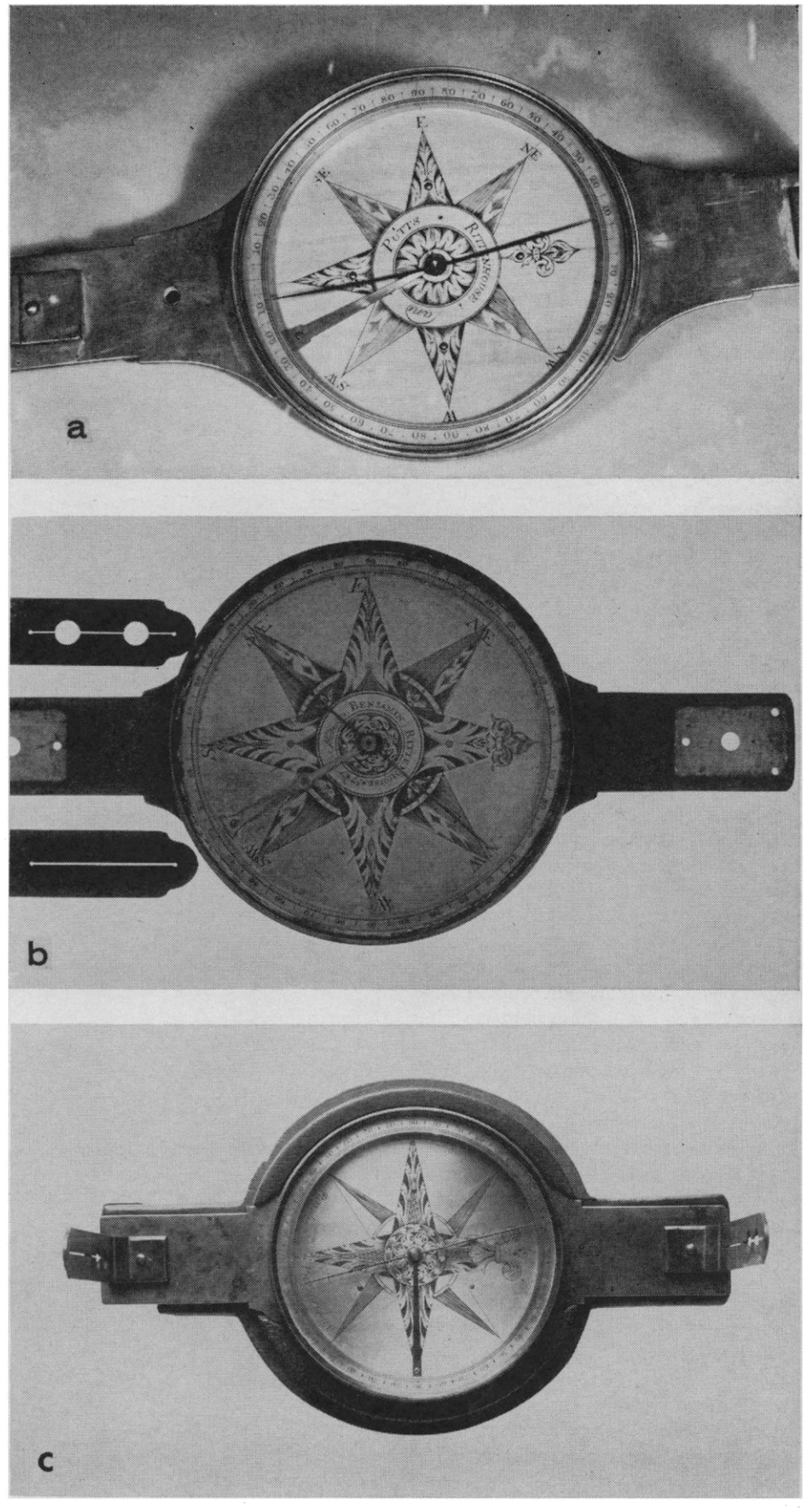
Scientific Instruments

Early American Scientific Instruments and Their Makers. Silvio A. Bedini. Smithsonian Institution, Washington, D.C. 1964 (order from Superintendent of Documents, Washington, D.C.). xii + 184 pp. Illus. Paper, $1.

This volume provides one of the essential building blocks on which we can place our gradually emerging understanding of the physical foundations of early American science and technology. The product of careful work, it is fundamentally a catalog, or a series of catalogs, of instrument makers and their instruments—telescopes, sectors, globes, and compasses (but more compasses than any other item).

After an introduction in which he sketches the European background and the early American practice of instrument making, Bedini singles out for extended examination a few of the most prominent instrument makers and then offers a descriptive catalog, first of immigrant and next of native makers, arranged state by state. Most surprising is the length of the next section, which is on craftsmen who made their instruments of wood, for this section is twice as long as his list of metal craftsmen. The extent of this practice has hitherto been obscured by our concentration on the most celebrated artisans who, following European precedent, worked primarily in brass. Finally, Bedini provides a list, with full descriptions, of the instruments in the possession of the U.S. National Museum and remarkably extensive lists of all the instrument makers he has identified. The many excellent illustrations form an integral part of the work; even the trade sign "Father Time" (see cover on this issue of *Science*) effectively conveys the spirit of the wooden instrument makers.

This book is more than a reference work; in itself, it is a source to be mined. For example, comparison of the illustrations reveals that the Benjamin Rittenhouse compass bears a much closer family resemblance to the Rittenhouse and Potts (not Potts and Rittenhouse) compass than does the David Rittenhouse compass (see cuts). Contrary to the usual assertion, therefore, both Rittenhouse and Potts as well as Rittenhouse and Evans compasses were probably made by Benjamin Rittenhouse.



Three 18th century, plain surveyor's compasses of conventional type and similar size. Comparison of their design and engraving appears to justify attributing the Rittenhouse and Potts compass (*a*) to a partnership of Benjamin Rittenhouse (*b*) rather than to David Rittenhouse (*c*), as has been usual. [(*a*) American Philosophical Society, (*b*) Ohio Historical Society, and (*c*) Smithsonian Institution]

This book answers many of the questions we have had; it is the most comprehensive and satisfying of a small group of recent works on instruments. At the same time, it points to many lines of desirable investigation relating to the evolution and use of instruments. Some of these questions—when was the vernier put to use? how was the magnetic declination set off? in what cases did telescopic sights become usual?—may never be very precisely answered. But Bedini offers the best starting point, a work of reference as well as a source of stimulus.

BROOKE HINDLE
New York University

History of Biology

The Evolution of Biology. M. J. Sirks and Conway Zirkle. Ronald, New York, 1964. vi + 376 pp. Illus. $6.

This book was first written by Sirks during the Nazi occupation of the Netherlands; that manuscript was published in 1942, with a second edition in 1947. Now, with the aid of Zirkle, a longer American version has been prepared.

The authors state that the title of the book was chosen deliberately to emphasize that focus is not on a detailed history of biology but rather on the developmental phases through which biology has passed in its long road to becoming an independent discipline. There are 12 chapters, the first 6 of which ("The beginnings of biology"; "Ex oriente lux"; "The Hellenistic-Roman period"; "A bucolic interlude"; "Retrogression and the beginnings of recovery"; and "Subhi Kazib: The false dawn") are concerned primarily with selected descriptions of early attempts to understand animals and plants and their usefulness to man. The remaining chapters ("Daybreak over Europe"; "The sun breaks through the clouds"; "Depression and revival"; "Specialization"; "Concentration"; and "Broad daylight") trace primarily the changing patterns of biological investigation which began with the Renaissance, intensified in the 17th and 18th centuries as new microscopic worlds were discovered, and came to a focus in the 19th century with the doctrine of organic evolution. Some of the spectacular advances of the present century, particularly the rise of modern genetics, are briefly traced in the last chapters. There is a useful bibliography and an index.

The competence of the authors is evident on every page—in the critical judgment with which they treat the contributions of individual naturalists and scientists and in the interesting and well-selected illustrations. Nevertheless, one may well inquire as to the usefulness of yet another history of biology which concentrates its attention (to the extent of 9 of its 12 chapters) on pre-19th century biology, particularly when very little attempt is made to correlate the impact of intellectual, social, and artistic influences of classical, medieval, and modern civilizations on the evolution of biology, and vice versa. Particularly disappointing, however, is the authors' failure to treat ecological, developmental, and physiological fields as comprehensively as they do those of natural history, heredity, and morphology. Finally, we are, perhaps, too close to the magnificant progress of biology in the present century to review it in proper perspective, but I believe that, in addition to the spectacular breakthrough in our understanding of genetic coding, there are many other areas of modern biology which also deserve thoughtful discussion, and, indeed, whose inclusion is mandatory if we truly are to understand how biology has "attained its present rank among the natural and physical sciences."

CHARLES S. THORNTON
Department of Zoology,
Michigan State University

For Students and Laymen

An Introduction to Radioactivity. Eric Neil Jenkins. Butterworth, London and Washington, D.C., 1964. viii + 193 pp. Illus. $5.95.

The general appeal of this little book on radioactivity will probably lie in its historical approach to the subject. It is by no means a history of radioactivity, and the development of subject matter is more logical than chronological, but many historically crucial experiments are described simply and clearly. The series of experiments leading to identification of the alpha particle and the sequence of observations that resulted in the discovery of nuclear fission are presented in strict chronology, but to follow developments in beta radioactivity as they occurred would only echo the early confusion. Fortunately Jenkins does not attempt to do so.

At first sight, the brief treatment of the Bohr atom, which is given halfway through the book, seems out of place, but it is set in context, between the discovery of the nucleus and consideration of the periodic table and nuclear structure. Jenkins stresses the role of Moseley's work on x-ray spectra in the identification of the nuclear charge with atomic number, together with the necessary reordering of the cobalt-nickel inversion anomaly. (These two elements had usually appeared in the periodic table in order of increasing atomic weight.) Curiously enough, however, no connection between Moseley's law and Bohr theory is noted, and the expression for atomic energy levels is never written to show its dependence on nuclear charge. Today the actual record seems curious in view of subsequent successes of the Bohr model: Moseley made the familiar comparison of x-ray wavelengths with Bohr theory only in his preliminary paper (*Phil. Mag.*, December 1913) and refrained from all mention of theory in his more complete report (*Phil. Mag.*, April 1914). Jenkins is content with the empirical arguments of the later paper.

The brief excursion into atomic structure suffices as a background for the consideration of artificial radioactivity and the chemistry of fission products. Modern applications are mentioned from the start—for example, the use of radioactive sources of ionization to eliminate static electricity in textile mills and a chapter on the uses of radioactive isotopes. The biological effects of radioactivity are discussed, both for their use in medicine and in connection with safety precautions. The author remarks repeatedly on the social and political implications of his subject and is "convinced that the subject of radioactivity provides ample useful starting points for general humane and cultural studies in sixth forms and technical colleges." It is difficult to know exactly what he means by "ample," but his inclusion of human interest and motivation in science certainly contributes to the value of his book for science students and for nonscientists.

Most of this book could be read