tradition of ingenious experimentation in optics—a tradition associated with the names of Henry Rowland and R. W. Wood. His flair for practical laboratory procedures shows itself throughout the book in useful descriptions of ways of testing lenses, selecting and polishing optical materials, and the like. That he is also very conscious of the "honorableness and antiquity" of his subject is evidenced by frequent historical references and direct quotations from original sources. The continuing growth of the field, on the other hand, is emphasized by several descriptions of recent developments.

One has the impression that the author continually strives to break away from the traditional presentation. In some respects this originality may not make for easy comprehension by the student. The suggested problems will challenge even the brightest. The notation, for which not only Greek but also German script symbols are used, gives a somewhat confusing impression, especially when the latter are adorned with combinations of bars and tildes.

Roger Hayward's distinctive drawings are especially helpful where three-dimensional visualization is required. The West Coast publishers are to be congratulated on the attractive appearance of their first volume in the field of physics.

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Scientific Societies in the United States. Ralph S. Bates. Technology Press, Massachusetts Institute of Technology; Columbia University Press, New York, ed. 2, 1958. xiii + 297 pp. $6.50.

This is the second edition of a book with the same title published in 1945 by John Wiley & Sons (and also Chapman and Hall, Ltd., London) for the Technology Press of Massachusetts Institute of Technology. The first five chapters have apparently been reprinted by offset, and hence remain unchanged. The new sixth chapter, "The atomic age, 1945–1955," was added to bring the story up to date.

The scope is indicated by the chapter titles: "Scientific societies in eighteenth-century America"; "National growth, 1800–1865"; "The triumph of specialization, 1866–1918"; "American scientific societies and world science, 1919–1944"; and "The increase and diffusion of knowledge."

This is not intended as a handbook of the scientific societies, such as *Scientific and Technical Societies of the United States and Canada* (National Academy of Sciences–National Research Council, Washington, ed. 6, 1955), which provides detailed information on 1712 societies. Instead, this book is a historical account of American scientific organizations from the colonial period to the present. (The author is professor of history at Massachusetts State Teachers College, Bridgewater.) Thus individuals, scientific developments, trends, societies, and governmental organizations are interwoven, and the intent has been to emphasize their interacting influences.

It is obvious that much reading and note-taking have gone into the preparation of the book. In the earlier chapters, in particular, many references have been condensed into an interesting history. The 432 footnotes and the bibliography will be useful for those interested in the beginnings of science in this country and those stimulated to delve more deeply into the subject.

Throughout the book there are repeated references, and considerable space is allotted, to the American Association for the Advancement of Science, the National Academy of Sciences–National Research Council, the American Academy of Arts and Sciences, the American Philosophical Society, and the Smithsonian Institution. This is not excessive in view of their long histories and ramified activities. On the other hand, the objectives and work of the Federation of American Societies for Experimental Biology, the American Institute of Physics, the American Geological Institute, and the American Institute of Biological Sciences all merit more attention. About five pages are devoted to UNESCO. The National Science Foundation, with no explanation of what it is or how it came into existence, is mentioned only twice and then in connection with other agencies.

A great many scientific societies are included but, inevitably, not all. Nearly all of the larger national scientific and engineering societies are present but, in many instances, coverage in the text is limited to a bare listing of names and the dates of founding. Sometimes national societies are rather uncritically grouped with less technical or local organizations. Since some degree of selection and compression were necessary, many of the points made might have had a few societies as examples instead of a dozen or more run together. The others, perhaps, could have been added in footnotes. Occasional paragraphs packed with long lists of societies, all founded about the same time or more or less in the same field, impart a checklist or compendium-like flavor and make the book less readable.

Since most of the state and city academies of science are included, probably all should have been. Among the regional societies, one finds the Western Society of Engineers but not the Western Society of Naturalists. The Southwestern Association of Naturalists is noted on both pages 197 and 198, but the older and larger Association of Southeastern Biologists has been overlooked. In surveying so many organizations over so many decades an occasional slip has occurred. To cite two: the American Association for the Advancement of Science was incorporated in 1874, not by Congress, but under the laws of Massachusetts; and it is the American Institute *of* Chemical Engineers, not *for*. But, in general, with such a plethora of names and dates, it is remarkable how relatively free from errors, typographical or otherwise, the book is.

The over-all impression is not unfavorable. The book is informative and provides, in the earlier chapters especially, a good introduction to a very complex and difficult subject.

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AAAS

The Reach of Science. Henryk Mehlberg. University of Toronto Press, Toronto, Canada, 1958. ix + 356 pp. $5.50.

As the title of this book indicates, the author is concerned with the range of applicability of scientific method to the problems of men. His conclusion is that "the universality of scientific method establishes that whatever is knowable is scientifically knowable" (page 343). His analysis leading to this conclusion is divided into three parts, which constitute the main divisions of the book. Part 1 deals with the concept of scientific method; part 2 considers the method of science; part 3 discusses the universality of science.

Throughout his analysis the author gives the principle of verifiability a central role, although, in the light of the recent literature on the difficulties of making this principle a criterion of meaningfulness, he attempts to connect verifiability to the truth rather than the meaning of statements. His discussion in various places of the relation between ostensive terms, conditional definitions, and the verifiable status of quantitative concepts is particularly good.

The author states in the preface that in spite of his concern with a single issue —the scope of science—he has in the course of his analysis dealt with the main problems of scientific methodology. It is in this connection that I have certain reservations about the book. On the one hand, I find myself agreeing with most of what the author has to say. His gen-

eral position seems sound and exceedingly sensible. On the other hand, what he has to say about probability, induction, or the theory of measurement would not give an uninitiated reader any feeling for the fact that these areas of the philosophy of science are full of exact results and specific unsolved problems. There is also, it seems to me, a disproportionately detailed discussion throughout the book of the relevance for scientific method of recent results in mathematical logic in comparison with the discussion of corresponding results in mathematical statistics.

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Principles of Field Biology and Ecology. Allen H. Benton and William E. Werner, Jr. McGraw-Hill, New York, 1958. vii + 341 pp. Illus. $6.50.

By approaching ecology from three directions—as a field study, as a taxonomic challenge, and as an economic problem because of man's biasing effects—Benton and Werner demonstrate a close relationship between the various principles described. A surprising amount of space is given to a clear account of the development of field biology in America, a topic usually neglected in any volume dealing with population dynamics and ethology. The concluding chapters, on the use of biological literature and on the choice and conduct of a field problem, will be helpful to advanced undergraduates and beginning graduate students.

The references following each chapter and a glossary of terms used in the book offer assistance and make the text matter itself more lively and interesting.

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Morphology of Plants. Harold C. Bold. Harper, New York, 1957. xxiii + 669 pp. Illus. $8.

This textbook organizes in one volume a survey of the whole plant kingdom. To cover this great diversity the author has adopted the "type method"—that is, the use, for each major group, of illustrative types for detailed study. Wherever possible the types are genera that are readily obtainable. Bold admits that there will be inevitable disagreement about emphasis and choice of types, but on the whole he seems to have made an excellent selection.

In format the volume is neat and attractive. In general, each major group of plants is dealt with in one chapter, which comprises an introduction or description of the general features of the groups, followed by detailed coverage of representatives. Coordination of the diverse subjects is accomplished largely by recapitulations and summaries. The greater part of the book concerns living plants. The treatment of fossil plants is concentrated in a single chapter, "Plants of the past," which is presented after all the living forms have been discussed. Although this approach has the disadvantage of separating the fossils from their nearest living relatives, it has the advantage of serving as a review and synthesis of the plant groups. It can also serve mechanically to bring all the fossil forms together in the laboratory.

The author has relied more heavily than the writers of conventional texts on photographic illustrations. Many of those that are included are good, but unfortunately many are only fair—either not clear or out of focus. More labeling might improve some of the photographs and drawings and increase their effectiveness.

A very useful appendix (pages 621–652) describes procedures and devices for preparing laboratory materials and adds much to the value of the book. It is Bold's belief that living materials are indispensable for good teaching. I believe that many teachers have a need for instruction, however, if this high ideal is to be achieved. The author has met this need by providing numerous tips on techniques, many of them original. Another pedagogically desirable innovation, in my opinion, is the providing of derivations of scientific names from the Greek or Latin roots.

My major criticism is that the number of plant divisions (the phyla) has been increased to approximately double that taught by most teachers. Bold has made a radical (called "conservative") classification that treats vascular plants, for example, in nine separate divisions —Psilophyta, Microphyllophyta, Arthrophyta, Pterophyta, Cycadophyta, Ginkgophyta, Coniferophyta, Gnetophyta, and Anthophyta. He holds that evidence of ultimate interrelationships of these assemblages, especially among land plants, is so tenuous that they must be considered as polyphyletic.

One may argue that not enough attention has been given here to efforts of phylogenists and taxonomists to detect and correlate not only differences but resemblances as well, and to weigh them justly. I really wonder whether the beginner in morphology has the necessary equipment to evaluate, on so little evidence, the propriety of the various "phylogenetic speculations," or whether an elementary textbook such as this one is the appropriate arena for such discussion.

The author, obviously, has not tried to avoid controversy in his presentation. This is evident again, for example, in his dealings with the interesting idea that seed plants are homosporous. There is no question in my mind that the text will stimulate both the teacher and the student. The style of writing is good, the book is interesting, and the text, in general, seems to me to be superior. Teachers will undoubtedly find the book a most valuable text, and it is probable that biologists in other fields will find it a useful and handy reference to general plant morphology.

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De l'actinie à l'homme. vol. 1, *Anticipation et mémoire.* Bases de l'évolution psychique. Henri Pieron. Presses Universitaires de France, Paris, 1958. viii + 306 pp. F. 1600.

Henri Pieron (1881—), who began his psychological writing just after the turn of the century, has been the leader in experimental psychology in France for the past 40 years. He inherited Binet's laboratory at the Sorbonne and Ribot's chair in the College of France and has been editor of *l'Année* since the 1920's. These important positions have enabled him to experiment, to lecture, and to publish extensively. This latest book, *De l'actinie à l'homme,* volume I, is a collection of 33 of his articles taken from 17 different journals, all French except one—a 1938 Russian journal of physiology. The dates of the articles range from 1907 to 1946, only four having appeared after 1916.

The collection is arranged in four parts: the first pertains to methodological problems of an objective psychology; the second, to studies of rhythms of behavior in sea anemones, certain Crustacea, and man; the third, to studies of mnemonics or cues for homing and direction orientation in mollusks and ants; and the fourth, to studies of memory in mollusks and to some general observations on animal memory. Each part begins with a brief introduction that has as its goal the tying together of the different parts in such manner as to show that anticipation (revealed by rhythms of behavior) and memory are the evolutional bases of mind. I am not enthusiastic about this aspect of the volume, for while the book thus provides in one place many facts about animal behavior, it does not make clear which of the connections that Pieron sees are his own