Biology: Exploring Life

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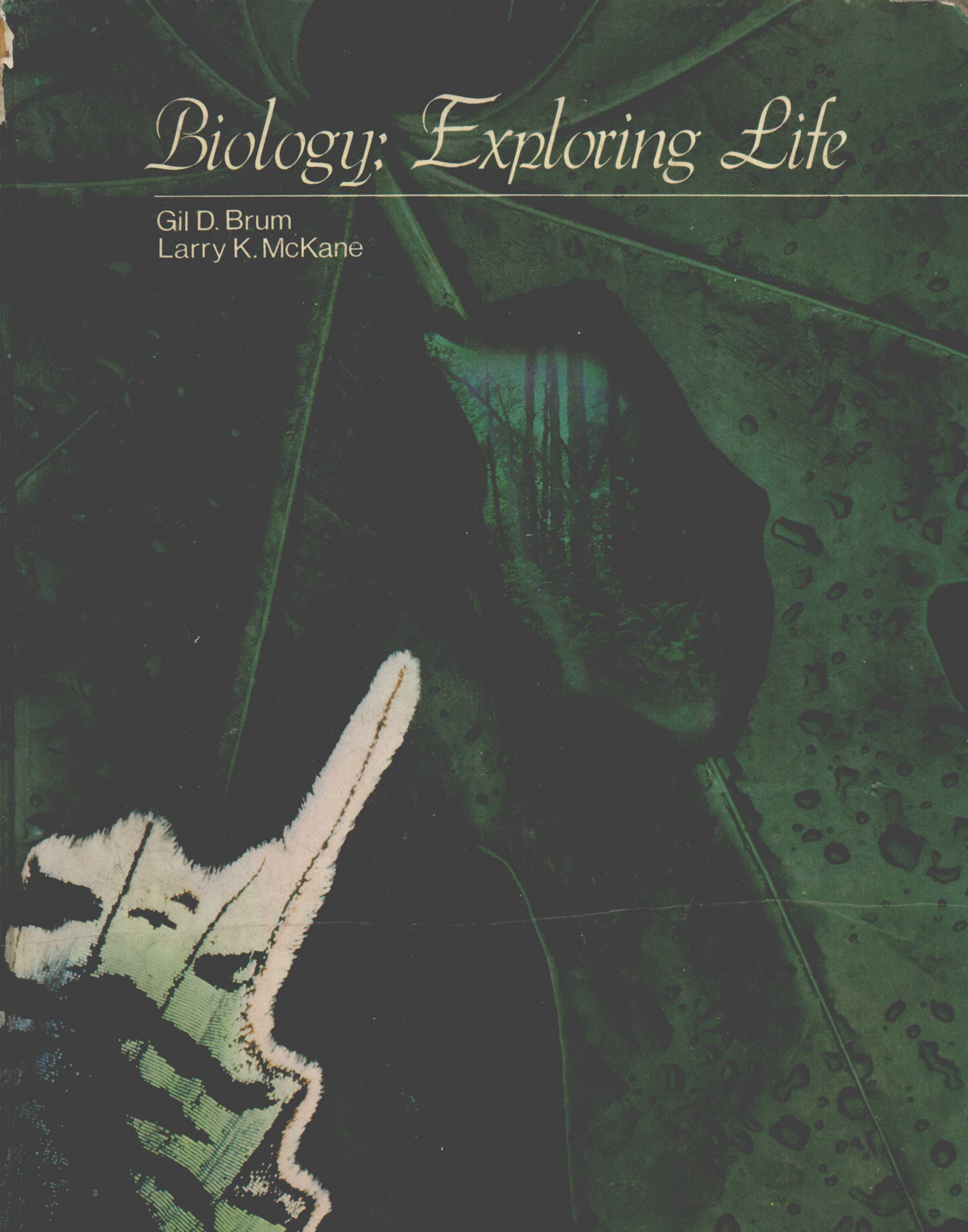

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Preface

A Process Oriented Book *for College and University Introductory Biology*

Biology: Exploring Life guides the student on a captivating journey of exploration and discovery into the world of life. We have reversed the traditional accent on static structures and terminology in favor of highlighting the *processes* of biology; bringing biology to life by emphasizing the ongoing quest for scientific understanding and the dynamic processes of life.

Our goal is to become partners with the instructor in teaching biology to college students. The biology teacher's greatest pedagogic asset is the basic desire of students to understand themselves as well as the natural world around them. We seek to arouse this fascination, building knowledge and insight that will enable them to make "real life" judgements as modern biology takes on greater significance in everyday life.

A Balanced Treatment

Biology is more than a compilation of facts and structures to be memorized. At the foundation of biology are basic concepts that tie facts and terms into a meaningful and integrated whole. By balancing concepts and facts, we help students better visualize the integrated processes of life so they come away not only knowing "what", but also "how".

Biology is not only about humans; it is about all life. We use the student's natural interest in human biology (and other animals) as a backdrop to describe many biological concepts, but we balance this with an equal emphasis on plants and microorganisms, areas often slighted in introductory texts. This balanced approach enables the student to fully appreciate and understand the diversity of life and the critical interactions necessary for perpetuating life on earth.

A Student-Centered Book

This book is for the student. It is a teaching-learning facilitator, designed to first pique interest and then reveal new facts and concepts. This is a book that sparks curiosity and makes students think. By arousing curiosity, building a foundation, and creating a desire to know more, students are better able to synthesize information, see natural relationships, and gain a sense of accomplishment and fulfillment as they acquire new insights and knowledge about the natural world.

Engaging the student in active learning is best achieved by biologists, not by professional writers. People who *do* biology know how science works and have the insight and broad knowledge needed to make connections, inspire true understanding, invent analogies with sharper clarity, inject more relevant examples, and challenge the student's intellect.

Learning Strategies

Our goal has been to write visually, painting verbal images that help students grasp the process and essence of biology. In addition to proven techniques, we have introduced many new pedagogic strategies that make this book an effective teaching tool.

- **Connections Series**—revealing the interconnectedness of all areas of biology. This innovation goes beyond cross-referencing and accomplishes far more than identifying biology's "unifying themes." The Connections Series is devoted to the major concepts that resurface throughout biology. The series includes:

  — ATP
  — Homeostasis
  — Totipotency
  — Multicellular Organization
  — AIDS and other Virus Infections
  — Cancer and the Cell Cycle
  — Cancer and Gene Regulation
  — Evidence for Evolution
  — Plasmids and Gene Transfer
  — The advantages and drawbacks of sexual reproduction

An "articulation icon" visually connects related topics that may be separated by hundreds of pages. By assembling connected facts and concepts into an integrated whole, the student forges a deeper understanding of biology.

- **Species Concept Series**—clarifies the "definition" of a species. Beginning with an overview, the sequence allows students to "grow into" a more complete understanding of what a species is, while acquiring insight into why definitions of a species differ from kingdom to kingdom, and sometimes from biologist to biologist.
- **Discovery Series**—explores specific eposides in the quest for knowledge. Students acquire insight into the *process of science* and the growth of scientific ideas and explanations. The reader experiences the dramas of scientific endeavor, while gaining an appreciation for the way science is performed in the real world.
- **Animal Behavior Series.** Each aspect of animal behavior is integrated into the chapters where they naturally fit, next to the biological principles that form the foundations of the behavior. The neurological basis of behavior, for example, is reinforced by discussing it with the nervous system rather than in a far removed chapter devoted to behavior alone.

- **Biolines** — highlight biology's fascinating facts, applications, and "real life" lessons. Each bioline enhances interest while providing additional information that enlivens the "mainstream" of biological information. Many are remarkable stories with unexpected twists that reveal nature to be as inventive and interesting as any imaginative novelist.

- **Synopsis — beyond Summaries and Key Terms.** The end-of-chapter material continues to teach by integrating and clustering material from the chapter into two effective innovations.

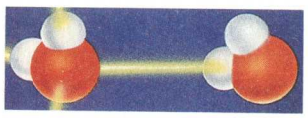
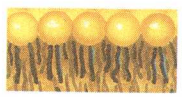
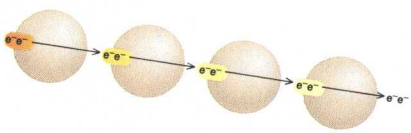
  Main Concepts — reemphasizes the major principles, underlying trends and emerging themes in the chapter. Such understanding facilitates all levels of learning.

  Key Term Integrator — clusters related terms in statements that reinforce the relationships between terms by joining them into meaningful units. It is not a glossary, but an organizer that conveys meaning beyond mere definitions.

- **From Overview to Understanding.** Each chapter begins with an outline that visually depicts the chapter's organization, and ends with **Review and Synthesis** questions and activities that reinforce, challenge, allow for self-assessment, encourage problem solving, and promote deeper understanding.

- **New Images with Improved Meaning.** Biology is visual and dynamic. In addition to realistic three-dimensional renderings, our illustrations add motion that reveals the process of biology, as well as making it more inviting and enjoyable to learn. You will not find the same old diagrams rehashed in this book. The use of full color throughout the text, combined with recent breakthroughs in understanding how students learn, has enabled us to open new doors to improve the teaching value of each illustration. Virtually every color in an illustration has a purpose. For example, we use color to help the student follow complex chemical pathways, to trace the flow of energy, electrons, and nutrients, to recognize recurring objects and processes, and to reinforce the location of the important molecules of life. This is the first book to standardize all objects and colors throughout, making it easier for students to mentally cross-reference related material presented many chapters apart. (The cell membrane in Chapter 4 looks exactly the same as the cell membrane in Chapters 6, 7, and 10.)

- **Standardized Representations.** Many structures and processes recur in biology, reminders of the unity of life. We have invented a recognizable icon to identify each of these repeating images. Our standard icons are presented on the following page for easy reference:

Icon	Description
	ATP
	Energized state
	Energized electrons
	Hydrogen bonds
	Energy-rich phosphate bond
	Phospholipids
	Electron transport, gradual loss of energy as energy-rich electrons pass from cytochrome to cytochrome
	High-energy arrow
	carbon
	hydrogen
	oxygen
	nitrogen
	sulfur
	phosphate

Acknowledgments

The evolution of this text has spread over 5 years and involved many people. Although it is impossible to mention each by name, we wish to acknowledge the talent and dedication of each of them here. This text evolved through two distinct phases—a development phase and a production phase—both of which were critical to getting a book of this ambition, vision, and quality in your hands. We extend our sincerest gratitude and thanks to the following people:

The Development Phase

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The Production Phase

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Jack Burk, California State University, Fullerton
Marvin Cantor, California State University, Northridge
David Cotter, Georgia College
Loren Denny, Southwest Missouri State University
Thomas Emmel, University of Florida
Alan Feduccia, University of North Carolina at Chapel Hill
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