erythromyeloblastosis. The brief article by K. M. Smith on "Morphology and development of insect viruses" is, as might be expected, stronger on morphology than on development.

The review by Maramorosch of the "Multiplication of plant viruses in insect vectors" is a convincing presentation of the evidence that certain viruses have both insect and plant hosts. Further evidence for this conclusion is presented in the paper by L. O. Kunkel on "Cross protection between strains of yellows-type viruses." Interference between related strains of the aster yellows virus occurs in the insect host as well as in the plant host. The chief criticism that one might make concerns the editorial policy of including a review on the "Current status of bacterial transformations" by Ephrussi-Taylor in a volume entitled *Advances in Virus Research*. There has been no dearth of good reviews on bacterial transformation in recent years, and there are many neglected topics that might more legitimately be classified as virus research. In science as in politics there is often a maldistribution of press agents.

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A Symposium on Inorganic Nitrogen Metabolism: Function of Metallo-Flavoproteins. Sponsored by the McCollum-Pratt Institute of the Johns Hopkins University. William D. McElroy and Bentley Glass, Eds. Johns Hopkins University Press, Baltimore, 1956. 728 pp. Illus. $10.

The sixth annual symposium of the McCollum-Pratt Institute is reported with the very high standard of excellence that is now expected. The subject is a very involved one with sufficient exact knowledge in some aspects to afford points of departure for the more unknown parts such as the reduction of nitrite to the level of ammonia.

Four leading topics are the reduction of nitrate and nitrite, the processes of denitrification, the nature of xanthine oxidase, and the significance of metalloproteins in electron transport. The functioning of molybdenum in nitrate reduction, xanthine oxidation, and nitrogen fixation is interwoven with the agricultural observations on its essentiality for plant and possibly animal nutrition. Other topics are nitrification, nitrogen fixation, and ammonia metabolism. There are 36 articles contributed by 62 authors, covering about all that is known on the several topics except that of electron transport. Each is well bulwarked with diagrams and tabular material.

Recorded discussions are an important part of these symposia. In this instance, they are extensive (60 pages) and serve to bring out interesting parts of the topics as well as to present some original short contributions. They are unusual, too, because they do not stray far from the central theme.

Bentley Glass again has supplied an excellent summary of the symposium (63 pages) showing his capacity both as an editor and as a dispassionate student of what others find. If one has an interest in the subject but is not a research worker in any of the several aspects, he should read this summary first and thus be led back to the original works.

An instance singled out by Glass exemplifies the tone of the work. Speaking of the work of Helmut Beinert and Frederick L. Crane on fatty acid oxidation, he quotes, " 'When we proceed to "isolate" these enzymes we wreck this whole edifice and obtain the associated flavoprotein dehydrogenases as one fragment and the connecting leads, electron transferring flavoprotein and the diaphorase, as another fragment. The terminal electron-transferring system is what we flush down the drain as insoluble. . . . We are then surprised about the headaches we experience in trying to reassemble the parts.' " Glass adds on his own account, "Perhaps the most significant change in point of view in biochemistry in recent years is, in fact, the growing realization on the part of biochemists that they will ultimately have to take into account the existence of organization on the biological level."

An adornment of the time is surely the great progress that is being made in all aspects of enzymology and in knowledge of the pathways of biological reactions. No more faithful picure can be gained of this scene than from the reports of these symposia.

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The Blood-Brain Barrier with Special Regard to the Use of Radioactive Isotopes. Louis Bakay. Thomas, Springfield, Ill., 1956. 154 pp. Illus. $5.50.

This book is primarily concerned with the penetration of radioactive ions into normal and abnormal brain tissues. The book is written within the framework of the author's personal experience with the uptake of phosphorus-32 labeled inorganic phosphate; only two pages are devoted to the uptake of other ions by brain tissue. Most of the information presented was derived by the author from autoradiography of brain slices and from direct counting of brain tissue samples following the intravenous injection of radioactive phosphate. Of the 32 illustrations, 18 are autoradiographs and 12 depict the temporal and spatial distribution of phosphorus-32 following its injection into patients and experimental animals. The author has had considerable experience with the differential uptake of phosphorus-32 by brain tumors, and the section of the book that deals with this topic will be of particular interest to neurosurgeons.

The book is written loosely from the point of view of style, organization, and scientific accuracy. Permeability is treated throughout in terms of penetration rates without consideration of either the driving force or the area available for the penetration process. In addition to conceptual errors, there are numerous grammatical mistakes and typographical errors. Direct quotations from other authors are not always provided with quotation marks. The comprehensive title and chapter headings in the table of contents may be somewhat misleading. There are 12 chapters that nominally cover the history, anatomy, physiology, and pathology of the blood-brain barrier. Actually, the book deals only superficially with these topics, and the reader who seeks a scholarly presentation of the field as a whole may be better advised to read the excellent chapter on cerebrospinal fluid given in Davson's *Textbook of General Physiology*.

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Bone, an Introduction to the Physiology of Skeletal Tissue. Franklin C. McLean and Marshall R. Urist. University of Chicago Press, Chicago, Ill., 1955. xii + 182 pp. Illus. $6.

This is the first of a series of publications in *The Scientist's Library: Biology and Medicine*. The object of the series can be inferred from the following statement by Peter P. H. De Bruyn in the preface: "The authors have been asked to emphasize introductory concepts and problems, and the present status of their subjects, and to clarify terminology and methods of approach instead of limiting themselves to detailed accounts of current factual knowledge. The authors have also been asked to assume a common level of scientific competence rather than to attempt popularization of the subject matter."

The topics covered in this book are bone as a tissue; histogenesis of bone; structure and chemical composition of the bone matrix; chemistry and crystal structure of the bone mineral; dynamics of calcification; enzymes and bone; re-

sorption of bone; hormones and bone; mineral metabolism; radiation, isotopes, and bone; postfetal osteogenesis; the healing of fractures; and pathologic physiology of bone. A bibliography and an index are appended.

Biology and Medicine

Physical Techniques in Biological Research. vol. I. *Optical Techniques.* Gerald Oster and Arthur W. Pollister, Eds. Academic Press, New York, 1955. xiii + 564 pp. Illus. $13.50.

This book is the first volume of a comprehensive series addressed to research workers in the biological sciences whose over-all objective is to present a description of the more recent developments in physical methods of analysis and instrumentation. In the words of the editors, "It is hoped that this treatise will serve as a real orientation for biologists and for chemists and physicists who may be potential biologists."

Following the modern trend of treatise preparation, each chapter is written by an individual contributor who is an expert in his particular field. In view of the complexities and diversity of modern instrumentation, the multi-author approach is to a large extent inescapable, and certainly one which facilitates the completion of the treatise shortly after its conception. Alexander Pope's lines: "One science only will one genius fit; so vast is art, so narrow human wit," written in an age when experimental science was in its infancy, becomes more difficult to refute with the passage of time and the accumulation of classified knowledge. This frailty of the human mind is apparently limited to the compilers of encyclopedias. It is a limitation to which book reviewers as a genus have not subscribed, and I have no intention of establishing a dissenting precedent.

The first chapter of the present volume consists of a comprehensive review by Jerome L. Rosenberg of photochemistry and luminescence, covering both the mechanism of photochemical reactions and the associated experimental techniques that are employed in their study. The bulk of the volume is composed of a series of related essays dealing with light scattering, birefringence and dichroism, absorption spectroscopy in the visual region, followed by independent treatments of ultraviolet and infrared spectrophotometry. The latter section, by Carl Clark, is particularly comprehensive; it also contains a brief description of infrared microscopy with Burch-type reflecting optics as applied to the absorption spectra of large cells. The several chapters contain a wealth of information that at times is critically evaluated by the authors; all chapters contain individual bibliographies of the fields surveyed.

The volume also covers the theory and operation of the light microscope, (phase and interference microscopy) and terminates with a chapter on electron microscopy. These sections are especially well prepared, present the reader with a mathematical background of the optical principles for the diverse types of lens systems, and also describe the practical adjustments for securing optimum performance. The section on the light microscope, by L. C. Martin, discusses the working distance of objectives and means for its increase by the Dyson reflecting attachment. However, no mention is made of the availability of "nuclear-type" oil-immersion objectives with working distances up to 3 millimeters and possessing an N.A. of 1.0. These refracting objectives, which are designed primarily for the study of tracks recorded by nuclear particles in very thick photographic emulsions, are equally effective in the examination of tissue autoradiographs and in *in vivo* histological techniques that necessitate a large separation between the front element of the objective and the lower layer of the sample.

It is difficult to evaluate the over-all effectiveness of this treatise, on the basis of the contents of the first volume, as a means of bridging the hiatus between the physicists who created the modern working tools and the investigators in the biological sciences whose work would profit by their application. The contributors have expended considerable effort on a lucid presentation that is further benefited by an unusually large number of charts and line drawings. Nevertheless, the book is not an easy one to read. It is a work that must be studied and one that is well worth the reader's effort.

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Embryologie. Ein Lehrbuch auf allgemein biologischer Grundlage. Dietrich Starck. Georg Thieme, Stuttgart, 1955. xix + 688 pp. Illus. $18.55.

Several decades ago, most textbooks of embryology were essentially descriptions of the serial changes in the morphological mold that an egg undergoes on the way to becoming a free-living individual. Textbook embryology was natural history of the initial phase of the life span, presented, like old-fashioned history in general, as a chronological record of events, with no more than side glances given to the forces, mechanisms, and interactions that do the molding. Meanwhile, the active study of development has become ever more analytic, with the center of interest shifting steadily from chronological seriation to causal explanation. Not just what happens, but precisely how and why it happens as it does, has become the focal issue. Moreover, developmental principles and mechanisms were found to be in operation way beyond the embryonic period, as, indeed, they form the rational basis for the understanding of pathological variations and subsequent repair throughout the life span. There has thus gradually come about a great widening of scope and outlook in the field of embryology. For such a reorientation at the research front to permeate the teaching process, and eventually the textbooks, quite commonly takes decades. The present text proves very convincingly that, for the teaching of embryology, this lag period has at last passed.

The book is the product of a scholarly effort to combine the disciplined description of detailed facts with a modern treatment of their underlying dynamics, and the effort has been crowned with admirable success.

Here is a book that conveys both information and understanding, treats its subject with breadth as well as depth, and above all, with a fine sense of proportion. In particular, it has resisted the temptation to make concessions to the modern analytic approach at the expense of rigorous treatment of morphological facts. There is always the danger that preoccupation with causal explanations may dim the exposition of the concrete factual phenomena that are to be explained. Some recent publications point up this danger. The present text, however, has carefully avoided it. It has struck a satisfactory balance between descriptive detail and excursions into the areas of genetics, cytology, physiology, endocrinology, experimental morphology, and evolution, through which the observational data are interwoven into an intelligible fabric. In full recognition of the fragmentary state of this fabric, the author has placed the emphasis on problems rather than on solutions, and he has been careful to present controversial issues as unresolved, without bias in favor of future solutions not warranted on the basis of existing evidence.

Quite naturally, such a broad treatment of the field, with equal attention to all three of its parameters—namely, morphological description, causal analysis, and evolutionary interpretation—required restraint in the choice of pertinent examples. Again, the choice has been very fortunate. There would be no point, therefore, in complaining that, for instance, histogenesis has been given only cursory consideration, for it could not possibly have been included without seriously weakening the rest of the offering. There are certainly no major omis-