

The book is undoubtedly addressed to ecologists, rather than to hydrologists and mathematicians. However, several parts of the book deserve the interest of the readership of this Journal. Ecology is one of the neighbour sciences of increasing interest to hydrology as manifested in the recently coined terms ecohydrology and ecohydraulics. On the other hand, much of the material (in particular that related to dynamic systems in general and to Markov-type models) embraces tools used in hydrology. One can find in the handbook references to hydrological works on Markovian stochastics in the transport of water through the unsaturated zone and through reservoirs with seasonally varying Markovian inflows.

Both ecological and hydrological systems are examples of the general category of dynamic systems, with its well established theory and practical methods. This approach provides a sort of common language enabling communication between two different, though neighbouring, fields of science.

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**Soil Physics (second edition) by T. J. Marshall  
& J.W. Holmes**

published 1988 by Cambridge University Press, The Pitt Building, Trumpington Street, Cambridge, CB2 1RP, UK; 374 + xii pp.; price £45 hardback, £15 paperback; ISBN 0-521-35270-3 (hardback) 0-521-35817-5 (paperback)

Until the first edition of *Soil Physics* by Marshall & Holmes appeared in 1979, textbooks on soil physics were aimed almost exclusively at students in subjects related to agriculture. Marshall and Holmes departed from this tradition to write a textbook "for the scientist who works with soils, plants or water resources, as well as for the student of soil physics". The appearance of this second edition is witness to the success of the book in providing a comprehensive account of soil physics of use to teachers, students and research workers not only in agricultural disciplines but also in the fields of environmental science and engineering.

The framework of the second edition remains unchanged from that of the first edition, with its central theme of soil-water relationships. Chapter headings remain the same. Thus, after an initial chapter discussing the composition of soils, there are five chapters on soil water, followed by one on the use of isotopes and tracers in groundwater movement studies that is particularly relevant to hydrology courses. Chapters giving introductions to soil structure and soil deformation follow before the three remaining chapters which deal with the more applied aspects of soil physics concerned with soil-water management, the physical environment of roots, and the effect of plants on soil water. The book has three appendices; the first, listing SI units with some conversion factors, is useful to those less accustomed to their use; the second, giving miscellaneous data including some physical properties of water, could perhaps have been more extensive; the third, deriving the continuity equation, would have been better included in the main text in the

discussion on the theory of soil-water movement. There is a comprehensive list of references and a good index.

With much of the text the same as in the first edition, the revisions to this new edition are not very apparent from a cursory inspection. However, the authors have changed the wording in many places throughout the book to give a clearer presentation, updating material with small deletions and additions, mostly concerned with field aspects of the subject. The description of the basic theory of water flow in uniform inert homogeneous soils has been revised to bring out the underlying unity of the process of water movement in saturated and unsaturated soils. The section on saturated flow now includes an elementary discussion on solving Laplace's equation using functions of a complex variable for groundwater flow problems. However, surprisingly, the authors do not mention surfaces of seepage that occur in many groundwater situations. Also, the Dupuit-Forchheimer analysis is considered only in the context of a means to analyse flow to land drains rather than as a general approximate analysis to be applied generally in shallow aquifers. The new presentation of the theory of soil-water movement allows Richards' equation for flow in unsaturated soils to be immediately stated, although perhaps the basic physical assumptions in formulating this equation should have been mentioned, in particular the neglect of the air phase in what is actually a process involving the two-phase flow of both air and water. Because of the difficulties that the air phase causes in determining soil-water diffusivity values using the outflow method, it would have been better to have given little attention to this method and instead to have described more reliable methods in detail.

Perhaps many soil physicists would have liked a more extensive updating on theoretical aspects of soil physics and would consider that the omission of reporting progress in some research endeavours gives an incomplete picture of current trends in soil physics. For example, over the last decade much attention has been given to the solutions of Richards' equation in two and three dimensions that are particularly needed for obtaining values of hydraulic soil properties from field measurements, for example, from infiltration tests; and considerable advances have been made in modelling soil-water movement. Also, attention is being directed more and more towards difficulties encountered in applying classical continuum soil physics in the field because of soil heterogeneity, soil swelling and shrinking, and soil aggregation. The book gives a sound physical basis for considering such difficulties with its inclusion of sections on the mechanics of the deformation of soils and the effect of soil structure on permeability, and throughout, the authors draw attention to field observations that complicate the physics of soil-water behaviour. However, to many who consider that departures from the classical continuum approach to transport processes in soils are the most important aspects now being studied in soil physics in relation to its application in the field, a fuller discussion, perhaps in a separate chapter, would have been useful. Nevertheless, in spite of these shortcomings which individuals with particular research interests might consider disappointing, the book certainly fills a gap by providing an exceptional textbook that can be used to give a good introduction to soil physics, with particular emphasis on soil water, to students

in a wide variety of disciplines. With the increased awareness of the importance of soil physics in the study of hydrological processes, this second edition of *Soil Physics* is most welcome to hydrologists.

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**The SAMWAT Database for Computer Models in Water Management - SAMWAT Report no. 2** *edited by C. Volp & A. C. W. Lambrechts*

published 1988 by the Netherlands Organization for Applied Scientific Research (TNO), PO Box 297, 2501 BD, The Hague, The Netherlands; 55 + vii pp + 75 pp appendix; ISBN 90-6743-129-X.

The SAMWAT Bureau is a Netherlands organisation with advisory services to offer in relation to research activity, hydrological data, literature searches, and - with the publication of this report - to computer models.

The aim was to collate all relevant information about computer models currently available in the field of water management and thence to make the information available via a modern database (dBase III, IV on a PC AT). The report is essentially about the questionnaire, the collation exercise and the database design rather than the actual contents but it is interesting to see the way in which the authors have tackled the classification of topics and decided on the information to be stored about each model, i.e.:

- the main characteristics of a model;
- the basic equations and numerical solution techniques;
- statistical and stochastic aspects;
- boundary conditions, input data and input facilities;
- applied error checking routines; and
- output data and facilities.

Four different categories of model were considered (groundwater, surface water, rainfall-runoff, agricultural production) and the type of information naturally varies with the model category. In the rainfall-runoff category, for example, the section (one of 28) on "statistics/stochastics" has 15 "questions" each with a choice of from one (i.e. yes/no) to six responses. To take just one question - "does the model include Monte Carlo generation of spatial distributions?" - the responses (apart from "no") are:

- uncorrelated (normal) random;
- multivariate (normal) random with given covariance matrix;
- nearest neighbour method; and
- conditional generation.

The report provides some useful discussion of database concepts and of the constraints imposed (a) by the size of the questionnaire on the choice of software package and (b) by the chosen package on the design of the database and the methods of accessing it.

The purpose of constructing a facility of this kind must be to encourage