social conscience, and will be useful, in addition, for the many courses now arising in response to the students' desire to consider the social relevance of the findings of biology.

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Quantitative Approach

Statistical Ecology. Vol. 1, Spatial Patterns and Statistical Distributions. A symposium, New Haven, Conn., Aug. 1969. G. P. PATIL, E. C. PIELOU, and W. E. WATERS, Eds. Pennsylvania State University Press, University Park, 1971. xxviii, 582 pp., illus. $14.50. Penn State Statistics Series.

This is the first of three volumes reporting the papers and discussions at a symposium held at Yale University in 1969. Two subsequent volumes are to deal with "Sampling and Modeling Biological Populations and Population Dynamics" and with "Many Species Populations, Ecosystems and Systems Analysis." Twenty-three specialized papers and some general addresses are featured in the current volume. The application of statistical and mathematical techniques in ecology has rapidly proliferated during recent years, and one of the editors (Pielou) is the author of a successful introductory text. Thus ecologists have generally accepted a quantitative approach. Yet this volume will leave many ecologists, even those with statistical proclivities, seriously perplexed. If this volume faithfully reflects the progress and achievements of statistical ecology, the direction of this science would seem misguided. At least 11 of the papers deal with the properties of various statistical distributions that *might* be of interest to ecologists. Yet the relevance of these distributions to real biological data and the biological significance of their occurrence are not discussed, biological keywords in the titles of articles notwithstanding. Some of these papers will be of interest to statistically minded ecologists, who will have to dig hard to extract for themselves kernels of material useful for their work. Other contributions clearly belong to the statistical literature. The fact that empirical data in ecology often do not permit decisions among alternative distributions is brought out in the discussion. Whether this will inhibit the generation of further distributions in the future is doubtful. The multiplicity of biological interpretations of given distributions is taken up in a paper by Hairston, Hill, and Ritte in this volume.

At least two important contributions to statistical ecology should be singled out. Morisita develops an index of environmental density which is likely to be taken up by ecologists, as were his earlier contributions, and Iwao and Kuno undertake an interesting analysis of aggregation patterns in biological populations and their implications for various theories of population dynamics. There are other papers of specialized interest which will be read with profit by ecologists of various persuasions.

Users of this volume will be seriously impeded in their ability to locate desired information by the editors' omission of any kind of index and by the publisher's unfortunate decision to employ uniform running heads for the entire volume, yielding a Shannon-Weaver diversity index of zero as one thumbs through the pages.

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Neurochemistry

Recent Advances in Adrenergic Mechanisms. BUDH DEV BHAGAT. Thomas, Springfield, Ill., 1971. x, 134 pp., illus. $13.75.

In this book Bhagat provides an introduction to the concepts of the biochemistry and pharmacology of the sympathetic nervous system. It may well serve the needs of many students, medical scientists, or practicing physicians with an inquiring interest in the field, who must have difficulty in finding a place to begin reading the accumulation of sophisticated and complete reviews, symposia, and monographs dealing with catecholamines and related subjects.

A concise account of any large and rapidly advancing field must necessarily suffer from simplifications, omissions, and personal bias. Bhagat has freely acknowledged and accepted these dangers in his attempt to present clearly and simply an account of adrenergic mechanisms. The result, although a somewhat personal view of the field, does bring to the reader a fair coverage of the major facts and concepts. In the interest of brevity, conclusions are stated with minimal attention to the data from which they were derived. Bhagat has effectively used schematic representation to explain the complex interactions of drugs with the mechanisms for synthesis, storage, release, and action of norepinephrine. The only original data presented are the author's own work, six smoked-drum tracings of cat blood pressure and nictitating membrane contraction; and as might be expected of any active investigator, the citations are skewed toward his own contributions to this field. In some of the references, abstracts rather than the full published work are cited.

It would be quite easy to suggest how this book might have been enlarged, but perhaps only at the expense of the author's objectives. There is little or no discussion of the isotopic or biochemical methodology used in catecholamine research; the cardiovascular system is the only area in which any clinical correlations are considered; the central nervous system is ignored; controversial subjects such as compartmentation or metabolic pools of norepinephrine are avoided; there is nothing about the role of nerve growth factor in the development of the sympathetic nervous system; and some important, relatively new information (for example, the release of dopamine-beta-hydroxylase from sympathetic nerves and its presence in blood) probably was still unpublished when the monograph was sent to the publisher. These omissions will not seriously hamper the reader's gaining an overview of current concepts, but the author might have included a list of other reviews and monographs which could be used to build on the foundation provided by this relatively brief introduction.

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Chemical Processes

Inorganic Reaction Mechanisms. JOHN O. EDWARDS, Ed. Interscience (Wiley), New York, 1970. x, 350 pp., illus. $15.95. Progress in Inorganic Chemistry, vol. 13.

Those who investigate mechanisms of reactions must always be aware that each specific reaction has its own characteristics; yet they hope the results on a specific system will aid in formulating a general scheme of reactivity for a class of reactions. As a field of investi-

gation—in this case, inorganic reaction mechanisms in solution—matures, the need to keep this general view while sharpening the focus increases. It is encouraging that in the volume under consideration several contributors have attempted to meet this need.

Cattalini's discussion of substitution in square planar complexes and Chaffee and Edwards's chapter on the importance of the role played by intermediates containing both oxidant and reductant in some nonmetallic systems are examples: In Cattalini's chapter, the data for many Pt(II) complexes are compared with more limited data on Rh(I), Pd(II), and Au(III) complexes, and from these comparisons the author makes arguments about the nature of the transition states and expanded coordination number intermediates as a function of metal ion identity. The article by Kustin and Swinehart is exceptional in the incisiveness of both the questions examined and the route taken to the answers. This chapter stresses the importance of the structure and rate of solvent exchange in describing metal-ion complexation processes. The rates at which the various lanthanide ions react with ligands, and especially the sudden decrease in reactivity in the second 7 of the 14 tripositive ions, well illustrate the authors' premise. It is somewhat disappointing to me, however, that there is no extended speculation on what structural and electronic properties of aquo metal ions lead to a choice between associative and dissociative mechanisms.

The chapter on peroxide reactions stresses the Fe(III)-catalyzed decomposition of hydrogen peroxide. The authors argue that the classic, Haber-Weiss, free radical mechanism of the ferric-hexaquo-ion-catalyzed reaction is not satisfactory, and stress the role of species such as $FeOOH^{2+}$ and FeO^{3+} in this reaction. They generalize this inorganic model to the catalase- and hemin-catalyzed decompositions. This chapter provides many interesting (admittedly biased) interpretations. Other reviews include a well-referenced chapter on binuclear cobalt complexes and a discussion of non-bridging ligand effects in oxidation-reduction reactions of metal complexes.

This collection offers several high-quality reviews and enough information of general interest to chemists and biologists dealing with related problems to warrant attention. The index is well done and the errors detected by this reviewer were few. Although not a complete survey of inorganic mechanisms, the book will serve a useful purpose.

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Concepts of Force

Force in Newton's Physics. The Science of Dynamics in the Seventeenth Century. RICHARD S. WESTFALL. Macdonald, London, and Elsevier, New York, 1971. xii, 580 pp., illus. $23.95. History of Science Library.

The literature on 17th-century dynamics is varied and plentiful, yet Westfall has succeeded in filling an empty slot. His book is the first account of the whole field since Dugas's *La Mécanique au XVII^e Siècle* of 1954, and is in fact the first extensive account in English. This alone makes its publication an event of special interest to historians of science and historically minded physicists.

Westfall's principal objective is to present a critical study of the growth of Newton's concept of force, both as a conceptual tool in his dynamics and in its relations to his philosophy of nature. Since Newton's dynamics cannot be properly understood without an appreciation of the 17th-century legacy he inherited, a secondary objective is to trace the development of dynamical ideas from Galileo to Leibniz. This is a sizable program, and difficult to carry out satisfactorily. To my mind, Westfall has achieved his purpose only to a moderate degree: there is a striking imbalance in structure and content, and considerable unevenness in interpretation.

Take the structural imbalance. The main title notwithstanding, less than half the book (the final two chapters) is devoted to Newton, though admittedly this asymmetry is mitigated by the much greater amount of detail that distinguishes the chapters on Newton. Moreover, Westfall does not always show clearly how Newton's ideas relate to the very wide range of dynamical thinking that preceded him (obvious exceptions being that of Galileo, Descartes, and Huygens); a fair proportion of the pre-Newton material, though wholly welcome in itself, does not do very much to illuminate Newton's own thought.

There are some unexplained omissions. I note with pleasure the great number of thinkers Westfall discusses: Galileo, Descartes, Gassendi, Hobbes, Baliani, Mersenne, Marcus Marci, Torricelli, Huygens, Pardies, de Chales, Wren, Wallis, Hooke, Borelli, Mariotte, Roberval, and Leibniz. But with a list already as long as this, why omit discussion of Isaac Beeckman, whose dynamical ideas strongly influenced Descartes and are of greater interest than those of (say) Hobbes? Or the Cartesian Malebranche, who wrote copiously on the collision problem, yet who is mentioned only once, in a footnote? Or Honoré Fabri, who is not mentioned at all?

The interest and value of the book are increased by Westfall's decision not to confine his analyses to force as a conceptual entity, but to examine also dynamical and physical problems in which the concept figured importantly. This being so, it is disappointing to find no mention of the problem of center of percussion as treated by Descartes, Roberval, or the aforementioned Fabri. Had Westfall examined Descartes's treatment of this problem he would surely have revised his claim that "the most important step he [Descartes] took in the direction of a mathematical mechanics was his analysis of impact" (p. 89). Given that this same analysis of impact is crucial to an understanding of Descartes's and indirectly Newton's concepts of force, it is depressing to find no reference to the Scholastic notion of modal contrariety between motion and rest, without which Descartes's rules of impact are unintelligible, and no reference to the principle of least change of incompatible modes, which Descartes himself showed was an essential component in the demonstration of his rules and which is an embryonic form of the principle of least action.

On the positive side, there are interesting chapters on Galileo and Leibniz and a fine chapter on Huygens. It is particularly pleasing to have this short study on Huygens, who for some reason has never attracted the same attention as Galileo, Descartes, or Newton but whose attempt to reduce mechanics to kinematics, a feature of his thought underlined by Westfall, was an important turn in 17th-century dynamics. The many sections on the lesser-known figures mentioned above contain much material not easy to obtain elsewhere; from these very useful