. $30.00.

This volume is a loose-leaf compilation of instruction sheets describing 126 analytical methods of clinical interest. The methods are based on published techniques and usually incorporate the most recent improvements and modifications of the original procedure. References to the sources are cited.

The author has translated each analytical method into a series of enumerated steps leading to the final determination of the transmittancy of the reaction mixture and the calculation of the sought-for concentration. The great detail in which the procedures are described is evidence that they are the products of the author's own extensive experience. Directions are given for the preparation of every reagent used, together with the specifications for each item of glassware, filter paper, and other necessary supplies. Care has been taken to include notation of temperatures, times, and other procedural factors. Manual operations are described down to the manner of mixing and rinsing. Of particular value are the suggestions on the useful life of unstable reagents and appropriate methods for storing them.

In a brief introduction to the manual, the author states that it "is designed and outlined for the use of those with little or no experience with spectrophotometric techniques." This aim is accomplished by setting down a precisely delineated course of action which seldom requires and rarely permits any exercise of judgment. In this sense, the use of the word "standardized" in the title appears to be justified.

It is this reviewer's impression that the manual was inspired by the problem faced by many clinical laboratories—that of producing accurate analyses in large numbers despite the lack of personnel whose training goes beyond the performance of routines. The manual deals with this difficulty by substituting the author's experience for experience lacked by the user. If the assumption is granted that an analytical laboratory can be successfully sustained by such a procedural surrogate, one can offer little in criticism of this work.

However, examined from the viewpoint that a manual designed for inexperienced technicians should educate as well as direct, some weaknesses can be found. Most obvious is the failure to mention the physical principles governing transmission measurements. At no point is the reader made aware of the exponential character of absorption functions. Instead, he is instructed to "plot the observed values on semi-log paper." The meaning of this act is further obscured by the fact that the sample plots that accompany each set of directions have unlabeled ordinates, marked with a scale of undesignated magnitude.

Similarly, no explanation is offered for the selection of the wavelength at which the technician is directed to set his instrument. No absorption spectra are given, and too frequently even the substance responsible for the color analyzed is not mentioned. Lacking such information, a technician would be helpless if faced with the need for running an analysis in the presence of extraneous light-absorbing material.

If the commendable thoroughness of the manual were extended to include this type of information, its usefulness would go beyond the narrow limits of guaranteeing the success of routine analyses. The manual might then leave its mark on the technician as well as on his notebook.

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