Book Reviews

A Branch of Ecology

Environmental Geology. Conservation, Land-Use Planning, and Resource Management. PETER T. FLAWN. Harper and Row, New York, 1970. xxii, 314 pp., illus., + map. $13.95. Harper's Geoscience Series.

Geologists have argued about the meaning of the term "environmental geology" over the past five years. Some have taken the position that all geology is by definition "environmental," and some have felt that environmental geology is not a valid subdiscipline of geology at all. Although one may still argue the niceties of this more or less semantic question, I believe that Peter Flawn has gone a long way toward providing a proper definition of what concerns should be included in this term in the first sentence of the preface of the book under review: "Environmental geology is a branch of ecology in that it deals with relationships between man and his geological habitat; it is concerned with the problems that people have in using the earth—and the reaction of the earth to that use." This statement sets the theme for the book.

The introduction outlines some of the problems faced by modern man and sets forth the purpose of the book as to examine the relationship of man to the earth, the consequences of man's actions, the second- and third-order effects of irreversible environmental reactions, and how man might improve his earth management skills.

Flawn mentions early in his volume that "urban geology" has been used as a synonym for "environmental geology." The urban areas are "where the action is," in the sense not only that man's activities with regard to the earth have a highly magnified scope and effect in the urban complexes but also that in them normal geologic processes have an effect on large numbers of people.

Although Flawn does give proper recognition to more spectacular and sometimes catastrophic geologic processes such as earthquakes, volcanism, landslides, and mud flows, he gives far greater attention to such matters as waste disposal, water supply, land subsidence, mineral supply, coastal processes, and air and water pollution.

The early chapters give the reader background information on dynamic earth processes, on engineering properties of rocks and soil, and on earth resources. The discussion of the earth resources concentrates upon the so-called nonrenewable (mineral and fossil fuel) resources. The principle of sequential multiple use of land is emphasized along with its corollary, the reclamation or restoration of land after the resources have been extracted.

The foregoing material furnishes the reader with the background for the longest chapter (70 pages) in the book, "Man as a geological agent." This chapter brings into focus some of the effects on the geological environment of solid, liquid, and gaseous waste disposal practices, engineering structures (highways, dams, aqueducts, wells), mining operations, and agriculture. This and the chapter on earth processes form the meat of the book. Flawn has an excellent narrative style and supports his observations with numerous examples, drawn from all over the United States, of practical geological problems and of attempts to deal with them. A final chapter, augmented by a foldout color map, treats in some detail the geology of Austin, Texas, "a typical fast-growing American city," in order to demonstrate the importance of geological information to cities.

Recurring themes throughout the book are the cost of environmental control, the assignment of priorities and how these priorities change with shifting economic conditions, and some deficiencies of current methods used in calculating cost-benefit ratios. Flawn emphasizes that man can have an improved environment if he is willing to pay for it and that the cost in a free-enterprise economy must ultimately be passed on to the consumer.

In some sections one gets the distinct impression that this is not only an exposition of the application of geology to environmental problems but also an evangelistic tract for selling the usefulness of environmental geology. This is by no means meant as an adverse criticism. There has long been a need for a book of this sort. Peter Flawn has been one of the few voices "crying in the wilderness" over the past decade on this subject, and I hope his book will help to arouse the geological community to a reexamination of its professional and personal responsibilities in this area of applied geology.

The book contains, in addition to the color foldout maps, 32 drawings and photographs and 11 tables. It would have been improved by more and better illustrations. Several maps and cross sections suffer from too much reduction and are consequently difficult to read. The foldout map, a 7½-minute quadrangle, of the Austin, Texas, area is excellently reproduced, but a legend emphasizing the environmental (engineering) geology properties of the various formations would have been helpful, as would a cross section. The glossary is a helpful addition for the nongeologist, but revision of the definitions to emphasize environmental aspects rather than the genetic aspects emphasized by classical definitions would probably have made it more useful both to geologists and to nongeologists.

These are by and large minor shortcomings in an otherwise excellent treatment of the subject, which will be valuable both for college courses and to planners, engineers, landscape architects, natural resource managers, and geologists.

KENNETH N. WEAVER
Maryland Geological Survey,
Johns Hopkins University,
Baltimore

Certain Key Figures

The Road to Medical Enlightenment, 1650–1695. LESTER S. KING. Macdonald, London, and Elsevier, New York, 1970. x, 210 pp. $11.50. History of Science Library.

Like his earlier works, *The Growth of Medical Thought* and *The Medical World of the Eighteenth Century*, Lester S. King's new book is "deliberately episodic, focusing on certain key figures

who exemplify, in medicine, particular aspects of intellectual history" rather than on discoverers or medical innovators. Lazar Riverius provides a baseline in Aristotelian metaphysics and Galenic medicine. The Neoplatonic and atomistic viewpoints are represented by Van Helmont and Robert Boyle, respectively. With respect to methodology, Sylvius is the iatrochemist and rationalist, Sydenham the empirically oriented clinician. "A number of minor figures reveal various degrees of critical acumen"—an attribute for which the key figures, too, are assessed. By the end of the 17th century "a synthesis began to occur and the best example of this is a little known work, of 1695, written by Friedrich Hoffmann, and embodying a new and 'modern' system," the *Fundamenta Medicinae*, King's translation of which has just appeared. A persuasive case is made for Hoffmann and the *Fundamenta* as precursors of Boerhaave and the *Institutiones*. Hoffmann, by the way, is not at all pictured as one of the rigid systematics.

A number of interesting links are developed, and some (like the juxtaposition of Van Helmont and Boyle) are unexpected. King recounts how Riverius found the moon inadequate to account for "critical days" and turned, instead, to the complex influence of the signs of the zodiac, and calls this "an interesting example of scientific method." This designation is an interesting example of King's procedure. We encounter references to such entities as "what we would call tissues" and "what we would call metabolism" more often than I would call the equivalence apparent. The lucidity of King's exposition sometimes owes more, indeed, to King himself than to the lambency of his authors' opinions. At the same time, King is a learned, well-balanced, and refreshing guide through a landscape that is not tiresomely familiar.

The "enlightenment" of the title ("it indicates a new critical acumen, a new regard for empiricism, a new approach to evidence and a new concept of validity") is at last defined as looking at things in a different light. Now and again, on *The Road to Medical Enlightenment*, a new tautology may be discerned. The development of a certain kind of empiricism is documented, however, as the central change that took place in the last half of the 17th century.

LLOYD G. STEVENSON
Institute of the History of Medicine, Johns Hopkins University, Baltimore, Maryland

Invertebrate Immunology

The Cellular Defence Reactions of Insects. GEORGE SALT. Cambridge University Press, New York, 1970. viii, 118 pp. + plates. $7.50. Cambridge Monographs in Experimental Biology, No. 16.

Salt's monograph is an elegant model of scientific writing, especially welcome in this heyday of the multiauthored treatise. Clearly, compactly, and discerningly the author discusses the response of insect cells to the stimuli presented by infectious and noninfectious foreign elements.

Following an introduction that defines the terms used and the scope of the volume, the major cellular reactions—phagocytosis, encapsulation, and nodule formation—are presented in three chapters. In the next two chapters Salt discusses the types of objects that incite reaction and the differing responses of the blood cells, which constitute the major group of cells involved. The last two chapters inform the reader of how these cellular reactions form a part of the immune system of insects and how they differ from or approximate defense reactions in vertebrates. There is a list of over 200 carefully selected references, followed by indexes of the organisms and subjects discussed.

The author is the long-time head of a productive laboratory which leads in the study of reactions of insects to macroparasites. The information and interpretations of data found in this book are the thoughtful distillation of many years' observations made by Salt and his coworkers at Cambridge.

The immediate practical worth of this volume will be in its contribution to studies of the biological control of pest insects through the use of parasites. As Salt points out, the better our understanding of the cellular reactions mustered by a pest insect for its own protection, the greater the chance that we will find methods by which they can be manipulated to human advantage. He proposes, for example, that methods might be devised "to develop new strains of parasites able to avoid or overcome the defence reactions of particular noxious insects."

Perhaps not so immediate as the application to biological control, but fully as important, is the contribution Salt makes to our knowledge of general defense reactions of invertebrates and thus to cellular defense as it occurs throughout the animal kingdom. Basic recognition of "self-nonself" occurs in cells of all members of all the animal phyla. Even now, the immune reactions of insects and other invertebrates serve as simple and convenient models for study of, for example, acceptance or rejection of tissue and organ transplants.

Every student of biological control, invertebrate pathology, and transplantation immunity (no matter how impecunious) should purchase this pleasingly turned-out little book and keep it close at hand. The price is small, and the book is surely destined to be a classic.

PHYLLIS T. JOHNSON
Center for Pathobiology, University of California, Irvine

Stasis and Coagulation

The Haemostatic Mechanism in Man and Other Animals. Zoological Society of London Symposium No. 27, London, Dec. 1969. R. G. MACFARLANE, Ed. Published for the Society by Academic Press, New York, 1970. xviii, 248 pp., illus. $13.50.

When animals became so large that diffusion was no longer sufficient for molecular exchange, body cavities containing fluid media were necessarily developed. In these, exchange is facilitated in simple systems by convection and flow (due to body motion and contraction) and in the most complex systems by pumped flow through closed vessels. The necessity for economizing the fluid media led to important requirements. The appearance of a wound, or opening, through which media might escape to the external environment had to trigger a mechanism which recognized the abnormal character of the opening and closed it with sufficient promptness, but which limited its effects internally to the immediate environment of the opening. In systems having a closed circulation, it became necessary also to cope with escape to the interior tissue spaces. An examination of the processes by which these fundamental requirements are met should appeal to all who have interests in regulatory mechanisms.

In all animals the means for producing stasis appear to be some combination of a few effects, which make widely different contributions in particular instances. Generally, the opening is either reduced by muscular contraction or, more frequently, closed by an adherent plug or cover. Closure may be due to the interaction of customarily free hemostatic cells or cell fragments. These may associate without obvious alteration in physical structure,