Michael W. Berns

Cells

Second Edition



Contents

1	The Diversity of Cells 1 Prokaryotes 1	
	Eukarvotic Cells	
	Unicellular Organisms 8 Cells of the Multicellular Organism Viruses 22	
	Viruses 22	15
-		

- How a Cell is Studied Light Microscopy 25 Video Microscopy Cell Fractionation and Centrifugation 33 Cytochemistry 37 36 Autoradiography 38 Cell Culture 42 Cytophotometry and Cytofluorometry Immunofluorescence Microbeam Irradiation 47
- 3 Chromosomes, Genes, and DNA 50
 Cytology 50
 Chromosome Structure and Chemistry 55
 DNA Replication and Informational Content 61

4	The Nucleolus and Ribosomes 73 Morphology 73 Ultrastructure 73 Origin of the Nucleolus (the Nucleolar Organizer) 77 Gene Amplification 82 Ribosomes 83
5	Membranelles 85 Cell Membrane 85 Other Membranous Organelles 95
6	Cell Energetics 105 Chloroplasts 106 Mitochondria 113
7	Cell Division 118 Types of Cell Division 118 Genetic Aspects of Cell Division 119 Morphological Aspects of Cell Division 122 Forces Involved in Cell Division 128 Gametogenesis 135
8	Cell Differentiation 143 The Cell in Early Development 143 Models for Gene Regulation 153
9	Genetic Engineering 157 Identification and Isolation of Desired Gene 158 The Right Clone 162 Gene Activation 166 Gene Insertion in Mammalian Cells 168 Other Forms of Genetic Engineering 173 Plant Genetic Engineering 173
10	Excitation and Contraction 177 Nerves and Action Potentials 177 Muscle Cells and Contraction 179 Control of Contraction 183

11 Cytoskeleton and Motility 185

Cytoskeletal Elements 186
Direction of Cell Movement 198
A Cytoplasmic Microtrabecular System 201

12 Cellular Immunology 205

Two Types of Immune Responses 206
Types of Cells 206
Cell-Cell Interactions 213
Surface Receptors 222
Genetic Control of the Immune System 223
Immunology as a Tool 229

13 Aging and Death 233

Cellular Aging 233
Intracellular Aging 237
Cell Death and Development 239

Glossary 243 Index 249