

BOOK REVIEWS

HYDROGEOLOGY, W. Back, J.S. Rosenshein and P.R. Seaber, (Editors). Geological Society of America, Decade of North American Geology (DNAG) series (1988). 534p. \$US 49.50 (Hardcover).

This book is a recent publication in the Decade of North American Geology series, produced by the Geological Society of America in honour of its 1988 centenary. The aim of this project is to produce a modern synthesis of North American geology through the publication of a set of 28 matched volumes (17 United States, 2 Mexican and 9 Canadian) supported by field guides, special volumes and map sheets. "Hydrogeology" is the 12th volume (Volume O-2) in the United States series.

"Hydrogeology" consists of 50 chapters divided into 5 sections. The sections are: *I. Introduction* — (2 papers) on the historical aspects of hydrogeology and basic hydrostratigraphic units; *II. Hydrogeologic Regions* — (29 papers) grouped into 6 sectors (Cordilleran, Central Cratonic, Appalachian, Coastal Plain, Island and Permafrost); *III. Comparative Hydrogeology* (9 papers); *IV. Ground Water and Geological Processes* (8 papers); and *V. Outline For The Future* (2 papers). The volume on the whole is well organised, with references at the end of each chapter, and an index containing a mixture of subject and place names. The index of places is comprehensive, but the subject index requires more detailed cross-referencing. It would have been better to provide separate place and subject indexes. Three colour plates (map sheets) are included in a rear envelope.

The volume focuses on the geological aspects of hydrogeology and attempts to provide a current synthesis of the subject. A major goal is "to identify, clarify and describe systematically the basic relation of hydrogeology to sub-disciplines of geology . . ." (p. ix).

Chapter 1, a "Historical perspective" on hydrogeology, is divided between physical and chemical hydrogeology and sets the tone for the rest of the volume. Chapter 2 ("Hydrostratigraphic units") concisely summarizes nomenclature and continues the historical theme from chapter 1. Since both these opening chapters have a historical theme they could have been combined.

Chapter 3 is a dogged introduction to the hydrogeologic settings of various regions, and makes good use of the excellent maps (Plates 1 and 2) included in the rear pocket of the volume. The highlight of this chapter, a table (p. 21-23) summarizing the hydraulic characteristics of the ground water regions, unfortunately is not discussed. Chapters 4 through 31 describe the hydrogeologic regions in detail, with contributions varying between two pages (Sierra Madre del sur) to 14 pages (e.g. Western Glaciated Plains) in length. The chapters generally cover the basic hydrogeologic descriptions well, and the various formats adopted by the different contributors prove interesting to read. Particularly enjoyable were chapters 29 and 30 in the "Islands" section. However, I was somewhat disappointed with the chapters on "Alluvial Valleys" and "Permafrost", which lacked examples and seemed rather mundane. This is regrettable as these hydrogeologic settings are unique and exciting.

Chapter 32 is a short introduction to the section on "Comparative hydrogeology", but seems redundant. Following the 28 chapters of regional description, discussion of regional hydrogeologic characteristics is an important

section of the book. In the next 8 chapters this is dealt with competently, if somewhat predictably. The chapter on the "*Western alluvial valleys and High Plains*" is probably one of the most stimulating.

The fourth main section of the volume opens at Chapter 41, and is grandly titled "*Ground water as a geologic agent*". This contribution is painfully short and offers little of merit. Luckily it is in sharp contrast with the following two chapters. Chapter 42, co-authored by 12 contributors, is a real gem, and covers thoroughly the effects of subsurface water on near-surface processes and landforms. Chapter 43 deals with landform development in Karst areas and neatly compliments the preceding chapter. "*Ground water and geologic processes*" is the best section of the entire volume and has good quality papers throughout. Chapter 44 "*Ground water and clastic diagenesis*" and chapter 46 "*Ground water and fault strength*" are also strong contributions.

The final short section of the volume, "*Outline for the future*", includes two chapters. Chapter 49 is an ". . . attempt to outline some of the significant scientific problems facing hydrogeologists today (p. 503)." This discussion emphasises the shift in focus from water quantity studies to a concern with water quality. The major problem areas, in hydrogeology, are identified as being in contaminant migration; solute transport and dispersion in anisotropic media; reactive solutes; mapping of contaminants; secondary permeability; flow and transport in fractured media; and the evolution of ground water systems. Chapter 50, "*Societal problems*", is too short and too vague to be of great value and would have been better combined with the preceding chapter in a joint discussion of scientific and societal problems. However, this assumes that the solutions to scientific problems are of value to society, which may not always be the case!

This is a very well produced volume. The text is clear, well set out, has few typographical errors and is thoroughly illustrated throughout. The colour plates in the rear envelope are of a very high quality, as are the black and white line diagrams. The 'blue-tone' diagrams, however, are not always effective and at times can be confusing.

The book is difficult to classify as different sections have differing qualities. Some parts read like a text book, some sections are distinctly research orientated, while others seem to resemble sections from an atlas on North American hydrogeology (although it is clearly stated in the foreword that this is not the case). The varied approaches adopted by the contributors means the volume should appeal to a wide audience. I would recommend it to anyone with a serious interest in hydrogeology, to anyone teaching aspects of North American hydrogeology and as a valuable reference for libraries. The editors are to be congratulated on producing a useful synthesis of the hydrogeology of North America. For \$US 49.50 this hardcover volume is very good value for money.

Jeff Warburton

SURFACE AND SUBSURFACE MAPPING IN HYDROGEOLOGY, M. Erdélyi and J. Gálfi. John Wiley and Sons Ltd., Chichester (1988), 384p., £stg 45.00.

"*Surface and Subsurface mapping in Hydrogeology*" claims to be the first

hydrogeological mapping manual to be truly interdisciplinary in its approach. The book is jointly authored by two Hungarian hydrogeologists, Mihály Erdélyi and János Gálfi, with a foreword written by András Ronái, formerly of the Hungarian Geological Institute, Budapest. The book has a co-edition published by Akadémiai Kiadó, Budapest. The aim of this manual is to educate field hydrogeologists in locating, assessing and developing subsurface water resources.

The book is divided into 15 chapters varying in length from 1½ to 73 pages. Chapter 1 is a short introduction. Chapters 2 through 8 deal with various practical and theoretical aspects of surface and subsurface hydrogeological mapping techniques. Mapping problems particular to certain geologic environments and situations are discussed in chapters 9 to 14. Chapter 15 outlines the use of hydrogeological mapping techniques for engineering purposes. Approximately half of the book is devoted to mapping techniques and about a third to the application of these techniques. A detailed table of contents is included at the start of the book. The references at the end of each chapter are indented by the *author's name*, a style which makes searching the list for a particular reference difficult. The references are also split into separate listings by author and by conferences/official bodies. This division is not always consistent, so one alphabetical listing would have been better. A comprehensive 8 page index provides good coverage of the subject material.

The introduction (chapter 1) is too brief and provides very little information about the approach adopted in the book or what can be expected of the content. Its message appears to be that, for most hydrogeological problems, there is no substitute for quality fieldwork and experience. The foreword, although in itself somewhat repetitive, provides a better introduction than chapter 1. The tone of the book is set in this opening chapter. The style of writing is very broken, the grammar poor and paragraphs very short (e.g. on page 229 there are 13 paragraphs). The book has been prepared from a series of post-graduate course lecture notes and at times reads very much like it.

Chapter 2, "*Preparation of hydrogeological field surveys*" is short at two pages and conveys very little. The basic point — *'proper planning of field survey, and the careful collection and storage of data is essential'* — could have been summarised in a paragraph. Chapter 3, "*Hydrogeological maps and cross-sections*" is a basic introduction to the topic. Each map type is described, but its advantages and disadvantages are not adequately discussed. The chapter is difficult to follow given the fragmentary structure and poor grammar of the text. For example, on page 24 it is stated that the purpose of hydrogeological cross-sections is ". . . to show in three-dimensional space those features which are shown in plan section by the map." This is misleading because cross-sections themselves are two-dimensional, and it is only when combined with a plan that they give an impression of three-dimensionality. Chapter 4 "*Hydrogeological mapping and prospecting*" follows in the same vein, and the coverage of the sub-topics in this chapter is highly variable. For example, "*Groundwater prospecting in regions of climatic extremes*" is covered in less than three pages. Problems of permafrost areas are dismissed in a cursory three sentences, yet two diagrams related to this topic are included in the text. Chapter 5 describes remote sensing techniques used in hydrogeology.

However, too much emphasis is placed on the details of the techniques and not enough on their application to hydrogeology. Much of the discussion of remote sensing techniques is readily available elsewhere. A similar criticism can be directed at chapter 6 on geological prospecting. The explanation of techniques and methods is very thorough, but it is not always clear where the discussion is leading. The authors appear to assume that their readers are hydrogeologists, but the material outlined is so basic that any partly trained hydrogeologist, or earth scientist, would already be familiar with most of the techniques.

Chapter 7 is a useful examination of "*Exploratory drilling and borehole geophysics*". The discussion on the construction of a geologic log, could, however, have been more orientated to recognising hydrogeologic features. Some examples illustrating geologic logs also would have been useful. Chapter 8 is a reasonable account of water quality mapping but some of the material is redundant e.g. "*8.2.2.1 Graphical representation*" of water quality data and some conversion tables should have been put in an appendix. Indeed the lack of appendices in a book which claims to be a manual is somewhat surprising as the use of appendices would have improved many of the chapters substantially. The '*Summary and conclusions*' section of this chapter, which appears to be the only explicit attempt to do this in the entire book, is not a summary of the chapter, merely a summary of one small section.

Chapters 9 to 14 cover hydrogeological mapping techniques applied to differing geological structures and areas. In this section the best material in the book is included in chapters which deal with "*Hydrogeological characteristics and mapping of sedimentary areas*" and "*Hydrogeological mapping of sedimentary lowlands*" respectively. These areas appear to be the author's specialty fields, and this is very evident in the quality of these chapters. Both chapters are intimately related, and are interesting and rich in examples. Chapter 13 addresses the hydrogeological mapping of river valleys. Unfortunately, not enough effort is made in distinguishing the influence of various river types on the hydrogeology. Parts of the discussion are set in a rather dated descriptive geomorphology framework, a fault common in other parts of the text as well. All these chapters tend to repeat information contained in earlier chapters. The same topics and points keep emerging in slightly different guises, adding to the repetitive nature of the material. In this section of the book, it would also have been useful to adopt a uniform format for each chapter.

"*Hydrogeological mapping for engineering purposes*" is covered in the last chapter. The lack of an introduction at the start of this chapter is an obvious limitation. There is no statement of how hydrogeological mapping can aid engineering. For example, it is acknowledged that hydrogeological mapping of dam sites is very important and highly complex, but only two sentences are reserved for this topic.

The reproduction of black and white photographs in the text is poor; some photographs lack contrast and have a strongly grained texture. In chapter 5, where photographs are used to illustrate applications of remote sensing in hydrogeology, many fail to illustrate the point being made. In addition, figures and diagrams included in the text are not referred to, or discussed in enough detail.

Absent from the book is any substantial discussion of statistics and quantitative map analysis. Although perhaps beyond the scope of this book, some consideration needs to be given to the statistical behaviour of spatial properties. This is especially true when field sampling and mapping.

A major shortfall in the organisation of the book is the lack of clear introductory and concluding statements for each chapter. There is no conclusion to the book and very little attempt to synthesize the material. There is a large amount of useful information here, but poor grammar and organisation make it difficult to extract. It is hard to imagine this book finding its way onto many personal bookshelves, but may find a niche in libraries, geological surveys and water authorities.

Jeff Warburton

JET CUTTING & CLEANING BIBLIOGRAPHY edited by R. Higginbotham. Published on behalf of BHRA, The Fluid Engineering Centre, by Elsevier Applied Science Publishers, London; New York (1988). ix, 258p. 23 cm. ISBN 1-85166-226-x. f.stg. 61.

This bibliography is intended as a reference book for engineers, scientists and researchers seeking literature relating to water jet cutting and cleaning. The ability of a pure or an abrasive entrained water jet to cut through a range of materials, soft or hard, flexible or brittle, has prompted research into ways of making the process more efficient. Documentary evidence ranging from journal articles, through to detailed research papers presented at International Water Jet Conferences, are referred to in this volume.

The bibliography includes all relevant data received by the Fluid Engineering Centre at the British Hydromechanics Research Association (B.H.R.A.) from 1980 to 1987. An earlier B.H.R.A. publication includes a review of Jet Cutting Technology and a bibliography of data received in the decade prior to 1980.

The bibliography is divided into sections covering Fluid Mechanics of Jets; Jet Impact; Equipment; Jet Cleaning; Jet Cutting; Civil Engineering; Mining and Tunnelling; Precision Cutting; Underwater; Safety; and Bibliographies. There are a total of 570 references in this volume, and the number of items contained in each section varies considerably. The section on Mining and Tunnelling includes 143 references, much more than any other section, reflecting research to find cost effective techniques for winning coal and mineral ores. At the other end of the spectrum, the section on Safety includes only four references.

Each section has a number of miscellaneous titles under the sub-heading of General, while a limited number of sub-headings are used to classify specific topics. While this classification can assist the reader to find articles relating to a particular topic quickly, the overlap in certain areas does necessitate additional searching, which can be time consuming if it is to be done thoroughly.

Indexes are included for both author and corporate source, which provides a clear document reference number for each title. The publication date, number of pages and language are also provided. Only a small number of titles are not published in English. In addition, a short abstract of each publication is included, which is essential to the reader in determining the potential value of the title.

The information contained in this bibliography has been obtained from the FLUIDEX database maintained by B.H.R.A., and is available online as file 48 on ESA/IRS and file 96 on DIALOG. Although online searching is generally a low cost option compared to manual searching where the source material contains a wide range of topics, a relatively concise bibliography such as this can be of value for people seeking information on a particular aspect of water jet technology, or who are perhaps trying to gain an idea of the capability and potential for various applications. However, the addition of a comprehensive subject index with cross-referencing using suitable key words would greatly enhance the value of this book as a way to find articles on specific topics relatively quickly.

This type of publication cannot be continually updated in the same manner as online databases. Several Water Jet Conferences have been held and many journal articles written since it was published. However, this bibliography is still useful as a complementary source of information, bearing in mind that it is by no means comprehensive.

Michael Simpson

ENGINEERING HYDROLOGY by R.S. Varshney (third edition 1985), 1012p, published by N.C. Jain, and supplied by Nerm Chand and Bros, Civil Lines, Roorkee, U.P. 247667, India. (Rupees 80, approx. \$NZ 8).

This book is intended as ". . . a reference book which could present clearly and concisely the fundamental principles which are basic to each aspect of engineering hydrology and demonstrate their actual application . . .". The first edition of the book is said in the preface to be the first of its type in India.

The book is arranged into 20 chapters; the first 8 chapters are introductory: they cover hydrology; meteorology; statistics and probability; systems methodology and mathematical models; simulation techniques; precipitation; evaporation and transpiration; and groundwater. The remaining 12 chapters deal mainly with what I presume the author perceives as the main engineering hydrology issues in his country. These are runoff, groundwater hydrographs, flood estimation methods, flood forecasting and routing, and reservoir sedimentation. The valuable part of the book is the number of Indian examples and illustrations in this section, but these must be distilled from much other material, such as lengthy examples of flood frequency analysis. I found the section on probable maximum precipitation comprehensive and informative but, by comparison, chapters on hydrology of forest areas and hydrology of coastal areas were very brief.

There were surprising omissions in emphases; neither irrigation nor current meters are in the index. On the other hand empirical envelope curves for estimating flood peak size are allocated 28 pages, with the Dickins (1865) formula and its many successors accorded a veneration apparently commensurate with age. While this chapter is of historical interest, for practical purposes it is completely superseded by modern frequency analysis methods of which the recent paper "*Flood Estimation in Indian Catchments*" by Garde and Kothyari (Journal of Hydrology, 113 (1990) p135-146) is an example. I found the coverage on hydrometry inadequate. Information on floods and sedimentation is heavily dependent on field measurements and it is incumbent

on the engineer to be fully familiar with field and data archiving practice, and to cross-check data wherever possible.

Typographical errors abound, to the extent that any formula used would have to be checked in its original reference. But this would be difficult if the reference is not among the "Selected References" at the end of each chapter.

The many examples from India will make the book a worthwhile acquisition for anyone seriously concerned with the hydrology of that country but it will not stand alone as an authoritative reference. Nevertheless I enjoyed reading sections of it; its contradictions and contrasts conveyed to me something of what I imagine India to be like.

A.I. McKerchar

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