

BOOK REVIEWS

Water Inventory of the Muskingum River Basin and Adjacent Ohio River Tributaries. Ohio Division of Water Intentry Report No. 21, Ohio Department of Natural Resources, Columbus, Ohio. 1969. 201 p. \$5.00.

This, the latest of the series of river-basin inventory reports by the Ohio Division of Water, is a very thick (201 pages, with 41 tables and 44 plates), complete report on the present water supply and demands, and future management needs in the Muskingum River Basin. The Muskingum River Basin, which includes about one fifth of the area of the state, has long been recognized for the accomplishments, by the Muskingum Conservancy District, of flood management and water conservation. This report recognizes these programs, but concludes that additional flood control in the tributary streams and further development of the potential for water recreation in the entire basin should be considered.

The present overall water supply is considered to be adequate to meet the three-fold increase in demand expected by the year 2000. There are also proposals for surface reservoirs for 39 communities and other ground-water developments for 112 communities to meet growing needs. Pollution abatement will require additional sewage-treatment facilities and stream-flow regulation. The high chloride content in the Tuscarawas River, and to a lesser degree in the Muskingum, is discussed at some length in the report. The reduction of this chloride contamination will be necessary to insure the future utility of the waters of these two large streams.

The report contains exhaustive data on the nature of the water throughout the basin, which will serve as basic data in the preparation of the Ohio State Water Plan which is now in preparation. Water-supply and sewerage engineers, as well as planning agencies in the basin, will find this report a valuable reference work. In addition, geologists and biologists concerned with streams and aquatic environments will profit by this publication.

OHIO DIVISION OF WATER

Minerals and Man. *Cornelius S. Hurlbut, Jr.* Random House, Inc., New York, 1968. 304 p. \$15.00.

To some people minerals are gemstones, to others part of an obscure science, to many just the raw materials of automobiles, but to everyone they ought to be objects of interest and often of exquisite beauty. This book by Hurlbut puts minerals and man's dependence on them in a new perspective for both the professional and the layman.

There are excellent chapters for the layman on the nature of minerals and the physical properties used for their identification, and the classification and description of the major rock types found at the earth's surface. The remaining and major part of the book is devoted to various minerals and mineral groups which are important in the history of man's exploitation of the earth, from the precious stones which have been used, from time immemorial, for human adornment, to the uranium minerals, which are very much part of modern technology. The remarkable collection of minerals at Franklin, New Jersey, jade carvings from China and other ornamental stones like lapis lazuli, the strikingly colored azurite and malachite, these and many more are described, together with much additional fascinating information. To the layman, the text will be both lucid and entertaining, as well as providing an excellent introduction to minerals; to the professional, it will be a source of information hard to acquire from more formal books. The outstanding feature of the book is the superb collection of photographs, three quarters of them in color.

This is not a comprehensive textbook, but an account of minerals and man's dependence on them, a beautifully produced book that will be attractive to the professional and will surely awaken the interest of the layman.

DAVID ELLIOT

The Collected Works of Count Rumford, Vol. II, Practical Applications of Heat. *Sanborn C. Brown*, Editor. The Belknap Press of Harvard University Press, Cambridge, Mass. 1969. x+523 p. \$10.00.

Part of the joy of the historian of science and the scientist, alike, comes from those moments when he can survey the happy interplay of theory, experiment, and, perhaps, even practical application of experimental results. *The Collected Works of Count Rumford*, of which we now have the second volume, provides us with such an opportunity. Rumford, before the turn of the

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nineteenth century, felt uneasy over what was almost the universal acceptance of heat as *caloric*, a fluid substance. The first volume of this collection showed us some of the experiments that Rumford designed to demonstrate the nature of heat, and how his results helped to bolster his conviction that a fluid, *caloric*, could not account for what he had observed. It was in the course of this work that he discovered convection currents. But Rumford was not content solely with such demonstrations. Basing further work on his firm theoretical position, he went on to show how chimneys could be properly constructed to minimize heat loss and, especially, not to smoke, and how cooking vessels should be best designed, and of what materials, to make the transfer of heat most efficient. (In all of this it should be pointed out that a perverse logician could show that his arguments up to this point could have been used equally well by a fluid calorist.) He had also to consider the efficiency of fuels—leading to the design of the combustion calorimeter—and the most favorable design for ovens and cooking stoves. To clinch further his theoretical position on the non-fluid character of heat, he studied the density of water, and its variation with temperature. Obviously, were *caloric* a fluid, the application of it should always expand a substance, yet, when water is above the freezing point (Rumford says near 5° C), its density is at a maximum, and therefore, it cannot contain a further fluid.

As in the first volume, Editor Brown has supplied an index to these 18 papers and given their sources in the section "Facts of Publication." It is possible to argue that the division of papers between the first and second volumes is arbitrary—after all, the man's work was all of a piece—but such an argument is spurious, for what is required in *all* of Rumford's papers. These are promised us, and when the five volumes have been completed, together with Brown's full diagnostic analysis, the deficiencies to which some may point will doubtless be overcome.

J. Z. FULLMER

The Prehistory of the Tehuacan Valley: Volume One, Environment and Subsistence. Douglas S. Byers, General Editor. University of Texas Press, Austin, Texas, 1967. viii+331 p. \$15.00.

Rarely is it appropriate for a biologist to venture a review of a scholarly work in archeology. However, "Environment and Subsistence", the first of six volumes on the prehistory of the Tehuacan Valley in east-central Mexico, brings into sharp focus the results of several different approaches to a single problem. Under the field direction of Richard S. MacNeish, teams of archeologists, anthropologists, botanists, zoologists, geneticists, and ethnographers have all combined to produce a major investigation into the origins of new world agriculture. It is not infrequent for such collations to be diffuse and so different in form, style, and substance as to be of interest only to experts in the separate fields represented. The coherence of this volume is a tribute to the skill of the general editor, D. S. Byers.

Following an outline of the general field plan, the regional environment, climate, hydrology, and geology of the region are described. Chapters on the few skeletal remains of the people and on the fauna associated with the archaeological sites, together with carefully documented studies of the cultivated plants, provide an integrated picture of the environmental history of the people of Mexico. Nine cultural phases spanning nearly 10,000 years are recognized from stratified deposits in seven caves and numerous surface sites.

The excavations yielded almost eleven thousand animal specimens, approximately a hundred thousand plant remains, and more than a hundred human and animal coprolites. The specificity of animal hairs and plant seeds provide incontestable evidence of the diet of the early inhabitants.

Almost five thousand years ago, as many as twelve races of domesticated corn were grown by the people of this area. In addition, five species of beans, pumpkins and gourds, ground cherry (*Physalis* sp.), avocado, sapote, guava, and peanuts are described. The familiar Central American association with chili pepper (*Capsicum annuum*) has a long history, almost from the earliest evidence of agriculture activity. Fragments of cotton bolls and yarn indicate that fibers were manufactured from early agricultural times. Bone remains show that dog and turkey were domesticated.

In summary, anyone with an interest in historical biography, the development of agriculture, or the relation of man to his environment will find this volume a valuable sourcebook of data, and a remarkably stimulating combination of evidence and inference. The remaining volumes will be concerned with the nonceramic artifacts, chronology, and archeological techniques. A final summary volume will attempt to synthesize the inferences derived in the series. The virtues of a multidisciplinary approach with a central focusing agency (R. S. Peabody Foundation for Archeology) to maintain perspective is clearly apparent. It is this reviewer's hope that the interdisciplinary approach described here will be a model for subsequent investigations and that similar attention to the ecology of people will be maintained.

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