which offers an extensive treatment of diffuse scattering as caused by disorder and thermal motion. This is a rather difficult subject in an area in which the authors have considerable experience. It is a pity that the book does not quite come out as well as might have been expected. The authors do not quite manage to get the subject across. The mathematics in the first three chapters is treated perfunctorily and nonrigorously, derivations are frequently left incomplete, and statements beginning "it is easily seen that. . ." occur rather too often in cases where the next step is not at all obvious. Proceeding to the next three chapters the reader will find that there is in fact rather little correlation between the theory he has just worked through and the applications he now finds. These last chapters, which occupy roughly the second half of the book, are suddenly quite descriptive, as if there were no real connection between this part and the first part of the book. In the many examples cited there is not a single case where a complete interpretation based on the preceding theory is given.

Added to this is the problem that the book contains an unacceptable number of mistakes, ranging from typographic errors, through references to wrong equations, to mistakes in the equations themselves.

Altogether this makes the book rather hard going. For those physicists and crystallographers who are intimately involved with the subject of disorder and diffuse scattering it will be a useful additional source of information, and the list of references is excellent.

K. ERIKS

Department of Chemistry,
Boston University,
Boston, Massachusetts

Astronomy in Britain

Astronomers Royal. COLIN A. RONAN. Doubleday, Garden City, N.Y., 1969. xiv + 226 pp., illus., + 16 plates. $5.95.

As a popular history of British astronomy, this volume has much to commend it. An engaging mixture of science and biography, the story is populated by first-rate characters such as Issac Newton, Edmond Halley, and William Herschel. Here are excellent reviews of material not readily found elsewhere, such as the introduction of Copernicanism into England or the development of photography; even oft-retold tales such as the Neptune scandal achieve a commendable freshness, and Airy—who is generally portrayed as the villain—wins a balanced presentation.

The original English title, *His Majesty's Astronomers,* was considerably more honest than the book's present appellation. This work does not attempt to cover each Astronomer Royal—for example, the enigmatic Nathaniel Bliss, who held the office for two years between Bradley and Maskelyne, is written off with the remark that his sole claim to fame is that his only known portrait is inscribed on a pewter tankard with the legend "This sure is Bliss, if Bliss on Earth there be." Happily, instead of the text's being limited to the lives of the Astronomers Royal, vital and lively sections are included on William Huggins, Arthur Eddington, and William Herschel.

The opening chapter on the Copernican revolution is unfortunately the weakest in the book. Ronan augments and perpetuates the traditional fallacious mythology. We find such statements as "Copernicus was not a good observer—the poor accuracy of his measurements of planetary positions proves that—but even his fumbling efforts made it clear to him that the theory and observation were poles apart. Predicted and observed positions were in wild disagreement." In fact, Copernicus worked basically from the time-honored positions of Ptolemy's *Almagest,* adding his own quite reasonable observations only occasionally. Whether the positions predicted from the Ptolemaic theory were "in wild disagreement" with the observations depends on one's point of view. Certainly severe discrepancies could sometimes be found —but predictions with the Copernican system fared little better. Indeed by the end of the 16th century, Tycho Brahe had occasion to complain that the Copernican tables were often worse than their predecessors.

Barring the first chapter, the presentation is generally accurate with regard to overall emphases as well as specific details. Ronan has a flair for popular science writing, and his narrative is both readable and informative.

OWEN GINGERICH

Smithsonian Astrophysical Observatory
and *Harvard University,*
Cambridge, Massachusetts

Stellar Events

Supernovae. I. S. SHKLOVSKY. Translated from the Russian by Literaturprojekt. Interscience (Wiley), New York, 1969. viii + 444 pp., illus. $20. Interscience Monographs and Texts in Physics and Astronomy, vol. 21.

At its maximum, the luminosity of a supernova equals that of an average galaxy. An event of such magnitude is important from many points of view, ranging from stellar evolution to the chemical composition of galaxies and to the origin of primary cosmic rays. Remnants of supernovae are an important class of radio sources. This wide range of problems is undoubtedly the reason why there have been review articles or chapters in compendia dealing with one or another aspect but never before a book presenting all observational information and the many theoretical discussions and speculations to which Shklovsky has made many important contributions.

Supernovae are rare, occurring at a rate of roughly one every several hundred years in an average galaxy. There has been no observed outburst in our own Galaxy in modern times. Data on the outbursts thus are obtained by observations of supernovae in external galaxies. Nebular remnants formed after the outbursts are found in our Galaxy, but only few can be connected with outbursts for which there are—necessarily crude—historic data. A gap of hundreds of years separates observations of the outbursts and of the remnants. Only one remnant, the Crab Nebula, is bright enough to be accessible to detailed observations. One third of the book is devoted to this object.

Shklovsky was well aware that a monograph in a rapidly evolving field is in great danger of becoming obsolete. The list of references has no entry later than 1965. The Russian edition was still essentially up to date at the time of publication, 21 September 1966. The translation, published more than two years later, is already seriously out of date in some respects. Since the translation was made from the original manuscript, one wonders why the delay was so long.

The translation is poor. There are too many differences between the English and Russian editions, some trivial—for instance, "astronaut" instead of "astronomer" at the end of the introduction—but some material—such

as "Baade's hypothesis" instead of "Blaauw's hypothesis" at the end of chapter 1. Mistakes in the manuscript may have been corrected in the Russian edition, but with two years between the dates of publication it should have been possible to make such corrections in the translation as well. The anonymous translator or translators obviously were not familiar with astronomical usage; "self-modeling solution" is used for "similarity solution," for example. Shklovsky's book is important; it deserves better treatment than it has received.

There is no index, a regrettable omission for a monograph in which by necessity not all information on a given object or problem is in one place.

R. MINKOWSKI
Radio Astronomy Department, University of California, Berkeley

Counting Pests

Ecology of Insect Vector Populations. R. C. MUIRHEAD-THOMSON. Academic Press, New York, 1968. viii + 176 pp., illus. $9.50.

Muirhead-Thomson has an important message for his discipline (medical entomology and epidemiology): there is an acute need for research into the ecology and population dynamics of vectors of human disease. His book repeatedly reveals that there is inadequate knowledge of such basic facts as life histories, reproductive and survival capacities, and relative abundances of most of the important vectors. In an age when the most compelling arguments in favor of environmental pollution with persistent insecticides rest upon those situations where human health and life are threatened, it is shocking that such an inadequate condition prevails in the science concerned with the pest populations.

The main body of the book is concerned with a review of sampling methodology dealing with adult populations of tsetse flies, anopheline mosquito vectors of malaria, culicine mosquitoes, blackflies, sand flies and midges, houseflies and blowflies, and fleas. The author is not concerned with statistical methodology but with the mechanical and biological aspects of obtaining samples. In this respect the book will be of considerable value to the investigator who intends to embark upon more comprehensive studies of population dynamics and ecology. Many of the facts he will require in designing statistical sampling plans are summarized, and there are 358 references to the recent literature, including some of the most relevant material from agricultural and forest entomology.

One hopes that this material will be used, and that future population studies can depend upon adequate statistical data rather than on such near-occult data as the number of mosquitoes biting a donkey outdoors for 30 minutes at sunset or the number of tsetse flies caught on a stationary black ox attended by two catchers. (Of course, other entomological disciplines have their share of such data: there is a wealth of population information in forest entomology based upon beating a tree with five strokes from a 10-foot pole and counting the number of insects falling on a 5-foot-square mat.) Population dynamics studies require that population per unit area of substrate or space be measured and that it be possible to calculate survivorship from stage to stage even where there is a movement to a different substrate at some stage.

Little general ecological information is presented for the insects discussed. The author has intentionally selected the information that bears upon the counting of adult populations. One also feels that the book could have been much improved by more detailed discussion of the objectives of research in medical entomology. The analytic methodology and the relevance of quantitative systems methodology that is available in closely allied biological disciplines could have been considered, and this would have led to a much more effective contribution.

The most important element in this book, however, consists in the author's call for improvement in the state of the art in his field. He offers constructive, detailed speculation throughout, and devotes substantial space in a final chapter to a more general discussion. He could have gone much farther than to endorse the notion that life-table construction is a route to be pursued. It saddens me to realize, for example, that an increasing malaria problem in the United States (because of the return of military personnel exposed in Southeast Asia) is likely to lead to increased pollution from insecticides here as a result of the need to control native vectors. Would that a comprehensive knowledge existed concerning the dynamics of an alternative system for vector population control; *that* would require more than the analysis of life-tables. If Muirhead-Thomson's book is heeded, medical entomology might leap ahead of agricultural and forest entomology in these matters, where it belongs.

D. GORDON MOTT
U.S. Forest Service, Northeastern Forest Experiment Station, Hamden, Connecticut

Silk Making

A Spider's Web. Problems in Regulatory Biology. PETER N. WITT, CHARLES F. REED, and DAVID B. PEAKALL. Springer-Verlag, New York, 1968. viii + 108 pp., illus. $9.

Surprisingly, this is only the second book in English on spider webs to be published during this century. Mostly a summary of the research published by the three authors during the last 20 years, it overlaps little with the other volume (*The Spider's Web* by T. H. Savory, 1952). Two subjects are covered: the nature and synthesis of spider silk, and web-building behavior. The chapter on silk includes short summaries of information on silk glands of spiders and the chemical composition of spider silk, and a detailed account of recent work on intracellular events associated with silk synthesis in one type of silk gland. Although there are some unfortunate inclusions (the application of the old name "aciniform" to a new, perhaps nonexistent set of glands will increase confusion of terms), the discussions in this chapter are clear, the findings are successfully tied to results of similar investigations of other systems, and questions that are unresolved are usually so designated. This successful chapter should serve as a text for anyone entering the attractive but largely unexplored field of physical and chemical characteristics of spider silk and its production.

The remaining two-thirds of the volume reports on web-building behavior of drugged and normal spiders. The results of most of the pertinent literature since 1950 are skimmed, although there are serious omissions (most of LeGuelte's work, for example). The detailed and generally com-