Our precious ground- and surface-water resources have been directly or indirectly impacted by anthropogenic activities over decadal time scales. The massive explosion in human population, dwindling supplies of ground-water, water contamination, and threats of climate change are just a few of the reasons why we as human species should protect and conserve groundwater—for ourselves and future generations. By doing so, we can leave a legacy as forebearers who built resilient water systems.

The second edition of Groundwater Science is filled with information about the basics of groundwater—the physics, chemistry, hydrology, and geology. The book is divided into 12 chapters. Chapter 1 introduces readers to the groundwater basic concepts such as fluxes, terminology, mass balance, and how we use water. Chapter 2 discusses physical properties of water, air, porous media, and hydraulic head. Several sections in these chapters benefit from examples as they reinforce practice and review of theoretical concepts. Some examples may be difficult for beginning students to understand (e.g., 2.1, page 25), due to different unit conversions.

Chapter 3 elaborates on principles of flow in saturated and unsaturated media, with helpful exercises that will enable students to grasp the theoretical concepts. This chapter would have benefited from discussion of the latest devices that are now available and routinely used in field studies such as electronic water level indicators to measure groundwater depth and in situ hydraulic conductivity measurement devices such as infiltrometer.

Chapter 4 explores mapping of groundwater using physical methods (drilling, wells) as well as geophysical methods (electromagnetic, radar, resistivity). Chapter 5 outlines the connectivity of geology with hydrology of groundwater, describes the methods to measure stream discharge with good example calculations, and discusses groundwater in unconsolidated deposits (such as High Plains aquifer), in sedimentary rocks (such as confined and artesian Dakota Sandstone aquifer), and in igneous and metamorphic rocks (such as Columbia Plateau Basalts in the northwest United States).

Chapter 6 introduces the reader to how changes in pore water pressure (and head) cause physical deformation in the landscape, resulting in impacts such as subsidence, liquefaction, and faulting. The next three chapters focus on modeling steady-state flow with simple one- or two-dimensional models (Chapter 7); transient well hydraulics with slug tests (quick and inexpensive) and pumping tests (laborious and expensive) (Chapter 8); and computer-assisted flow, with an excellent overview of the modeling process (Chapter 9). The book includes excellent resources such as a computer model (Analytic Aquifer Simulator) and example spreadsheets on the book’s companion Website.

Chapter 10 shifts gears to groundwater chemistry, providing an excellent summary on solutes (inorganic and organic), chemical reactions, dissolution and precipitation of minerals, and various aqueous-phase reactions controlling acidity and basicity of groundwater along with metal complexation, and oxidation and reduction. The chapter concludes with examples of groundwater chemistry in Floridan and Milk aquifers. Chapter 11 transitions to groundwater contamination and describes contaminant sources, organic contaminants, solute transport processes, with a few selected case studies, and solute transport models. The chapter concludes with sections on investigating and remediating groundwater contamination.

The last chapter (Chapter 12) explores two interlinked concepts of subsurface heat flow and geothermal energy, with a...