consistencies and an occasional infusion of laboratory jargon. These are not sufficiently frequent to be irritants and may even contribute to the sense of being there where it is happening that one gets from the overall treatment.

The volume throughout is colored with the bias of present thinking of the inner circle. This bias is not necessarily objectionable provided it is recognized, but it may mislead the innocent. For example, most of the authors tend to deemphasize the fact that the use of the acetylene-ethylene reaction as an indicator of nitrogen fixation is based only on presumption. There is no question of the value of this reaction for field and laboratory studies and as a tool in enzymology, but the calibration is not rigid.

Although admittedly not a complete report of the action in nitrogen fixation, this volume includes much of current thought and is indispensable for anyone interested in nitrogen. Everyone should be.

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## Biodisciplines

**Annual Review of Biophysics and Bioengineering.** Vol. 1. MANUEL F. MORALES, WILLIAM A. HAGINS, LUBERT STRYER, and WILLIAM S. YAMAMOTO, Eds. Annual Reviews, Palo Alto, Calif., 1972. x, 590 pp., illus. $10.

Compendia are never easy to review, especially if they cover a very broad spectrum of interests as does this first volume of a new series. I doubt that any one person could write authoritatively or even persuasively on all the topics that have been subsumed under these two disciplines whose limits are notoriously ill-defined. Inevitably, therefore, this review will deal with the scope of the book rather than with its content, and, equally inevitably, the reviewer's prejudices are bound to show.

It is worth asking whether it is a mark of scientific respectability to profess a discipline which is a topic of an "Annual Review" and whether the announcement of this volume automatically legitimizes the bioengineer. If so, what of the partnership between biophysics and bioengineering? To pursue these questions too far is to become entangled in semantic snares (is biophysics a branch of biomathematics or vice versa?), but some discussion of the limits and overlaps of the fields is necessary and desirable. We should first ask if engineering is in any meaningful sense a science. The goals of science, it seems to me, are directed to the *understanding* of the world around us, and those of engineering are directed to *modifying* it. Because these goals are not always pursued in the appropriate temporal order, the heavy emphasis on theoretical concepts in this book may be salutary to engineers. They are warned, however, that parts of it will seem very hard going, and they are likely to feel they have less than equitable representation.

The editors say that the "marriage between biophysics and bioengineering . . . was by no means just a union of convenience." They prudishly refrain from mentioning that they have, in fact, established a *ménage à trois* with biochemistry as the dominant partner. At least half the papers could probably be considered in that category, and unless engineering curricula have changed a good deal since my day a critical reading of several of the surveys will be beyond the scope of the bioengineer. The foregoing should not be taken to imply that none of the theoretical papers are valuable to the engineer. Pecora's paper "Quasi-elastic light scattering from macromolecules" describes a technique just due to emerge into practice which will involve advanced engineering concepts. The same is true of the sophisticated computer graphics work of Katz and Levinthal.

There are excellent papers in neurophysiology—a topic of substantial interest to practicing engineers who have traditionally seen links between their networks and those infinitely more refined communication systems found in living things. Ehrenstein and Lecar discuss the mechanism of signal transmission in nerve axons with real authority, and Hagins's discussion of the primary processes in vision is a model of its kind. Both these papers are tutorial in nature rather than surveys of recent work. They are certainly none the worse for this.

In the expectation that other reviews of this volume will come from biophysicists, this bioengineer makes a plea for a broader base in future years. May we have some materials technology, some discussion of orthotic and prosthetic engineering, some details of biological power sources, and some wide view of developments in computer science? These are but a few of the scientific advances which are clearly ready to move from academia to the wider service of man.

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## Geomorphology

**Hillslope Form and Process.** M. A. CARSON and M. J. KIRKBY. Cambridge University Press, New York, 1972. viii, 476 pp., illus. $19.50. Cambridge Geographical Studies, No. 3.

It is customary to bemoan the high cost of technical books, but in this case the contents of the work certainly provide good value for the money spent. The authors selectively consider not only geomorphic but also engineering and agricultural literature to produce a comprehensive survey of the diverse publications pertaining to slopes. Hillslopes have always been a major concern of geomorphologists, and there was a definite need for such a review and synthesis.

Hillslopes in this treatment are not just hillsides; they are taken to include any inclined surface that is composed of earth materials, ranging from short, gently sloping agricultural plots to the massive escarpments of the Colorado Plateaus. As the title indicates, the subject of the work is the form and evolution of slopes, but the major concentration is on the processes operating to cause their modification. In contrast, detailed mapping techniques and the increasingly esoteric theoretical models are given less attention; nevertheless, process-response models are developed, which are based both on physical principles and on the realities of field and experimental evidence.

Of especial value is the interdisciplinary approach, which is obviously necessary when dealing with such a complex subject. The huge body of descriptive literature is not considered except for some necessary examples. Instead, more than half the book is devoted to the pertinent aspects of physics, hydraulics, soil mechanics, rock mechanics, and rock weathering that are basic to the development of a better understanding of slopes. This makes readily available the essence of a very scattered literature. One problem is, of