who hold only 16 of these preference scales, namely (ABCDE), (ACBDE), (ABCED), (ACBED), (DEABC), (DE ACB), (EDABC), (EDACB), and the same eight in reverse order. Voters with these preference orders cannot do better than vote "sincerely." For others, "sophisticated" voting strategies are more rational.

Farquharson relates his theory to the "classical" *n*-person game theory as follows: While in the approach emphasized by Von Neumann and Morgenstern (*Theory of Games and Economic Behavior*) both coalitions and side payments are allowed, and in the approach emphasized by John Nash the noncooperative game, disallowing either coalitions or side payments, is taken as fundamental, in the present theory coalitions are taken into account but side payments are not possible; in fact, utilities of different players are not comparable because only an ordinal scale is assumed for preferences. Farquharson considers these assumptions to be more realistic. Furthermore, he writes, "It is no longer the case that the possibility of coalitions prevents any determinate solution. There can exist situations that are not dominated by any others" (p. 72).

The point about the ordinal preference scale is well taken inasmuch as practical applications of *n*-person game theory are severely restricted by the requirement of a cardinal utility scale. With regard to the cited remark, however, it might be pointed out that undominated situations occur also in the classical theory. For example, the core of an *n*-person game in characteristic function form, if it exists, consists of undominated imputations. Moreover, deterministic solutions are offered also by the Shapley value and in Harsanyi's bargaining model. This, however, is a minor point.

The great merit of the book is first of all in the rare combination of complete rigor and remarkable clarity, which makes its sophisticated ideas immediately comprehensible to *any* reader motivated to understand them. Secondly, the reader's interest is held at a high pitch by the graceful style and the felicitous examples, some taken from real life, ranging from deliberations in the Roman Senate to the five-year, $18-billion highway program offered by Tennessee's Democratic Senator Albert Gore (1955). Many readers interested in voting theory will be thrilled to read the cited letter of Pliny the Younger to Titus Aristo, containing a detailed and perceptive analysis of voting procedures in connection with a case before the Senate with which Pliny was concerned. This was 17 centuries before Marquis de Condorcet, the reputed father of mathematical voting theory, laid its foundations at the dawn of the Age of Democracy.

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An Astronomer in Paris

Science in France in the Revolutionary Era. Described by Thomas Bugge, Danish Astronomer Royal and Member of the International Commission on the Metric System (1798–1799). With Extracts from Contemporary Works. MAURICE P. CROSLAND, Ed. Society for the History of Technology and M.I.T. Press, Cambridge, Mass., 1969. xvi + 240 pp. $10. Society for the History of Technology Monograph Series, No. 7.

Representatives from most of the states of Western Europe were invited to Paris in 1798 to examine the work done by the French on the metric system, to participate in its formal adoption, and, thereby, to endow the new standards with the greater authority derived from international support. Delays in this work provided the Danish representative, Thomas Bugge, with the time, and his own lively curiosity with the desire, to investigate virtually every aspect of the intellectual and artistic life of the French capital. Moreover, Bugge's official position—and the fact (unmentioned in Crosland's brief but useful biography) that, because he had been a correspondent of the former Academy of Sciences, his works and name were known to many Parisian scientists—gave him access to people and meetings closed to more ordinary visitors. And so he went everywhere—not only to every significant scientific and technological institution, but to almost every functioning educational establishment and to artistic centers as well. He was even allowed, despite the continuing war, to inspect such facilities as arms factories. With one major exception, to be noted below, his observations on all these things were marked by a kind of scientific objectivity. Thus, although he offered comments critical of the war, he never complained of the "looting" practices of the French armies; he was content simply to note the many works of art, scientific books and instruments, and other goods with which they were enriching France.

More than most such efforts, therefore, Bugge's account—translated into English from its original Danish in 1801 under the title *Travels in the French Republic*—is a valuable tool for the historian, providing data and dimensions lacking in "official" sources. Thus, where a contemporary document may inform us of the presentation of a specific lecture in the amphitheater of the Museum of Natural History, it will not tell us, as does Bugge, about that auditorium's poor acoustical qualities (a judgment with which, having heard speakers there in the summer of 1968, I must concur). Nor do the minutes of the meetings of the National Institute reveal the voice qualities and speaking abilities of the scientists reading papers there. These are the kinds of things offered to us in this selection of the most scientific sections of Bugge's account.

But Crosland has done more than simply make these scarce observations available again. He has both improved the earlier English version of Bugge's account itself and added some general contributions. One significant item under the former heading is that the 1801 edition, despite its suggestion to the contrary, was not a complete translation. Crosland not only tells us what it omitted, but provides some of that material—perhaps most importantly, some considerations on the metric system and a variety of comments by Bugge on governmental support of science and the works of several private societies and instrument makers which Crosland has placed together in a chapter entitled "Science—public and private," a logical grouping typical of his meaningful recategorizing throughout.

He has, further, made some changes —modernizations and clarifications—in wording, while eliminating some of the listlike offerings of the original. Recognizing the difficulties that most readers might have with the Republican calendar, he has provided Gregorian dates throughout, though happily avoiding the all too frequent practice of dropping the former after converting to the latter. As to general contributions, the most significant is his injection of additional materials, especially comparative evaluations taken from other travelers' accounts, a listing of which constitutes far and away the

best part of an otherwise sketchy bibliography. Further, he has supplied both a general introduction and specific topical ones which, though containing some small errors of omission and commission, are rather good.

But all is not positive. Bugge's account itself has some failings. As Crosland points out, one of them is that the breadth of coverage is frequently achieved by the sacrifice of depth. Crosland finds this particularly upsetting in the case of the metric system materials; I find it so in the case of educational institutions, and particularly the treatment of the School of Geographers where Bugge's special competence led one to hope for useful details on a little-known establishment, but where he did not even provide its address. More important than this kind of thing, however, is the pronounced anti-Jacobin bias which runs throughout and occasionally distorts Bugge's account and is probably based to a considerable extent upon his reading of Grégoire's famous report on vandalism, the source of so many myths about the infamous period of the Terror.

Unfortunately, Crosland seems to share that bias, for, while correcting Bugge on numerous small points, he never enters a caveat against this, and, in fact, does not even rectify the error of one year in Bugge's dating of Grégoire's report (p. 183). A greater failure to correct occurs in the case of Bugge's conversion of the name of a French artisan from Carochez to Laroche (pp. 169–70). Indeed, not only did Crosland not catch this error, he credits Bugge with "rescuing from obscurity" (p. 155) an instrument maker of significant stature; Bugge, that is, created a ghost that Crosland did not lay to rest. But even more serious than slips and not-provided supplements is the matter of Crosland's deletions from Bugge's account. He has removed some materials of considerable consequence. For example, Bugge several times visited the Observatory of Paris, and his observations thereon are, by Crosland's own admission, among the most important in the entire work. Why, then, did Crosland choose to delete such items as Bugge's critical comments on the mounting of instruments? Is not this, after all, precisely the kind of thing we should want more of?

Despite these flaws, this is a valuable contribution which will place historians of the science of the Revolution in the same kind of debt to Crosland that historians of the science of the Napoleonic period already owe him by virtue of his interpretative study of the Société d'Arcueil and his editing of that body's *Mémoires*.

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Practical Biology

The Biological Basis of Medicine. E. EDWARD BITTAR and NEVILLE BITTAR, Eds. Academic Press, New York, 1968–1969. Six volumes, illus. Vol. 1, xvi + 590 pp., $19.50; vol. 2, xvi + 578 pp., $21; vol. 3, xvi + 494 pp., $17.50; vol. 4, xii + 396 pp., $14; vol. 5, xvi + 548 pp., $19.50; vol. 6, xvi + 618 pp., $19.50.

This six-volume compendium is clearly superior—in purpose, scope, readability, and pertinence—to most of the recent massive biomedical publications. Much of the credit for this excellence must go to the editors, the brothers Bittar. The topics covered are timely, and the various chapters are cogent and well written and all have the same format. Each chapter is preceded by an outline, most end with a summary, many contain a clinical section, and the reference system is uniform. (Unfortunately, the titles of the articles cited were omitted to save space.) Whether the choice of topics seems acceptable, poor, or excellent will depend on the individual interests of the reader. It is unfortunate that there is no master index to all six volumes.

In the space available I cannot list the titles of the 85 chapters, but must indicate the headings of the 21 major sections: The Dynamic State of the Cell; Growth; Cell Injury; Ageing (vol. 1); Hormones; Control of Metabolic Processes; Mechanism of Action of Biological and Physical Agents (vol. 2); Blood; Connective Tissue; Synovial Membranes and Skeletal Muscle; Bone (vol. 3); Molecular Genetics; Immunology and Transplantation (vol. 4); The Nervous System; The Liver and Gall Bladder; The Alimentary Tract; The Cancer Cell (vol. 5); Hair and Skin; The Cardiovascular System; The Lung; The Kidney (vol. 6).

Many of the chapters deal with subjects far from my field of interest and could not be reviewed by me with any authority. However, many other chapters were of compelling interest, often because they discuss material I wanted to explore, either because I was unfamiliar with the subject and had never come across a review that could be read conveniently ("The nature of the ageing process"; "The thymus in immunity"; "The biochemistry of mental illness"; "Transplantation of the kidney: the present position"), or because they discuss reasonably familiar topics which I wanted to review ("The control of respiration in health and disease"; "The effects of raised intrapulmonary pressure"; "Selected aspects of lung metabolism"; "The basis of uremic toxicity"; "The metabolism of heart muscle in health and disease"; "Effect of low temperature on tissues of the body"; "Host defense and the reticulo-endothelial system"; "Autoimmunity and disease").

Each chapter just listed goes far toward achieving the editors' stated aim for the volumes—that is, "providing a balanced treatment between contemporary medical science and the applications of cellular biology in medicine." Because of this virtue I think these volumes belong in all but the smallest, or most specialized, biomedical libraries. Many biomedical investigators will also want them for their personal, or departmental, libraries.

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Groups in the Animal Kingdom

Principles of Comparative Anatomy of Invertebrates. W. N. BEKLEMISHEV. Translated from the third Russian edition (Moscow, 1964) by J. M. MacLennan. Z. Kabata, Ed. Vol. 1, Promorphology. xxx + 490 pp., illus. Vol. 2, Organology. viii + 532 pp., illus. Oliver and Boyd, Edinburgh, 1970, £10. University of Chicago Press, Chicago, 1970, $35.

The two volumes that make up Beklemishev's treatise on comparative anatomy will be welcome to all non-Russian-reading invertebrate and general zoologists. They represent a unique approach and have no parallel in modern zoology.

The volumes cannot be read lightly and, since much of Beklemishev's terminology will not be familiar to most English-speaking zoologists, a major learning effort is called for in order to follow the text. New terms are consistently and carefully defined as they are introduced, and, fortunately, the introduction presents a synoptic outline of