Contents

SECTION I

Introduction to Cell Biology

- 1 Introduction to Cells, 3
- 2 Evolution of Life on Earth, 15

SECTION II

Chemical and Physical Background

- 3 Molecules: Structures and Dynamics, 31
- 4 Biophysical Principles, 53
- 5 Macromolecular Assembly, 63
- 6 Research Strategies, 75

SECTION III

Chromatin, Chromosomes, and the Cell Nucleus

- 7 Chromosome Organization, 107
- 8 DNA Packaging in Chromatin and Chromosomes, 123
- 9 Nuclear Structure and Dynamics, 143

SECTION IV

Central Dogma: From Gene to Protein

- 10 Gene Expression, 165
- 11 Eukaryotic RNA Processing, 189
- 12 Protein Synthesis and Folding, 209

SECTION V

Membrane Structure and Function

- 13 Membrane Structure and Dynamics, 227
- 14 Membrane Pumps, 241
- 15 Membrane Carriers, 253
- **16** Membrane Channels, 261
- 17 Membrane Physiology, 285

SECTION VI

Cellular Organelles and Membrane Trafficking

- 18 Posttranslational Targeting of Proteins, 303
- 19 Mitochondria, Chloroplasts, Peroxisomes, 317
- 20 Endoplasmic Reticulum, 331
- 21 Secretory Membrane System and Golgi Apparatus, 351
- **22** Endocytosis and the Endosomal Membrane System, 377
- 23 Processing and Degradation of Cellular Components, 393

SECTION VII

Signaling Mechanisms

- 24 Plasma Membrane Receptors, 411
- 25 Protein Hardware for Signaling, 425
- 26 Second Messengers, 443
- 27 Integration of Signals, 463

SECTION VIII

Cellular Adhesion and the Extracellular Matrix

- 28 Cells of the Extracellular Matrix and Immune System, 491
- 29 Extracellular Matrix Molecules, 505
- 30 Cellular Adhesion, 525
- 31 Intercellular Junctions, 543
- **32** Connective Tissues, 555

SECTION IX

Cytoskeleton and Cellular Motility

- **33** Actin and Actin-Binding Proteins, 575
- **34** Microtubules and Centrosomes, 593

X CONTENTS

- 35 Intermediate Filaments, 613
- **36** Motor Proteins, 623
- **37** Intracellular Motility, 639
- **38** Cellular Motility, 651
- **39** Muscles, 671

SECTION X Cell Cycle

- **40** Introduction to the Cell Cycle, 697
- **41** G₁ Phase and Regulation of Cell Proliferation, 713

- 42 S Phase and DNA Replication, 727
- **43** G₂ Phase, Responses to DNA Damage, and Control of Entry Into Mitosis, 743
- 44 Mitosis and Cytokinesis, 755
- **45** Meiosis, 779
- **46** Programmed Cell Death, 797

Cell SnapShots, 817

Glossary, 823

Index, 851