

aging. In some respects, it has even now been superseded by new results. Nevertheless, its main conclusions will stand the test of future research.

Why are the variable stars important in galactic research? The answer to this question is given only by implication in this volume. It has, however, been stated lucidly by B. V. Kukarkin in a Russian book under the title *The Study of the Structure and Evolution of Stellar Systems upon the Basis of our Knowledge of Variable Stars* (Moscow-Leningrad, 1949; this book is now available in a German translation. It is strange that Mrs. Gaposchkin gives no reference to this monograph, which treats the problems of variable stars in much the same manner—except, of course, for some Communist-inspired ideological nonsense that abounds in the introductory and closing pages of the Russian book): (i) The variable stars identify themselves by their light-curves as objects of comparable physical properties. (ii) They can be discovered and investigated with relatively modest instruments; since some groups of variable stars are exceedingly luminous, they can be isolated at great distances from the sun in the Milky Way and in other galaxies. (iii) Their variations—due to pulsations and to explosive processes—provide information regarding the evolutionary processes in all stars. These processes are intimately related to the structure and evolution of galaxies.

A single example (not given in these two books) may suffice to illustrate the third point. Consider the mean density of a star and its evolutionary change. If the evolution proceeds with only a negligible change in mass, as in the case of thermonuclear energy-generation, $\bar{\rho} = \frac{\text{constant}}{R(t)^3}$. But the radius is very poorly determined from direct observations, and its change with time t cannot be found. But most variable stars obey the universal law of vibrating systems, $P\sqrt{\bar{\rho}} = \text{constant}$. For many variables the period P is known to a small fraction of 1 sec, and in a few, changes of P amounting to 1 sec/century (when $P \sim 4$ hr) have been definitely established. If these changes in period are systematic in character, they imply a corresponding change in $\bar{\rho}$ —with a fantastic degree of precision!

The first chapter, "The galaxy," will be of special interest to nonastronomical readers. It lists all the major "races" of stars, not just those that are characterized by changes of brightness, and it contains estimates of their frequencies relative to the entire disk and halo populations. The second chapter on "The pulsating variable stars" is a summary of our knowledge of the light-curves, radial velocities, and spectral characteristics of the principal groups of intrinsic variables. Mrs. Gaposchkin has omitted the T Tauri

stars because "our knowledge of these groups of stars is very fragmentary and permits us to investigate them only in our immediate neighborhood." She does not mention the stars of the β Canis Majoris type. They may turn out to be a particularly valuable tool in the future study of associations of very young stars in the Milky Way and in other galaxies.

The third chapter, "The explosive variables," deals with novae and nova-like stars. The fourth, on "The magnitude scale for variable stars" fixes the scales of intrinsic luminosities for the various sequences of variable stars. It recognizes the change in the distance scale of the galaxies first established by W. Baade in 1952. The fifth chapter, "Distribution of variable stars" contains a cautious discussion of the difficult problem of interstellar absorption.

The sixth chapter is a rather abbreviated treatment of the "Motions of variable stars," and the concluding chapter entitled "Variable stars, galactic structure and evolutionary problems" summarizes the results. It "is an expression of opinion [of the author] and touches upon the important problem of the effective planning of research."

Not all of these chapters will make easy reading for a nonastronomical reader. The text is so concise that many terms that are familiar to every astronomer have not been explained. A physicist may not know what a "Bottlinger diagram" is, and a geologist or chemist may wonder what the 21-cm line of hydrogen is supposed to do for astronomy.

OTTO STRUVE

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Modern Gas Analysis. Paul W. Mullen.
Interscience, New York-London, 1955.
ix + 354 pp. Illus. \$5.50.

This book on gas analysis is divided into two parts. Part I on "Absorptometric gas analysis" makes up about 60 percent of the text. Part II on "Instrumental gas analysis" takes the remaining 40 percent.

The book is quite complete; practically all known methods of gas analysis are discussed. It is profusely illustrated, as is shown by the fact that illustrations take up space equivalent to about 15 percent of the total. It is a pocket-size book. These facts indicate that the treatment of topics is necessarily condensed. For example, mass spectrometry is described in some 12 pages of text. In such a condensation, when the field to be covered is very broad, it might have been better to have limited the number of topics rather than to strive for historical and subject completeness.

As a survey of an important field, this work will be useful, but for specific applications the information given in it must be supplemented by other sources.

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An Introduction to the Study of Insects.

Donald J. Borror and Dwight M. DeLong. Rinehart, New York, 1954.
ix + 1030 pp. Illus. \$9.

This volume received one of the most extensive reviews to which a science textbook can be subjected. A panel of entomology professors exhaustively and comparatively discussed it at the December 1954 meetings of the Entomological Society of America's Section A. The authors were present to explain some details of contents and arrangements that were mildly criticized.

The consensus of the panel was that the authors had made a major contribution to entomological education, with a textbook that has a somewhat different approach and is of considerably wider taxonomic coverage than most standard introductory textbooks. The panel's principal criticism related to the type of treatment rather than the quality of the material. Those who contend that ecology, morphology, physiology, and other facets of zoology should be segregated and highlighted, will find this textbook deficient in that respect. What the authors have accomplished so well is to weave information concerning environmental relationships, form, structure, and function of insects in the explanatory matter throughout the chapters related to the individual orders.

The typography is excellent. Its 10-point modern type makes it unusually legible. Illustrations are sharp and clear. Authors of species names are written in full, except the customary abbreviation of Linnaeus. An extensive glossary and an adequate index complete the volume.

Professors of beginners' courses who choose to emphasize the taxonomic end of entomology will find this book ideally suited to their use. It also fits especially well in an undergraduate course in insect taxonomy that emphasizes field collection, identification, and preservation of insects. Professors already using it have reported that the keys are excellent, key characters very well illustrated, and students have little difficulty in determining what is meant by a given character. Students can get a close and intimate acquaintance with each insect family from this book. Students have also expressed much interest in the section on each insect order that describes methods of collecting and preserving insects of that

order. A separate chapter on "Insect study activities and projects" describes many basic techniques of insect rearing and study that could be quite valuable in arousing an interest in insect research.

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An Annotated Bibliography of Submarine Technical Literature: 1557 to 1953. Committee on Undersea Warfare. National Research Council, Washington, D.C., 1954. xiii + 261 pp. Paper, \$1.50.

Divided into eight sections, this bibliography of unclassified material concerning submarine development is the first compilation of such data since World War I. The first section, which embodies material related to nontechnical and historical data, is followed by sections that are technical and specific. The classifications within the sections are further divided by subheadings. For example, section 6, "The submarine in war," has two subheadings: "Submarine warfare operations" and "Effectiveness and potentialities." The first of these has four subheadings that give the data in the time sequence of: prior to 1914; 1914-18, 1919-38; and 1939-52. Under the subheading "1914-1918 inclusive," there are three divisions that group the material according to "General," "Germany," and "Other countries." Titles of foreign documents have been translated as an aid to clarifying the content thereof. There is a table of contents, a list of sources searched, and an author index.

New Books

Industrial and Manufacturing Chemistry. pt. I, *Organic*; ed. 7; 752 pp. pt. II (in 2 vols.), *Inorganic*; ed. 6; 1091 pp. Geoffrey Martin. Philosophical Library, New York, 1955. \$50 per set.

Elements of Zoology. Publ. in the Zoological Sciences. Tracy I. Storer and Robert L. Usinger. McGraw-Hill, New York-London, 1955. 552 pp. \$5.50.

The Story of Man and the Stars. Patrick Moore. Norton, New York, 1955. 246 pp. \$3.95.

Einführung in die Medizinische Psychologie. Für Mediziner und Psychologen. Georg Destunis. De Gruyter, Berlin, 1955. 218 pp. DM. 22.

Microwave Spectroscopy. International Ser. in Pure and Applied Physics. C. H. Townes and A. L. Schawlow. McGraw-Hill, New York-London, 1955. 698 pp. \$12.50.

Causalités et accidents de la découverte scientifique. Illustration de quelques étapes caractéristiques de l'évolution des sciences. R. Taton. Masson, Paris, 1955. 168 pp. F. 980.

Electro-Technology. Basic theory and circuit calculations for electrical engineers. M. G. Say. Philosophical Library, New York, 1955. 167 pp. \$6.

Industry and Tropical Health: II. Proceedings of the second conference of the Industrial Council for Tropical Health. Harvard School of Public Health, Boston, 1955. 266 pp. \$10.

Prácticas de Fisiología. Eduardo Briese. Instituto de Fisiología, Universidad de los Andes, Merida, Venezuela, 1955. 232 pp.

Crust of the Earth. A symposium. Arie Poldervaart, Ed. Geological Soc. of America, New York, 1955. 762 pp. \$6.50.

Problèmes de structures, d'ultrastructures et de fonctions cellulaires. J. André Thomas. Masson, Paris, 1955. 358 pp. Paper, F. 3000.

The Decline of Wisdom. Gabriel Marcel. Philosophical Library, New York, 1955. 56 pp. \$2.50.

Pilot Plant Techniques of Submerged Fermentation. Special English edition of Rendiconti Istituto Superiore di Sanita, vol. 17. Fondazione Emanuele Paterno, Rome, 1954 (Distrib. by Interscience, New York). 243 pp. Paper, \$8.10.

Miscellaneous Publications

(Inquiries concerning these publications should be addressed, not to Science, but to the publisher or agency sponsoring the publication.)

Observations de la radiation solaire durant l'éclipse de soleil du 30 juin 1954. Publ. Ser. B, No. 13. R. Dogniaux. 1954. 11 pp. *Les périodes de grands froids en Belgique (1901-1954).* No. 14. A. Vandenplas. 1954. 29 pp. *Sur les transformations adiabatiques et isobariques dans l'atmosphère.* No. 15. L. Dufour. 1954. 10 pp. *Les aspects météorologique et climatologique des pollutions atmosphériques.* Contrib. No. 16. L. Poncelet. 1954. 15 pp. *L'aéronomie et sa nomenclature.* No. 17. M. Nicolet. 1954. 6 pp. *Etude du climat de la radiation en Belgique.* No. 18. R. Dogniaux. 1954. 54 pp. *Sur l'organisation de la météorologie agricole en Belgique.* No. 19. A. Vandenplas. 1955. 13 pp. Institut Royal Météorologique de Belgique, Brussels.

Current Research in Human Fertility. Papers presented at the 1954 annual conference of the Milbank Memorial Fund. The Fund, New York, 1955. 162 pp. \$1.

Scientific Research Activities of Mellon Institute, 1954-1955. Annual Rpt. Ser. No. 42. The Institute, Pittsburgh, Pa., 1955. 53 pp.

Soviet Bloc Economic Activities in the Free World. Mutual Defense Assistance Control Act of 1951. Sixth report to Congress, second half of 1954 (Order from Supt. of Documents, GPO., Washington 25). 100 pp. \$0.35.

Paleozoic and Mesozoic Rocks of Gros Ventre, Teton, Hoback, and Snake River Ranges, Wyoming. Geological Soc. of America Mem. 63. Harold R. Wanless, Ralph L. Belknap, and Helen Foster. The Society, New York 27, 1955. 90 pp.

Humanitas. Revista de la facultad de Filosofia y Letras. Universidad Nacional de Tucuman, Argentina, 1954. 525 pp.

Revision of Some Recent Foraminiferal Genera. Smithsonian Misc. Coll. vol. 128, No. 5. Alfred R. Loeblich, Jr., and Helen Tappan. The Institution, Washington, D.C., 1955. 37 pp.

Annual Report (1954) of East Malling Research Station. Kent Incorporated Soc. for Promoting Experiments in Horticulture, Kent, Eng., 1955. 170 pp. \$2.

Chronic Pancreatitis and Multiple Sclerosis. E. P. Evans. The author, 1088 Pembina Highway, Fort Garry, Manitoba, Canada, 1955. 16 pp. \$1.

Units of Weight and Measure—Definitions and Tables of Equivalents. Misc. Publ. 214. U.S. Dept. of Commerce, Natl. Bur. of Standards, 1955 (Order from Supt. of Documents, GPO, Washington 25). 64 pp. \$0.40.

A Radiation Counting System for Recording Rapidly Varying Count Rates. Bull. No. 59. Frances M. Richardson and Harold A. Lamonds. Dept. of Engineering Research, North Carolina State College, Raleigh, 1955. 13 pp. \$0.35.

Bird Houses, Baths and Feeding Shelters. How to make and where to place them. Edmund J. Sawyer. Cranbrook Institute of Science, Bloomfield Hills, Mich., 1955. 36 pp. \$0.50.

Application of Dimensional Analysis to the Relationship between Velocity of Sound and Physical Properties in Organic Liquids. Eng. Expt. Sta. Ser. No. 100, vol. XLVIII, No. 8. Dudley Thompson and N. N. Bakhshi. Virginia Polytechnic Inst., Blacksburg, 1955. 26 pp.

Studies on the Ecology and Sedimentation of Matsukawa—Ura, Soma City, Fukushima Prefecture (No. 1). Contrib. No. 45 of the Inst. of Geology and Paleontology. 96 pp. *The Science Reports of the Tohoku University.* Ser. 2 (Geology), vol. XXVI. 114 pp. Tohoku Univ., Sendai, Japan, 1955.

Manpower Needs in Highway Engineering. Highway Research Bd. Bull. 106. Natl. Acad. of Sciences-Natl. Research Council, Washington, D.C., 1955. 30 pp. \$0.60.

Anales. vol. III, No. 4. Ministerio de Agricultura. Instituto Nacional de Investigaciones Agronomicas, Madrid, 1954. 586 pp.

Supplement to a Survey Report on Human Factors in Undersea Warfare. Panel on Psychology and Physiology of Committee on Undersea Warfare. Natl. Acad. of Sciences-Natl. Research Council, Washington, 1949. 541 pp.

Native Land. National Assoc. of Manufacturers, New York 17, 1955. 46 pp. \$0.10.

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