discussion of allosteric systems, including the Monod-Wyman-Changeux model. This and other aspects of regulatory control receive due emphasis at many points throughout the book.

The discussion is critical and detailed. In the chapter on photosynthesis, for instance, after describing the Calvin-Bassham cycle for CO_2 assimilation, the authors point out in some detail the various remaining discrepancies between the postulated cycle and the experimental findings. The discussion of the tricarboxylic acid cycle presents, among other features, the most thorough discussion I have seen in any book of the stereochemistry and mechanisms of the reactions involved. These examples are typical. The detailed and critical character of the presentation will make the book slow reading for the beginner, but those who master the material presented will be brought close to the frontiers of current research. To lead them further, each chapter includes an extensive list of references, both to reviews and to original papers.

The book contains no chapters dealing specifically with the biochemistry of blood, muscle, kidney, or other mammalian tissues, and the references to hormone action are extremely brief. Hemoglobin structure is discussed in chapter 3; and the reactions of hemoglobin with ligands are treated briefly, together with those of other heme proteins, in the chapter on biological oxidations; but the Bohr effect, which is one beautiful example of a biological regulatory mechanism, is not discussed at all, although it is implicit in Fig. 14–6.

There are, I think, some weaknesses in the organization of the book. The chapter on coenzymes overlaps with several of the later chapters, and the student must refer back and forth repeatedly between chapters to get a full understanding of many important biochemical processes. The complicated acid-base equilibria and ion binding of proteins are thoughtfully treated on pages 50 to 57, but the corresponding relations for the simplest acids and bases are not encountered until page 189. One could cite other such examples. On the whole, however, such problems are minor by comparison with the outstanding virtues of the book.

This book is not likely to be used as a text in medical school biochemistry courses, in part at least because, as indicated above, it omits several topics of importance to medical students, and indeed to others. However, medical students who are deeply interested in biochemistry should certainly find it valuable. For graduate students, and for undergraduates with adequate preparation, I would rate it very high. It has not only the transitory advantage of being the most up-to-date textbook but the more enduring values of solidity, reliability, and depth of insight into the central problems of biochemistry today. Many investigators, long past their graduate student days, will also find it profitable reading.

JOHN T. EDSALL
Biological Laboratories, Harvard University, Cambridge, Massachusetts

Keeping Book on Social Realities

Social Indicators. RAYMOND A. BAUER, Ed. M.I.T. Press, Cambridge, 1966. 379 pp., illus. $10.

This is the second volume in the series on Technology, Space, and Society prepared by the American Academy of Arts and Sciences. (The first, *The Railroad and the Space Program*, edited by Bruce Mazlish, was reviewed in *Science*, 25 Feb. 1966, p. 979.) It consists of two sizable monographs, one, on "Social indicators and goals," by Albert D. Biderman, and the other, entitled "The state of the nation: Social systems accounting," by Bertram M. Gross. In addition there is a long introduction by the editor which largely recapitulates the rest of the book, and there are two shorter essays, one by Biderman, entitled "Anticipatory studies and standby research capabilities," and one by Robert A. Rosenthal and Robert S. Weiss, "Problems of organizational feedback processes."

As in the case of the first volume of the series, the space program has provided an excuse for doing something which should have been done anyway. The references to NASA are slightly reminiscent of the libations to Marxism-Leninism that one finds in otherwise very sensible Russian works. The essential problem of the book is that of the epistemology of social systems, that is, how do we collect and organize information about very complex systems, especially with the aid of statistical and numerical techniques, which will give us a clearer picture of what the system is like and what is going on. The Biderman monograph is a substantial piece of work. It does not pretend to be comprehensive, but it shows how social indicators, that is, quantitative indices of social realities collected by careful sampling and published as continuous series, can be used and misused as what he calls vindicators and indictors. His discussion of the pitfalls of social indicators, as illustrated by crime statistics and their misuse, is brilliant and deserves to be widely read. One hopes he will write articles about this for the popular press.

The Gross essay is more speculative and abstract. Bauer's introduction suggests that while Biderman describes where we are, Gross indicates where we want to go. The essay is a rather ambitious summary of Gross's own system of analysis of the components and relationships of a total social system. One cannot in a brief review examine the merits of the Gross system. One can, however, criticize the essay, as in effect Biderman himself does, on the grounds that the system does not tie in very closely with the epistemological problem which is the core of the book.

The second Biderman essay is an eloquent plea for stand-by facilities and for a well-organized research apparatus which is equipped both to anticipate future events of interest and to take immediate advantage of research opportunities provided by unusual current events. This is reminiscent of what some of us have been advocating as "hot-spot research." It is when a system is exhibiting unusual variations that knowledge about it is most easily acquired. In the social sciences we take very little advantage of this principle, and the Biderman proposals are worthy of strong support.

The essay by Rosenthal and Weiss is an interesting though rather elementary piece on the epistemological problems of organizations, marred, however, by a very careless use of the word "feedback" and by what impresses this reviewer, at any rate, as a certain deficiency in epistemological theory. The whole work, indeed, is a kind of social indicator itself of the deficiencies not only of our information system and of the social sciences, but also of our epistemological theory. Perhaps the next venture in this program should be some excursions in the sociology of knowledge.

The style of the book is somewhat diffuse and verbose, and it would have

been better if it had taken twice as long to write and been half the size. There is a certain air of inter-office memorandum about it, which is not wholly unattractive but which makes at times for tedious reading. In my own set of social indicators the book suggests that too much money is going into excuses, not enough into reasons. There is too much pressure for quick publication, and I notice a slight rise in the index of diversion of the academic community by the grants economy.

KENNETH E. BOULDING
Department of Economics,
University of Michigan, Ann Arbor

Microbiology

Principles of Microbial Ecology. THOMAS D. BROCK. Prentice-Hall, Englewood Cliffs, N.J., 1966. 320 pp., illus. $7.75.

Principles of Microbial Ecology is to be recognized and welcomed as the first volume in any language dedicated to this difficult but timely and deserving subject. Unfortunately, the book, though commendable in concept, is not so in content. I regret that it is not more carefully composed and that it is not profound. The author's approach is more qualitative than quantitative. His intended audience is not clear, but it is one that requires simple definitions and descriptions of water, *p*H and E_h, of pure culture, virus, and micorrhiza, of ecosystem, productivity, and succession, and of the carbon, nitrogen, and sulfur cycles. There is little new information that the book can impart to a college student who has completed courses in introductory chemistry and microbiology, and the brevity and superficiality of treatment are emphasized by the author's frequent referral of the reader to other texts for "details."

Brock has considerable knowledge of his field, but in attempting to integrate facts and derive principles he sometimes contradicts himself. In the introduction to the book he writes that microbial ecology has developed slowly "partly because of experimental difficulties," but then goes on to explain that "Microbial ecology can become a meaningful experimental science, since in many cases a simple test tube or flask can be converted into a precise, reproducible, and meaningful ecosystem." On page 76 of the text the reader learns that the "interior of an experimental animal is usually sterile," but on page 86 he is informed that "No animal in nature is sterile and microorganisms are frequently present in huge quantities, especially on the skin and in the intestinal tract." Brock expends effort and space (pp. 28–33) to support his conclusion that pure culture work in the laboratory is "merely taking a situation which may already exist in nature and magnifying it in order to study it conveniently." But he considerably weakens this argument by later questioning whether the movement of colonies on agar plates is "merely a laboratory artifact" (p. 92) and by issuing a "warning to those who would attempt to measure the ecological roles of antibiotics by the use of agar plates" (p. 133).

The volume is a readable introduction to the subject in spite of its faults, however, and Brock is certainly correct in his concluding statement that "The future of microbial ecology holds nothing but promise."

DAVID PRAMER
Department of Biochemistry and
Microbiology, Rutgers University,
New Brunswick, New Jersey

An Advance in Epidemiology

A Prospective Study of the Incidence of Mental Disorder. OLLE HAGNELL. Svenska Bokförlaget, Stockholm, 1966. 175 pp. Paper, Kr. 37.

An investigation can be notable for what it discovers or because it points the way that future research must follow. Olle Hagnell's unpretentious book provides little new substantive knowledge; it nevertheless marks an important advance in the epidemiology of mental disorder, for it demonstrates in the most convincing way possible that the approach we have all along known to be best is in fact possible.

Up to now, epidemiologists have relied either on incidence data limited to people who undergo one or another form of treatment or on prevalence data. Both of these are seriously deficient for any studies concerned with etiology. The difficulty with the first is that the many ill people who never enter treatment are markedly dissimilar to those who do. The difficulty with the second is that prevalence reflects both incidence and duration of illness, and duration is highly correlated with etiologically relevant variables. Hagnell has now done a study the way it should be done: he has taken a population that was carefully examined 10 years ago and has reexamined virtually everyone to see who has become ill in the interim. His data provide the most accurate information ever obtained on the true incidence of mental disorder.

Unfortunately, there are stringent limits to how much a single investigator can do. In interviewing 2550 people, Hagnell comes up with too few cases of any particular type or degree of mental disorder to be able to go much beyond establishing rates for the population as a whole. Furthermore, in the limited time he could spend on each interview he got very little more information than what was needed for making an accurate diagnosis. Thus, when he comes to what should have been the most exciting part of the book—the analysis of the relationship between variables of possible etiologic importance and rates of disorder—he has little to say. He tells us that there is no apparent relationship between occupational level or income and overall rates of mental disorder, but that there is an apparent relationship between migration and these rates. The negative findings are of no great significance, because there was no reason to expect otherwise: occupation and income have proved to be very potent variables in studies of large cities, but not in studies of rural and small-city populations like the one Hagnell studied. The finding on migration is potentially very exciting, but Hagnell has not the data to carry the analysis forward to discover how and why migration matters.

For future investigations to proceed further will require major modifications of method. Hagnell did the most that was possible for a single psychiatrist going into the field with the traditional diagnostic techniques of his discipline. The larger studies of urban populations that must now be done will require new techniques of measurement that can be used reliably by teams of investigators and that make much greater use of our developing abilities at multivariate analysis. In the not very distant future we may look back upon Hagnell's study as primitive in method as well as limited in scope; we shall nevertheless applaud it for having demonstrated that it is possible to do a true incidence study of mental disorder. That having been demonstrated, the technical problems we now face should not prove insuperable.

MELVIN L. KOHN
Laboratory of Socio-environmental
Studies, National Institute of Mental
Health, Bethesda, Maryland