in Mineralogy from the Mineralogical Society of America, and short course notes from the Mineralogical Association of Canada. People may wonder whether a single book can successfully cover such a broad topic.

The answer is definitely yes. This book remains the best textbook for non-specialists because it covers every aspect of stable isotope geochemistry from analytical techniques to natural variation in isotope ratios. The small size of the book is not overwhelming for non-specialists that would like to get an introduction of the subject. But it is also useful for specialists because of the fairly well updated references of ever broadening applications of stable isotopes. Additionally, the style is appropriate. The author maintains a neutral position in debated subjects, even though he has published papers supporting one side of the debate. One example is the discussion regarding the oxygen isotope record of the ocean water. This is good for non-specialist readers because they can view both sides. The book is well produced with few technical errors.

This book should be placed in all science libraries. It serves as a compact reference for earth scientists and is particularly useful for non-earth scientists who are considering the use of stable isotopes.

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PII S0037-0738(97)00056-0

Complex Confining Layers. Architecture and Hydraulic Properties of Holocene and Late Weichselian Deposits in the Fluvial Rhine–Meuse Delta, The Netherlands. Henk J.T. Weerts. Netherlands Geographical Studies 213, KNAG/Faculteit Ruimtelijke Wetenschappen Utrecht, 1996, paperback, 189 pp., Dfl. 44.50, ISBN 90-6809-233-2.

The Rhine–Meuse delta, which is composed of unconsolidated sediments, dominates the western part of The Netherlands. An important component of the delta are braided river deposits dating from the Last Glaciation and older. They belong to a large aquifer that is used for groundwater extraction. This aquifer is confined by Holocene fluvial deposits on top.

The book discussed is a PhD thesis from Utrecht University, which is complementary to the thesis of M.F.P. Bierkens (*Complex Confining Layers; A Stochastic Analysis of Hydraulic Properties at Various Scales*, Netherlands Geographical Studies 184, KNAG/Faculteit Ruimtelijke Wetenschappen Universiteit Utrecht, 1994, 346 pp., ISBN 90-6809-202-2). Their research focusses on the problems when modelling complex confining layers. The importance of studying the heterogeneity of aquitards was often underestimated in the past, but nowadays errors in hydrological model output are more and more sought in the complex architecture of the layers involved. Since the different facies that are encountered in fluvial depositional systems each have their own hydraulic characteristics, the application of simple hydrological models to predict groundwater flow has limited value. The increasing problem of groundwater pollution in this part of The Netherlands clearly demands a more thorough understanding of groundwater flow through these complex aquitards. The thesis of Bierkens (1994) concentrated on the hydraulic properties of the complex layers, whereas the book reviewed here aims at a better understanding of the sedimentary characteristics of a complex aquitard as a function of its hydraulic characteristics.

The book describes the sedimentary characteristics of this complex top layer. The layer consists of Holocene fluvial sediments that were deposited by meandering and anastomosing rivers. Their mode of deposition resulted in a complex facies architecture. The author uses the architectural element approach of Miall to characterize this complex reservoir. Firstly, all facies are described, based on their genesis and sedimentary characteristics, after which the sedimentary facies are transformed into hydrofacies, by the establishment of their hydraulic properties.

Chapter 1 discusses the scope of the research. Chapter 2 deals quite extensively with the characterization of all different sedimentary facies that were identified. Grain size, sedimentary bedding, and the genesis of the facies are discussed and compared with the general, well-known models of meandering and anastomosing rivers. Chapters 3 and 4 show the facies architecture and fluvial development of several representative areas in the Rhine–Meuse delta. The lateral and vertical variation between the different facies is discussed for each river type, being

an important factor for characterization of the reservoir. The results show that the anastomosing river deposits contain a very large variation in lateral and vertical facies changes. As a result, a very dense boring network is needed to map them reliably.

In Chapter 5 a translation from sedimentary facies to its hydraulic properties is made. Each facies, already characterized by its grain size characteristics in Chapter 1, is defined by its porosity and permeability. The resulting hydrofacies are needed as input for a groundwater model. Furthermore, the problem of upscaling and the difficulty of assigning hydraulic parameters to heterogeneous sedimentary facies are discussed in this chapter. Chapter 6 shows the importance of a thorough understanding of the geology when applying a hydrological model. It shows how the uncertainties of several parameters can be decreased significantly by using geological knowledge. The last chapter summarizes the results and recommends further research topics.

The book deals with an important issue and is intended for people with interests in reservoir geology and hydrology. Although this complex matter has not been solved, the book certainly contributes to an increase in knowledge of complex aquitards. I hope that this book, by addressing the problem, will result in gaining interest of hydrologists for the facies architecture of a reservoir.

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PII S0037-0738(97)00063-8