

Contents

Preface ix

Acknowledgments xiii

- CHAPTER 1. Cells, Genes, and Evolution: On the Nature and Workings of Life 1
- CHAPTER 2. The Tree of Life: Universal Phylogeny and Its Discontents 18
- CHAPTER 3. A World Mostly Made Up of Microbes: Bacteria, Archaea, and Eukarya 35
- CHAPTER 4. The Deep Roots of Cellular Life: The Common Ancestry of Living Things 51
- CHAPTER 5. The Perplexing Chronicles of Bioenergetics: Making a Living, Now and in the Past 68
- CHAPTER 6. Life's Devices: On the Evolution of Prokaryotic Cells and Their Parts 86
- CHAPTER 7. Emergence of the Eukaryotes: The Second Mystery in Cell Evolution 104
- CHAPTER 8. Symbionts into Organelles: Mitochondria, Plastids, and Their Kin 126
- CHAPTER 9. Reading the Rocks: What We Can Infer from Geology 145

CHAPTER 10. Ultimate Riddle: Origin of Cellular Life 164

CHAPTER 11. The Crooked Paths of Cell Evolution:
Cell Evolution Is Special 190

CHAPTER 12. Summing Up: Journey without Maps 215

Notes 231

Glossary 249

References 261

Index 289