tions have occupied stratigraphers for more than a century. Almost from the beginning, even before radioactivity was discovered, there was a great urge to put numbers on the stratigraphic table and thereby to endow the table with meaning in absolute time. The task turns out to be most difficult, but that has not damped the enthusiasm. Few things in geology are read so avidly as a paper on the time scale, and "Time Scale" on the program of a geologic meeting is sure to pack any hall. These must have been the thoughts that prompted the Geological Society of London to organize the symposium on the Phanerozoic time scale.

Its product is an impressive-looking, handsomely printed book, consisting of a foreword, 22 articles, and a long list of data. Among the papers, I found a scholarly review of the history of the time-scale concept by L. R. Wager, a concise summary of the rubidium-strontium method of age determination by Stephen Moorbath, and a calmly incisive analysis of the problems of potassium-argon dating of sedimentary rocks by Halfdan Baadsgaard and M. H. Dodson. In a group of stratigraphic papers, B. M. Funnell gives a detailed chronology for the Tertiary period, E. H. Francis and A. W. Woodland present fresh conclusions relating to the Carboniferous period, and H. B. Whittington and Alwyn Williams critically reexamine the definition of the Ordovician period. The rest of the stratigraphers either admit that the information at their disposal is inadequate or struggle on without saying it.

Almost half the book (193 pages) is devoted to an annotated list of nuclear age determinations which the editors deemed pertinent to the time scale. It is love's labor lost. The list is arranged in "the order in which the original abstracts were received by the editors," which makes the first few items Devonian, then some Permian, followed by Triassic, Paleocene, Permian again, and so on. Included is a profusion of now discredited interpretations, such as the uranium-lead "ages" of Colorado pitchblendes, the Swedish kolm, and the Chattanooga shale; potassium-argon results on sylvite, old glauconite, and illite; and even the ill-fated single-shot lead-alpha "age" of the Martinsburg bentonite. Apparently the editors overlooked the basic lead-alpha paper by H. Rose and T. W. Stern (*American Mineralogist*, 1960) and chose to disregard the good advice given by Baadsgaard, Dodson, and Moorbath in this very volume. The data, and in fact the whole book, are steeped in a jumble of multiple decay constants. In an effort to cope with the chaos, the editors invented a complex symbology which only furthers the muddle.

Owing to the magic of its title, the book is likely to sell to a large market, and many geologists will have the satisfaction of finding in it numbers that suit them. In that sense it is a contribution, if only to comfort. To those who join me in my long-standing admiration for Arthur Holmes, I would suggest reading his newly rewritten *Principles of Physical Geology* (Nelson, London, 1964). It is a masterpiece of geologic writing.

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Radioactive Isotopes

Radiotracer Methodology in Biological Science. C. H. Wang and David L. Willis. Prentice-Hall, Englewood Cliffs, N.J., 1965. xviii + 382 pp. Illus. $16.

The vast accumulation of knowledge in the biological sciences during the past two decades has been made possible, in large measure, by the availability of radioactive isotopes. Although various aspects of radiotracer technique have been treated in textbooks, review articles, and symposia, no single volume has treated all facets of this powerful research tool. The need for such a work has now been fulfilled by Wang and Willis in their book *Radiotracer Methodology in Biological Science.*

The work owes its quality, in no small degree, to the special training that each author has had; Wang has long been active in the field of tracer methods and Willis in vertebrate biology, appropriate ingredients for a treatise of this kind.

For a scientific text, this book is unusually well written; by the use of well-chosen words and a style that is compact and clear, the authors have avoided the dull repetitiousness often encountered in scientific publications. The scope of subject is especially wide, and it is treated in great depth. A section is devoted to theoretical principles of radioactivity, another to description and theory of all practicable methods of measurement with most emphasis appropriately on liquid scintillation counting, statistical analysis of counting data, health hazards in the handling of radioisotopes, radiotracer laboratory design, experiments in radiotracer techniques, and other useful information. Each chapter is well documented with abundant bibliography, and, where applicable, chapter material is illustrated with mathematical problems.

One application of liquid scintillation counting of which no mention could be found, possibly owing to its late advent in the literature, is the use of Čerenkov radiation in measuring high-energy nuclides such as sodium-24 and phosphorus-32 where aqueous systems can be counted without contamination by fluor.

Although the book is generally well organized, the inclusion of operational directions for various counting systems in the experimental chapters seems arbitrary because such manipulation is not actually experimental. Similarly, the statistical experiment could have been combined with analysis of data.

Except for a single miscaptioned figure (6–7), the format is excellent. A statement to the contrary notwithstanding, the old style of isotope designation with superscript following symbol persists in several diagrams.

The overall impression that I gained from reading this book is that the biological scientist at any level of training and experience has at hand, in this volume, a valuable and an essentially completely up-to-date source of information in radiotracer methodology.

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Geologic History

Geological History of Western Canada. R. G. McCrossan, R. P. Glaister, Grey H. Austin, and S. J. Nelson, Eds. Alberta Society of Petroleum Geologists, Calgary, Canada, 1965. x + 232 pp. Illus. $25.

This book is a magnificent cooperative achievement. Forty-four authors —mostly from oil companies but including a number of contributors from universities, the Geological Survey of Canada, the research councils of Alberta and Saskatchewan, and independent geologists—have cooperated to