

Teleosts

Functional Morphology and Classification of Teleostean Fishes. WILLIAM A. GOSLINE. University of Hawaii Press, Honolulu, 1971. x, 208 pp., illus. Paper, \$5.

The teleostean fishes are the largest group of vertebrates: with more than 20,000 living species, they probably outnumber all others combined. Partly because of this abundance and bewildering variety, the evolution and interrelationships of teleosts are still understood only in a rudimentary way, and the classification has not developed much beyond the framework laid down by C. Tate Regan before the first World War.

W. A. Gosline is one of the few living zoologists who have consistently directed their efforts toward problems of "higher classification" in teleosts, and he has made himself familiar with at least the bare bones of all the main types. His book consists of two very different sections, one on functional morphology and one on classification. The first 90 pages are an account of what is known about the structures involved in the various activities of teleosts—moving, feeding, breathing, and sensing. This section demands surprisingly little specialized knowledge from the reader and is agreeably written: it could be read with ease and profit by undergraduates and many biologists. Gosline's approach to functional morphology is not experimental or physico-mathematical but is that of the naturalist. It is based upon extensive anatomical knowledge and leavened by the author's opportunities to observe tropical inshore fishes, the richest fauna in the world. This section is sparsely illustrated with line diagrams.

The second half of the book presents a new classification of living teleostean fishes, and will be appreciated by a different audience. Understanding of this section requires wide knowledge of teleosts and close familiarity with previous classifications, especially that of Greenwood, Rosen, Weitzman, and Myers (1966), with which Gosline's will inevitably (and according to his intention) be compared. There are no illustrations to give the uninitiated some idea of the animals under discussion, and few but professional ichthyologists will feel at home.

Gosline introduces the classification with an account of his philosophy: that classification should express "genetic relationships" (how these are to be determined is not specified); that groups

should be biologically definable; and that a classification is at best an interim summary of information and therefore should in fields where knowledge is advancing rapidly have as little formal superstructure as possible, serving as a vehicle for discussion rather than an end in itself. He divides his 27 orders among three grades, "lower," "intermediate," and "higher" teleosts, each introduced by a survey of the evolution and interrelationships of the contained groups. Every order is diagnosed and discussed, something is said about each suborder, and families are listed. The arrangement is traditional in that it uses no formal supraordinal categories, discarding those (cohorts and superorders) set up by Greenwood *et al.* Gosline admits that this is, in part, due merely to a difference in philosophy, but to my mind it is the chief defect of his system, for these supraordinal groupings, right or wrong, are a great stimulus to research, and some such synthesis must eventually be agreed upon. Gosline has withdrawn to an earlier disposition partly because he wishes to emphasize the primitiveness of certain forms (*Elops*, *Chanos*) rather than their relationships. But no other up-to-date account of the scope of this one exists, and ichthyologists will find it indispensable as a reference work and spur.

The book includes an index and a bibliography of more than 400 items.

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The Isotope Kinetics Method

Isotope Effects in Chemical Reactions. CLAIR J. COLLINS and NEWELL S. BOWMAN, Eds. Van Nostrand Reinhold, New York, 1971. xii, 436 pp., illus. \$22.50. American Chemical Society Monographs, 167.

Isotope chemists in general and isotope kineticists in particular will find much of value in the six chapters comprising Collins and Bowman's volume on the kinetic isotope effect as a tool in reaction mechanism studies. The book can—and, one hopes, will—serve to introduce the field to others now uncommitted; this review is intended for them. I assure the committed that the book is worthy of their attention and their purse.

The best places for the neophyte to

start are Joseph J. Katz and Henry L. Crespi's chapter on isotope effects in biological systems and Arthur Fry's detailed survey of the kinds of reaction mechanism questions for which answer-like results are yielded by carbon, nitrogen, oxygen, chlorine, and other "heavy element" isotope kinetics studies. Katz and Crespi treat systems of such complexity that any source of insight is welcome; Fry emphasizes formation and rupture of chemical bonds whose end atoms can be labeled, thus introducing the isotope kinetics method with a maximum amount of straightforwardness.

If the novice's interest has been engaged, he is advised to turn next to Elizabeth and Edward Thornton's fine chapter on the origin and interpretation of isotope effects. Here, the phenomena are examined as nonelectronic substituent effects; the origins of primary, secondary, and solvent effects are discussed, as are approximations inherent in the transition state theory (which is nearly everyone's vehicle for interpretation of results). Then, half a dozen examples are set out to show "how the combination of isotope effect theory with experiment may lead to interesting conclusions about reaction mechanisms."

The remaining three chapters comprise one and a pair; some will feel comfortable reading them in that order, others will prefer the reverse.

W. Alexander Van Hook's chapter 1 of the volume is a detailed, insightful introduction to the theory of kinetic isotope effects and its applications as developed and practiced during the past 25 years. Exact approaches are treated, as well as a number of successful and unsuccessful approximation methods. As examples, $H + H_2$ and $H_2 + Cl$ are given the full treatment. This chapter abounds in helpful mention and explanation of a host of subtle points (the kind that "everyone understands"—except you and me).

The reader should now be well prepared to digest and appreciate the chapter by V. J. Shiner, Jr., on deuterium isotope effects in solvolyses at saturated carbon and that of Dionis E. Sunko and Stanko Borčić on secondary deuterium effects and neighboring group participation. Both of these are systematic surveys containing but not emphasizing their authors' own important contributions (and unpublished results).

Isotope kinetics seems to have lost its early attractions for many organic

and physical chemists, possibly because it is difficult to go beyond the yes/no stages in interpretation of the results; greater detail is not easily won. Collins and Bowman's book does much to expose the richness and power of the method; successive labeling and temperature dependence studies are virtually untapped resources; perhaps recent improvements in mass spectrometry and simplifications in techniques for large-scale model calculations will encourage new workers to try their hands at this rewarding scientific game.

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Toxic Metal

Cadmium in the Environment. LARS FRIBERG, MAGNUS PISCATOR, and GUNNAR NORDBERG. CRC Press, Cleveland, Ohio, 1971. 176 pp., illus. \$25.

Cadmium is one of the five most toxic of the environmental metals to which industrialized man has unwittingly exposed himself. Lacking a homeostatic mechanism, mammals can only sequester this metal and accumulate it in kidney, liver, and blood vessels, where it remains apparently for life.

This volume attempts to compile "information essential to the understanding of the toxic action of cadmium and the relationship between dose and effects on human beings and animals." It is based on the authors' long experience with a relatively small group of workers exposed industrially to cadmium fumes and dusts, and on the experimental literature. It is therefore misnamed, for factories do not represent the environment nor exposed workers the population.

The book, which contains many data, has several defects. There is no index; a complicated five-page table of contents has to serve—but does not. There is no way to track down an intriguing reference without reading the whole book. Through an error, pagination is off by 12 pages, a constant irritation. Of the 90 tables and figures, 25 are "unpublished observations" of the authors or, surprisingly, of other workers here and abroad, and there are many such references in the text. The text at times is wordy and repetitive. The relation of cadmium to zinc, probably the basis of its toxicity, is sparsely covered.

Animal experiments are well docu-

mented, although there is a tendency to apply effects from injected cadmium to disease in the population at large. For example, injected cadmium causes sarcomata, as do six other metals; ingested cadmium does not. This section ends with an uncritical discussion of the high rate of stomach cancer in Japanese. Some good work has been reported on cadmium teratogenesis which is not mentioned; this section is poor.

The treatment of the effects of cadmium on human health is largely confined to exposed and poisoned workers, and a great deal of attention is paid to proteinuria with little to renal function. Effects on blood, bone, liver, and other organs are discussed in respect to heavy air exposures. Respiratory effects are well considered, but the authors judge too adversely the hypothesis that cadmium from air and cigarettes could cause pulmonary emphysema in the general population. They are also too critical of the hypothesis that cadmium is a cause of hypertension, which has confirmation from the epidemiological, pathological, and experimental evidence although this disorder does not accompany overt poisoning. They imply that cadmium exposures of the general population come mainly from air, which is not the case in this country, nor was it in "itai-itai" osteoporosis in Japan.

This book contains much of what one wants to know about overt cadmium toxicity in animals and man—if one can find it. It should be useful to students and workers in this area of toxicology, if read with a critical eye. The overall situation is not nearly as bad as one is led to believe.

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Element 81

The Chemistry of Thallium. A. G. LEE. Elsevier, New York, 1971. xii, 336 pp., illus. \$19.95. Topics in Inorganic and General Chemistry, Monograph 14.

It is stated in the preface that this book was written "to provide a comprehensive and critical review of the chemistry of thallium, paying special attention to the advances of the last decade." The author has, however, been successful in only one of his objectives. Within his terms of reference, Lee has certainly provided a compre-

hensive review of the field, and his book will serve as a useful source of references to the primary literature. Both inorganic and organometallic chemistry are described in detail and the organization of the content of the chapters is good. No attempt has been made to provide a "critical review of the chemistry of thallium," however; the facts are presented more or less correctly and critical appraisal by the author is carefully avoided.

There are three main features of this first monograph on the general chemistry of thallium which, singly or collectively, will infuriate most readers. First, the number of typographical errors is quite incredible. Second, and more serious, is the fact that in a significant number of instances large parts of the author's "discussion" are merely reproductions of discussions from the original literature, inserted without acknowledgment. And third, the index is inadequate. Because it is the only monograph on thallium available, this book will be a necessary purchase for specialists in this area—but only until a better volume is published.

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Books Received

Acoustique et Musique. Données Physiques et Technologiques. Problèmes de l'Audition des Sons Musicaux. Principes de Fonctionnement et Signification Acoustique des Principaux Archetypes d'Instruments de Musique. Les Musiques Expérimentales. L'Acoustique des Salles. E. Leipp. Masson, Paris, 1971. iv, 340 pp., illus. Paper, 80 F.

The Analysis of Subjective Culture. Harry C. Triandis, in association with Vasso Vassiliou, George Vassiliou, Yasumasa Tanaka, and A. V. Shanmugam and with the assistance of Earl E. Davis, Keith M. Kilty, Howard McGuire, Tulsi Saral, and Kuo-shu Yang. Wiley-Interscience, New York, 1972. xiv, 384 pp., illus. \$16.95.

Analytic Properties of Feynman Diagrams in Quantum Field Theory. I. T. Todorov. Translated from the Russian by Clifford Risk. Pergamon, New York, 1971. xvi, 152 pp., illus. \$10.50. International Series of Monographs in Natural Philosophy, vol. 38.

Annual Review of Psychology. Vol. 23. Paul H. Mussen and Mark R. Rosenzweig, Eds. Annual Reviews, Palo Alto, Calif., 1972. x, 786 pp. \$10.

The Ascent of Man. An Introduction to

(Continued on page 439)