figures assist greatly in the easy comprehension of the text. The pleasure of reading such a well-written treatise is increased by its fine production.

The short chapter "Gravity and geophysical surveys" is the least satisfactory part of the book for, with the exception of a few standard texts, references to modern work are restricted almost entirely to the British experience. "A surface feature can be traced beyond its visible outcrop, and anomalies can indicate the existence of a disturbance of some kind, but it is difficult to go much further" is a rather discouraging summary of the potentialities of magnetic surveys, in view of their extensive and successful use in ore location and in "depth to basement" studies. However, the chapter on geophysics is a minor sideline to Bomford's main topic, and any weakness there is more than compensated for by an excellent discussion of the reduction and use of gravity observations.

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Irreversible Processes

Non-Equilibrium Thermodynamics. S. R. de Groot and P. Mazur. North-Holland, Amsterdam; Wiley, New York, 1962. x + 510 pp. Illus. $15.50.

Nonequilibrium Thermodynamics. A phenomenological theory of irreversible processes in fluid systems. Donald D. Fitts. McGraw-Hill, New York, 1962. xviii + 173 pp. Illus. $7.95.

With the publication of *Non-Equilibrium Thermodynamics* by de Groot and Mazur, we have at last an authoritative and very nearly definitive treatise on the thermodynamics of irreversible processes. The volume is divided into two parts, A, on principles, and B, on applications. In the first four chapters of part A, the basic hydrodynamic and phenomenological equations, including the Onsager reciprocal relations, are introduced, and the modern version of the second law of thermodynamics is discussed. The remaining three chapters discuss some relevant aspects of the statistical and statistical-mechanical foundations of nonequilibrium thermodynamics. Part B is devoted to a survey of the applications of the principles to chemical reactions, to flows of heat and matter, to electrical phenomena in both unpolarized and polarized media, and to discontinuous systems. The monograph concludes with three appendixes, numerous problems, and author and subject indexes. It is difficult to find much to criticize about this excellent volume. The most that can be said is that an occasional argument is vague, that the book might be too mathematical for some tastes, or that not enough attention has been paid to the experimental foundations of the theory. However, these are merely matters of personal opinion. Without question, *Non-Equilibrium Thermodynamics* by de Groot and Mazur belongs on the bookshelf of every research worker in the field of transport processes.

Nonequilibrium Thermodynamics by Fitts is intended to be an introductory textbook on the advanced graduate level. It consists of 11 chapters, four appendixes, and name and subject indexes. Numerous references are listed. Interestingly, many are different from those cited by de Groot and Mazur. In the first five chapters, the transport equations of fluid systems are developed. The last six chapters are devoted to applications of the equations to systems that are undergoing transport phenomena. The author pays particular attention to the step-by-step derivation of each equation, and for this reason the book will be especially valuable to the beginning student. Although overly formal in places, the treatment of the subject matter is accurate on the whole. The reader should be forewarned, however, that the treatment of the rate of cooling in a magnetic field (in section 6–2) appears to be erroneous. The appearance of experimental results in the sections on diffusion and thermal diffusion lends some perspective to the general theory. The book would have benefited even more by lengthier discussions of how experimental data are related to theoretical transport coefficients. Although *Nonequilibrium Thermodynamics* is not without shortcomings, its pedagogical virtues certainly outweigh them. What it does teach, it teaches well. It can be highly recommended as a first textbook, either for classroom use or for self-study.

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Physics and Biology

Biophysical Science. Eugene Ackerman. Prentice-Hall, Englewood Cliffs, N.J., 1962. xiv + 626 pp. Illus. Trade ed., $13.35; text ed., $10.

Biophysics: Concepts and Mechanisms. E. J. Casey. Reinhold, New York; Chapman and Hall, London, 1962. xiv + 335 pp. Illus. $7.95.

It would appear that nature abhors a vacuum in the textbook field as well as elsewhere, and that the prior lack of textbooks in what may be termed general biophysics has accordingly been corrected. The two books reviewed here provide a pleasant surprise in the general similarity of the topics covered, and parenthetically they refute the occasional assertion that biophysics as a field is undefined. The stated purpose in preparing these texts is also similar; they are directed primarily to students of biology or medicine, although they presume different levels of previous training.

The selection of the material seems to have been dictated both by the inclinations of the respective authors and by the unstated admonition to apply physics where it is the most applicable. Yet it is interesting to compare the chapter headings with those in a standard textbook of general physiology and to note the similarity of coverage. The distinction drawn here between biophysics and physiology is not so much one of content, or perhaps even of viewpoint, as it is a distinction of technique and of the use of physics contrasted with talking about physics.

Biophysical Science, the more detailed of the two volumes, is nearly twice as long as *Biophysics: Concepts and Mechanisms*. It presupposes a knowledge of general physics and elementary calculus (actually, Laplace's equation and the diffusion equation are introduced, but the solutions are stated). A considerable portion of the book will be comprehended by the average undergraduate student of biology or medicine. Ackerman has divided his material among six main sections: Special Sensory Systems (on hearing and vision), Nerve and Muscle (nerve conduction and neural aspects of vision and hearing), Physical Microbiology (a miscellany of topics that includes cell radiobiology, ultrasonics, and viruses), Molecular Biology (x-ray diffraction, the radiochemistry of macromolecules,

enzyme kinetics, the molecular basis of vision, and photosynthesis), Thermodynamics and Transport Systems (thermodynamics, diffusion and active transport, and information theory), and Specialized Instrumentation (optical, spectroscopic, and isotopic instruments, and computers). Each chapter concludes with a short list of references, and each main section includes a set of discussion questions.

Ackerman's style is concise and clear, and the necessary biological (and biochemical) concepts and terminology are explained and defined as they are introduced. The book is well produced and appropriately illustrated. It should be extremely useful as the textbook for a course in general biophysics and, to more advanced workers, as a source for independent reading or reference. To the physicist or the engineer, it offers a pleasant opportunity to acquaint himself wth those biological or biochemical fields in which his own techniques have been employed with success.

Biophysics: Concepts and Mechanisms is intended for students of biology and medicine who are without a background in either calculus or physics, and both subjects are introduced in a somewhat abbreviated fashion. The topics treated here are quite similar to those treated by Ackerman, but their treatment is necessarily less detailed. A set of problems and a list of references are provided at the end of each chapter. The style is informal and at times even whimsical.

An unfortunate number of errors, both of fact and of typography, remain in the text—the following are a small sample: "Because they carry more energy than photons in the visible region, the photons in the ultraviolet region are less likely to be absorbed" (p. 92); "Punctures [in the lung], called air embolism . . ." (p. 33); . . . [the ion] is deflected there by the magnetic field, by an amount determined by the weight of the flying particle . . ." (p. 119); "If waves are *diverging*, or being dissipated or scattered, the important general rule, called the 'inverse square law,' is obeyed" (p. 52). In other instances imprecision detracts from the presentation: ". . . in destroying the bacteria, *escherichia coli* and *bacteria coli*, in foods or in our water supply. Each of these is killed by about 14×10^{-6} ergs per bacterium" (p. 93); "The heart is a pulse pump. It distends . . . closes its inlet valves, and contracts, forcing the blood out through the aorta" (p. 35).

Although this book is written for a deserving audience and its subject matter is well chosen, the many errors make it impossible to recommend the book in its present form.

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Note

Water Maps

Water Atlas of the United States (Water Information Center, Port Washington, N.Y., 1962. 7 pp. + 40 plates. $6.95), by David W. Miller, James J. Geraghty, and Robert S. Collins, contains 40 well-prepared maps; all are on a uniform scale of 1:16,500,000 (260 miles per inch).

The maps contain data on physiographic provinces, average annual precipitation, areas of cloud seeding operations, mean annual evaporation, average temperature of groundwater, strontium concentration in streams, and the amount of water used for various purposes. Each map is accompanied by a few paragraphs of explanatory text.

Professional workers in the field will find nothing in the atlas that they do not already have in their libraries. Nineteen maps are adapted from publications of the U.S. Geological Survey and eight from books sponsored by Resources for the Future. The layman can easily be misled by the apparent simplicity of the extremely small-scale maps which cannot represent accurately the complex areal patterns of the various factors, especially in the western United States. The brief descriptions are overly generalized and superficial.

The atlas does not live up to its advance billings as "a single authoritative reference book; nor does it provide "answers to almost every conceivable question on water." It is clearly a commercial venture which falls far short of meeting the need for a detailed and comprehensive national water atlas.

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New Books

Biological and Medical Sciences

Aktuelle Fragen der Psychotherapie. vol. 4, pt. 2, *Selected Lectures*. Proceedings of the fifth International Congress of Psychotherapy (Vienna, Austria), 1961. Berthold Stokvis, Ed. Karger, Basel, Switzerland, 1963. 287 pp. Illus. Paper, $16.75.

Comparative Aspects of Neurohypophysical Morphology and Function. *Symposia of the Zoological Society of London*, No. 9. Proceedings of a symposium, 1962. H. Heller, Ed. Zoological Society of London, London, 1963. 193 pp. Illus. Paper, £2 10s.

Comparative Nutrition of Man and Domestic Animals. vol. 1. H. H. Mitchell. Academic Press, New York, 1962. 723 pp. Illus. $25.

Evolution of Neotropical Cricetine Rodents (Muridae). With special reference to the phyllotine group. Philip Hershkovitz. Chicago Natural History Museum, Chicago, Ill., 1962. 524 pp. Illus. Paper, $12.50.

Faune de France. vol. 66, pt. 2, *Isopodes Terrestres*. Albert Vandel. Lechevalier, Paris, 1962. 514 pp. Illus. NF. 110.

Flora of Illinois. George N. Jones. Univ. of Notre Dame Press, Notre Dame, Ind., ed. 3, 1963. 407 pp. $7.50.

The Growth of Plants. G. E. Fogg. Penguin Books, Baltimore, Md., 1963. 288 pp. Illus. Paper, $1.65.

Horticultural Science. Jules Janick. Freeman, San Francisco, Calif., 1963. 484 pp. Illus. $8.50.

Methodology in Mammalian Genetics. Walter J. Burdette, Ed. Holden-Day, San Francisco, Calif., 1963. 660 pp. Illus. $6.

Methods in Carbohydrate Chemistry. vol. 2, *Reactions of Carbohydrates*. Roy L. Whistler and M. L. Wolfrom, Eds. Academic Press, New York, 1963. 588 pp. Illus. $19.50.

Methods of Biochemical Analysis. vol. 11. David Glick, Ed. Interscience (Wiley), New York, 1963. 452 pp. Illus. $14.50.

The Neural Mechanism of Parkinsonian Tremor. J. M. Gybels. Arscia and Presses Academiques Europeennes, Brussels, Belgium, 1963. 161 pp. Illus. Paper, F. 320.

Physiology. Ewald E. Selkurt, Ed. Little, Brown, Boston, Mass., 1962. 749 pp. Illus. Paper, $7.50.

The Pigment Cell: Molecular, Biological, and Clinical Aspects. *Annals of the New York Academy of Sciences*, vol. 100. Vernon Riley and Joseph G. Fortner, Eds. The Academy, New York, 1963. 1124 pp. Illus. Paper.

Progress in Medicinal Chemistry. vol. 2. G. P. Ellis and G. B. West, Eds. Butterworth, Washington, D.C., 1962. 211 pp. Illus. $11.25.

Stages in the Development of Ictalurus Nebulosus. Philip B. Armstrong. Syracuse Univ. Press, Syracuse, N.Y., 1962. 8 pp. 16 plates. $4.95.

A Stereotaxic Atlas of the Brain of the Squirrel Monkey (Saimiri Sciureus). Raimond Emmers and Konrad Akert. Univ. of Wisconsin Press, Madison, 1963. 120 pp. Illus. $15.