PREFACE

The Author's Viewpoint

Perspectives in Human Biology begins with the assumption that there are many important ways to view human activities in the world in which we live, but that the most powerful perspective is that of science. It is interesting to note that the original meaning of the word science is knowledge. The focus of *Perspectives* is on the underlying principles of biological science and on how the discovery of these principles has allowed humans unparalleled capacity to describe themselves and their relationship to the physical world. This capacity has manifested itself in many ways and has resulted in the establishment of medical specialties, such as anatomy and physiology, and basic research fields, such as molecular biology and ecology. Scientific approaches to understanding the world and our place in it have led to the invention of the means to describe and manipulate the smallest particles of atomic matter, as well as the development of the tools needed to influence many large and diverse types of ecosystems. Although other nonscientific views provide vital perspectives on how members of our species relate to each other (psychology and sociology), organize into groups (politics and religion), and establish working relationships (economics) to the benefit of individuals, families, and nations, the most powerful modern vision of us and our place in the world is provided through the eyes of science.

Perspectives in Human Biology is organized by scale, from small to large. The goal is to establish a framework of thinking in which the smallest units of matter (atoms and molecules) are perceived as connected in logical stages to the largest (ecosystems), as students progress through the book. *Perspectives* starts out with a concise overview of what science is and how scientific thinking proceeds. It also undertakes to show that what scientists do in their work provides an intellectual basis for judging the ceaseless changes in the way we view the world. The book provides insights into the underlying foundation of thought by which we define what life is, and how and when life might have arisen during the history of the primordial Earth. *Perspectives* emphasizes the fact that science is a uniquely human endeavor and is required by its nature to be organized as an open-ended and argumentative process in which new discoveries build on, or replace, established ideas only when they can be rigorously supported with data. This leads to the constant updating of scientific knowledge and drives the development and refinement of all discoveries from the newest innovations in engineering and electronics to the clinical applications of biotechnology. Within this constantly changing knowledge base, *Perspectives* creates a framework for understanding the science of human biology.

The chemistry of life and the organization and function of cells and tissues are covered early in the book. These subjects establish the core of knowledge needed to bridge the conceptual nature of atoms and molecules to the actual behavior of cells. Cells are central to life, and they are the basic units that compose all living things. *Perspectives* goes into the details of how the collections of cells in multicellular organisms such as ourselves are organized into tissues and organs, which in turn have specialized roles to perform. The expansive middle section of *Perspectives in Human Biology* presents and integrates the anatomy and physiology of the major human organ systems, from skin to nerves. The particular emphasis of this section is on understanding the function of specialized cells and on explaining how this knowledge may be applied to maintaining our individual and collective health and well-being. But this book is not only about describing issues of human health and well-being, or depicting humans as organized masses of specialized molecules, cells, and tissues in organ systems, but rather, it shows humans as extremely complex and unique biological forms intimately embedded in the environments (habitats and niches) in which they live and function.

The concluding sections of *Perspectives* focus on a number of broad issues of importance in widening a student's view of him- or herself. These include issues related to developing a better understanding of human behavior, human evolution, and human genetics. It is my contention that, in the context of understanding human genetics and evolution, we come to see ourselves as closely related to one another and, by descent, ultimately to all life on Earth. I have sought to develop enduring connections between human genetics and human history and to extend the knowledge in these fields to understanding human behavior. The question of how we are influenced by our genes as opposed to how we are shaped by the environments in which we presently live is of tremendous scientific and social importance, and it has not yet been completely resolved. It is a question that all students should consider from a biological point of view as they come to terms with their own development and growth and the immense complexity and diversity of life around them.

Perspectives in Human Biology closes with a description of the biosphere. Students are here confronted with a brief but broad exposure to some of the main ideas associated with our understanding of the organization and function of the life-sustaining surface of Earth. It is within this context that a description of aquatic and terrestrial ecosystems is presented, and that a short journey across the ever-changing face of the planet is undertaken. Such a journey

is a metaphor for life: one journey over, another begun. The delicate balance of forces that maintains many of the ecosystems on Earth is subject to disturbance from the destructive activities of humans, as in the case of no other species living or extinct. The success of human beings in science with their seemingly mindless application of technology is viewed by some as a potentially fatal flaw in human nature. In discussing the biosphere, the author asks the reader to pause and consider issues important to the future. How may we learn to protect the Earth for generations to come while still reaping the benefits of a human science aimed at enhancing our own quality of life? *Perspectives* ends as it began with the assumption that there are many ways to view human activities in the world. I hope it has led the student to consider that we should seek to develop the clearest view of science. Why? The answer lies on the horns of a dilemma: science is solely the province of humankind and the one endeavor that is capable of providing both the tools to destroy us and the tools to sustain us. It is to build knowledge of and about humans, from the fundamental particles of atoms composing them to the globe-spanning organization of ecosystems in which they live, that *Perspectives in Human Biology* was written.

In Support of Learning

Starting with the first chapter and continuing in all chapters throughout *Perspectives in Human Biology,* there is a pattern of organization to aid the student in understanding what is presented. This includes an abundance of illustrations, photos, and tables. Included also are definitions of *key terms* presented in the margins of the pages of the chapters in which the material is covered as well as in a general glossary. This will help reinforce general scientific and biological concepts by allowing terms associated with them to be emphasized as the student reads. Furthermore, at the end of each chapter is a series of *Questions for Critical Consideration.* These are formulated to invite the student to speculate on what they have read, as well as accurately to relate the facts presented in each chapter. To enrich the student beyond the scope of *Perspectives,* a number of books and articles of particular relevance are listed at the end of the chapter. This will allow the interested student to explore in more detail some of the information presented in *Perspectives.* In addition, there are many special sections throughout the book (called *Biosites*) that provide readers with interesting and intriguing material of historical or conceptual importance aimed at widening their view of the significance of the subject matter of the chapter.

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DEDICATION

Perspectives in Human Biology is dedicated to my wife Suzie and my children Laurie and Zann, whose enthusiasm, support, and timely review of the evolving text and art were invaluable from beginning to end. The book is also dedicated to all the students of my courses in human biology over the years, whose role as willing guinea pigs helped shape its content for future classes who, hopefully, will benefit from it. Special thanks to Peter Marshall, without whom I might never have been given the opportunity to present these perspectives at all.