logical clock, is now abundantly clear. Sweeney takes this as a point of departure in her short but authoritative monograph. The book is more explicative than encyclopedic, covering all the basic concepts in the field. Although it deals primarily with plant material, the author does not hesitate to refer to results with animals where it is appropriate. The emphasis throughout is on the mechanism and biological function of clock systems.

The chapters not only cover daily or circadian rhythms but also include tidal, semilunar, lunar, and annual cycles. There is also a valuable chapter on the cell division cycle and its relation to endogenous rhythms.

A final chapter on mechanism, on the "clock" and its "hands," serves to set in good perspective the present knowledge and the speculations. Unfortunately, no good theories are currently available concerning the cellular and biochemical identity of the clock or its functional nature. Sweeney's book provides an uncluttered descriptive background, especially for "the students of the future who will reveal the balance wheel of the biological clock."

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Degenerate Materials

Heavily Doped Semiconductors. VIKTOR I. FISTUL'. Translated from the Russian edition (Moscow, 1967) by Albin Tybulewicz. Plenum, New York, 1969. xii + 420 pp., illus. $25. Monographs in Semiconductor Physics, vol. 1.

In 1965 (when this book was written) it was still common to equate heavily doped semiconductors with those that are electronically degenerate. Thus they are treated as "poorly conducting metals" throughout this volume. Other topics of recent interest in heavily doped semiconductors—energy band tails and the properties of disordered systems—are barely mentioned.

Within this context, the book is a detailed compilation of relevant formulas and properties for these materials. It is not a textbook so much as a reference for those who are familiar with solid state and semiconductor phenomena. The reader should, in fact, treat with care the first chapter, which is intended as a summary of semiconductor physics but which is in several places misleading and sometimes simply wrong. The remainder of the book, though short on explanations, contains probably the most extensive treatment of degenerate semiconductors now available. Germanium and silicon get the lion's share of space to such a degree that most of the theoretical relations are extended to include the explicit details of their individual energy-band structures.

One-third of the book consists of the chapter on transport phenomena, which is, in itself, a tour de force. The preceding chapter on semiconductor statistics is also quite detailed and adds to the standard material some not-so-familiar graphical techniques for Fermi-level determination. Optical absorption is given a fair treatment, but other optical effects are somewhat slighted. In addition to a chapter on the preparation of heavily doped semiconductors (written by M. G. Mil'vidskii), the author includes a short chapter on solubility relations for impurities which is evidently largely his own work. A chapter on applications of these materials and a large set of tables of Fermi integrals and transport integrals complete the volume.

The references are very comprehensive through 1963; thereafter, the author's own works appear to outnumber all the rest. The translation reads very fluently. In conclusion, this is a unique book which can be of value to the knowledgeable workers in this field.

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The Magnetosphere

Magnetospheric Physics. Proceedings of a symposium, Washington, D.C., Sept. 1968. DONALD J. WILLIAMS and GILBERT D. MEAD, Eds. American Geophysical Union, Washington, D.C., 1969. iv + 460 pp., illus. Cloth, $10. Paper, Vol. 7, Nos. 1 and 2, of *Reviews of Geophysics*, available by subscription only.

This book differs from the usual symposium proceedings in that it is very well done. One has become accustomed to the publication of symposium proceedings in expensive volumes with long production times and containing many papers that either advertise work published elsewhere or are not good enough to survive the refereeing process of a reputable journal. This book was produced relatively quickly and at a cost of less than half that of the usual symposium proceedings. The symposium was restricted to a single topic: the magnetosphere. The volume contains only the 15 invited review papers presented at the symposium, and these papers, as a collection, constitute good reviews.

The contents of this book have also been published as the first half of volume 7 (1969) of *Reviews of Geophysics*, the interdisciplinary review journal of the American Geophysical Union. This last point has led to some difficulties for the journal. It has been questioned whether an interdisciplinary review journal such as *Reviews of Geophysics* should devote half a year's output to such a narrow topic. This question may have been largely responsible for the motion made in the spring meeting of the Council of the AGU that *Reviews of Geophysics* "be discontinued at the earliest possible date." [See *E⊕S* **15**, No. 6, 465 (1969). It appears that this matter has since been resolved.]

Although this collection may be criticized from the point of view of its publication in *Reviews of Geophysics*, it is a model of what a good symposium proceedings should be. The authors were carefully chosen to cover a wide range of topics and subdisciplines within the general discipline of magnetospheric physics. There is not much overlap among the various papers. What overlap does exist is useful in that it sometimes results in the presentation of divergent views of the same topic. For example, four of the contributions are by Soviet authors. The areas of overlap between these papers and the U.S. papers indicate to me that the Soviet program of magnetospheric research is not operating at the same dynamic level as the U.S. program. Most discoveries and innovative new ideas have come from U.S. research.

The book contains some minor flaws that detract slightly from its overall excellence. The lack of an index is annoying. Some topics of importance are treated lightly; for example, the production of ELF and VLF emissions by trapped radiation and the existence of field-aligned currents in magnetosphere are mentioned only casually.

This conference proceedings provides an excellent benchmark for progress in magnetospheric physics. (The conference was held in observance of the tenth

anniversary of the discovery of the Van Allen radiation belt.) Magnetospheric research has evolved through the preliminary stage of first-order discovery and qualitative description to a more mature, sophisticated level wherein experiments are flown to answer specific detailed questions; theories, which are becoming more quantitative, are closely restrained by a growing body of rather definitive data. The next decade of magnetospheric research should see the unification and generalization of much that is contained in this volume. Meanwhile, I would commend this book to students and research workers who are interested in having a complete, well-edited collection of review papers that covers magnetospheric physics as it appeared to leading experts in the field in September 1968.

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Geomorphology

Weathering. C. D. OLLIER. Elsevier, New York, 1969. viii + 304 pp., illus. $14.50. Geomorphology Texts, vol. 2.

When I first glanced through this book, I found that Ollier had used a photocopy of one of my published diagrams without mentioning its source. Somewhat annoyed, I was in a poor mood to read this book with the care that it deserves. Fortunately, I persevered and found, contrary to initial expectations, a thoroughly documented book, generally well written, and, above all, interesting and informative. Soil scientists and geologists who desire a general review of weathering will find this book useful. Details of physical chemistry are avoided, however, so the serious student of weathering will still do well to read Krauskopf's *Introduction to Geochemistry* or Keller's classic volume *Principles of Chemical Weathering*.

The first part of Ollier's book gives a general description of physical, chemical, and biotic weathering of rocks and minerals. This section contains enough elementary geology and mineralogy to make it understandable to anyone with a minimal background in science. The central part of the book describes the effects of hydrology, climate, and time on the nature and rates of weathering. A discussion of weathering in past geologic ages and a review of study techniques conclude the book.

North American geologists will be pleased with photographic illustrations of many unfamiliar geomorphic features found in Australia. They will be dubious, nevertheless, concerning many statements in the book. A noneolian origin of loess is suggested in two separate sections. Insulation weathering is emphasized strongly. Weathering to depths of several thousand feet is described. Constant-volume weathering is championed. Part of the potential differences in understanding can be related to Ollier's use of technical terms. For example, if loess is defined as a well-sorted, homogeneous silt, no argument exists about the noneolian origin of some loess. Or, if all chemical changes induced by circulating meteoric water can be called weathering, then weathering certainly extends to depths of several thousand feet.

Although the book contains some quantitative information, most North American geomorphologists will probably share my impression that too much emphasis has been placed on descriptive terms and the classification of surface forms. Do we really need an 11-term classification of *Karren* and do we need to know that *visors, plinths,* and *imprisoned boulders* are found along our coastlines? I think not. Careful measurements and experiments will advance geomorphology much more rapidly than giving a name to every bump molded by the capricious hand of nature.

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Lunar and Other Eclipses

Eclipse Phenomena in Astronomy. F. LINK. Springer-Verlag, New York, 1969. x + 272 pp., illus. $19.50.

It might be expected that a book with this title would cover the entire field of eclipse phenomena in astronomy. The reader discovers, however, that phenomena related to solar eclipses and eclipsing binaries are entirely omitted. A glance at the table of contents soon reveals the author's intention. He is concerned principally with phenomena related to the attenuation of light as it passes by the eclipsing body and with the information that can be gathered about this from photometric studies of the eclipsed body. It is then clear why the author concentrates on a very thorough analysis of phenomena associated with lunar eclipses, which comprises 45 percent of the book. After a short section on the geometrical conditions of lunar eclipses and a sample computation of the circumstances of an eclipse, the author covers such subjects as the general photometrical theory of the umbra, molecular scattering of light, aerosol scattering, attenuation of light by refraction, normal densities of the shadow, theory of refraction and air mass, climatic influences on the refraction of air mass, climatic variations of the shadow density, and atmospheric illumination of the eclipsed moon.

The author then takes up the problem of photometry of the moon during eclipse, describing first the theory of luminescence and instrumentation involved in experiments, and then moving on to discuss the increase of the shadow, shadow flattening, and thermal phenomena during eclipse.

In the remaining half of the book, the author covers such subjects as eclipses of artificial earth satellites, twilight phenomena, occultations and eclipses by other planets, transits of planets over the sun, eclipse phenomena in radio astronomy, and finally Einstein's deflection of light. The text for this book arose from a series of lectures given at the Faculté des Sciences in Paris in 1967–68, and perhaps because of this each subject is treated independently of those that precede and follow it.

Each chapter gives a short historical review and a survey of the fundamentals and concludes with the latest experimental results. For the casual reader this is an advantage, for it is possible to follow one subject through completely without having to backtrack for fundamentals. Each subject section is followed by a fairly complete bibliography, some references being as recent as 1968.

The book is profusely illustrated, there being 201 figures and tables within the 268 pages of text. This interesting and informative volume is marred only by evidence of hasty proofreading and the distraction caused by occasional awkward English expressions in translation from the original French.

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