SOIL WATER

An Introduction to the Physical Basis of Soil Water Phenomena

By E. C. Childs. Pp. xiii+493. (Wiley: London and New York, May 1969.) 120*s*.

THE agriculturalist has his reasons for wishing the soil to be wet and the civil engineer for wishing it dry. This book is not concerned with these aspects of soil water. Scant attention is paid to the source of the soil water and only little more to the sinks where it might go. The book is devoted almost in entirety to the manner in which water is held in the soil and in which, while there, it may move.

A course of lectures to postgraduate students in the University of Cambridge School of Agriculture has provided a basis for the arrangement of subject matter, starting from the most elementary concepts and following an appropriate logical sequence to the more difficult ideas. Thus from the structure of materials in general, the book proceeds briefly to the structure of some of the minerals which form the soil and to the structure of the water that wets it. A fourth chapter is devoted to the equilibrium of particles suspended in water. Here the meaning of suspension has been stretched to include solution, permitting a miscellany of ideas, from ionic dissociation, through *p*H and osmotic pressure, to Gouy layer theory, to be presented. Mechanical analyses, Stokes law with applications, limitations, and extension to centrifugation complete a fifth chapter. A short chapter on soil pore-space defines relevant terms, suggests how quantitative measurements of porosity may be made, then introduces the important fact of a pore size distribution against a concept of textural versus structural pore space.

So far the book has followed a course in soil physics rather than in soil water: the matter presented is not irrelevant but provides a broader basis for the understanding of what follows. The measurement of soil water pressure and suction is next discussed. The author is at pains to show that soil water at all points in the system exerts pressure. Because, however, these pressures are for convenience referred to a datum of one atmosphere rather than zero, the somewhat confusing idea of suction has crept into regular usage.

With the preliminaries thus disposed of in little under one quarter of the book, the stage is set for a discussion of those aspects of soil water wherein lies Childs's real expertise. A most readable account of the hydrostatic equilibrium of water in soil includes an admirable exposition of the theory of independent domains. This provides the much needed background for those who would have followed this aspect in the learned journals. Hysteresis is discussed, typical moisture characteristics—albeit at small suctions only—are illustrated, and the effect of stability of soil structure on these is mentioned. The remaining two thirds of the book are devoted entirely to moisture movement in the aqueous phase; no reference is made to vapour assisted flow. Chapter headings for this part of the book give only the broadest outline of the subject matter. Indeed, it is tempting to write simply that it is all there, and then try to spot something that isn't. Sections are devoted to the laws of soil water movement, the hydraulic conductivity of the soil to water, movement of water in the soil profile, surface infiltration—the laws of Green and Ampt, Horton, Kostiakov and Philip are all presented—and the flow of groundwater in both steady and non-steady states: it is here that we have to acknowledge the inevitability and irregularity of rainfall.

Throughout the book, Childs has been aware of the need to reconcile the different approaches to the subject of, on the one hand, the physicist and engineer and, on the other, the biologist. Thus he has recognized that the mathematical treatments essential for the full attainment of his objects might form a serious break in continuity to a reader who does not follow them easily. Accordingly, he has adopted a praiseworthy practice of including the mathematical treatments as separate numbered notes at the ends of the chapters. This works well in the earlier part of the book, but in later sections the mathematics is almost inseparable from the descriptive text and segregation becomes somewhat arbitrary. Mathematical procedures using the Laplace transform and the Dupuit–Forchheimer approximation are discussed. The flow of groundwater to drains or ditches of varied ground patterns is considered and perhaps the most elegant if not the most useful of the solutions presented is for flow to an elliptical peripheral drain. The final chapter contains some laboratory and field methods for measuring hydraulic conductivity. An extensive bibliography, an author index and a comprehensive subject index complete the book.

The prose is readable and conveys exactly and without ambiguity what the author wishes to say. Text figures are numerous and well used. Indeed, it is not unusual to read on for several pages with a finger still marking the place of a relevant figure. There is room for this book on the shelves of any library serving those who work with soil. I would predict further that many such workers will be delighted to find a place for this book on their own shelves. One final consideration. Has modesty perhaps compelled Childs to use the terms "soil" and "water" in the book? While the boundary conditions of the problems considered do tie much of the discussion to soil systems, there is plenty to interest all who are concerned with fluid flow through porous media. J. A. CURRIE

SPECTRAL DATA

An Introduction to Practical Infra-Red Spectroscopy

By A. D. Cross and R. Alan Jones. Third edition. Pp. viii+102. (Butterworths: London, April 1969.) 20*s*.

THIS is a revision by R. A. Jones of the 1964 edition of Cross's indispensable little book, the original author being no longer active in the field. The book has grown by 18 per cent, with eight additional entries in the index (and three deletions).

In part one, the sections dealing with the elementary theory and uses of infrared spectroscopy remain unchanged, and there is very little change in the section on instrumentation. I wish, however, that this part had been as carefully revised as later parts. For example, on page 17 it is said that "low cost instruments commonly have scales which are linear in wavelength rather than in wavenumber"; and on page 37 that "filters *may* be used" for order sorting, but that "in practice unwanted orders are rejected by a small prism". This was indeed so ten years ago; but the comprehensive and up to date information provided in Table 3 on currently available spectrophotometers clearly shows the subsequent very marked changes to the reverse situations. A "recent" survey made in 1959 is mentioned on page 18, and the reference to this is still incomplete.

Discussion of sample handling now includes mention of newer micro-techniques and reflectance methods, though it is still contended that "current procedure" for obtaining solution spectra is to use "matched cells with carefully machined spacers of equal thickness" rather than a variable-path compensating cell.

The section on interpretation now includes six worked examples to illustrate the use in structure determination of infrared in conjunction with NMR, mass, and electronic spectroscopy.

Undoubtedly, the great worth of this book lies in the invaluable collection of structure/frequency correlation tables and charts in part two. These have been thoroughly revised and updated, with the addition of significant