data on independent variables, e.g., permeability or porosity distributions, then a major step will have been taken towards getting the types of information sorely needed by the scientific hydrologist.

The book presents a number of articles dealing with test methods for obtaining and, perhaps more importantly, interpreting results to get information on some of the above-mentioned soil parameters; more work of this type is needed. Also, worthwhile presentations are included on the application of specific radioisotopes and desirable characteristics for tracing. There is, however, a general lack of supporting analysis needed for rational interpretation of tracer results and the setting of error bounds in the cases of measuring large discharges of water.

R. William Nelson

Battelle-Northwest Laboratory
P.O. Box 999
Richland, Washington

Received November 19, 1965

About the Reviewer: Mr. Nelson is presently a senior research scientist with the Pacific Northwest Laboratories of the Battelle Memorial Institute with particular interest in the mathematical description of flow in heterogeneous porous media and its application to the solution of natural flow systems involved in ground-water management, petroleum engineering, and nuclear waste disposal. Prior to his association with BMI, he was with the General Electric Company at Hanford and, earlier, with the U. S. Department of Agriculture. His academic training was at Colorado State University and at the University of Idaho.

Plutonium. By M. Taube, translated by E. Lepa and Z. Nanowski. The MacMillan Company, New York (1964), 258 pages. $8.50.

This is a recent translation of a Polish book originally published in 1964. The blurb inside the jacket of the book states, "This book deals comprehensively with the properties of plutonium, its technical background and its application to nuclear research and practical use." I disagree with the term "comprehensive" since, with the exception of aqueous chemistry and processing technology, the various topics are treated in a rather superficial manner. The reader who is engaged in the plutonium field will not find this book especially useful. However, for someone interested in a broad descriptive review of separation techniques, processing procedures, and ways in which plutonium may be utilized in reactors, the book will provide ample return for the time spent in its perusal. The book, which contains several hundred references and reads like a novel, can be finished in a few hours.

The work is divided into six chapters. The first chapter begins with a brief history of plutonium discovery and production methods. The nuclear chemistry of plutonium is then treated in an elementary manner but adequately enough to familiarize the reader with the subject. The section is concluded with a treatment of the fission process and fission product yield from both fast and thermal neutron spectra.

Chapter 3 deals with the chemical properties of plutonium and plutonium compounds. There is little discussion (other than acknowledging their existence) of metallic plutonium, alloy systems, or refractory compounds such as PuO_2 or PuC. On the other hand, considerable treatment is given to the aqueous chemistry of plutonium. Some of the subjects discussed are plutonium compounds in aqueous solution, oxidizing-reducing reactions, complex compounds in aqueous medium, hydrolysis, ion-exchange, etc. The part of this chapter on aqueous chemistry is the most detailed of the book.

Chapter 2 is devoted to the physiological effects and health physics aspects of plutonium. The author discusses plutonium and its alloys as sources of alpha, gamma, and neutron radiations, and then describes the effects of these radiations on the human body. The chapter is concluded with sections on prophylaxis, therapy, and general work rules for use in plutonium laboratories.

The longest chapter, Chapter 4, is entitled "Plutonium Technology." The author has defined "plutonium technology" as being that segment of engineering associated with processing plutonium from its formation into forms suitable for use as nuclear reactor fuel. A title more meaningful to Western readers would be "Plutonium Processing Technology." As in Chapter 2, rather detailed descriptions are given techniques involving aqueous chemistry. This chapter has a rather large number of flow charts and covers nearly every processing technique in use today.

Chapter 5 deals with plutonium as a nuclear fuel in both fast and thermal reactor systems. This chapter contains much that is elementary, such as sections on neutron capture, moderation, and the definition of breeding ratio. The important subject of irradiation performance is given only one-half page. Next, the reasons why plutonium is favored for fast reactor systems, rather than for thermal systems, are discussed and the chapter is concluded by predicting that plutonium will be the principle fuel of the future.

The author ends his book with Chapter 6 in which he tries to predict the future role of plutonium in the timetable of nuclear power development. The worth of this chapter is severely reduced in that the economic aspects of his arguments are based on pre-1962 cost analyses. Since that time, the economics of nuclear power plants have changed drastically, and consequently, this treatment is of interest only for its historical value.

Louis D. Kirkbride

University of California
Los Alamos Scientific Lab.
Los Alamos, New Mexico 87544

Received December 21, 1965

About the Reviewer: Louis D. Kirkbride is Group Leader of the Materials Research and Development Group of the Power Reactor Division of Los Alamos Scientific Laboratory. His current interests are associated with the behavior of plutonium, sodium, and refractory metals in reactor environment. Recent research has been concerned with grain-boundary phenomena in tantalum alloys, principally with solute-plutonium interactions in grain-boundary diffusion processes. Prior to joining Los Alamos in 1961, he was connected with Knolls Atomic Power Laboratory, Schenectady, New York, where he was Manager, DIG Fuel Element Materials in the Nuclear Core Operation of the Laboratory. He received his education at Carnegie Institute of Technology where he was granted a MS and PhD (Metallurgical Engineering) in 1957.