Groundwater

Book Review/

Groundwater for the 21st Century: A Primer for Citizens of Planet Earth

reviewed by Tara L. Root

Although the daily water needs of 2.5 billion people worldwide are met with groundwater (UNESCO 2012), only a small percentage of the world's population has any formal education in hydrogeology. Thus, there is a profound need for educational materials that introduce hydrogeology in a manner that is accessible to a wide audience, including nonscientists. Conners (2013) recognizes and addresses this need with his book, *Groundwater for the 21st Century: A Primer for Citizens of Planet Earth*.

In the preface, Conners describes his book as "a broad flexible resource" that "does not have pages filled with differential equations" and is also not a "'popular science' book, filled with human interest stories" but that does "provide a basic understanding of groundwater science . . . in a manner that is accessible to all." (viii). To make the book both widely accessible and applicable, Conners includes chapters on basic scientific and geologic principles, global water resources issues, and applied hydrogeology, in addition to covering the fundamentals of hydrogeology. As a consequence of being broad, the book is rather long. With 614 pages, 14 chapters, and 3 appendices, I suspect some readers, particularly those without a scientific background, might be overwhelmed by the book's size. In my opinion the book is unnecessarily broad and long. Although the basic science and geology chapters provide background for later chapters, they also cover several topics (e.g., subatomic chemistry, plate tectonics, modes of crustal deformation, and periglacial geology) that are well beyond the background necessary for a general, nontechnical understanding of hydrogeology and groundwater resources.

The readability of the text and Conners's professional yet unintimidating writing style are notable. Several case studies are presented in boxes throughout the book and these very effectively elucidate the applicability of the subject matter. Similarly, the book is rich in figures and plates that are clear and concise and help to illustrate complex concepts. I found the book to be both well written and edited with very few, if any typographical errors.

There are several chapters, including those on hydrogeologic regions, groundwater chemistry and pollution, applied hydrogeology, groundwater supply issues, and perspectives for the future, that are mainly descriptive. These provide a very readable and succinct overview of pertinent issues that will benefit especially those readers who have not previously studied groundwater resources. These descriptive chapters have a very broad relevance to global water resources and are therefore likely to also benefit those hydrogeologists who have not taken a water resources class.

There are several misconceptions conveyed in the more technical chapters covering the fundamentals of hydrogeology. Hydraulic conductivity is introduced as "the rate at which ground moves through a medium," and the text goes on to state that hydraulic conductivity can be expressed as velocity, as the volume of water per unit time passing through a given cross-sectional area, as meinzers, or as darcies (175 to 176). Additionally, the text does not adequately distinguish pressure from hydraulic head: "Groundwater flows from areas of higher pressure to areas of lower pressure" (101) and "... water below the water table is under hydrostatic pressure due to the weight of overlying water pushing down on it . . . This driving force or pressure is hydraulic head" (181). There are other places in the text where these topics are covered more accurately, but I feel that makes the text inconsistent and therefore does not alleviate the misconceptions.

In summary, with this book John Conners has tackled the very difficult task of presenting a technical and quantitative subject to a wide audience. The book is well written in a tone that makes it accessible, even to nonscientists. The more descriptive chapters of the book have a lot to offer to both non-hydrogeologists and to hydrogeologists without a strong background in water resources. However, the book is less successful at covering the technical aspects of hydrogeology and

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presents some of the most basic hydrogeologic concepts in a manner that is likely to promote misconceptions.

References

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