

Preface

The authors and publisher are pleased to present the twenty-seventh edition of *Harper's Illustrated Biochemistry*. First published as *Review of Physiological Chemistry* in 1939 and revised in 1944, it quickly gained a wide readership. In 1951, the third edition appeared with Harold A. Harper, University of California at San Francisco, as author. Dr. Harper remained the sole author until the ninth edition and co-authored eight subsequent editions. Peter Mayes and Victor Rodwell joined as authors in the tenth edition, Daryl Granner in the twentieth, and Rob Murray in the twenty-first edition. We now bid a fond and grateful farewell to our long-time colleague Peter Mayes, who retired from active authorship after the previous edition. Asked by Harold Harper to review portions of the ninth edition, Peter joined as an author for the tenth through twenty-sixth editions. Peter contributed a unique ability to design diagrams that integrate all key aspects of a metabolic pathway: the enzymes, intermediates, and the mechanisms that guide and regulate metabolic flow. Such skills, his concise and informative prose, and his collegial relationships with the other authors contributed significantly to the continued success of this text. He will be greatly missed by his fellow authors and by readers.

The ever-increasing complexity of biochemical knowledge has led to the addition of several co-authors in recent editions. Peter Mayes' responsibilities now pass to his former collaborators, David Bender and Kathleen Botham, continuing the long-standing trans-Atlantic ties in the authorship of this text. P. Anthony Weil, a co-author with Daryl Granner in the previous edition, continues his invaluable input. Additional co-authors for this and prior editions include Fred Keeley and Margaret Rand with Rob Murray and Peter Kennelly with Victor Rodwell. The senior authors are grateful to their new colleagues for bringing their expertise and fresh perspectives to the text.

CHANGES IN THE TWENTY-SEVENTH EDITION

A major goal continues to be to provide to students of medicine and the health sciences a text that describes and illustrates the basics of biochemistry in a concise, user-friendly, and interesting manner. Significant advances in biochemistry that are of importance in medicine continue to be emphasized. The twenty-sixth edition incorporated drastic revisions, motivated by the fact that many students expressed a desire for a shorter text. Important new features of the twenty-seventh edition include:

- All chapters have been revised, with the inclusion of many new figures and references.
- The origins of the term pH are clearly described.
- The completely new chapter on bioinformatics and computational biology, which emphasizes their impact on present and future medical practice provides valuable insight into these fast growing fields.
- Modern methods of drug discovery that build on advances in genomics and proteomics are emphasized.
- Introduction of the concept of the protein life cycle provides a unified framework for understanding the inter-related processes of the maturation, post-translational modification, regulation, and degradation of proteins.
- The role of mass spectrometry in identification of proteins and small molecules that facilitate the diagnosis of metabolic diseases is emphasized.
- Descriptions of the cell cycle and of the ubiquitin-proteasome pathway of protein degradation have been included.
- The chapter on the respiratory chain and oxidative phosphorylation has been extensively revised.
- Text relating to metabolic disorders of the urea cycle has been revised and updated, and the biosynthesis and metabolic roles of selenocysteine, the twenty-first amino acid, have been introduced.
- New material has been included on lipid rafts, ion channels and voltage-gated channels, glucose transport, and gap junctions.
- With regard to intracellular traffic and sorting of proteins, information on the unfolded protein response and ER-associated degradation has been added.
- The involvement of glycoproteins in many diseases, including peptic ulcer, certain congenital muscular dystrophies, and cystic fibrosis, has been discussed.
- The many newly discovered proteins involved in iron metabolism and hemochromatosis are described.
- Information on hemostasis, thrombosis, and platelet action has been updated.

ORGANIZATION OF THE BOOK

Following two introductory chapters ("Biochemistry & Medicine" and "Water & pH"), the text is divided into

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six main sections.

Section I deals with the structures and functions of proteins and enzymes, the workhorses of organisms. Because almost all of the reactions in cells are catalyzed by enzymes, it is vital to understand the properties of enzymes before considering other topics. Section I also contains a new chapter on bioinformatics and computational biology, reflecting the increasing importance of these topics in modern biochemistry, biology, and medicine.

Section II explains how various cellular reactions either utilize or release energy, and traces the pathways by which carbohydrates and lipids are synthesized and degraded. Also described are the many functions of these two classes of molecules.

Section III deals with the amino acids, their many metabolic fates, certain key features of protein catabolism, and the biochemistry of the porphyrins and bile pigments.

Section IV describes the structures and functions of the nucleotides and nucleic acids, and includes topics such as DNA replication and repair, RNA synthesis and modification, protein synthesis, the principles of recombinant DNA and genomic technology, and new understanding of how gene expression is regulated.

Section V deals with aspects of extracellular and intracellular communication. Topics include membrane structure and function, the molecular bases of the actions of hormones, and the key field of signal transduction.

Section VI discusses ten special topics: nutrition, digestion, and absorption; vitamins and minerals; intracellular trafficking and sorting of proteins; glycoproteins; the extracellular matrix; muscle and the cytoskeleton; plasma proteins and immunoglobulins; hemostasis and thrombosis; red and white blood cells; and the metabolism of xenobiotics.

The **Appendix** contains a list of useful web sites and a list of biochemical journals or journals that contain considerable biochemical content. All of the Sections contain numerous illustrations of the medical relevance of biochemistry.

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