

Contents

Preface xi

Acknowledgments xiii

1. What Is an Epiphyte? 1

Getting to Know the Epiphytes 2

Body Plans 8

The Epidermis 11

Other Notable Features of the Epiphytes 11

Starting at the Beginning 12

Geological History 14

Geographic Distribution 15

Use by Humans 17

Conservation 18

2. The Types of Epiphytes and Their Evolutionary Origins 20

The Free-Living Epiphytes 23

The Biological Underpinnings of Epiphytism 33

How Epiphytism Evolved 34

The Taxonomic Affiliations of the Epiphytes 37

Genetic Heritage and Evolutionary Options 37

Epiphytism and Speciation 39

3. Epiphytes in Communities and Ecosystems 42

The Nature of Aerial Habitats 43

Mineral Nutrients 45

Water 47

Light 49

Epiphytes as Members of Communities 53

Random Factors Also Structure Communities 54
Ecological Succession 56
What Makes a Tree a Host for Epiphytes? 58
How Epiphytes Can Impact Their Hosts 59
Nutritional Piracy 61
Additional Ways That Epiphytes Harm Their Hosts 63
Manifold Effects on Ecosystems 64

4. Water Management 66

Variations on Basic Themes 66
How Biological Structure Relates to Function 67
Water Management 68
How Epiphytes Cope with Drought 71
Drought Avoidance 73
Leaf Economics 73
Roots 75
Leaves as Proxies for Roots 78

5. Photosynthesis and Mineral Nutrition 83

The Photosynthetic Syndromes 83
C₃ versus CAM-type Photosynthesis 85
Light and Adaptive Growth 87
Mineral Nutrition 89
The Mistletoes 94

6. Reproduction and Other Interactions with Animals 98

Pollination 98
Fruits and Seeds 102
Asexual Reproduction 105
Plant Defenses 106
Ants and Epiphytes 106
Termites 110
Leafy Tanks and Phytotelms 112
Case Studies 114

7. The Epiphytic Monocots 119

Orchidaceae 121
The Vegetative Body 121
Reproduction and Speciation 123
The Adaptive Types 126

<i>Bromeliaceae</i>	127
<i>Bromeliads versus Orchids</i>	129
<i>Adaptations for Epiphytism</i>	129
<i>Hemi-epiphytism</i>	132
<i>The Atmospheric Bromeliads</i>	134
<i>Araceae</i>	136
<i>Amaryllidaceae and Additional Families in Order Liliales</i>	140

8. The Epiphytic Eudicots 142

<i>Cactaceae</i>	143
<i>General Characteristics</i>	143
<i>Adaptations for Epiphytism</i>	145
<i>Evolutionary History</i>	145
<i>Ecology</i>	148
<i>Reproduction</i>	148
<i>Ericaceae</i>	149
<i>Adaptations for Epiphytism</i>	150
<i>Epiphytism and Speciation</i>	151
<i>Reproductive Biology</i>	151
<i>Horticulture</i>	151
<i>Gesneriaceae</i>	152
<i>Adaptive Variety</i>	153
<i>Evolutionary History</i>	153
<i>Reproductive Biology</i>	155
<i>Rubiaceae</i>	156
<i>Melastomataceae</i>	158
<i>Apocynaceae</i>	159
<i>Solanaceae</i>	161

9. The Pteridophytic Epiphytes 162

<i>The Major Groups of Pteridophytes</i>	166
<i>The Ferns</i>	167
<i>The Lycophytes</i>	179

10. Miscellaneous Epiphytes 182

<i>Piperaceae</i>	182
<i>The Carnivorous Epiphytes</i>	184
<i>The Stranglers and Other Primary Hemi-epiphytes</i>	187
<i>The Gymnosperms</i>	189
<i>Additional Oddities</i>	190

11. Threats and Conservation 196

How Epiphytes Influence Microclimates 197

Contributions to Biodiversity 197

Global Change 198

Excess Nutrients 201

Plant Invasions 201

Habitat Loss 202

Glossary 205

References 219

Subject Index 225

Taxon Index 235

Color plates follow page 48