discuss in considerable depth various aspects of the production and use of liquid helium. The chapter on helium resources, production, and conservation by William Deaton and Paul Mullins, of the Bureau of Mines, is indeed a mine of information for the general reader. The roles of the U.S. government and private industry in the history of helium production provide perhaps a classic example of government pioneering followed by the emergence of industrial interest as a result of national demand. The last two chapters, on cryoelectronics and applications, are less extensive and aim to give the general engineering reader some idea of the scope, use, and possible areas of future development of cryoelectronic devices.

This monograph serves as an excellent source document on helium technology in all areas other than those associated with the present-day use of liquid helium in the low-temperature research laboratory. There is no mention of the technology associated with the temperature range below the helium boiling point (approximately 4.2°K), of superfluidity, of liquid He^3, or of the rapidly emerging millidegree technology associated with He^3-He^4 mixtures. Considering the remarkable strides taken in the development of a liquid-helium technology over the past 20 years, it is surely not too fanciful to expect a similar development with respect to the technology associated with the temperature range below 4.2°K. Perhaps in 20 years' time, or less, this development will form the basis of a new source document on helium technology in this NBS monograph series.

MAX LIPSICAS
Department of Chemistry,
Belfer Graduate School of Science,
Yeshiva University, New York City

Ethnic Artwork

Southwest Indian Craft Arts. CLARA LEE TANNER. University of Arizona Press, Tucson, 1968. 206 pp., illus. $15.

This is a book for laymen and specialists alike, by an authority on the handicrafts of two dozen or more ethnic groups throughout southwestern United States. By words, drawings, and selected photographs it depicts pottery, basket and textile weaving, and the manufacture of personal ornaments as family activities from remote times. It shows, too, how techniques find a way from tribe to tribe.

Author of the informative and popular *Southwest Indian Painting*, published in 1957, Tanner knows her subject in its every detail. A member of the anthropology faculty of the University of Arizona for 40 years, she has traveled throughout Arizona, New Mexico, and bordering states, finding her informants in their own homes and brush shelters, surrounded by their families, young and old. Her information is abundant and richly illustrated with superb photographs and analytical drawings that portray in the clearest manner methods of manufacture and differences in decoration within a single tribe and from one group to another.

The author has been particularly successful, in this reviewer's opinion, in depicting craft changes that have taken place within the last two generations. This presentation is especially important for those ethnologists who study culture in all its ups and downs. Old styles, methods, and materials have been abandoned or forgotten. Fluctuating tourist demands are often blamed, although this fact is not emphasized in the present volume. Navajo weaving and silversmithing, for example, have changed to keep pace with the whims of retail buying. Double, two-faced, and "tufted" blankets are rarely woven today. Each area of production has its own distinctive patterns; full-width designs have been replaced by those with borders, and the so-called "ceremonial" or *yei* blanket has become increasingly popular for its decorative qualities. Efforts to revive vegetal dyes have been generally unsuccessful. Like his white counterpart, the Indian craftsman wants a quick turnover and a quick sale.

So, too, with basketry and pottery. Guided by drawings showing every twist and turn and by unusually clear photographs, the reader will have little difficulty in distinguishing between Apache and Navajo basketry, for example, or between the wickerwork of Hopi weavers and their Pueblo relatives from the Rio Grande. Likewise, superb illustrations and knowing descriptions trace the evolution of earthenware products from the regional wares of pre-Spanish times to those of the present. Here design form and method distinguish the products even of neighboring villages. Here, too, fancies of the passing tourist are evidenced in some localities more than in others.

Silversmithing, presumably introduced from Mexico in about 1800 and immediately adopted by the Navajos, has more recently spread to other tribes. The Zuñi, for one, have been exceptionally alert to commercial possibilities and now offer bracelets, rings, and necklaces of clustered and minute machine-ground turquoise they purchase by the quart.

Altogether, Tanner has produced in the present volume a work of lasting value. And this reviewer, for one, also applauds the University of Arizona Press for a magnificent job of printing.

NEIL M. JUDD
1423 Highland Drive,
Silver Spring, Maryland

High Polymers

Characterization of Macromolecular Structure. Proceedings of a conference, Warrenton, Va., 1967. National Academy of Sciences, Washington, D.C., 1968. x + 410 pp., illus. $15. NAS Publication No. 1573.

The papers in this volume were presented at a three-day conference concerned primarily with methods of polymer characterization that are applicable to a variety of macromolecules and that can be used on commercially available instruments. No attempt was made to cover the entire field of polymer characterization. The volume includes both reviews of previous work and short notes on current work. If any discussions took place, they have been omitted.

The subjects covered include molecular-weight determinations by ebulliometry, membrane osmometry, light scattering, small-angle x-ray scattering, and sedimentation-equilibrium experiments. Papers by Coll and Stross and by Elias provide excellent reviews of the latest developments and problems in membrane osmometry. The separation of macromolecules according to size or shape and the determination of molecular weight distribution are well covered. A critical review of solubility phenomena is given by Allen. Fractionation techniques are also discussed, and Moore's short, concise review of gel-permeation chromatography is well written and well referenced. Part of the proceedings covers the characterization of polymers by transport phenomena such as vapor-phase osmometry as well as the determination of

molecular weight distribution by sedimentation transport. The characterization of branched and crosslinked macromolecules is reviewed and analyzed briefly and lucidly in papers by Graessley and by Shultz.

Most of the papers are well referenced, and the quality of the writing is uniform. There is no subject index, however, and the lack of experimental details in a number of the papers on current work further reduces the value of the book.

WILLIAM C. FEIST
Forest Products Laboratory,
U.S. Department of Agriculture,
Madison, Wisconsin

Blood Flow

Rheology of the Circulation. R. L. WHITMORE. Pergamon, New York, 1968. xii + 196 pp., illus. $9.

The breadth of the subject matter of Whitmore's short monograph is considerable, spanning a distance from Kelvin-Voigt solids and other mechanical models all the way to blood chemistry and fluid mechanics in complex geometries. Comprehensiveness of treatment, however, has limited the depth of technical discussion to significant highlights and results, with frequent reference being made in the text to entries in the excellent list of more than 450 books and journal articles given as a bibliography. This is consistent with the intent, as stated in the preface, of providing a guide for nonrheologists, enabling them "to interpret the biophysics of the circulation in modern terms." For the reader with scant background in the life sciences, an outline of cardiovascular anatomy and physiology is provided. Although the range of the book is broad, the unifying theme of the implications of blood rheology for the cardiovascular system is emphasized throughout.

As is noted in the concluding chapter, a complete exposition of circulatory rheology seems very remote at present, and much of our current knowledge is tentative. In many instances, reports of conflicting experimental data make conclusions impossible to draw—for example, under what circumstances is blood plasma Newtonian, and when is it not? Whitmore is eminently fair in giving equal time to the work of researchers whose results appear to be in conflict, but at the same time he does little to resolve issues. This comparison of conflicting results brings home clearly the need for further research. For example, very little headway has been made so far toward clarification of our understanding of the rheology of blood flow in complex geometries or under pathological conditions. In addition, although the probable importance of various types of red cell aggregates is apparent, present understanding of the effects of particle-particle interactions on flow characteristics is insufficient to permit real insight.

Inasmuch as the author aims at the nonrheologist, and in particular the life scientist, it would be well to note that some confusion may result from the somewhat careless treatment given to some physical concepts, such as force, force per unit length, and stress, in the first chapter. Many of the freehand illustrations would have benefited from the use of drafting instruments and are not really acceptable in their present form. However, these two criticisms do not seriously detract from an overall impression that Whitmore has done an admirable job in selecting and condensing much of the pertinent literature of the past decade into a brief, worthwhile synopsis.

MICHAEL H. WEISSMAN
Biotechnology Program,
Carnegie-Mellon University,
Pittsburgh, Pennsylvania

Books Received

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