Book Review

“Modeling Groundwater Flow and Contaminant Transport”, by Jacob Bear and Alexander H.-D. Cheng, Theory and Applications of Transport in Porous Media, vol. 23, Springer, 2010; ISBN: 978-1-4020-6681-8 (hardback), USD: 99.00

SUJIT S. DATTA¹

Groundwater plays an essential role in our lives. It makes up 20 percent of the world’s fresh water supply, providing us water to drink, cook with, bathe with, and irrigate crops with, for example; indeed, the typical American uses over 100 gallons of groundwater in a single day. In many areas, excessive extraction is depleting increasing numbers of aquifers; in others, pollutants seep into aquifers, severely contaminating them. This decline in its supply, combined with the demands of a growing world population, have led some to call groundwater “the oil of this century”. Overcoming these challenges requires more efficient extraction methods, better aquifer management, and effective ways of preventing or mitigating the effects of contamination. These in turn rely on being able to accurately model groundwater flow and contaminant transport. This new textbook by Jacob Bear (author of the 1972 classic, *Dynamics of Fluids in Porous Media*) and Alexander H.-D. Cheng provides a comprehensive reference on this subject.

This textbook treats much of the same material as Bear’s 1972 book. This includes the basics of groundwater flow, including Darcy’s law and the Dupuit assumption; the deformation, storativity and

subsidence of porous media; models of unsaturated flow; and models of seawater intrusion into coastal aquifers. Similar to the 1972 book, this material is covered meticulously, within a unified theoretical framework. Unlike the 1972 book, this textbook does not include example problems and solutions; however, the authors provide numerous worked example problems, relevant to real-life situations, throughout the text.

Bear and Cheng also expand on the 1972 book, including additional, more contemporary topics; for example, they provide a detailed analysis of contaminant transport, treating diverse effects ranging from contaminant advection, diffusion, and dispersion to molecular absorption and degradation. They also outline various numerical approaches and computer codes, and explore the use of statistical analysis and optimization theory in flow modeling.

The topics covered in this textbook are comprehensive, and the treatment is extremely thorough; thus, while I would not recommend it as an introductory text, *Modeling Groundwater Flow and Contaminant Transport* provides an excellent, up-to-date reference for researchers and professionals interested in modeling groundwater flow.

¹ Department of Physics, Harvard University, Cambridge, MA 02138, USA. E-mail: ssdatta@fas.harvard.edu