the light microscope after various pertinent staining procedures. It is not electron microscopy or morphology in the sense that it illustrates bacterial anatomy and fine structure, but rather a collection of photographs that show what one will see in the laboratory when the organisms are cultivated. Atlases of this type have been very popular in the past. Such an atlas, produced by Lehmann and Neumann in the early 1900's and translated by Breed in the 1930's, became the standard work on the subject in the United States. However, most of the figures in that atlas were produced from drawings, and the colored plates were not comparable to what the student would see in the laboratory. With the development of color photography and advances in color printing, one of the present authors produced a new atlas (1947). In the production of this volume, *Bacteriology Illustrated,* advances in the art of illustrative reproduction and some editing and condensation of the material have resulted in a volume that is more usable and not so unwieldy as its predecessor. The text is very brief but pertinent.

The volume is divided into three sections. The introduction (37 pp.) covers methods of staining, cultivation, and classification. The next section (69 pp.) consists of 3- to 5-page descriptions of 16 bacterial genera of medical importance (plus 3 pages on organisms closely related to bacteria); in each case, gross morphology, staining character (either in culture or in tissue, or both), the usefulness and results of biochemical tests, and animal inoculation are considered, and about three or four color photographs of the material discussed are provided. In the third section (30 pp.), on diagnostic methods, most of the illustrations are diagrams, not photographs. In fact, most textbooks are singularly lacking with respect to good photographs of colony form and individual stained cells, largely owing to the present tendency to use electron micrographs for illustration.

The present book fills a definite need. It is well done, and the illustrations (to be viewed in tungsten light) are well reproduced and well printed. Such volumes are expensive to produce.

W. W. UMBREIT
Department of Bacteriology,
Rutgers University

National Bureau of Standards Monograph

Ionospheric Radio Propagation. Kenneth Davies. U.S. Department of Commerce, Washington, D.C., 1965 (order from Superintendent of Documents, Washington, D.C.). xiv + 470 pp. Illus. $2.75.

The National Bureau of Standards has been for many years the most important organization in ionospheric research and radio propagation prediction, and its publications are well known throughout the world. *Ionospheric Radio Propagation,* written by Kenneth Davies with the cooperation of members of the NBS staff, is an authoritative and clearly written book that will take its place as the essential basic reference work in the field. It will also be widely used in teaching, although it does not contain problems. Especially attractive is the price, only $2.75 for the 470-page, hard-bound volume with an attractive blue cover.

The volume is intended to replace *NBS Circular 462,* which has been widely used as a basic ionospheric propagation reference in the past. In comparison with the *Circular,* the present volume includes more coverage of electron production processes, the geomagnetic field, magnetoionic theory, and oblique propagation, and less coverage of frequency prediction and atmospheric noise, since they are covered in other publications. Other topics include a general description of the ionosphere and of the sun, theories of wave propagation, synoptic studies of the ionosphere, signal strength, ionospheric disturbances, scatter propagation on very-high frequencies, and propagation at low and very-low frequencies.

Ionospheric Radio Propagation is intended for research workers and communications engineers who have some background knowledge of radio propagation via the ionosphere, but the coverage is more descriptive than mathematical, and a great deal of hard information is included. The material is taken primarily from the published literature, but lecture notes from a course in radio propagation, which was given at NBS in 1961 and 1962, have also been drawn on. The book contains many useful tables and charts, such as the ARDC model atmosphere, photoionization data, world maps of the geomagnetic field, and sunspot activity curves; also included are the basic equations describing wave behavior in ionized media, meteor echo properties, sounding techniques, and the like. Perhaps the easiest aspect of this excellent volume to fault is the index. A greater use of subentries would have been helpful. For example, there is only one entry for the F2 layer, and it is followed by a list of 51 page numbers.

L. A. MANNING
Radioscience Laboratory,
Stanford University

Contemporary Biology

The Biology of Cells. Herbert Stern and David L. Nanney. Wiley, New York, 1965. xii + 548 pp. Illus. $7.95.

The Biology of Organisms. William H. Telfer and Donald Kennedy. Wiley, New York, 1965. xiv + 374 pp. Illus. $6.95.

These two volumes fill a place between the standard inclusive textbooks and the innumerable specialized paperbacks, and they do it extremely well. Their professed intent is to present contemporary biological science and to do so on a level that will challenge the interest of the better-prepared students now entering our colleges. With these books in hand, no student will have any doubt that he is experiencing instruction on a much deeper level than he found in his AIBS–BSCS courses. The material is clear, readable, and up-to-date. Both volumes are selective and, although one might occasionally wish that some other selection had been made, the choices are good choices. Moreover, it is important to remember that those old texts of the 1920's and the 1930's were also selective. The Opisthobranchs, for example, a remarkable group of mollusks with much to teach, were usually not even mentioned.

Both volumes pay some attention to the fact that science itself is a growing thing with a past and, we hope, a future. No student will find them such a thin slice of the contemporaneous that he is left holding a brittle if brilliant piece of veneer.

The authors of the volume on or-

ganisms express concern lest, between molecular biology beneath and populational biology above, the organism itself may have faded away, presumably like the Cheshire cat. It will surprise few, and I suspect that it really didn't surprise the authors, that they discovered that organisms are still with us. If there was any "shot-gun" marriage here, as the authors suggest might have been the case, it was not to hold together the organism. However, the utility of treating complex, multicellular plants and complex, multicellular animals in the same or at least alternate breaths is open to question. Although as an undergraduate I was brought up in an old-fashioned department of biology, I have come increasingly to wonder if the unity that undoubtedly exists on the biochemical and cellular levels actually exists to anything like the same meaningful extent when the higher plants and animals are reached. After all, did not a brilliant experimental physicist, Robert Wood, once explain to all of us that it is easy to tell cows from cowslips, parrots from carrots, and even beets from beetles?

GAIRDNER B. MOMENT
Department of Biological Sciences, Goucher College, Baltimore, Maryland

Mathematics for Teachers

A Vector Space Approach to Geometry. Melvin Hausner. Prentice-Hall, Englewood Cliffs, N.J., 1965. xii + 397 pp. Illus. $12.

This text was developed for use in a 1-year, in-service course for teachers of high-school mathematics, but it is not confined to the topics taught in such courses or to those closely related thereto. The central topic is geometry, but there is little preoccupation with what the high-school course is or ought to be. Instead the book shows how geometry actually figures in contemporary mathematics. The simplicity and generality of vector space methods underlie the whole development and make the content mathematically attractive. Actually what is presented is a fusion of geometry and (linear) algebra, and numerous applications of this composite discipline to other subjects are given—for example, applications to probability, physics, and function spaces. The chapter titles are "The center of mass," "Vector algebra," "Vector spaces and subspaces," "Length and angle," "Miscellaneous applications," "Area and volume," "Further generalizations," "Matrices and linear transformations," "Area and metric considerations," "The algebra of matrices," and "Groups."

The exposition is commendable from the pedagogical standpoint also. The reader's "knowledge" is invoked to lead him painlessly to "facts" which then become formalized as axioms. The axioms are then used to derive consequences that are not just antiseptic versions of the previous material but substantial extensions of it. The area and volume treatment, in terms of outer products, is especially successful. Not so successful is the treatment of angles. Cosines are obtained from inner products, and angles are defined as what these cosines are the cosines of. In the section on rotations, these objects, properly, turn out to have a much richer structure than their noncommittal definition seems to warrant. Mathematical honesty in the treatment of angles, angle measures, and trigonometric functions is notoriously lacking in our undergraduate curriculum, and this could have been an appropriate place to supply some.

Another of my reservations is concerned with the emphasis on barycentric coordinates, at the expense of the more commonplace yet perfectly adequate affine coordinates. However, their introduction and exploitation is the most original part of the entire book, and it is probably better that they be oversold, as they are here, rather than not presented at all, which is their usual fate.

HOWARD LEVI
Hunter College, City University of New York

The Sea

La Vie dans les Mers (Presses Universitaires de France, Paris, 1965; 128 pp.), by Jean-Marie Pérès, replaces René Legendre's book by the same title in the series "Que Sais-Je?" Of course the subject is the same, but the book is completely different from its predecessor. Pérès is an enthusiastic ecologist, and his treatment of the subject is therefore much more ecological than that in the earlier version. Pérès is also on the side of the angels in cautioning the reader against the notion of inexhaustible resources from the sea. The French have a way of presenting science in a lucid and concise manner, but Pérès has outdone his distinguished predecessor. The French is beautifully simple and should encourage candidates who are studying for their language examination.

JOEL W. HEDGPETH
Marine Science Laboratory, Newport, Oregon

New Books

Mathematics, Physical Sciences, and Engineering

Acoustic Coagulation and Precipitation of Aerosols. Evgenii Pavlovich Mednikov. Translated from the Russian edition (Moscow, 1963) by Charles V. Larrick. Consultants Bureau, New York, 1965. 188 pp. Illus. Paper, $25.

Advances in Electronic Circuit Packaging. vol. 5. Proceedings, 5th International Electronic Circuit Packaging Symposium. Sponsored by the University of Colorado, Electrical Design News, and Design News (Boulder, Colo.), August 1964. Lawrence L. Rosine, Ed. Plenum Press, New York, 1965. 303 pp. Illus. $15. Twenty-six papers.

Advances in Heterocyclic Chemistry. vol. 4. A. R. Katritzky, A. J. Boulton, and J. M. Lagowski. Academic Press, New York, 1965. 478 pp. Illus. $15. Six papers: "Covalent hydration in nitrogen-containing heteroaromatic compounds: [pt. 1] Qualitative aspects" by Adrien Albert and W. L. F. Armarego and [pt. 2] "Quantitative aspects" by D. D. Perrin; "Recent advances in oxazolone chemistry" by Robert Filler; "Isotriazoles" by R. Slack and K. R. H. Wooldridge; "Hetarynes" by H. J. den Hertog and H. C. van der Plas; and "Reactivity of azine, benzoazine, and azinoazine derivatives with simple nucleophiles" by Robert G. Shepherd and James L. Fedrick.

The Application of Wave Mechanical Methods to the Study of Molecular Properties. R. Daudel, Ed. Interscience (Wiley), New York, 1965. 198 pp. Illus. $9.25. Advances in Chemical Physics Series, vol. 8, edited by I. Prigogine. Ten papers presented at the International Summer Institute (Menton, France), July 1963.

Applied Geochronology. E. I. Hamilton. Academic Press, New York, 1965. 283 pp. Illus. $10.

Applied Optics and Optical Engineering. vol. 2, *The Detection of Light and Infrared Radiation*. Rudolf Kingslake, Ed. Academic Press, New York, 1965. 406 pp. Illus. $15. Nine papers contributed by Glenn A. Fry, Leslie P. Dudley, Fred H. Perrin, E. W. H. Selwyn, Rudolf Kingslake, Benjamin H. Vine, Charles H. Evans, Henry Levinstein, and Charles F. Gramm.

(Continued on page 1282)