than high school mathematics, as well as for the more advanced mathematician." It is claimed that the book "can be read once lightly for enjoyment, and a second time more seriously as an exciting mental stimulant." I did read the book once lightly for enjoyment and found it an entertaining excursion. Beginning with about page 60, I began to find things I had not known before.

There are spots which could be improved. On page 22 the authors seem to confuse a statement with its converse. In dealing with certain arithmetic progressions they lapse into the teaching role and prove results by mathematical induction which could be much more easily obtained by other means. The "monkey and the coconuts" problem can be solved with less algebra. On page 80, line 2, a multiplication sign appears instead of an addition sign. But these are minor flaws.

The important fact is that this book could be understood and read with enjoyment by the high school student having some acquaintance with algebra. The "amateur mathematician" would be fascinated by it (as a matter of fact, I know one to whom I want to lend my copy). Also there is at times the turn of phrase, the fresh approach, the new relationship which gives the mathematician pleasure even when the facts are not new. The book does not claim to be all things to all people but it is many things to many.

BURTON W. JONES
Department of Mathematics, University of Colorado, Boulder

Metallurgy

Alloy Phase Equilibria. A. PRINCE. Elsevier, New York, 1966. 305 pp., illus. $30.

This is an extremely well-done book. Although it is written for metallurgists, we would recommend it also to other scientists and engineers in related fields. The author's style is very readable, and the book is well illustrated.

The first two chapters outline in an unusually lucid manner almost all the most essential thermodynamic principles used in phase equilibrium and phase transformation. The author then applies those principles extensively to the construction and interpretation of phase diagrams. Many derivations of the phase diagrams from free energy curves are given. Colored space diagrams greatly help the reader to visualize ternary and other multicomponent phase diagrams.

Chapter 14 introduces the essential part of L. S. Palatnik and A. I. Landau's recent work on application of topo-analytical methods to the study of phase diagrams. This may stimulate the reader to read Palatnik and Landau's *Phase Equilibria in Multicomponent Systems* (J. Joffe, Transl. Holt, Rinehart and Winston, 1964).

The book deals only with metal systems. If the author had included discussions of some of the phase diagrams in *Phase Diagrams for Ceramists* by E. M. Levin, C. R. Robbins, and H. F. McMurdie (American Ceramic Society, 1964), it would have had even more value to nonmetallurgists.

The book discusses binary and ternary systems quite thoroughly. The higher-component systems are discussed selectively. No exercise problems are given. A discussion of recent research work on spinoidal decomposition would have improved the book.

Although its price is high, this excellent book could be used as a textbook for senior and graduate students of material science, or by professional scientists and engineers.

H. C. YEH
A. M. ALPER
Technical Staffs Division, Corning Glass Works, Corning, New York

Light, Reactions, and Techniques

Photochemistry. JACK G. CALVERT and JAMES N. PITTS, JR. Wiley, New York, 1966. 917 pp., illus. $19.50.

During the last 15 years photochemistry has grown explosively and has also become highly diversified and compartmentalized. Photochemists who study the reactions of simple molecules using vacuum ultraviolet light have few interests in common with those who investigate the reactions of polyatomic molecules produced by visible or near ultraviolet light. Neither group has much enthusiasm for the work of organic chemists who use photochemical techniques as a method of organic synthesis. The author of a work on photochemistry must decide whom he wishes to address. He must also decide whether his book is to be a text for beginners, an introductory monograph for physical or for organic chemists, an advanced monograph for specialists, or an encyclopedia of published results.

The present volume appears to be the result of an attempt to embrace most of these diverse and partially incompatible aims. The book includes, in chapter 1, an introduction to the "wave and particle properties of light"; in chapters 2 and 3, discussions of the spectroscopic properties of atoms and diatomic molecules; and in chapter 6, outlines of the collision and transition-state theories of reaction rates. This material is clearly and well written, but is all readily available in standard textbooks. It occupies 180 pages—nearly a quarter of the entire volume.

Chapter 4, entitled "The primary photophysical processes of polyatomic molecules," contains an excellent account of that rapidly developing subject. Much of this information has not previously been brought together in any one place.

More than 100 pages of chapter 5 are devoted to an encyclopedic listing of published studies of decompositions of aldehydes, ketones, esters, amines, and other compounds. For many of these reactions, the mechanisms postulated by the original authors are briefly stated. Usually, no convincing evidence is cited in support of them, but they are followed by statements such as "most investigators agree," "by analogy with," or occasionally by "again it is difficult to differentiate between. . . ." The chapter is followed by a list of 759 references.

In chapter 6 it is correctly stated that detailed, systematic measurements of the quantum yield as a function of the concentrations, temperature, wavelength, and intensity are essential for the determination of reaction mechanisms. Unfortunately, the order of presentation and the amount of space devoted to the several topics is likely to leave the young-man-in-a-hurry with his opinion unchanged that analogy, prejudice, and one critical experiment are enough to "prove" any mechanism.

The chapter on experimental methods should be required reading for all beginners in the field. It contains some new unpublished material which is of value to the expert as well as the neophyte.

This is a valuable book, timely and sound and containing a prodigious amount of information, but it might have been a better and shorter one if the (unquestionably competent) authors had decided what purpose it was to serve.

ROBERT LIVINGSTON
School of Chemistry,
University of Minnesota, Minneapolis

Plants and Pollinators

The Principles of Pollination Ecology. K. FAEGRI and L. VAN DER PIJL. Pergamon, London, 1966. 258 pp., illus. $9.50.

In view of the central position of pollination in the morphology, ecology, and evolution of flowering plants and the popular appeal of the precise and intricate interrelationships involved, it is remarkable that comprehensive books on the subject are so scarce (only four in English or translated into English in the last 25 years). The authors of *The Principles of Pollination Ecology* supply their own explanations of this anomaly.

First, there was the early disrepute which befell floral biology following the sometimes overenthusiastic and undercritical studies of 19th-century botanists. More recently the emphasis on cellular biology has tended to relegate nature study (including pollination ecology) to a low position on the biology totem pole. As might be expected, the book vigorously defends the value of and need for studies in floral ecology.

The authors emphasize principles rather than handbook information. There is, however, a systematic treatment of methods of pollen dispersal and of flower types on a functional rather than a phylogenetic basis. The floral biologies of particular plant species are described only to illustrate the various principles and functional groupings discussed. The next-to-last chapter serves as an appendix of additional examples to illustrate the preceding chapters. Naturally, this could serve as a reservoir of illustrative material for many types of classroom discussions and exercises.

The book was obviously written by botanists for botanists, but there is a better presentation of animal structure and behavior in relation to pollination than one might expect. Animal pollinators are not taken up systematically but are grouped into functional classes on the basis of the types of floral mechanisms with which they are associated.

A short and rather inadequate chapter on applied pollination looks like an afterthought intended to widen readership. The final chapter is an epilogue stating the authors' philosophy concerning such evolutionary problems as morphogenetic potentiality, orthogenesis, specialization versus generalization, and the fallibility of adaptations. The bibliography is extensive. A collection of the works listed would make an excellent representative library for the floral biologist.

On the whole, the book is well organized and the ideas clearly expressed, with only an occasional slip to reveal that English is not the authors' native language. The authors are not reticent about ascribing functional evolutionary significance to nearly every modification of floral structure and activity. Van der Pijl's experience with tropical floras leads him to emphasize the important role of birds and bats in parts of the world other than Europe, where insects are almost the only animal pollinators.

In many ways this book resembles *The Story of Pollination* written in 1961 by B. J. Meeuse. However, the style is less popular and the documentation more complete. There is also a more elaborate classification of adaptive phenomena and a consequent greater use of definitions and terminology. *The Principles of Pollination Ecology* should be very useful as a textbook for pollination courses and as source material for courses in evolution, behavior, ecology, general botany, and plant systematics.

G. E. BOHART
Entomology Research Division,
U.S. Department of Agriculture,
Logan, Utah

Nature Guide

Wild Flowers of the United States. Vol. 1, The Northeastern States. HAROLD WILLIAM RICKETT. Published for the New York Botanical Garden. McGraw-Hill, New York, 1966. In two parts, boxed. 575 pp., illus. $39.50.

This is the most extensive book on wild flowers of the northeastern states ever published, containing over 1200 photographs in natural color, mostly of flowers growing in their natural surroundings, and 350 line drawings. The first of five projected volumes, it takes in the region from Maine to Minnesota to Missouri to Virginia. Of the 3000 wild flower species (exclusive of woody plants, grasses, and sedges) known to exist in that region, 1700 are here represented, in pictures contributed by 51 nature photographers, several of whom were commissioned to find and photograph particular plants.

Six eminent botanists collaborated with the author, a senior curator at the New York Botanical Garden, to supply detailed, although mostly nontechnical, information. Various means are provided by which the amateur can easily identify plants as he finds them. There is a key to 14 groups of plants based on general flower characteristics, and each group is further reduced by simple keys to genus and species. The pictures are conveniently grouped with the text. Taxonomists may be disappointed by the absence of detailed information concerning individual plants, but amateurs, and many others who appreciate good, simple aids to plant identification, will be delighted.

DONALD WYMAN
Arnold Arboretum,
Harvard University,
Jamaica Plains, Massachusetts

Mathematics for Geologists

Geological Data Processing Using FORTRAN IV. F. G. SMITH. Harper and Row, New York, 1966. 302 pp., illus. $14.

This book, written to help students in geology develop a wider working knowledge of mathematics, introduces the reader to a variety of mathematical topics at a level intermediate between abstract theory and actual computer programs. It is intended for those who wish to learn FORTRAN IV computer programming but who lack sufficient mathematical background. The exercises at the end of the chapters have been designed especially for geologists.

The first part of the book covers symbolic logic, Boolean algebra, number systems, vectors and matrices, the calculus of discrete and continuous functions, probability, and statistics. For each topic, the basic concepts are simply stated and then formulated as part of the FORTRAN IV language. This is supplemented with numerous examples of short written computer programs. There is a chapter describing the basic FORTRAN IV language. One