BOOK REVIEWS, continued

Simulation of Transport Processes in Soils

The purpose of this book is to acquaint the reader with simulation as a tool for studying transfer processes in soils. Simulation languages have been developed to provide computer users with an application-oriented language that allows models to be prepared from a block diagram or a set of ordinary differential equations. These languages are particularly useful for individuals with limited programming experience but extensive technical background, deWit and his co-workers deserve credit for bringing the simulation approach to the attention of researchers in plant and soil science.

In this book, they have brought together their experience with the use of one such language, CSMP (Continuous System Modelling Program), in describing transfer processes in soils. After an introductory chapter on the general principles of transport processes in soil, there are five chapters dealing with heat, salt, and water movement in soil. In each of these five chapters the basic approach is presented first, followed by a step-by-step description of a complete simulation program. Through the simulation programs, the reader is gradually introduced to the use of many of the CSMP functions such as integrators and the various control statements.

In Chapter 2 the flow of heat in soil is presented followed by a discussion of the time constant and a listing of the integration methods available in CSMP. The chapter ends with a simulation program on the influence of a sand cover on the temperature regime of a peat soil. The third chapter deals with the movement in soil of a noninteracting salt in a linear and cylindrical fashion. In the fourth chapter, diffusion of ions is discussed and a simulation program is developed where the effects of mutual interference of ions of different sign and valency are taken into account. In Chapter 5 the transport of ions in soil by mass movement is considered, and exchange of ions on the adsorption complex is discussed.

The last chapter discusses infiltration of water in soil. A comparison is made of the effects of various methods of averaging the hydraulic conductivity of successive layers on the infiltration process. At the end of this chapter, a very short discussion is presented about the relationship between the time interval, layer thickness, and water content. It would have been helpful if a discussion had been given here of the need for using proper boundary conditions in the programs, and of the considerable numerical dispersion that may be introduced in the simulation program for mass movement of ions.

This book should be very helpful to those interested in using the simulation approach, specifically CSMP, for studying transfer processes in soils. For those who want to use CSMP in simulating other phenomena or processes, this book will be a welcome addition to the CSMP users’ manual.—R. J. WIERENGA, Professor, New Mexico State Univ., Las Cruces.

The penetrometer and soil exploration

This book will undoubtedly have greater interest for the foundation engineer than it will for the soil scientist. The author treats at some length the history and use of static and dynamic penetrometer tests in subsurface exploration. The large number of penetrometer designs, the many theories of penetrometer resistance and settlement, and the differing professional opinions will unfortunately confuse rather than assist the reader who has only a limited interest in soils engineering. The book is evidently written with the objective of making foundation engineers aware of the extensive use being made of static penetrometers in soils investigations. The detailed coverage of the many differences in penetrometer design draws attention to the need for international standardization of equipment and procedures. One would hope that the author could deal with the penetrometer in such a way as to make it more useful to both foundation engineers and soil scientists.

This contribution to applied soil mechanics shows how practical experience coupled with empirical and semimeirical relationships between test data and basic soil properties can be a valuable aid in engineering design. While Professor Sanglerat’s concern for objectivity in his presentation of the subject matter is commendable, the usefulness of the book would have been increased considerably if a more critical approach had been adopted. Most readers will quickly realize that soil mechanics remains very much an art as well as a science. A few may be disturbed by the quite large safety factors in current use and the lack of a mathematical rigor in the theories of penetrometer resistance and settlement. This state of the art reflects the complexity of the problem to be solved, on imperfect knowledge of the mechanical properties of soils, and the ability of the experienced engineer to make sound decisions based on seemingly crude methods of field investigation.

The fact that penetrometer resistance is shown to be dependent on cohesion and the angle of internal friction in chapters 3 and 9 and is then correlated with settlement in chapter 11 may mislead some soil scientists into thinking that studies of penetrometer resistance alone will provide satisfactory estimates of soil cohesion, angle of internal friction, and soil compressibility. These estimates are, however, markedly affected by soil type and initial soil condition and should be used only when the errors associated with such estimates are fully appreciated. There is nevertheless considerable scope for using the static penetrometer in field investigations of the properties of subsurfaces where variability and soil sampling difficulties make more sophisticated laboratory methods impractical or too expensive.

The brief treatment afforded the effect of rate of penetration on point resistance will have only passing interest for the soil scientist. The rates of penetration used in the engineering studies reported in Chapter 10 are several orders of magnitude greater than the rates used in simulation studies of root growth in compacted soils.

Although this book contains little information that is of immediate relevance to the work of the soil scientist concerned with soil mechanics in agriculture the potential value of the penetrometer as an aid in field investigations should not be underestimated. Scientists concerned with land stability, the growth of gullies, and soil compaction could profitably explore the merits of the static penetrometer in the identification of field problems and in the in-situ characterization of the mechanical properties of soils.—DAVID A. FARRELL, Formerly Soil Scientist ARS-USDA and Professor of Soil Science, University of Minnesota, St. Paul, now Research Scientist, Division of Soils, CSIRO, Adelaide, Australia.

The Quantitative Analysis of Plant Growth
Volume 1—Studies in Ecology

This is a very British book concerned chiefly with growth analysis, the almost uniquely British approach to the quantitative study of plant growth. It is written primarily for "ecologists and others interested in obtaining quantitative solutions to problems involving plants growing in natural or semi-natural conditions." The author addresses it "to those with little or no biological training" and throughout the book adheres to his announced intention to keep the book "striped as far as possible of jargon and technical terms."

The first four chapters of the book deal with definitions and an introduction to the general nature of plants as experimental subjects. In these chapters the author tries to set the background for the more detailed discussions to follow. The next eight chapters are concerned with the problems of experimental design and the details of measuring and harvesting different plant types in various experimental environments. These chapters draw on the extensive experience of the author in teaching and supervising practical plant courses at the University of Cambridge for over 35 years. Almost anyone involved in field or greenhouse experimentation will find useful ideas and cautions in these chapters.

In addition to writing for readers with limited backgrounds, the author gives frequent attention to problems confronting those who must conduct their studies in remote locations with simple equipment. He also discusses the ethics of those ecologists studying plants growing in necessarily remote habitats as well as those working where sophisticated equipment is not available.