

Preface

Biology is the study of living things. This complex, dynamic, and constantly evolving science is fascinating and vast. Biology encompasses all living organisms from the microscopic bacteria that live in the human gut to the largest mammal on earth, the blue whale, which can reach 100 yards in length. Life at every level entails patterns and processes, from the development of a new individual to the evolution of a whole species, or from the expression of a single gene to the nutrient cycling of an entire ecosystem. Biology is an ever-changing science as new discoveries and advancements lead to a deeper understanding of the natural world.

Central Ideas

How can a single book, or even a four-volume encyclopedia, encompass so vast a subject? It can't. In producing the second edition of *Biology*, we haven't tried to cover every topic from Aardvark to Zyzzyva. Instead, in our 438 entries we present a broad introduction to the many facets of biology, while concentrating in depth on a smaller number of central ideas and phenomena that are at the heart of all biological processes.

One of the major themes is molecular genetics, which in the last two decades has taken center stage in biology, along with its offspring, biotechnology. In these volumes, students will find detailed and accessible descriptions of many aspects of these growing disciplines, including non-coding RNA, recombination, induced pluripotent stem cells, and cancer immunotherapy. Genes exert their effects through proteins in cells: this publication examines both individual cell processes and the rapidly growing understanding of genetic control mechanisms. Throughout, the emphasis is on giving clear explanations of underlying principles, so that students are equipped to understand existing phenomena and can also build a foundation to understand phenomena that as yet remain undiscovered.

Human physiology is central to medicine and health. The second edition of *Biology* discusses almost every aspect of the human system, including bones, brains, and behavior. Several health issues important to students receive special attention, including alcohol and sexually transmitted diseases. The use of emerging biotechnology as a means to treat and cure many genetic disorders is also highlighted. Comparative animal physiology and plant physiology are featured as well.

Scientific exploration increasingly reveals the world's biodiversity, even as this very biodiversity is increasingly threatened. Both of these critical aspects are covered. Animal and plant diversity is discussed in many separate entries, and major entries are provided on archaea, eubacteria, fungi, and protists. Up-to-date classification systems are used throughout. The major environmental challenges facing the world today are also covered, including global climate change, extinction, and desertification, along with the evolving body of knowledge on both behavioral and community ecology.

"The ecological theater and the evolutionary play" is how one notable biologist described the vital connection between these two major areas in biology. This interplay is explored in entries that range from physiological ecology to human evolution and in environments from the Arctic tundra to the depths of the oceans. Finally, the history of biology is examined through major entries and capsule biographies, as well as varied careers in biology.

Organization of the Material

To aid students and teachers in exploring the topic, the second edition of *Biology* includes a thematic outline in the front matter of each volume and a cumulative index at the end of Volume 4. Definitions of more than 560 terms appear in the page margins and are collected in a glossary at the end of each volume. Each entry contains suggestions for further reading. Useful references, including a geologic time scale and tables of metric conversions appear in the front matter.

Acknowledgments and Thanks

A work of this scope would be impossible without the dedication and hard work of many people. The contributors to this reference are biologists who have devoted their careers to understanding the living world and have here devoted many hours to explaining it carefully and clearly for a beginning audience. The editors at Gale, Cengage Learning offered invaluable oversight and assistance, and the copyeditors and proofers enhanced the content with their careful review and fact checking.

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