ing the material in two sections makes the treatment spotty. One finds the description of the microscopes in one place and their use in other parts of the book; filters are discussed in several places; objectives are discussed under microscope optics and defined under photomicrography, and so on.

The vocabulary could be improved by omitting the words which vary only slightly in spelling and including words like *manche à balai* ("joy stick"—that is, micromanipulator control) whose meaning is not obvious from the words themselves. Some of the preparation is a bit careless: *Kristall* is given as the English for *cristal,* some references include only month and year, a book reference lists the third author as the first, the origin of Fig. 4 is not acknowledged, and so on.

There is much valuable material in this book, which presents French microscopy as it is viewed by three experts.

OSCAR W. RICHARDS
American Optical Company

Corrosion and Wear Handbook for Water Cooled Reactors. TID 7006. D. J. DePaul, Ed. U.S. Atomic Energy Commission, 1957 (order from Government Printing Office, Washington, D.C.). 293 pp. $2.25, paper.

Corrosion and Wear Handbook for Water Cooled Reactors is the sixth report in an unclassified series on reactor technology sponsored by the Naval Reactors Branch of the Atomic Energy Commission.

The handbook supplies theoretical background as well as experimental data on corrosion and wear of materials in water-cooled nuclear reactors. These data were provided by both governmental and private organizations which were prime- or subcontractors for the *Nautilus* Submarine Reactor and the Shippingport Pressurized Water Reactor projects.

The book is organized in three parts. Part A (four chapters) states the problems of using high-purity, high-temperature water as a reactor coolant. This part generally discusses nuclear reactors for power plants, choosing reactor materials, fundamental facts of corrosion and wear, and water technology. Part B (four chapters) gives basic reference data for use in design work. Corrosion and wear properties of various materials and combinations of materials under specified conditions are listed, as are the effects of variable factors on corrosion and wear and on recommended testing procedures. Part C (six chapters) deals with such special problems as crevice, stress, and intergranular corrosion, and with application and manufacturing problems involving wear.

Dictionary of Microbiology. Morris B. Jacobs, Maurice J. Gerstein, William G. Walter. Van Nostrand, Princeton, N.J., 1957. 276 pp. $6.75.

The authors have been liberal in marking out the scope of this dictionary, the first in its field. It "defines the terms commonly used in microbiology and the related fields of bacteriology, mycology, virology, cytology, immunology and immunochemistry, serology and microscopy." The fence erected to define these areas proved to be permeable to many of the protozoa of medical importance, but most of the helminths were effectively excluded. There are an estimated 4700 entries, consisting mainly of brief definitions or descriptions, arranged in a pleasing double-column format with key words in bold-face type. An occasional helpful chart or diagram is included. Cross references appear to be ample.

There may be a need for an alphabetically arranged reference book in microbiology, but opinions will differ concerning the form it should take. Entries as brief as most of those in the present volume will certainly restrict its usefulness. Perhaps this degree of brevity was felt to be necessary in order to produce a book of moderate size. Nevertheless, space could have been saved by other means, such as the omission of numerous terms that are defined as well and more completely in an ordinary desk dictionary and the avoidance of unnecessary repetition in the description of the several species of one bacterial genus. The striving for brevity, with the breadth of scope indicated above, may have contributed to inadequate coverage (for example, *myeloblast* and *myelocyte* are included; *lymphoblast* and *erythroblast* are excluded) as well as to unfortunate ambiguities and outright errors of fact. Examples will be found in the definitions of *fluctuation test, macrophage,* and *vaccination, bacterial.*

A better effort than that represented by this book will have to be made before the question of the usefulness of a dictionary of microbiology can be adequately answered by practical test.

FRANCIS B. GORDON
Naval Medical Research Institute

The Modern Researcher. Jacques Barzun and Henry F. Graff. Harcourt, Brace, New York, 1957. xiii + 386 pp. $6.

This useful handbook for anyone who has to put his thoughts in writing, from a college freshman to a foundation president, is offered in the twofold conviction that poor expression is nothing more than poor thinking and that there is no substitute for hard work. All is explained—how to use a library, how to take notes from the books found there, how to compose a periodic sentence, how to give a paper a beginning and a middle and an end, how to correct galley proofs. In addition, considerable space is devoted to a discussion of history, its methods of research, its logic, and its laws (if such there are). This discussion represents, at least in part, good popularizing, but it is never made clear just why it is included in the book, unless the reason is that the two authors are both also professional historians.—J. T.

A History of Luminescence from the Earliest Times until 1900. vol. 44 of *Memoirs* of the American Philosophical Society. E. Newton Harvey. American Philosophical Society, Philadelphia, Pa., 1957. xiii + 692 pp. Plates. $6.

When an electron in a molecule or atom is raised to a high-energy level and then drops back again, radiant energy is emitted. In some cases the emitted rays are visible to the human eye. When heat furnishes the energy for excitation, as in the sun, a candle, or tungsten filament, low-efficiency incandescence is observed. When the excitation energy is supplied from other sources, such as a chemical reaction, luminescence or "cold light" is observed. Examples of luminescence are numerous. There is *electroluminescence,* resulting from a flow of current (fluorescent lights, aurora borealis, *ignis lambens,* and St. Elmo's fire). *Phosphorescence* is the lasting luminescence which results from the exposure of a substance to irradiation. When the light emission is of very short duration (10^{-9} sec) it is known as *fluorescence. Thermoluminescence* is the emission of light on slightly heating a substance to liberate excited electrons from a trapped state. *Triboluminescence* and *piezoluminescence* are light emissions that result from rubbing and pressing a material, respectively.

There are many other examples of luminescence, including light emission by organisms (bioluminescence), and the purpose of the present book "is to trace the discovery and the ideas regarding these lights without heat from the earliest times until the end of the 19th century." The book is divided into three parts. In the first part a general survey of our knowledge of luminescence is given, while parts 2 and 3 deal with special types of luminescence associated with the nonliving and the living world, respectively.

For students of luminescence, physical or biological, this book is required reading. To others, it will be the fascinating

story of historical reports on the glowing of cats' eyes, the light of the warrior's eyes during battle, Aristotle's observations on light which appears when the eyeball is pressed, and so forth. The first recorded explanations of the phosphorescence of the sea, wood, and flesh are ingenious and fantastic when compared with contemporary beliefs. It is surprising how frequently luminescence stimulated the great men of all branches of science, and, as Newton Harvey points out, the "history of luminescence is a guide to the history of science in general." It might also be said that men of literature were influenced by luminescence: for example, Dante, in the *Inferno* ("Fire-flies innum'rous spangling o'er the vale") or Shakespeare, in *Pericles* (1609) ("Like a glow-worm in the night the which hath fire in darkness, none in light.")

Harvey, who has spent more than 40 years in the study of luminescence, has provided us with a very readable and detailed history of a subject which is fast becoming the universal method of illumination and communication.

W. D. McElroy
Johns Hopkins University

Concepts of Force. A Study in the Foundations of Dynamics. Max Jammer. Harvard University Press, Cambridge, Mass., 1957. viii + 269 pp. $5.50.

Physical theories operate with concepts which, though free creations of the human mind in their strict logical character, are usually found to have their roots in human experience extending over long periods of time. Hence, critical examination of them is a peculiar combination of historical and methodological research. This is particularly true of the concepts of mechanics, the oldest of physical theories. The attitude of scientists toward these has undergone great changes from the days of Greek science to our own. It is the purpose of the author of *Concepts of Force* to trace the development of the idea of force from its meaning in ancient physics to that in 20th-century science.

The story is a long and complicated one, demanding great skill on the part of the writer in the choice of the relevant elements in an enormous body of more or less obscure material. He has to search for the origin of the idea in the groping attempts of our ancestors to give an explanation for motion in general, based on the analogy with human exertion and activity represented in such terms as *effort, force, power, work*. He must then proceed to note how these ideas were refined by abstract thinkers, given quantitative status, and made useful for the solution of practical problems. Finally he has to show how, in the process of refinement, the concept of force reaches the stage where it can be eliminated from the logical structure of the theory without hampering the deductions of the latter and becomes a mere heuristic device whose precise philosophical meaning no longer has significance.

The author has obviously studied the literature with great thoroughness. Historians will approve his dependence, in most cases, on original rather than secondary sources. His interpretations are carefully made, though he is candid in admitting the ever-present difficulty of really understanding what ancient writers on mechanics meant by what they said. This problem makes the history of science an involved and uncertain discipline, though perhaps only a few degrees more so than history in general. Two-thirds of the book is devoted to the history of the force idea, from Galileo to modern times. There is a particularly good discussion of the problem of the possible influence of theological ideas on Newton's concept and of the converse problem of the influence of his mechanics on theological thought in the 18th century. Probably not enough attention is paid to Newton's third law, which has had such an enormous influence on the development of modern physics through the conservation theorems.

I am glad to see adequate justice done to the ingenious ideas of Boscovich (1745), with his point centers of force. Moreover, there is an excellent presentation of the famous controversy between the followers of Descartes and of Leibnitz on the "true" measure of the effect of a force. Through the careful critiques of Hertz, Mach, and Poincaré, the logical status of force in modern physics has been completely clarified, though the melancholy fact remains that many writers of elementary textbooks are still not aware of this. It is to be hoped that the publication of books like that of Jammer will help to rectify this situation.

R. B. Lindsay
Brown University

New Books

The Shakespearean Ciphers Examined. An analysis of cryptographic systems used as evidence that some author other than William Shakespeare wrote the plays commonly attributed to him. William F. Friedman and Elizabeth S. Friedman. Cambridge University Press, London, 1957. 320 pp. $5.

Marysvale, Utah, Uranium Area. Geology, volcanic relations, and hydrothermal alteration. Special Paper 64. Paul F. Kerr, Gerlad P. Brophy, Harry M. Dahl, Jack Green, Louis E. Woolard. Geological Society of America, New York, 1957. 212 pp.

Angular Momentum in Quantum Mechanics. A. R. Edmonds. Princeton University Press, Princeton, N.J., 1957. 154 pp. $3.75.

Synthesis of Passive Networks. Theory and methods appropriate to the realization and approximation problems. Ernst A. Guillemin. Wiley, New York; Chapman & Hall, London, 1957. 759 pp. $15.

Quantitative Inorganic Analysis. G. Charlot and Denise Bezier. Translated by R. C. Murray. Methuen, London; Wiley, New York, 1957. 701 pp. $15.

The Visual Pigments. H. J. A. Dartnall. Methuen, London; Wiley, New York, 1957. 223 pp. $6.

An Encyclopaedia of Annual and Biennial Garden Plants. Faber & Faber, London, 1957 (order from Macmillan, New York 11). 488 pp. $12.50.

The Faunal Connections between Europe and North America. Carl H. Lindroth. Wiley, New York; Almquist & Wiksell, Stockholm, 1957. 344 pp. $15.

Bacterial Fermentations. H. A. Barker. Wiley, New York; Chapman & Hall, London, 1956. 102 pp. $3.

A Classified Bibliography of Gerontology and Geriatrics. Supplement 1, 1949–1955. Nathan W. Shock. Stanford University Press, Stanford, Calif., 1957. 553 pp. $15.

Nomina Anatomica. Fr. Kopsch. Thieme, Stuttgart, Germany, 1957. 166 pp. $1.55.

For Future Doctors. Alan Gregg. University of Chicago Press, Chicago, 1957. 174 pp. $3.50.

Science in Australian Primary Schools. C. D. Hardie. Melbourne University Press, Carlton, N.3, Victoria, 1957 (order from Cambridge University Press, New York). 90 pp. $3.75.

Advances in Radiobiology. Proceedings of the Fifth International Conference on Radiobiology held in Stockholm on 15–19 Aug. 1956. George Carl de Hevesy, Arne Gunnar Forssberg, John D. Abbatt. Oliver & Boyd, Edinburgh, Scotland, 1957. 519 pp. 77s. 6d.

Dawn in Arctic Alaska. Diamond Jenness. University of Minnesota Press, Minneapolis, 1957. 222 pp. $4.75.

Chemistry for the Laboratory. Alfred B. Garrett, Joseph F. Haskins, Thor R. Rubin, Frank H. Verhoek. Ginn, Boston, ed. 2, 1957. 423 pp. $4.25.

Language: An Enquiry into Its Meaning and Function. Ruth Nanda Anshen, Ed. Harper, New York, 1957. 384 pp. $6.

Religion without Revelation. Julian Huxley. Harper, New York, 1957. 252 pp. $4.

The Divine Quest in Music. R. W. S. Mendl. Philosophical Library, New York, 1957. 265 pp. $7.50.

Handbook of Chemical Data. F. W. Atack, Ed. Reinhold, New York, 1957. 629 pp. $6.75.

The Carbohydrates. Chemistry, biochemistry, physiology. Ward Pigman, Ed. Academic Press, New York, 1957. 919 pp. $20.

Conservation. An American story of conflict and accomplishment. David Cushman Coyle. Rutgers University Press, New Brunswick, N.J., 1957. 296 pp. $5.