in 1877, is consistently misspelled (with a double *n*) in this text as in many others. (ii) The use of the term "myelin" rather than "myelin fraction" for material biochemically separated from the brain can be misleading; is it correct to imply that this fraction contains only myelin and nothing else?

The two brief final chapters of the book discuss the myelin deficiencies that accompany inborn errors of amino acid metabolism and the myelin diseases that afflict domestic animals. These suggest areas in which research on myelin may be expected to concentrate in the immediate future. One point that might have been made more strongly is the need for more anatomical and biochemical data regarding the myelin changes in multiple sclerosis.

This monograph provides the reader with a comprehensive review of the normal development, structure, and chemistry of myelin, as well as an insight into the fact that fuller understanding of myelin will depend on acquiring more data from instances in which its development is abnormal or its normal state altered by disease.

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Fish Physiology

Circulation in Fishes. G. H. SATCHELL. Cambridge University Press, New York, 1971. x, 132 pp., illus. $7. Cambridge Monographs in Experimental Biology, No. 18.

This is the year for synthesis of matters related to circulation in fishes. Satchell's monograph appears almost simultaneously with Kjell Johansen's review "Gas exchange and circulation in fishes" (*Ann. Rev. Physiol.* **33**, 569–612 [1971]). Satchell's book is meant as an introduction to the subject, directed principally toward the undergraduate student or the mammalian physiologist interested in acquiring an overview of the area. It thus forms a natural bridge to the more technically oriented review by Johansen. The book requires an elementary knowledge of the physical principles of hemodynamics, for various aspects of resistance, capacitance, and compliance in the vascular system are introduced without explanation of their meanings. A brief section on hemodynamic principles would have been helpful for the undergraduate audience. Another difficulty the reader unfamiliar with fish taxonomy will encounter is the use of scientific names with only occasional reference to the larger taxonomic subdivision or habitat. An appendix organizing this information would have saved the reader the frustration of having to turn to reference works for it.

An outstanding feature of the work is Satchell's handling of the venous return of blood to the heart. Fishes are generally characterized by arterial pressures which are low compared with those in most vertebrates. To some extent, this is so because of the loss of energy imparted to the blood by the heart as the blood traverses the gill circuit. Satchell develops, especially well for the elasmobranchs, the role of auxiliary pumps that operate on the venous system and supply additional energy to the blood, favoring its return to the heart. This energy is supplied largely by the action of the muscles of locomotion. Another factor Satchell emphasizes is the importance of subambient pericardial pressure in favoring venous return to the heart, a subject deserving of more attention in other vertebrate groups.

Acquisition of oxygen from a relatively viscous medium containing little oxygen, compared with air, poses for the gill breather problems not encountered by terrestrial vertebrates. Satchell introduces his reader to the anatomical arrangement of the capillaries of the gills, an arrangement that assures that blood flow is counter to the direction of water flow across the gills. Such piping arrangements, long used by industrial engineers for conservation of heat, result in a more efficient extraction of oxygen from the water. Fishes anticipated the human technological development by millions of years. An additional aid to oxygen acquisition is cardiorespiratory synchrony, a phenomenon which Satchell's own researches have gone far to elucidate. Here, the reader learns of the reflex coordination, evident in some fishes, which results in the coupling of cardiac ejection with the respiratory phase in such a manner that maximum gill capillary flow coincides with maximum water flow across the respiratory surfaces. The result is enhanced gas exchange.

Fishes exhibit a variety of special microvascular arrangements characterized as retia mirabilia, in which there is dense packing of inflow and outflow vessels in certain organs. Satchell gives a lucid picture of how such countercurrent systems contribute to the existence of striking temperature gradients between red and white muscles and to the establishment of the high partial pressures of gases which have been demonstrated in both the swim bladders and the eyes of various fishes.

The book also contains useful sections on cardiovascular responses to exercise and to lack of oxygen, the transport of gases by the blood, and the fragmentary data available on the innervation of the cardiovascular system of fishes. For the person interested in acquiring some knowledge of fish circulation, Satchell's little monograph should serve as a useful starting point. There is an extensive reference section for the reader who is stimulated by Satchell to explore further this fascinating subject.

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Biochemistry of Lipids

Lipid Metabolism. SALIH J. WAKIL, Ed. Academic Press, New York, 1971. xiv, 614 pp., illus. $28.50.

According to the preface of this book, "Recent advances in methodology and instrumentation have made more impact on the field of lipids than on any other area of biochemistry. As a result, there is a pressing demand from investigators, teachers, and students for a comprehensive account of the major achievements and trends in this field. This treatise . . . was conceived to help satisfy this need." In my opinion, the authors have succeeded fairly well in reaching the stated objective.

The expertise is there. In three separate chapters on fatty acid metabolism, Salih Wakil, Rubin Bressler, and Paul Stumpf deal, respectively, with the general aspects of fatty acid metabolism, fatty acid metabolism in animals, and fatty acid metabolism in plants. While this fragmentation in the treatment leads to some slight overlap, it is not a serious matter and it enhances the ability of the separate chapters to stand alone.

A second group of three chapters

deals mainly with the chemistry and metabolism of glycerides, and appears under the authorship of William Lennarz (bacterial lipids), Edward Hill and William Lands (phospholipid metabolism), and G. Hübscher (glyceride metabolism). Again the division of labor is somewhat arbitrary. The organization might have been more successful had the chapters on bacterial lipids and phospholipid metabolism been combined.

A third group of chapters, on the biosynthesis and metabolism of prostaglandins (Bengt Samuelsson), steroids (P. Holloway), aromatic substances (John Corcoran and F. Darby), and polyisoprenoid quinones (Ronald Bentley), rounds out the book and makes it much more comprehensive than most books on lipids. Thus, the general impression is of a substantial effort to present in a relatively brief form a considerable amount of the latest information on lipid metabolism.

Although the separate ways in which the material has been treated by the various authors may lead to some inconvenience in the use of this book for teaching purposes, there is no question that it has permitted each author to deal in a personal way with his subject and to inject new insights that might otherwise have been lost. The literature appears to have been covered up to and including part of 1969. Because of this and because of the sophisticated level of discussion, I would expect this book to be highly useful to the research specialist and the graduate student in biochemistry or molecular biology.

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Chemical Deduction

Problems in Organic Reaction Mechanisms. HERMANN HÖVER. Wiley-Interscience, New York, 1970. x, 470 pp., illus. $24.95.

Most organic chemistry texts at both the elementary and the advanced level have aimed at a logical and compact exposition of a vast and burgeoning body of knowledge. The result has all too often been a bloodless and dull classified directory, categorizing facts and advertising theories—fine for the stranger in town, but of little use to the student who aims to stay and find the action by learning how theories are formulated and tested. How then are chemists trained? They are trained in the classroom by talking about problems, solving them on paper by deciding what experimental measurements have bearing on what theoretical and practical questions. Students are launched at the blackboard and in the laboratory with small, well-defined problems whose goals are clear and which invite certain modes of attack, and by a combination of intellectual and manual effort they are gradually advanced toward more subtle and difficult problems. Learning chemistry is therefore more the Socratic dialogue as embodied in the give-and-take of seminars than the mere transmission of information, to which conventional texts and most lecture courses seem devoted.

Here in Hermann Höver's *Problems in Organic Reaction Mechanisms* we are given within the covers of a book the elements of a seminar. In the first section of just 52 pages are brief descriptions, consisting of information about starting materials, reaction conditions, and reaction products, of some 200 reactions. The reader is invited to deduce from this information the mechanisms by which these reactions take place. Then follow 400 pages explaining how reaction mechanisms can be deduced which account for the observed data given in the problems, mechanisms which are in accord with, and exemplify, general principles of chemical reactivity.

The deduction of the detailed pathways by which chemical transformations take place is less a matter of discovering "truth" than of constructing a heuristic framework which correlates chemical structure with chemical reactivity. It is important to all organic chemists, as an end in itself to those who are theoretically inclined, and to those who are more practical as a means for extending analogies from the known to the unknown.

To use this book is to undergo a true bootstrap operation. By thinking about the information given with a view to fitting it into a consistent picture, the student learns how deductions are made and what minimum information is necessary to make and substantiate a particular kind of conclusion. This is the heart of chemistry as it is practiced.

Höver asks a great deal of his readers, but their effort will be richly rewarded. Höver's discussions of specific problems exemplify much of current mechanistic thought and, more important, give a student a feeling of how these ideas develop—how fact and imagination interact. The selected literature references and the index are also admirable. Best of all, the book provides a new approach for reducing to paper our teaching of what goes, somewhat pretentiously, under the name of "theory" in organic chemistry.

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Biometeorology

Biometeorological Methods. R. E. MUNN. Academic Press, New York, 1971. xiv, 336 pp., illus. Cloth, $12.50; paper, $6.95. Environmental Sciences series.

The methodology of biometeorological research cuts across many disciplinary lines, as does biometeorology itself. Researchers must concern themselves with the whole range of meteorological measurements and analysis, but must also be knowledgeable about relevant aspects of biological research. Too rarely have researchers been experts in both fields. If primarily biologists, they have tended to accept meteorological data uncritically and used naive methods of data analysis and interpretation. Meteorologists approaching biological problems have often made similar errors in the interpretation of biological data.

This volume by Munn should go a long way toward correcting these inadequacies. It is a useful synthesis of methods from a very broad range of disciplines, showing how many diverse methods can be used to solve biometeorological problems.

A considerable portion of the book deals with problems of sampling the atmosphere in time and space, and it includes a useful discussion of instrument response and time constants. Statistical methods are considered somewhat cursorily, but in enough detail to indicate the range of applications. Methods of dimensional analysis and physical modeling of biological phenomena receive brief treatment, along with useful illustrative examples. Applications of synoptic climatology to such diverse problems as forest fire weather forecasting and the large-scale dispersal of insects and birds il-