flow paths, residence time, storage, and mixing and dispersion. Used in labeling individual or packets of water molecules, environmental and artificially introduced isotopes offer a means for obtaining direct and relatively accurate answers to such questions. Under favorable conditions the results are preferable to, or at least supplement, results obtained by indirect methods based upon macroscopic flow considerations.

This symposium reflects the continued interest of the International Atomic Energy Agency in development of isotope techniques as hydrologic tools and follows an earlier symposium, Radioisotopes in Hydrology, held in Tokyo in March 1963. Development of isotope methods has progressed to the point where, under favorable conditions, practical applications yield useful results. Of the 41 papers, nearly all are devoted to field applications and related technology.

Applications of environmental isotopes, ^{14}C and ^{3}H—natural and bomb-produced—and stable isotopes of hydrogen and oxygen, have developed rapidly over the past five years. Ample reasons exist for this development. Because the concentration of stable isotopes in precipitation is dependent on geographic location, altitude, and season, they can be used for determining source areas and external inputs to hydrologic systems. The seasonal-geographic dependence of ^{3}H in precipitation permits it also to be used for the same purposes. Because of their decay and recent pulse-input, ^{3}H and ^{14}C are particularly useful in revealing the internal characteristics of flow systems.

This encouraging and very worthwhile development is well reported and is clearly the salient point of this symposium. In contrast to those in the earlier symposium, a large proportion of the papers, nearly half, concern the use of environmental isotopes. Several of the papers, notably one by J. R. Gat and Y. Tzur, make the significant point that modification of isotope concentrations may occur in the time-space interval between the interception of precipitation and its final incorporation into the ground- or surface-water system. Risk is involved in assigning the isotopic composition of precipitation to the input waters of hydrologic systems, particularly in arid areas of high evaporation. Additional work is needed on this matter.

As is evidenced by the proceedings, use of artificially introduced radioisotopes continues to be restricted to specialized situations, generally where flow times are short or velocities are high under natural or artificially produced conditions. Several sections of the proceedings cover this aspect rather adequately. A section of ten papers deals with the movement of sediment in surface waters by particulate labeling techniques. A short section of five papers deals with determination of local characteristics of aquifers. Another section covers applications in unsaturated flow and seepage. Instrumentation, tracer characteristics, and streamflow applications are also covered.

Only five papers are authored by Americans, and of these three deal with field measurement techniques. The lack of participation by American hydrologists is both a weakness and strength. Certainly American workers are active in the field and their absence limits the coverage of this symposium. On the other hand, the American worker in isotope hydrology will find the proceedings a valuable adjunct to his national literature, a ready reference to progress being made elsewhere. To those interested in gaining a general view of the field, the application approach of this volume will necessitate further reference to the literature on basic principles, much of it American, and to the American literature for complete coverage of applications.

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A Sampling of Helmholtz

Helmholtz on Perception. Its Physiology and Development. RICHARD M. WARREN and ROSLYN P. WARREN. Wiley, New York, 1968. x + 277 pp., illus. $9.95.

The opening sentence in the preface to this book asks, "Why read Helmholtz today?" Most scientists for whom his work is relevant and who have read Helmholtz would have quick answers. For those outside this set, the present collection of some of his shorter survey articles should help to make these answers plausible. There may be a number of reasons for reading Helmholtz's contributions—for example, to appreciate the man as a scientist or to gain historical perspective for many problems that are still being actively investigated. For many readers these reasons may spell past history, and in an era of rapid advancement our impatience and urge to move ahead have created an atmosphere in which such reading is frequently perceived as a luxury for all except the historian.

One hopes that what this volume will do is stimulate some readers to go back to Helmholtz's major works and read, not for history or biography, but for ideas and for an approach to the subject matter. Such readers need hardly be warned that much of the factual material has been enlarged upon in a substantial way. What they can be promised, however, is a discovery that understanding of a surprising number of problems discussed by Helmholtz has been little advanced in the intervening decades. In addition, much can be learned by all of us in following the reasoning and ingenuity of a man, competent as a physicist and physiologist, as he attacks sensory and perceptual problems.

Allowing for the size and the purpose of the present volume, the choice of material is excellent. It would be extremely difficult to select a portion of the three volumes of *Physiological Optics* and do justice either to Helmholtz's contributions or to his mode of thinking. The presentation of a popular article written shortly after he had completed this work allows Helmholtz to represent himself. This is done in the chapter on "The recent progress of the theory of vision." An almost analogous situation holds with respect to Helmholtz's monograph *Sensations of Tone* and the contribution in this volume entitled "On the physiological causes of harmony in music"; in this case, however, the popular writing proceeded, and provided a preview of, the longer and more detailed monograph. In all, six contributions are presented, and the comments by the editors, as well as their brief review of Helmholtz's life, help to round out the volume.

Two of the contributions appear for the first time in English: "The facts of perception" and "The origin of the correct interpretation of our sensory impressions." In both of these, and particularly in the former, we find Helmholtz's strongest arguments for the empiricist position in perception and his involvement in the nativism-empiricism debate of the 19th century.

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