

# Contents

Preface xix

Organization and Features of *The Cell* xxi

Media and Supplements to Accompany *The Cell* xxiii

## Part I Introduction 1

### CHAPTER 1

## An Overview of Cells and Cell Research 3

### The Origin and Evolution of Cells 4

- The first cell 4
- The evolution of metabolism 6
- Present-day prokaryotes 8
- Eukaryotic cells 9
- The origin of eukaryotes 10
- The development of multicellular organisms 13

### Cells as Experimental Models 17

- E. coli* 17
- Yeasts 18
- Caenorhabditis elegans* 18
- Drosophila melanogaster* 19
- Arabidopsis thaliana* 19
- Vertebrates 20

### Tools of Cell Biology 22

- Light microscopy 22
- Electron microscopy 28
- Subcellular fractionation 31
- Growth of animal cells in culture 32
- Culture of plant cells 36
- Viruses 36

#### KEY EXPERIMENT

- Animal Cell Culture 34

#### MOLECULAR MEDICINE

- Viruses and Cancer 37

*Summary and Key Terms* 39

*Questions* 40

*References and Further Reading* 41

### CHAPTER 2

## The Composition of Cells 43

### The Molecules of Cells 43

- Carbohydrates 44
- Lipids 46
- Nucleic acids 49
- Proteins 52

### Cell Membranes 58

- Membrane lipids 58
- Membrane proteins 59
- Transport across cell membranes 62

### Proteomics: Large-Scale Analysis of Cell Proteins 65

- Identification of cell proteins 65
- Global analysis of protein localization 67
- Protein interactions 68



