Book reviews

Geology in Engineering by R. Bowen
Elsevier Applied Science Publishers, London, New York. 1984. £32.00. 411pp. ISBN 4110-9533-2

This book is of a style which was familiar some years ago in engineering geology and other component subjects of geotechnology. The relevance of geology in civil engineering earthworks design is illustrated by means of case histories without recourse to analysis, other than by an occasional formula.

The book consists of 10 chapters equally divided into two sections. In the first section the influences and interrelationships of mineralogy, petrology and structural geology on foundation materials are discussed. Some strength characteristics of rocks, rock weathering, groundwater, permafrost and glacial deposits (as foundation horizons) are considered in this section. Most of the case histories are to be found in the last five chapters. These are concerned with the choice of shallow and deep foundations, earth movements (largely slope stability), tunnelling, dams, and finally, an account of remote sensing and its future potential.

The balance of the book and the treatment of some topics (e.g. slopes, ground investigation, foundations) do not appeal to this reviewer. Regardless of personal likes and dislikes, however, it is the technical contents which are of concern.

The omission of a prime on $\theta$ to signify effective stress, and the definition of $\tau_s$ as 'shear' rather than shear stress at failure in the Coulomb equation are errors which can slip through in a first printing. However, an incorrect presentation of the Coulomb equation when it appears in rock mechanics guise in a later chapter, or the suggested dependency of foundation width (taken as 2B) and foundation depth on angle of shearing resistance in the Terzaghi bearing capacity equation are mistakes which should not pass.

Tabulated standard triaxial compression test data which include 'fault angle' without any comment or interpretation will not advance the understanding of (say) a first- or second-year geology student. Neither will a completely unlabelled diagram illustrating the method of slices analysis for slopes. In a similar vein, it does not help to mix units (kg/cm$^2$, kN/m$^2$ compressive strength; lb/ft$^2$, density) in successive tables which are meant to be read together. Other examples can be found in the text.

A number of the case histories cited in the later chapters and the historical account of remote sensing are useful references, but readers should exercise caution and ensure that they check carefully the equations and tabulated data in this book.

R. K. Taylor

Micromorphology of soils by E. A. Fitzpatrick
Chapman and Hall, London, 1984. £32.50, hardback 433pp. ISBN 412–242–001

This book is about the examination of soils in thin sections, principally using the polarizing microscope but also using other techniques such as X-ray diffraction and electron microscopy. It deals with procedures for preparation and examination of thin sections and it discusses teaching and application of micromorphology in several pure and applied soil sciences. The book covers methods for description of thin sections in terms of the many properties and features visible, and it contains a most helpful list of the visible properties of 51 common soil minerals, from allophane to zircon.

This book contains a great deal of information. Parts of it are a laboratory manual and parts are a catalogue and there is also a useful glossary in which the author attempts to unravel some of the current nomenclature and terminology of soil micromorphology. It is well produced and contains many good photographs that illustrate various features of thin sections described in the text. Much of the information is conveniently summarized in tables and in clearly defined sub-sections.

Engineering geology is concerned with the engineering properties of soils and rocks and their influence on engineering works and, in many cases, the results of routine mechanical tests can be understood and enhanced by study of micromorphology in thin sections. For example, the engineering properties of many soils may be understood with knowledge of the minerals present and fabric of the soil. This book will be an important reference for those engineering geologists and others concerned with the study, description and classification of soils in thin sections.

J. H. Atkinson

Ground Movements and Their Effects on Structures edited by P. B. Attewell & R. K. Taylor
Surrey University Press, 1984. £35.00. 441pp. ISBN 0-903384-36-1. Distributed in the USA by Chapman and Hall, USA ISBN 0-412-00391-0

This book contains 13 chapters, each written by a different contributor, whose task it was to consider
some aspect of ground movement. Although not formally divided into parts, the chapters are grouped into related subjects. The first two chapters are concerned with settlement of natural ground under static load, and of placed fill. The next chapter examines the stability of slopes and embankments and in some respects provides a link between the previous chapters and the four that follow, which concentrate on ground movements associated with excavation. Trenches and other deep excavations in soil, tunnels in soil, and mining subsidence are the subjects studied. Chapter 8 reviews the structural designs required to cope with ground movements. The remaining chapters focus their attention upon geological aspects of ground movement and start with a digest of the mineralogical controls on volume change. This is followed by chapters describing the effects of clay soil volume changes on low-rise buildings and the settlement and stability of embankments on soft sub-soils. The last two chapters are devoted to dynamic ground movements, one being concerned with seismic movements and the other with dynamic movements including man-made vibrations.

The contributors were drawn from industry and academia, and include many well-known names in geotechnical engineering. They were given the freedom to develop their own chapters in whatever manner they thought best and this has resulted in each chapter having its own rather personal approach. It is interesting to note that this freedom has provoked the editors to acknowledge that they may not always share the views expressed by the contributors. An editorial introduction provides a unifying theme for the contributions and a general index has been thoughtfully provided so that the book may be used as a single work.

The chapters are all well written and clearly illustrated; items of particular note include a most interesting review of slope movements (E. N. Bromhead), a very useful account of the behaviour of trenches in soil (P. B. Rumsey & I. Cooper), design curve graphs for the prediction of ground displacements and strains associated with tunnelling in soil (P. Attewell & J. Yeates), a fascinating chapter on the mineralogical controls affecting clay mineral expansion and volume changes associated with soluble minerals (R. K. Taylor & J. C. Cripps), and seismic movements elegantly explained in 27 pages (N. Ambraseys & J. Jackson). Other readers will undoubtedly find much of interest and the editors are congratulated on compiling a book that will certainly be of value to practising engineers and geologists. It is also most definitely a source of recommended reading material for postgraduate students attending courses in geomechanics and can be strongly commended to librarians as being a worthwhile addition to their book stock.

M. H. de Freitas

Groundwater as a Geomorphic Agent
edited by R. G. LaFleur

Proceedings of the 13th Annual Geomorphology Symposium held at Rensselaer Polytechnic Institute, New York in September 1982

George Allen and Unwin Ltd, London, 1984. £30.00. xvi + 390pp. ISBN 0-04-551069-5

As the title suggests, this volume has a message for the geomorphologist and hydrogeologist from 19 different authors of varied technical backgrounds. That the effects of groundwater acting as a geomorphic agent can be observed at first hand is, indeed, a tribute to these field scientists.

If there were no free water on the surface of the earth its form would be very different from what it is today. If the surface of the earth were also utterly impermeable and there were no subterranean water, geomorphology as a science would not exist. There would be little soil, no etch forms, no karstic features, and none of the morphological varieties developed on granite. Water, therefore, contributes enormously to the development of land forms. It is an agent of alteration, a medium of translocation of salts, a lubricant and an important constituent of the rock-forming minerals. Water is not only active in a destructive role but in the construction of land forms.

Of the many ways groundwater can alter the form of the world we live in, its solutional destruction of carbonate rocks is best known. Karst formations have been recognized for some time due to their fascinating nature and economic importance as a water resource. However, more recently, new quantitative work on the rates and styles of cavern formation and on the geomorphological controls on karst evolution are emerging.

The section that deals with the solution of carbonate rocks begins with a hydrological classification of karst land forms and continues with a detailed examination of karst denudation rates, making use of mass transfer calculations and laboratory-determined solution kinetics. An interesting example of how karstic land forms may be useful to the geomorphologist is in the distinction between unsaturated and saturated zone care formulation, which allows exact measurement of ancient sea levels. This section concludes with studies on the modelling of karstic land forms and karst evolution in arctic terrain.

However, only about half of this book is concerned with the geomorphology of carbonate rocks. The effects of groundwater on non-carbonate strata being equally important, if not so well documented, as the contribution of groundwater flow to the formation of early land forms may be masked by later, more easily observed, surface water effects. Contributions in this

Q. J. eng. Geol. London, 1985, Vol. 18
section deal with water in several geological settings: as a soil permeant; as an eroding, seeping and piping fluid; as a subsurface etch former on granite; and as a precipitator of crusts.

At the end of this volume there are a number of case studies from the USA, Canada and Mexico.

The book is well distributed and edited, following a logical sequence, but a detailed glossary of geomorphological terms would be useful to the general reader.

K. M. Baxter

Glacial Geology—An Introduction for Engineers and Earth Scientists
edited by N. Eyles

Pergamon Press, Oxford. 1983. £9.95. 152 mm × 227 mm. ISBN 008-030-2637

Nick Eyles is to be congratulated on gathering together such an excellent group of authors who have something to contribute to the subject and yet who have not published the same material elsewhere.

Although the word processed typescript is not as clear as normal black and white print, it forms an easily readable yet not too verbose text running to some 400 pages. Generally, the photos are good, but the standard of text illustrations is variable in content and quality. This should not be taken as a condemnation of all text figures, of which are new and clearly illustrate the features mentioned.

The initial chapters on ‘A Landscape Approach’ and ‘The Subglacial and the Glacial Valley Landsystems’, give good descriptions of the main processes involved, using examples from several countries and different glacial periods. Unfortunately, a few of the photos, such as the one showing a supraglacial landsystem, did not reproduce satisfactorily and there seems little point in their inclusion.

In the chapters dealing with Lowland Sediments and the chapter on Glacio-lacustrine and Glacio-marine Clay Deposition, some of the information given is of particular interest; although, to be balanced, a little more could have been included on the European examples. The chapter on Geotechnical Properties of Lodgement Till is good and contains much information that is not easily accessible elsewhere. The chapter on Site Investigation and Foundation Engineering is again well written and gathers together much useful information, presenting it in a way that makes the book easy to use.

As an introduction for engineers and earth scientists, the book has much to be commended. It is a valuable addition to the literature, putting together papers on a topic of concern to engineers. It provides the information needed to understand the geological aspects of the deposits and saves engineers and earth scientists having to hunt for data amid a vast volume of papers, many of which contain geomorphic information of little interest to them.

A. B. Hawkins

Dictionary of Geotechnics
by S. H. Somerville and M. A. Paul

Butterworth & Co., 1983, £20.00, hardback, 283 pp. 220 × 140 mm, ISBN 0-408-00437-1.

The authors have identified the need for a concise dictionary of geotechnical terms and have directed their useful reference work particularly to practising engineers, advanced students and those either in allied professions or who are interested in having basic information about the subject.

The book includes terms in everyday use by geotechnical engineers and covers the fields: soil and rock mechanics, soil and rock engineering, site investigation, hydrology and the various geotechnical processes such as dewatering, ground stabilization, earthmoving and compaction, trenching and excavation. A selection of terms is included in the subjects of engineering geology and engineering geomorphology. As such, the authors have carefully selected a range of terms which previously had been spread amongst earlier published dictionaries of soil mechanics and foundation engineering (1981), civil engineering (1980), earth sciences (1976) and applied geology (1967). The field covered is therefore potentially vast and the authors recognize that their list (which contains over 2000 main items) is not meant to be exhaustive. In recognition of this, they have included, in a novel way for a dictionary of this type, references to direct the reader towards additional study where necessary. Unfortunately, references for some items are sparse or non-existent. For example, under ‘critical state soil mechanics’ there is no reference to Schofield & Wroth (1968) or any others under ‘Camkometer’ there is no reference to Wroth & Hughes (1973) or any others, although this reference does appear under K0, but is not cross-referenced. In contrast, an excellent set of references is given under ‘standard penetration test’; this emphasizes the bias given in this book to established field applications.

Along with the definitions, the authors have used selected diagrams to good effect which have therefore reduced the need for extended descriptions, for instance in describing the various piling systems and their installations, slope stability analyses, residual strength, seepage and permeability, borehole and trial

Q. J. eng. Geol. London, 1985, Vol. 18
pit records. Cross-referencing is generally used to good effect and the definitions are of well chosen length, although it is felt that the entry for 'critical state soil mechanics' was rather brief and could have been illustrated with a diagram.

Practical information and useful basic formulae, together with 20 tables of typical values of soil and rock parameters, and other practical information add to the book's usefulness in the field and office.

The dictionary is easily readable and up to date with references to several well established terms introduced during the last couple of decades, such as critical state soil mechanics, soil fabric, Rowe consolidation cell, reinforced earth, Moss computer programs. Developments in field measurement devices such as penetrometers, extensometers, pressuremeters (Camkometer and PIP) are likewise included.

At the beginning of the book a useful short list of publications is given. However, it is surprising to see the omission of such a standard reference as 'The measurement of soil properties in the triaxial test' by Bishop & Henkel (1957), although the more knowledgeable reader would find this under 'triaxial compression machine'. If this book is to fulfill its appeal to practising engineers, this reviewer feels that mention should also have been made of the collected Rankine lectures published by ICE as Milestones in Soil Mechanics (1975) and Developments in Soil Mechanics (1983) for their content as state of the art reports and wealth of additional references. Mention could have been made of other publications such as 'A Century of Soil Mechanics' (1969), with its collection of classic papers in the early development of soil mechanics, Design Parameters in Geotechnical Engineering volumes 1–5 (1979), Geotechnique published quarterly by ICE since 1949 and Quarterly Journal of Engineering Geology published by The Geological Society since 1968. At £20.00 (hardback only) the book may well attract such critical attention to detail from its potential market that it may be judged on its omissions rather than its content. Although, undoubtedly a useful library reference, the book would probably prove too expensive for students and those referring to it from interest. To increase market appeal, it is strongly suggested that a paperback edition should also be published.

In the list of authorities given at the beginning of the book, mention is made of ICE, BRE, TRRL and CIRIA, but surprisingly not of IGS or BGS. The list would have been of more practical benefit with addresses and telephone numbers.

The reviewer considers that a list of accepted International symbols and associated definitions should have been included at the beginning of the book and would have led to the use of the symbol 'u' for pore pressure rather than ‘μ’ as used throughout the book and rather confusingly for Poisson’s ratio as well. The accepted SI units for terms such as coefficient of consolidation (m²/year), permeability (m/s), coefficient of compressibility/swelling (m²/MN) are not given where they are defined. A number of useful tables given at the rear of the book are not cross-referenced to the corresponding item in the text which they quantify; for example, Table 3 (Compressibility of clays), Table 5 (giving SPT values for cohesive soils), Table 6 (SPT and relative density of granular soils), Table 11 (Seismic (P-wave) velocities) and Table 12 [Elastic constants (Lamé)]. Their usefulness could be missed in a passing reference.

Just to remind the reader that they are dealing with a highly practical subject, the authors have included the occasional refreshingly illustrative term such as blooey-line, cowbelly, dolly, roughneck, sticky limit and wilting coefficient.

In summary, the writer feels the authors are to be congratulated on producing an easily readable, informative and innovative dictionary combining definitions, formulae, illustrative, diagrams, tables and references which hitherto has not been attempted. The book will undoubtedly be of value to those working in or studying civil engineering, building construction, geotechnics and allied professions.

R. J. W. McDermott