growth of man's control and understanding of his environment. The volume as a whole proves that the knowledge and insight of specialists can be made available to the general reader with dignity and without loss of critical standards.

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The Scientific Revolution, 1500–1800. The formation of the modern scientific attitude. A. R. Hall. Longmans, Green, London–New York, 1954. xvii + 390 pp. Illus. $3.50.

The period 1500–1800 saw the formation of the intellectual movement known as modern natural science. A. R. Hall, lecturer in the history of science at Cambridge, regards the thought of the previous age not as "unscientific" but simply as different, and that of the last century and a half not as different but rather as "more scientific," in the sense that the approaches of more recent scientists differ from those of 1800 chiefly in the refinement of detail. Thus he sees this period neither as an "awakening," as it used to be called, nor as a "phase," as some now would have it, but as the crucial period in the genesis of a development in the course of human events the importance of which few of the present generation are likely to minimize.

The book begins with a judicious and well-informed summary of medieval science, which exhibits, as does the entire book, an impressive familiarity with the literature on the subject. The treatment of astronomy and mechanics, in which the author has already published distinguished work, is excellent. Chemistry and biology are treated less originally but are not neglected. As befits a book described by its author as a "character study" of the scientific revolution, approximately one-third of the space is devoted to consideration of philosophy and methods. Well-selected bibliographies and appendixes are included and there is an index. I know of no more sound introduction to the history of modern science.

ROBERT MULTHAUF

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American Men of Science. vol. I, *The Physical Sciences.* Jaques Cattell, Ed. Science Press, Lancaster, Pa.; R. R. Bowker, New York, ed. 9, 1955. 2180 pp. $20.

A new edition of *American Men of Science* is always an important event and a welcome addition to a scientist's bookshelf. As the scientific population grows, the necessity for this biographic reference work increases; since the eighth edition appeared in 1949, the number of names included has increased from 50,000 to 90,000. This increase convinced the publishers that a single volume was no longer practicable. In splitting 90,000 names into separate volumes, the publishers had to choose between making the division alphabetically and making it along subject-matter lines. They chose the latter course.

Volume 1 includes physical scientists; volume 2 (fall 1955) will include biological scientists; and volume 3 (spring 1956) will include social scientists. Users whose interests are largely confined to getting information about persons in a particular field, such as geology or mathematics, will find this arrangement convenient and will save money by buying only one volume.

There are, however, major disadvantages to the volume separation. The question of where to include biochemists and biophysicists illustrates the fact that not all scientists can be classified neatly into one of three pigeonholes. Each member of these groups was given his choice of a listing in volume 1 or volume 2. Some chose one way; some, the other. This made it necessary to list practically all names in both volumes, with a biography in one and a cross reference in the other. The cross-reference feature is also used in the inclusion of some names in the new edition with a reference to the eighth edition for detailed information. The book is therefore less handy than an alphabetic division would have been for users who are interested in all fields of science or in those fields that do not fit neatly into the current arrangement.—D.W.

Composition of Scientific Words. A manual for the methods and a lexicon of materials for the practice of logotechnics. Roland Wilbur Brown. Published by the author, U.S. National Museum, Washington 25, D.C., 1954. 882 pp. $8.

The legion of dictionaries gains recruits almost daily, but most such recruits are the stuff that privates are made of, following in well-defined paths. This "manual and lexicon" has the stuff of leadership in it, for it is not designed to be consulted passively but to enable its users to make new words. Since most of these new words will be the names of plants and animals, the book is especially rich in examples of how such names have been made. While the bulk of the book consists of the lexicon, the 54-page introduction is the essential guide to the lexicon. This introduction is not only an essay on the origins of the language and the nature of Greek and Latin but it is a readable essay on the nature of words. In it the author does not suppress his own opinions, which are often entertaining, but there are many practitioners of nomenclature who will part company with him on his recommendations about correcting the deficiencies of previous namesmiths. But this is the old controversy between those who want a name to make sense and those who regard it as simply an arbitrary convention.

The lexicon itself is a fantastic compilation. It does not attempt to be a simple dictionary, listing as many words as possible in order, but is rather a sort of thesaurus, grouping words by concept or general meaning. Under "bad" for example, are two pages of words, some synonyms, others simply uncomplimentary or unfavorable adjectives of various degrees; "bog" is followed by a similarly long list of all sorts

of sacklike containers; the entries under "bind" fill nearly three pages. This sort of thing will be of great help to the desperate systematist in search of a new name in some large genus, or to anyone else in search of a root on which to graft a new word in this day of complex molecules and disintegrating atoms. A further aid are the special sections here and there in the lexicon, such as the discussion of diminutives (under "little") and figures of speech; these are listed in the index. A typical entry gives the derivation, combining forms, and gender of the word. Pronunciation has been omitted, since this is debatable for Greek and Latin, but the author's recommendations are to be found in some sprightly passages (with amusing examples) in the introduction. It does not seem possible that a book this size should be innocent of typographic error, but after several days of dipping into it here and there, I have been unable to find one.

In short, this is the dictionary that many of us have long been waiting for, and it should be on the shelf of all who want to understand the words they use.

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An Autumn Gleaning. Occasional lectures and addresses. Henry H. Dale. Interscience, New York; Pergamon Press, London, 1954. x + 225 pp. $4.25.

This is a collection of lectures and addresses delivered between 1935 and 1952 by the venerable British medical scientist, Henry Hallett Dale.

This volume presents a wealth of material on the development and nature of the intellectual, moral, and social aspects of science during the last century, particularly in medical research. It reflects the valiant struggles of man with life under the increasingly confusing impact of rapidly growing science and technology.

Typical of these essays is the Huxley memorial lecture on viruses. Dale discusses the controversial literature by Tyndall, Pasteur, Buffon, Huxley, Needham, and others on spontaneous generation and its relation to the modern researches on the generation of ultramicroscopic viruses and bacteriophage.

Extracts from his five wartime presidential addresses to the Royal Society present such problems as the relatively long-range advantages of freedom in individual research and of organization in group research; the dangers of entangling science with politics; the dangers of neglecting fundamental in favor of applied research; the importance of recognition of achievement in the more fundamental and academic ranges of science; the significance of the numerous meetings held during the war in commemoration of the tercentenary of the birth of Newton, not only in English-speaking countries but also in such out-of-the-way places as Novosibirsk: "Newton's achievement is a part of the common heritage of all peoples"; and the evils of secrecy forced upon science and government by the new conception of "total war."

Dale's other lectures include history of the discovery and use of insulin; freedom and function of science (Benjamin Franklin's question to candidates for admission to the scientific junto was: "Do you love truth for truth's sake, and will you endeavor impartially to find and receive it for yourself, and communicate it to others?"); science in education; accident and opportunism in medical research; medical research as an aim in life; Thomas Addison as a pioneer of endocrinology; the mechanism of anaphylaxis; and transmission of effects from nerve endings.

This book should be of interest to the numerous professional admirers and friends of Henry Dale as well as to philosophically minded laymen not overwhelmed by the implication of the equation $E = mc^2$.

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Physics and Mathematics

Concepts of Space. The history of theories of space in physics. Max Jammer. Harvard Univ. Press, Cambridge, Mass., 1954. xvi + 196 pp. $3.75.

This is a scholarly history of the concept of space, starting from antiquity and extending to contemporary times. The great scientists and religious leaders pass in rapid kaleidoscopic procession, each contributing his concept of the space which forms the universe. In early times, and even in much of Newton's philosophy, contemporary theology restricted the notions of cosmology. Gradually the experimental approach became predominant. One sees how Isaac Newton considered geometry as a phase of mechanics, but insisted that the center of mass of the sun's planetary system must be at absolute rest. Leibnitz and Huyghens argued for relative motion. The argument was finally settled by the Michelson-Morley experiment. Then Riemann became the prophet of non-Euclidean space. To test this hypothesis, Gauss hauled surveying equipment up to the tops of three high mountains, and when he did not detect any deviation from 180° for the sum of the interior angles of the triangles formed by the three mountain peaks, he concluded that space was indeed Euclidean. Lobachevski tested the hypothesis using astronomical triangles, and so began our modern attack on cosmology.

In a brilliantly written foreword, Einstein divides the basic concept of space into two viewpoints: "(a) space as positional quality of the world of material objects; (b) space as container of all material objects." One gathers that general relativity merges the two concepts into one. That is, space can be thought of as boxes but the size and shape of these boxes are modified by the presence of matter.

Max Jammer is to be congratulated on the large and interesting selections of excerpts that he has given from original documents. Most of these are given in Latin, French, or German. Although for true scholars the subtle meanings might be lost in translation, for more casual readers footnotes providing the transla-