Trace Elements in Agriculture


It is not an easy task to review for one's professional associates a book published posthumously by a respected member of the group. Respect for the memory of the former associate makes it difficult to meet with the review obligation to be objectively critical. Vincent Sauchelli's book on "Trace Elements in Agriculture" was written with a definite objective stated in the preface. This objective was to provide in one place, in simple terms, information on the trace mineral requirements of plants and animals, the toxic effects caused by an excess, or disease effects induced by an insufficiency of the various trace elements for use by fertilizer field representatives and similar agricultural advisors. The book goes a long way toward meeting this objective.

In the details of the book, most soil scientists who work with trace elements will find occasional disappointments. Some of these can be traced to the fact that research in trace elements is moving so rapidly that books summarizing this work suffer from obsolescence by the time they come off the press. For example, in Sauchelli's chapter on "Selenium," the most recent reference is dated 1964. This book, however, perhaps be more useful if the progress made on the selenium problem between 1964 and the copyright date (1969) of the book had been summarized.

There are some errors that are often found in first editions; perhaps the most glaring one being the misspelling of "Bio-physiochemical" in the Table of Contents. In the chapter on "Copper," no mention is made of the dietary level of molybdenum upon the animal requirement for copper, although the relationship between molybdenum and copper is described in the chapter on "Molybdenum." The chapter on "Flourine" leaves one a bit confused over whether or not it is required by animals. A level of 2 ppm fluorine is indicated as excessive. Many researchers in this area would not be concerned about this level, and mottled but sound teeth would be more likely than the weakened teeth indicated in this book. A few of the reference footnotes are incomplete.

In spite of these generally minor errors, the book has much to recommend it. This reviewer was especially pleased with Dr. Sauchelli's denunciation of shotgun mixtures of trace elements in fertilizers. The book will, as Sauchelli hoped, be useful to many people, such as fertilizer field workers, who encounter trace element problems, but who have little opportunity to consult the voluminous and scattered literature in this field.

For this reviewer, however, the book will have a special value. It will preserve in my library a bit of the philosophy of Vincent Sauchelli. During his active career, he personally was a major bridge between the agronomist and the fertilizer chemist. This book is a plank in that bridge.--W. H. Allaway, Director, USDA Plant, Soil, & Nutrition Laboratory, Ithaca, N. Y.

Effects of Temperature and Heat on Engineering Behavior of Soils


This special report consists of three parts (I) Introduction and General Reports, (II) Thermal Characteristics of Soils, Thermodynamics of Soil Systems, Fluid Flows, and Frost Action; and (III) Temperature Effects on the Engineering Properties of Soils. Each part includes the keynote address by Dr. Hans F. Winterkorn to whom the Conference was dedicated in recognition of his 30 years of service as chairman of the Committee on Physico-Chemical Phenomena in Soils. It also contains summary reports of the papers presented. There is no question, however, but it is doubted whether the one on Part III will accomplish its purpose in view of its length. It would have been interesting to have reports on the panel discussions mentioned included in this volume.

Part II contains eight papers which deal with the more fundamental aspects of the subject matter. This section will be of most interest to the soil scientist. It is similar to Special Reports 40 "Water and Conduction in Soils" (1958), although the latter is much wider in scope.

One paper develops a "special classical thermodynamics of granular systems." Isothermal changes are assumed in the derivation of the equations of state presented. It is drawn between the temperature of a molecular system and the relative density of a granular assembly. This relatively new approach merits more study and experimental verification.

The book is of great interest to those who work on the temperature dependence of surface tension as a possible mechanism in unsaturated systems. The net pressure difference in a saturated capillary under a temperature gradient is attributed to the thermo-osmosis directed toward the warm side, thermo-self-diffusion directed toward the cold side, and Poiseuille flow directed opposite to the resultant of the first two. Poiseuille flow may reverse direction with time. A second paper on this subject points out the coupling between thermo-osmosis and electro-osmosis and suggests that the particular temperature dependence of activity coefficients of electrolytes in pure water determines the direction of thermal water flow. In another paper, a conductance equation is developed for saturated granular materials based on a series paths through the granular network, aided by the portion of the pore fluid that transfers the heat from grain to grain and a continuous path through the remainder of the fluid. Interfacial resistances in the first path are taken into account, reportedly for the first time.

The physics and chemistry of frozen soils are reported to be strongly related to the amount of unfrozen soil, which depends both on temperature and soil type.

Other papers concern the influence of temperature on the water retention and swelling of clay soils and the influence of the diurnal and seasonal soil temperature variations on the development of natural soil profiles.

Part III deals with the importance of thermal influences in soil mechanics and thermal treatment of soils for property improvement. Engineering soil properties covered are volume changes, pore pressures, compressibility, strength, elasticity, creep and stress relaxation, and swelling coupled with "salt heave". Thermal stabilization and temperature effects on pavement subgrades are also discussed. In general, temperature effects on the engineering properties of soils have practical significance only when they are radically changed by freezing or artificial heating. This may be why in this section few references are made to the soil science literature.

Of the 22 papers, exactly half are from foreign countries—three from West Germany, two each from Australia and Japan and one each from Brazil, Canada, India and Russia. The Highway Research Board is to be commended for publishing these Proceedings in the same year that the Conference was held. This attractive volume is recommended to all soil scientists interested in the thermal aspects of soil and water. C. L. Jensen, Corn Belt Soil & Water Conservation Research Division, ARS, USDA, and the University of Wisconsin, Madison.

Handbook of Geochemistry


The heart of this work is Volume II, presently 586 pages. It will eventually contain about 2,000 pages, be published in four installments, and occupy 3 or 4 loose-leaf binders. Each chapter in Volume II is devoted to a single element. Only the elements polonium, radon, radium, actinium, and proactinium...