tribution studies and on mass distributions. Although many more observations and types of data are available for the galaxy than for other stellar systems, neither its mass nor dimensions are satisfactorily established. Perek favors a galactic mass slightly less than 10^{11} suns, while other workers in the field—for example Brandt—favor a figure more closely comparable with that suggested for the Andromeda spiral: 3 to 4 $\times$ 10^{11} solar masses.

The shock-wave theory of novae is presented in considerable mathematical detail by John Hazelhurst. Whether or not one accepts this theory (and I do not), it is valuable to have a thorough presentation of shock-wave phenomena in stellar interiors or atmospheres. The theory of starlight polarization and the method for analyzing it are presented in some detail by K. Serkowski. Although it seems most likely that polarization results from the scattering of starlight by elongated grains in a galactic magnetic field, attempts to detect or measure the magnitude of this field by studies of the Zeeman effect on the radio-frequency 21-centimeter line have proved unsuccessful.

G. Herbig's review of the *T* Tauri stars is a well-organized, lucid account of these exotic variables, which are believed to represent the earliest stages of stellar evolution. Clearly many additional difficult observations will have to be obtained before we solve the problem presented by these stars. Data from both Schmidt cameras and large telescopes are needed to supply statistics, to monitor light variations, and to provide detailed information on individual strategic stars. Unfortunately, progress toward the solution of this and many other problems, such as galactic dynamics, is impeded by lack of adequate optical instruments. Despite great increases in astronomical activity, only three optical telescopes with an aperture greater than 60 inches have been constructed in the United States since World War II: California Institute of Technology, Kitt Peak National Observatory, and Lick Observatory. Most observatories have only small telescopes, many of which are more than half a century old.

Kopal and his associates have done a good service to astronomy by producing this excellent volume; hopefully, many other volumes will be published in the series.

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Avian Biology

The Life of Birds. Joel Carl Welty. Saunders, Philadelphia, 1962. xiii + 546 pp. Illus. $9.

This textbook of avian biology is intended for general, not advanced, students, and it successfully avoids mere technicalities. However, despite Welty's expressed modest aims, the coverage is much greater in scope and more inclusive in content than the opening statements led me to expect. In fact, the book will easily hold its place among recent ornithological texts. The author has read widely and has chosen his sources wisely. He states that he has depended on Stresemann's masterful volume more than on any other single reference (and who can criticize him for this?), but that he has included material and ideas from over 8000 books and articles, of which more than a tenth are listed in his bibliography. He has done a good job of organizing this vast amount of information and has created a simple, straightforward account that the general reader can follow with easy comprehension.

The material is presented in 23 chapters covering various aspects of morphology, physiology, locomotion, behavior, life histories, ecology, evolution, and the classification of birds. Each chapter is well illustrated with photographs, drawings by the late Norman Tolson, diagrams, and tables. On the whole, the drawings, either from the birds themselves or from the literature, are well done and demonstrate the superiority of drawings over photographs in conveying information. Bird photographers have produced pictures that give pleasure to lay audiences, but by and large they have not added seriously to the knowledge of birds. I have long thought that the very excellence of many photographers' "shots", which obviously involve the expenditure of much time, skill, and patience, could almost be used as a measure of the unused opportunities these men had to learn new facts.

Thus, the book's coverage is broad; birds from all parts of the world and of all families are used to exemplify and to illustrate special problems and topics, and the pertinent literature is used to document the account. If any criticism is to be made, and this may be only my personal reaction, it is that some of the author's generalizations are oversimplifications—for example, the first sentence of chapter 1: "The great struggle in most animals' lives is to avoid change," or the statement (p. 139) that brood parasites possess a "psychic control over egg-laying." The index is adequate.

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Organic Reaction Mechanisms

Physical Organic Chemistry. Jack Hine. McGraw-Hill, New York, ed. 2, 1962. x + 552 pp. Illus. $11.50.

After the appearance, in the early 1940's, of the important books on organic reaction mechanisms by Branch and Calvin, by Hammett, and by Watson, more than a decade passed before books of comparable scope and stature were published by Ingold (1953) and Hine (1956). Inasmuch as Ingold wrote as a charter member and dean of the field, it is a tribute to Hine that his *Physical Organic Chemistry* (a misnomer) achieved influence and authority on a par with Ingold's work.

This second edition, thoroughly revised and brought up to date, is as authoritative for 1962 as its predecessor was for 1956. The organization of the first edition is retained, for the most part, but two chapters have been added. One, on methylenes, is welcome both for the importance of the topic and for Hine's special contributions to that area. Another, on quantitative correlation of rates and equilibria, includes topics formerly treated in other chapters.

Hine's scheme of organization and his general emphasis tend to be guided by tradition. These and other conservative qualities are laudable, in that they guarantee attention to topics of focal interest in the recent past and restrain the endorsement of radical points of view, but the traditional approach is often uneven. For example, the chapter "Mechanisms for nucleophilic displacements on carbon" deals only with those mechanisms in which the old bond is broken *before* or *during* formation of the new bond. The equally important mechanism in which the old bond breaks *after* the new bond is formed is not presented until several chapters later, and even then that aspect is not placed in proper perspective.

Some topics are not adequately treated, and some important ones are