Preface

Reflecting for this Preface, I realized my experiences with water in all its forms undoubtedly parallel those of most earth scientists, and most humans in general, for that matter. I became keenly interested in geology as a Boy Scout, and carried this interest through to my doctorate degree at Yale University. So my training has always been shaped by an appreciation of scenery and the mighty influence of liquid water and ice.

What about my personal adventures with water? Once my geology field partner and I lost a Jeep® in a flash flood in West Texas: a bright blue sky was overhead, but torrential rains upstream had quickly filled the streambed we were trying to cross. Then there was a voyage from Iceland to eastern Greenland on an icebreaker, crunching its way through the sea ice to reach the remote Skaergaard igneous rocks. And a flyover of the then-underwater (currently emerged) Kovachi volcano in the South Pacific's Solomon Islands.

The most spectacular experience with water? That would have to be 5 weeks on the ice of Antarctica, searching for meteorites. In my tent during the sunlit "night," I wondered at the occasional cracking noises of the vast but slowly moving continental glacier on which I slept.

Why Water?

My adventures with water have given me a keen appreciation for this simple molecule. After all, it creates much of the impressive scenery on planet Earth—from clouds, oceans, streams, and glaciers, to erosional and depositional landforms such as steep cliffs and river plains. It is Earth's most ubiquitous and most effective dissolving agent, whether in the cells of plants, animals, and humans; in a stream; or in the deep plumbing system of a hydrothermal vent. Water quenches thirst and enables the growth of food and fiber for Earth's 6.1 billion human inhabitants. Put simply, water offers the medium for the origin, development, and maintenance of life as we know it.

But why should water have an entire encyclopedia devoted to it? Why should students, educators, decisionmakers, scientists, and general readers want to learn more about this critical and multifaceted topic? And why now?

It is precisely the necessity—indeed, the urgency—of water resources that makes this encyclopedia a timely contribution. Daily news reports tell the story: droughts, floods, damaged ecosystems, invasive species, chemical pollution, human health threats, and water shortages, to name a few. In 2002

alone, headlines included the severe drought in Canada; the massive floods in Europe; the "dead zones" of Lake Erie and the Gulf of Mexico; the highly invasive snakehead fish in the United States; natural arsenic contamination of groundwater wells in Bangladesh; the West Nile virus in North America; and inadequate drinking-water supplies in many developing countries.

But headlines can only hint at the importance of this vast topic. Water's key role in human civilization is without dispute. Consider the following:

- The history of civilization cannot be discussed apart from water. Water is interwoven with humanity's physical, social, economic, and cultural spheres. It runs like a thread through each person's life.
- The Earth is undergoing rapid and unprecedented change. Humans are truly changing the face of the planet: degrading fresh-water and marine ecosystems; depleting natural water-supply sources; and influencing global climate.
- Human consumption of water rose by a factor of six in the last century—twice the rate of global population growth. Humans now use more than half of the readily available fresh water, which already is in short supply: less than 1 percent of Earth's water is readily usable for human or agricultural needs. (The rest is in the salty oceans or locked up as ice.)
- Worldwide, more than 1 billion people do not have safe water to drink, and 2 to 3 billion lack access to basic sanitation (sewerage) services. Between 3 and 5 million people, mostly children, die each year from water-related diseases. By the year 2025, one-third of the world's population in approximately 50 countries likely will face severe water scarcity. In fact, water scarcity is the greatest threat to global food production, and has been deemed by some experts as the global security issue of the twenty-first century.

In a nutshell, human societies are challenged with assuring the quantity and quality of our most precious water resource while maintaining or improving its environmental integrity. But we cannot meet the challenge in a vacuum. We need a broad understanding of water in its varied forms, distribution, occurrence, and quality—and all within a human context. The encyclopedia *Water: Science and Issues* offers a vehicle to enhance such understanding.

The World of Water (in Four Volumes)

Because the interdisciplinary topic of water covers a wide range of subjects, our development of encyclopedia material was a challenge. The editors chose a three-way organization: fresh waters (groundwater, lakes, streams, and ice); marine waters; and policy and management. Although the entries appear alphabetically, they reflect this threefold categorization. The Topical Outline following this Preface clusters the entries by major themes.

The complexities of water are made understandable in just over 300 essays written by water scientists, professors, educators, and professional communicators. Entries addressing key concepts, current issues, traditional and emerging research, and major legislation are integrated with historical overviews, biographical sketches, and career information.

The table of contents reflects a breadth of topics not found in any other work at this level: namely, a scientific reference work tailored for nonspecialist readers, yet suitable for people already knowledgeable about water topics. Entries ranging from 500 words to 2,500 words cover hydrology, geology, chemistry, ecology, environmental science, waterways and waterbodies, engineering, earth science, oceanography, economics, policy, planning, management, law, rights, and more.

The table of contents also reveals aspects of water never before addressed in a comprehensive water-related encyclopedia. Topics such as security, globalization, sustainability, global warming, pollution, and water scarcity are not new, but have been thrust to the forefront as the twenty-first century opened. *Water: Science and Issues* addresses subtopics as diverse as pharmaceuticals and personal care products in water supplies; caffeine as a tracer; the search for water on Mars; hydrosolidarity; the ocean's role in human health (good and bad); protecting the water-supply infrastructure; issues in developing countries; survival needs; the search for drinking water; and water's role in war.

Our goal is to tell the interdisciplinary story of water in a format accessible to a wide readership. *Water: Science and Issues* is geared toward high school students and a general audience, but also forays into discussions appropriate for undergraduates and water resource professionals seeking concise overviews of complex subjects. Hence, the audiences include students, educators, communicators, decisionmakers, scientists, and the interested public.

More than 575 color photographs and illustrations help tell this interdisciplinary story. Selected glossary definitions, sidebars, cross-references, and a short bibliography accompany each entry. Reference aids in the frontmatter, a comprehensive glossary in the backmatter, and a high-quality cumulative index provide additional tools.

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Cumulative Index

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