

UNDERSTANDING OUR ENVIRONMENT

The debate about dredging the Hudson River illustrates some of the complexity and importance of contemporary environmental issues. Human actions are having widespread impacts on our world and the other organisms with which we share it. Science and technology have become pervasive forces, both to explain how things work and to reveal how we can make our environment safer, more comfortable, and more enduring. The knowledge being gained by scientists is fundamental to our ability to manage the earth's resources in a sustainable manner and to improve the quality of our lives and those of our children. Environmental scientists work on many problems that critically affect our well-being in many ways. Because of the significance of its findings, an understanding of environmental science is becoming increasingly necessary for any educated person.

As you study environmental science, you will learn about many serious problems. But environmental science can also be exciting and highly gratifying. Environmental scientists explore coral reefs, live with great apes, collect ice samples from deep within glaciers, study exotic plant species, and listen to whales as they study the world around us. They also examine the social institutions and built environment that we create for ourselves using science, technology, and political organization. There is room for many different kinds of interests and abilities within this broad discipline. Whether you are a professional scientist or a concerned citizen, you can apply your knowledge of environmental science in enjoyable and useful ways.

A Marvelous Planet

Before proceeding in our discussion of current dilemmas and how scientists are trying to understand them, we should pause for a moment to consider the extraordinary natural world that we inherited and that we hope to pass on to future generations in as good—or perhaps even better—condition than we found it.

Imagine that you are an astronaut returning to the earth after a long trip to the moon or Mars. What a relief it would be, after experiencing the hostile environment of outer space, to come back to this beautiful, bountiful planet (fig. 1.2). Although there are dangers and difficulties here, we live in a remarkably prolific and hospitable world that is, as far as we know, unique in the universe. Compared to the conditions on other planets in our solar system, temperatures on the earth are mild and relatively constant. Plentiful supplies of clean air, fresh water, and fertile soil are regenerated endlessly and spontaneously by biogeochemical cycles (discussed in chapters 2 and 3).

Perhaps the most amazing feature of our planet is its rich diversity of life. Millions of beautiful and intriguing species populate the earth and help sustain a habitable environment (fig. 1.3). This vast multitude of life creates complex, interrelated communities where towering trees and huge animals live together with, and depend upon, such tiny life-forms as viruses, bacteria, and fungi. Together, all these organisms make up delightfully diverse, self-

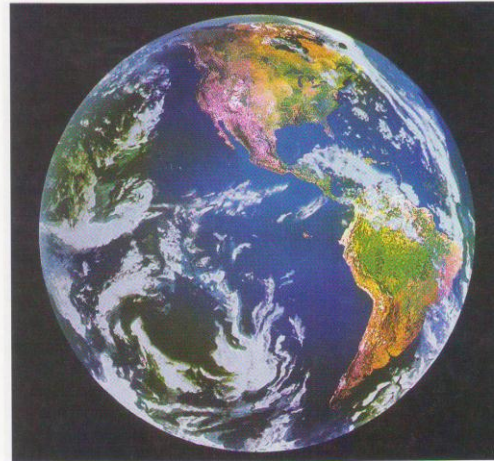


FIGURE 1.2 The life-sustaining ecosystems on which we all depend are unique in the universe, as far as we know.

sustaining ecosystems, including dense, moist forests; vast, sunny savannas; and richly colorful coral reefs.

From time to time, we should pause to remember that, in spite of the challenges and complications of life on earth, we are incredibly lucky to be here. We should ask ourselves: what is our proper place in nature? What *ought* we do and what *can* we do to protect the irreplaceable habitat that produced and supports us? These are some of the central questions of environmental science.

What Is Environmental Science?

We inhabit two worlds. One is the natural world of plants, animals, soils, air, and water that preceded us by billions of years and of which we are a part. The other is the world of social institutions and artifacts that we create for ourselves using science, technology, and political organization. Both worlds are essential to our lives, but integrating them successfully causes enduring tensions.

Environment (from the French *environner*: to encircle or surround) can be defined as (1) the circumstances and conditions that surround an organism or group of organisms, or (2) the social and cultural conditions that affect an individual or community. Since humans inhabit the natural world as well as the “built” or technological, social, and cultural world, all constitute important parts of our environment (fig. 1.4).

Environmental science is the systematic study of our environment and our place in it. A relatively new field, environmental science is highly interdisciplinary. It integrates information from biology, chemistry, geography, agriculture, and many other fields. To apply this information to improve the ways we treat our world,

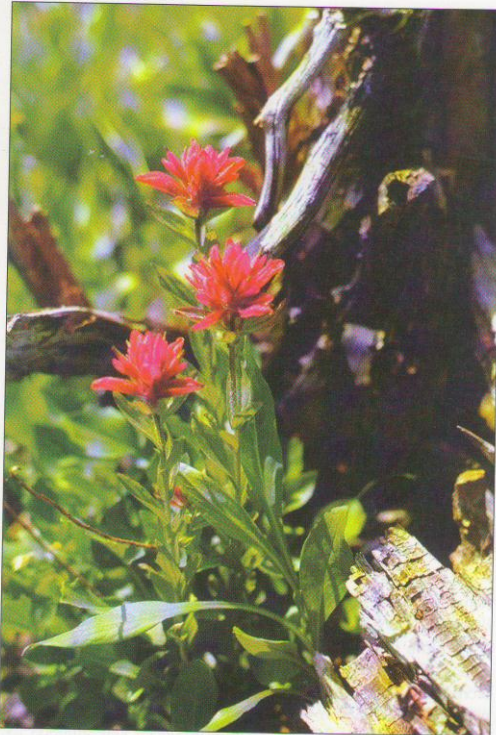


FIGURE 1.3 Perhaps the most amazing feature of our planet is its rich diversity of life.

environmental scientists also incorporate knowledge of social organization, politics, and the humanities. In other words, environmental science is inclusive and holistic. Environmental science is also mission-oriented: it implies that we all have a responsibility to get involved and try to do something about the problems we have created.

As distinguished economist Barbara Ward pointed out, for an increasing number of environmental issues, the difficulty is not to identify remedies. Remedies are now well understood; the problem is to make them socially, economically, and politically acceptable. Foresters know how to plant trees, but not how to establish conditions under which villagers in developing countries can manage plantations for themselves. Engineers know how to control pollution, but not how to persuade factories to install the necessary equipment. City planners know how to design urban areas, but not how to make them affordable for the poorest members of society. The solutions to these problems increasingly involve human social systems as well as natural science.

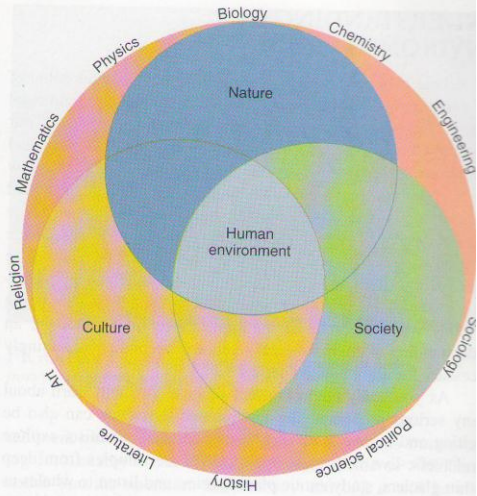


FIGURE 1.4 The intersections of the natural world with the social and cultural worlds constitute our environment. Many disciplines contribute to environmental science and help us understand how our worlds intertwine as well as our proper role in them.

Criteria for environmental literacy have been suggested by the National Environmental Education Advancement Project in Wisconsin. These criteria include awareness and appreciation of the natural and built environment, knowledge of natural system and ecological concepts, understanding of current environment issues, and the ability to use analytical and problem-solving skills on environmental issues. These are good goals to keep in mind as you study this book.

SCIENCE AS A WAY OF KNOWING

Science, derived from "knowing" in Latin, is a process for producing knowledge. It depends on making precise observations of natural phenomena and on formulating reasonable theories to make sense out of those observations. Science rests on the assumption that the world is knowable and that we can learn about how things work through careful empirical study and logical analysis. Moreover, because science provides information about both material and mechanisms in the world around us, it can help us find practical solutions for many problems (table 1.1).

An important value of scientific thinking is that it reduces our tendency to rely on emotional reactions and unexamined assumptions. In the Middle Ages, the ultimate source of knowledge about matters such as how crops grow or how diseases spread was religious authorities or cultural traditions. While these sources may have provided useful insights in many cases, there was no way to test their explanations independently and objectively. They were



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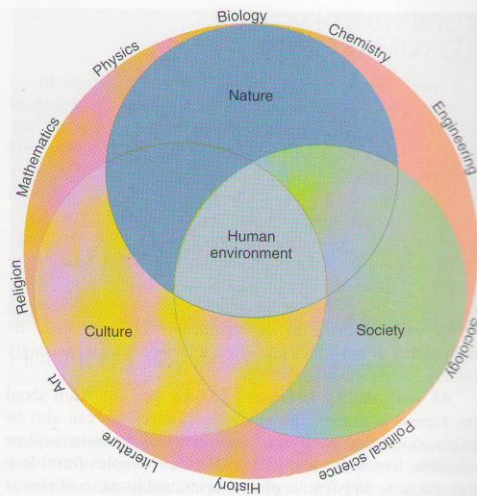


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