

of small sedentary communities," and "The beginnings of town life." In considering the later part of the record attributable to the Mogollon people, Martin looks beyond the usual cultural residue of archeology to seek inferences of a more sociological nature.

The booklet is handsomely illustrated. Martin has used well-selected pictures taken in the field, photographs of specimens, and drawings that show the function of what otherwise would be only curiosities.

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### **Tools for Machine Literature Searching.**

Semantic code dictionary, equipment, procedures. J. W. Perry and Allen Kent, Eds. Interscience, New York, 1958. xviii + 972 pp. Illus. \$27.50.

In the words of its authors, "This book presents the . . . status of a research program initiated over ten years ago with the purpose of formulating methods to apply existing—or anticipated—developments in electronics to providing ready access to information stored in extensive collections of documents." Although bound in a single volume, *Tools for Machine Literature Searching* is not one but two books. The first 600 pages are textual in nature. They are in effect a compilation of reports on the activities of personnel at the Western Reserve University Center for Documentation and Communication Research in the field of information storage and retrieval.

Among these discussions is an extremely lucid and interesting chapter by John L. Melton, entitled "The semantic code." The purpose of this chapter is to explain the purpose and workings of semantic codes as a form of standardized language which can be used for the definite and consistent identification of concepts that is necessary in information storage and retrieval systems which utilize machines with limited logical capabilities. The chapter is followed by three tables of "semantic factors," which are the building blocks upon which semantic coding is based. In Melton's chapter and the tables that follow it, the reader is given a very fine (perhaps the best extant) explanation of the rationale that led to the development of the semantic code. The reader can also grasp quite easily from Melton's contribution the detailed workings of semantic codes and semantic factors. The chapter does not settle the very basic question of whether a universal machine language is really possible, or desirable if possible; but it does at least show the reader what one example of such a language looks like and how it works.

This being the case, one is led to wonder about the purpose of the second half (or section) of the book, which is a semantic code dictionary occupying 364 pages. Can it be that the authors assume that everyone who buys the book will want to make use of the semantic code dictionary? This would seem very unlikely at the present stage of mechanical storage and retrieval of information. Presumably most readers of the book will use it as a source of background information on machine codes and coding. The Melton chapter would seem to serve this background function nobly.

In view of this, the inclusion of the entire semantic code dictionary seems a rather unfair "tie-in" sale. It makes the book needlessly bulky and expensive. The authors themselves seem to argue against the inclusion of the semantic code dictionary in the present volume: "For those readers who plan to make extensive use of the code dictionary . . . it is suggested that arrangements be made with the Center for Documentation and Communication Research . . . to use the latest edition of the . . . dictionary. *It should be kept in mind that the code dictionary is being continually expanded by inclusion of new terms*" (italics mine). In view of this, it seems unfortunate that the authors did not see fit to issue the code dictionary as a separate publication in a readily expandable (perhaps loose-leaf) form.

Another source of bulk and annoyance is the fact that, although "this book was not written for the novice in the documentation field," chapter after chapter is given to relatively elementary considerations, and much of the material in these chapters is reprinted from common documentation periodicals which any advanced worker in the field is bound to read regularly. Is this publishing and republishing of essentially the same thing not glutting the literature with sources of the information that the authors seek to codify? The authors have contributed many profound and important writings to the literature of documentation, but the repetition of these writings before the same audience will not increase their usefulness. It will merely frustrate this audience by forcing it to wade through more and more literature in the vain hope that something new has been added.

There are, happily, parts of the present book that have not been published before, to my knowledge. These come mainly from the pens of John L. Melton and Jessica Melton, who, in my opinion, "carry" the book. In addition to the very fine chapter by John Melton on semantic codes, there is a well-written, informative chapter by Jessica Melton, entitled, "Procedures for preparation of abstracts for encoding." This chapter takes the reader quickly and clearly through the

basic problems and procedures involved in the process of converting the conventional prose of the scientific and technical abstract into the specialized language of the machine. The author wisely limits herself to abstracts in a single field, metallurgy. By doing so, she is able to present her exposition in the form of a case study—an excellent means of conveying relatively complex ideas. It would perhaps have been better from the viewpoint of the reader if the chapter by John Melton which lays the groundwork of codes and coding had preceded rather than followed the chapter by Jessica Melton, which constitutes a specific example. But, in any event, both chapters are well worth reading.

Similarly, there are a number of new and worth-while chapters dealing with other phases of machine processing of information. Notable among these is one entitled, "Automatic encoding for machine searching," in which procedures by which machines are made to recognize conventional words and convert them into machine language are outlined. This discussion is extended (again by the Meltons) in a chapter dealing with, first, the conversion by machine of foreign words into machine words and, second, the reconstitution of these machine words into English words. In view of the expanding interest in the use of foreign-language information, this chapter is very timely and useful.

From the foregoing sampling, it should be clear that there is a good deal of worth-while material in *Tools for Machine Literature Searching*. Much of this material is perhaps the most definitive in its field to date. It is unfortunate that the impact of this material is dulled somewhat by its surroundings.

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**Voice across the Sea.** Arthur C. Clarke. Harper, New York, 1958. xiii + 208 pp. Illus. \$3.75.

The problem of communicating by electricity has been relatively well solved in the past hundred years. How this was done is a fascinating story to those who are acquainted with the technical details, but it is a difficult one to narrate because of the rather specialized problems involved. Arthur C. Clarke, however, has not only told the story accurately, as those familiar with it can testify, but has made it intelligible and interesting, as those unacquainted with it will discover.

This is not to say that *Voice Across the Sea* is a scholarly monograph in the history of technology. The author himself points out that his purpose is to en-

tain. There are occasional points one might quibble about, but these tend to lie on the fringe of the story and do not interfere with the main tale: how man learned to convey written and spoken intelligence underneath the ocean by electrical means.

Two main incidents are described: how the first telegraph cables were deposited on the bed of the Atlantic Ocean and how the first telephone cables were designed and laid there almost a century later. The first incident is one of determination and physical adventure and how problems were solved in the infancy of electrical technology, while the second is more about intellectual adventure and skill and how the problems were solved once the engineer had mastered the theoretical means. Although one would expect the author to fall between the two extremes of theory and adventure, his light, racy description, filled with the human-interest details of modern journalism, tends to keep the reader's interest throughout. Clarke's ability to seize the main features of the technical problem and to present them in familiar but not too superficial terms contributes much to his breezy style. The numerous illustrations add to the interest of the book.

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**Survey of Raw Material Resources.** vol. 2 of *Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy*. United Nations, Geneva, Switzerland, 1958 (order from Columbia University Press, New York). x+843 pp. Illus. \$18.50.

This is volume 2 of an extraordinary series of papers (published in 33 volumes) that represent the scientific presentations at the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. At the first conference, held in 1955, there were only three technical sessions. At the second conference, in 1958, the number of papers presented had almost doubled. The editorial committee is to be congratulated not only upon the speed with which it published the results but also upon the excellent organization of the material.

Volume 2, entitled simply *Survey of Raw Material Resources*, actually goes far beyond this subject and thus differs considerably from the comparable volume published after the first conference (No. 6, *Geology of Uranium and Thorium*). This earlier volume was indeed concerned primarily with the descriptive geology of radioactive mineral de-

posits. In contrast, the new volume is concerned not only with the mineralogy and geology of such deposits but also with prospecting techniques, geochemistry, age determination methods, isotope composition, and genesis. The work contains 102 papers, grouped in the following categories: raw material supplies (17 papers) (session E-5); geochemistry (session E-7b), including geochemical prospecting (15 papers) and isotopic composition and age determination (9 papers); and mineralogy, geology, and prospecting (session E-9), including mineralogy and genesis of deposits (21 papers), geology of deposits (30 papers), and prospecting (10 papers).

Another contrast lies in the better organization of the material in the new volume, and yet another, in the greater number of papers from countries other than the United States that have been included. Volume 6 of the first series included 117 papers, of which 88 were by scientists from the United States. In this new work, only 30 of the papers are presentations by geologists from the United States. This reflects the gratifying increase in scientific investigation outside the United States of radioactive mineral deposits and also the increasing willingness of the various governments to allow their nationals to present the results of their research.

One further contrast lies in the great increase in the number of papers from the U.S.S.R. Unfortunately the policy of the Soviet Union with respect to revealing locations of deposits remains unaltered. In one of the longer Soviet articles ("Paragenetic associations of hydrothermal uranium minerals in uranium deposits of the Soviet Union," by A. I. Tishkin, G. A. Tananayeva, G. D. Gladishev, I. V. Melnikov, V. A. Polikarpova, and M. S. Tsiulskaya) a great variety of uraniferous mineral associations are described in detail, yet not for a single one is a specific locality cited as an example. This indicates continuation of the unfortunate policy that first became evident in two previously published monographs on Soviet uranium mineralogy [see *Am. Mineralogist* **43**, 378 (1958)].

Although this volume is concerned primarily with uranium and thorium, it also contains papers on other metals of importance to the atomic energy industry—namely, zirconium, rare-earth elements, and beryllium. Another group of papers deals with geochemical problems that are related only incidentally to the geochemistry of radioactive elements. For example, there is a paper entitled "Some geochemical determinations using radioactive and stable isotopes," by A. A. Smales, D. Mapper, J. W. Morgan, R. K. Webster, and A. J. Wood; another, by A. P. Vinogradov, entitled "Meteorites and the earth's crust"; and

a third, by J. R. Merrill, M. Honda, and J. R. Arnold, called "Beryllium geochemistry and beryllium-10 age determination." This all too brief sampling is intended merely to show that the scope of this volume far exceeds that of its earlier counterpart and that scientists are increasingly directing some of their attention to more fundamental problems of "radioactive" geology.

The work is monumental in scope, and all serious students of radioactive mineral deposits will benefit greatly from a careful study of the numerous papers. Even those geologists who are not directly concerned with uranium and thorium geology will find this book a valuable addition to the modern literature on mineralogy, geochemistry, and prospecting.

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**The Enzymes.** vol. 1. Kinetics, thermodynamics, mechanism, basic properties. Paul D. Boyer, Henry Lardy, and Karl Myrback. Academic Press, New York, ed. 2, 1959. \$24.

This first volume of a new edition of *The Enzymes* is concerned primarily with the kinetics, thermodynamics, and mechanism of enzyme reactions. Molecular aspects of enzymology are stressed to a greater extent than metabolic functions and relationships. It is most appropriate that a book which closely relates protein chemistry to the mechanism of enzyme action should begin with a moving tribute to the late James B. Sumner, an editor of the previous edition of this monumental treatise, whose experimental ingenuity and scientific courage did so much to establish the protein nature of enzymes.

Although there is considerable overlap in subject matter between many of the chapters, each is written from a unique standpoint, and they complement each other admirably. All of the 20 authors have made outstanding contributions to their respective fields. The first three chapters deal with enzyme kinetics. Rufus Lumry then contributes a very stimulating discussion which relates the thermodynamics of enzyme reactions to the peculiar catalytic properties of proteins. Five chapters on various physicochemical aspects of enzyme mechanisms follow; one of these chapters (that by F. H. Westheimer) is a superb account of enzyme models. The next three chapters consider the structural features of the protein moieties of enzymes which determine the binding of substrates and inhibitors. The volume concludes with a comprehensive review of enzyme induction (by M. R. Pollock)