cannot quarrel. Animals divide up their living space in patterns we must learn to recognize and quantify; we don't know how they do it or how this behavior has been selected; but we do know that its functions are too diverse and too poorly understood at present to explain the developmental history of our own behavior. Given the present selection of topics, which includes almost nothing on primates, the reader will therefore wonder where to find those theories of animal behavior that, in the optimistic prose of the editor, "are and will continue influencing present civilization in important ways."

DENNIS CHITTY
Department of Zoology,
University of British Columbia,
Vancouver

Solid State Technology

Physics of Semiconductor Devices. S. M. SZE. Interscience (Wiley), New York, 1969. xvi + 814 pp., illus. $19.95.

Since its initial successful application in transistors some 20 years ago the semiconductor has played an increasingly important role in our technology. It is now the basis of the 30-odd individual devices described in this volume and the subject of an intensive research program which has helped make solid state physics a major area of study in laboratories throughout the world. The breadth and cost of such research have raised questions during the past several years about the need for further large-scale effort. The fruit of recent laboratory work (with one major omission) is explored in this volume, and the variety of possible devices that are described indicates a continuing basis for support of application work on semiconductors.

This book is long and fully packed; the characteristics of the devices, a simple understanding of their operation, and the state of the art today are all conveyed well in the text and the 500-odd illustrations. The author intended to provide a background that will enable the reader to follow the development of future devices with ease. In this he misses his mark, but that is easy to understand. There is not enough space in one volume to properly discuss semiconductor physics and still describe the variety of devices that are available today. The compromise the author has made is well balanced. As a result, the book should be both a highly useful reference to research scientists and engineers in the solid state field and a valuable source book for students.

This book contains a number of minor errors, is uneven in its timeliness, and unduly favors the author's own institution in describing the contributions to the development of several devices. Sze occasionally makes reference to the importance of one device relative to another, but provides no facts to support his opinions; a systematic attempt to provide the reader with a comparative evaluation of the various devices would have been useful. The book makes no reference to a growing area of device research involving amorphous materials, particularly amorphous semiconductors. Although it is early to say that this research will have a practical impact on our technology, it does involve new devices and a little-understood area which could be important. Sze spends time on devices he admits (and we know) to be interesting but technologically of little importance; a new field should certainly have been worth as much space. These criticisms notwithstanding, I believe this book to be an important addition to the large body of literature in the field. For all its minor faults, it surpasses other attempts to provide a survey of semiconductor devices and a modicum of discussion of how they work.

MAURICE GLICKSMAN
Division of Engineering,
Brown University,
Providence, Rhode Island

Inorganic Films

Physical Measurement and Analysis of Thin Films. Eastern Analytical Symposium, New York, 1967. E. M. MURT and W. G. GULDNER, Eds. Plenum, New York, 1969. xii + 196 pp., illus. $12.50. Progress in Analytical Chemistry, vol. 2.

This volume contains eight papers on thin films. All the articles use the term "thin" without explicitly defining the range, which may be from a few angstroms up to 40,000. The first chapter describes the nondestructive optical techniques for the determination of the thickness of thin films. It starts with the fundamental optical principles necessary for understanding the methods described. It can be read with profit by nonspecialists who are curious to learn more about determining film thickness by simple optical means but who have a limited knowledge of optics. The major part of this chapter (13 pp.) is devoted to the method of "variable angle monochromatic fringe observation" developed by the author, W. A. Pliskin. "Ellipsometry" is dealt with in five pages. It is to be regretted that no comparison is made between the methods described, and explicit mention of the smallest change in thickness detectable by the different techniques would have been of interest.

In the second article, Eugene P. Bertin reviews comprehensively the x-ray methods for investigating thin films and platings. X-ray methods can yield information on more properties of thin films than can optical methods, which are limited to thickness and index-of-refraction determination. However, the majority of the articles mentioned in the bibliography concern the evaluation of thickness. No figure is given as to the accuracy achieved in the measurement of thickness.

The x-ray fluorescence and electron microprobe techniques for determination of film thickness are treated by Jane E. Cline. The ultimate sensitivity is estimated to be ± 6 angstroms of aluminum.

The fourth article is more specialized. It describes the beta-backscattering technique for determining the density of sputtered tantalum films. The important use of electron microscopy and electron scattering for the characterization of film is thoroughly treated by R. B. Marcus. This paper discusses electron microscopy and electron diffraction for determining the texture of films, the crystal structure, and the defect structure of materials.

The sixth and seventh articles concern the analysis of films by spectrography and mass spectrography, respectively. The last article deals with chemical and structural analysis of glass films by infrared spectroscopy, interference in the visible range, and selective etching. Only metallic and glass films are discussed in this book, and biological organic films are not covered. It would thus have been more realistic to entitle the book "Physical Measurement and Analysis of Thin Inorganic Films."

In summary, this small book can serve as a good introduction to film techniques, mostly thickness determination, and the thorough bibliographies given at the end of each chapter will allow the reader to go more deeply into the subject if necessary.

ALEXANDRE ROTHEN
Rockefeller University,
New York City