



Fundamentals of Plant Physiology

Lincoln Taiz

Professor Emeritus, University of California, Santa Cruz

Eduardo Zeiger

Professor Emeritus, University of California, Los Angeles

Ian Max Møller

Professor Emeritus, Aarhus University, Denmark

Angus Murphy

Professor, University of Maryland



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Brief Contents

CHAPTER 1	Plant and Cell Architecture	1
CHAPTER 2	Water and Plant Cells	45
CHAPTER 3	Water Balance of Plants	65
CHAPTER 4	Mineral Nutrition	91
CHAPTER 5	Assimilation of Inorganic Nutrients	121
CHAPTER 6	Solute Transport	147
CHAPTER 7	Photosynthesis: The Light Reactions	181
CHAPTER 8	Photosynthesis: The Carbon Reactions	213
CHAPTER 9	Photosynthesis: Physiological and Ecological Considerations	243
CHAPTER 10	Translocation in the Phloem	269
CHAPTER 11	Respiration and Lipid Metabolism	303
CHAPTER 12	Signals and Signal Transduction	341
CHAPTER 13	Signals from Sunlight	369
CHAPTER 14	Embryogenesis	391
CHAPTER 15	Seed Dormancy, Germination, and Seedling Establishment	411
CHAPTER 16	Vegetative Growth and Senescence	445
CHAPTER 17	Flowering and Fruit Development	473
CHAPTER 18	Biotic Interactions	507
CHAPTER 19	Abiotic Stress	537

Table of Contents

CHAPTER 1

Plant and Cell Architecture 1

Plant Life Processes: Unifying Principles 2

Plant Classification and Life Cycles 2

Box 1.1 Evolutionary Relationships among Plants 3

Plant life cycles alternate between diploid and haploid generations 4

Overview of Plant Structure 6

Plant cells are surrounded by rigid cell walls 6

Primary and secondary cell walls differ in their components 7

The cellulose microfibrils and matrix polymers are synthesized via different mechanisms 9

Plasmodesmata allow the free movement of molecules between cells 10

New cells originate in dividing tissues called meristems 11

Box 1.2 The Secondary Plant Body 14

Plant Cell Types 15

Dermal tissue covers the surfaces of plants 15

Ground tissue forms the bodies of plants 15

Vascular tissue forms transport networks between different parts of the plant 17

Plant Cell Organelles 17

Biological membranes are bilayers that contain proteins 18

The Nucleus 20

Gene expression involves both transcription and translation 23

Posttranslational regulation determines the life span of proteins 23

The Endomembrane System 25

The endoplasmic reticulum is a network of internal membranes 25

Vacuoles have diverse functions in plant cells 26

Oil bodies are lipid-storing organelles 27

Microbodies play specialized metabolic roles in leaves and seeds 27

Independently Dividing Semiautonomous Organelles 28

Proplastids mature into specialized plastids in different plant tissues 31

Chloroplast and mitochondrial division are independent of nuclear division 31

The Plant Cytoskeleton 32

The plant cytoskeleton consists of microtubules and microfilaments 32

Actin, tubulin, and their polymers are in constant flux in the living cell 33

Microtubule protofilaments first assemble into flat sheets before curling into cylinders 34

Cytoskeletal motor proteins mediate cytoplasmic streaming and directed organelle movement 34

Cell Cycle Regulation 37

Each phase of the cell cycle has a specific set of biochemical and cellular activities 37

The cell cycle is regulated by cyclins and cyclin-dependent kinases 38

Mitosis and cytokinesis involve both microtubules and the endomembrane system 39

CHAPTER 2

Water and Plant Cells 45

Water in Plant Life 46

The Structure and Properties of Water 46

- Water is a polar molecule that forms hydrogen bonds 47
- Water is an excellent solvent 47
- Water has distinctive thermal properties relative to its size 48
- Water molecules are highly cohesive 48
- Water has a high tensile strength 49

Diffusion and Osmosis 51

- Diffusion is the net movement of molecules by random thermal agitation 51
- Diffusion is most effective over short distances 52
- Osmosis describes the net movement of water across a selectively permeable barrier 53

Water Potential 53

- The chemical potential of water represents the free-energy status of water 53
- Three major factors contribute to cell water potential 54
- Water potentials can be measured 55

Water Potential of Plant Cells 55

- Water enters the cell along a water potential gradient 56
- Water can also leave the cell in response to a water potential gradient 56
- Water potential and its components vary with growth conditions and location within the plant 58

Cell Wall and Membrane Properties 58

- Small changes in plant cell volume cause large changes in turgor pressure 58
- The rate at which cells gain or lose water is influenced by plasma membrane hydraulic conductivity 60
- Aquaporins facilitate the movement of water across plasma membranes 60

Plant Water Status 61

- Physiological processes are affected by plant water status 61
- Solute accumulation helps cells maintain turgor and volume 62

CHAPTER 3

Water Balance of Plants 65

Water in the Soil 66

- A negative hydrostatic pressure in soil water lowers soil water potential 66
- Water moves through the soil by bulk flow 67

Water Absorption by Roots 68

- Water moves in the root via the apoplast, symplast, and transmembrane pathways 69
- Solute accumulation in the xylem can generate “root pressure” 70

Water Transport through the Xylem 71

- The xylem consists of two types of transport cells 71
- Water moves through the xylem by pressure-driven bulk flow 73
- Water movement through the xylem requires a smaller pressure gradient than movement through living cells 73
- What pressure difference is needed to lift water 100 meters to a treetop? 74
- The cohesion–tension theory explains water transport in the xylem 74
- Xylem transport of water in trees faces physical challenges 76
- Plants minimize the consequences of xylem cavitation 78

Water Movement from the Leaf to the Atmosphere 78

- Leaves have a large hydraulic resistance 79
- The driving force for transpiration is the difference in water vapor concentration 80
- Water loss is also regulated by the pathway resistances 81
- The boundary layer contributes to diffusional resistance 81
- Stomatal resistance is another major component of diffusional resistance 82
- The cell walls of guard cells have specialized features 82
- An increase in guard cell turgor pressure opens the stomata 83

Coupling Leaf Transpiration and Photosynthesis: Light-dependent Stomatal Opening 85

Stomatal opening is regulated by light 85

Stomatal opening is specifically regulated by blue light 86

Water-use efficiency 87

Overview: The Soil–Plant–Atmosphere Continuum 87

CHAPTER 4

Mineral Nutrition 91

Essential Nutrients, Deficiencies, and Plant Disorders 92

Special techniques are used in nutritional studies 95

Nutrient solutions can sustain rapid plant growth 95

Mineral deficiencies disrupt plant metabolism and function 98

Analysis of plant tissues reveals mineral deficiencies 103

Treating Nutritional Deficiencies 104

Crop yields can be improved by the addition of fertilizers 105

Some mineral nutrients can be absorbed by leaves 106

Soil, Roots, and Microbes 106

Negatively charged soil particles affect the adsorption of mineral nutrients 107

Soil pH affects nutrient availability, soil microbes, and root growth 108

Excess mineral ions in the soil limit plant growth 109

Some plants develop extensive root systems 109

Root systems differ in form but are based on common structures 110

Different areas of the root absorb different mineral ions 112

Nutrient availability influences root growth 114

Mycorrhizal symbioses facilitate nutrient uptake by roots 114

Nutrients move between mycorrhizal fungi and root cells 118

CHAPTER 5

Assimilation of Inorganic Nutrients 121

Nitrogen in the Environment 122

Nitrogen passes through several forms in a biogeochemical cycle 122

Unassimilated ammonium or nitrate may be dangerous 124

Nitrate Assimilation 125

Many factors regulate nitrate reductase 125

Nitrite reductase converts nitrite to ammonium 126

Both roots and shoots assimilate nitrate 127

Ammonium Assimilation 128

Converting ammonium to amino acids requires two enzymes 128

Ammonium can be assimilated via an alternative pathway 128

Transamination reactions transfer nitrogen 129

Asparagine and glutamine link carbon and nitrogen metabolism 130

Amino Acid Biosynthesis 130

Biological Nitrogen Fixation 131

Free-living and symbiotic bacteria fix nitrogen 131

Nitrogen fixation requires microanaerobic or anaerobic conditions 132

Symbiotic nitrogen fixation occurs in specialized structures 134

Establishing symbiosis requires an exchange of signals 134

Nod factors produced by bacteria act as signals for symbiosis 135

Nodule formation involves phytohormones 136

The nitrogenase enzyme complex fixes N_2 138

Amides and ureides are the transported forms of nitrogen 139

Sulfur Assimilation 140

Sulfate is the form of sulfur transported into plants 140

Sulfate assimilation occurs mostly in leaves 140

Methionine is synthesized from cysteine 141

Phosphate Assimilation 141

Iron Assimilation 141

Roots modify the rhizosphere to acquire iron 141

Iron cations form complexes with carbon and phosphate 142

The Energetics of Nutrient Assimilation 143

CHAPTER 6

Solute Transport 147

Passive and Active Transport 148

Transport of Ions across Membrane Barriers 150

Different diffusion rates for cations and anions produce diffusion potentials 151

How does membrane potential relate to ion distribution? 152

The Nernst equation distinguishes between active and passive transport 153

Proton transport is a major determinant of the membrane potential 154

Membrane Transport Processes 155

Channels enhance diffusion across membranes 156

Carriers bind and transport specific substances 158

Primary active transport requires energy 158

Secondary active transport uses stored energy 160

Kinetic analyses can elucidate transport mechanisms 161

Membrane Transport Proteins 163

The genes for many transporters have been identified 163

Transporters exist for diverse nitrogen-containing compounds 165

Cation transporters are diverse 166

Anion transporters have been identified 168

Transporters for metal and metalloid ions transport essential micronutrients 169

Aquaporins have diverse functions 170

Plasma membrane H⁺-ATPases are highly regulated P-type ATPases 170

The tonoplast H⁺-ATPase drives solute accumulation in vacuoles 171

H⁺-pyrophosphatases also pump protons at the tonoplast 173

Ion Transport in Stomatal Opening 173

Light stimulates ATPase activity and creates a stronger electrochemical gradient across the guard cell plasma membrane 173

Hyperpolarization of the guard cell plasma membrane leads to uptake of ions and water 175

Ion Transport in Roots 176

Solutes move through both apoplast and symplast 176

Ions cross both symplast and apoplast 176

Xylem parenchyma cells participate in xylem loading 178

CHAPTER 7

Photosynthesis: The Light Reactions 181

Photosynthesis in Higher Plants 182

General Concepts 182

Light has characteristics of both a particle and a wave 182

When molecules absorb or emit light, they change their electronic state 183

Photosynthetic pigments absorb the light that powers photosynthesis 185

Key Experiments in Understanding Photosynthesis 186

Action spectra relate light absorption to photosynthetic activity 186

Photosynthesis takes place in complexes containing light-harvesting antennas and photochemical reaction centers 187

The chemical reaction of photosynthesis is driven by light 189

Light drives the reduction of NADP⁺ and the formation of ATP 189

Oxygen-evolving organisms have two photosystems that operate in series 190

- Organization of the Photosynthetic Apparatus 192**
 The chloroplast is the site of photosynthesis 192
 Thylakoids contain integral membrane proteins 192
 Photosystems I and II are spatially separated in the thylakoid membrane 193

- Organization of Light-Absorbing Antenna Systems 195**
 Antenna systems contain chlorophyll and are membrane-associated 195
 The antenna funnels energy to the reaction center 195
 Many antenna pigment–protein complexes have a common structural motif 196

- Mechanisms of Electron Transport 197**
 Electrons from chlorophyll travel through the carriers organized in the Z scheme 197
 Energy is captured when an excited chlorophyll reduces an electron acceptor molecule 199
 The reaction center chlorophylls of the two photosystems absorb at different wavelengths 200
 The PSII reaction center is a multi-subunit pigment–protein complex 201
 Water is oxidized to oxygen by PSII 202
 Pheophytin and two quinones accept electrons from PSII 202
 Electron flow through the cytochrome b_6/f complex also transports protons 203
 Plastoquinone and plastocyanin carry electrons between photosystem II and photosystem I 205
 The PSI reaction center reduces NADP^+ 205
 Cyclic electron flow generates ATP but no NADPH 206
 Some herbicides block photosynthetic electron flow 206

Proton Transport and ATP Synthesis in the Chloroplast 207

**CHAPTER 8
 Photosynthesis: The Carbon Reactions 213**

- The Calvin–Benson Cycle 214**
 The Calvin–Benson cycle has three phases: carboxylation, reduction, and regeneration 215
 The fixation of CO_2 via carboxylation of ribulose 1,5-bisphosphate and the reduction of the product 3-phosphoglycerate yield triose phosphates 215
 The regeneration of ribulose 1,5-bisphosphate ensures the continuous assimilation of CO_2 217
 An induction period precedes the steady state of photosynthetic CO_2 assimilation 219
 Many mechanisms regulate the Calvin–Benson cycle 220
 Rubisco activase regulates the catalytic activity of Rubisco 221
 Light regulates the Calvin–Benson cycle via the ferredoxin–thioredoxin system 221
 Light-dependent ion movements modulate enzymes of the Calvin–Benson cycle 222

- Photorespiration: The C_2 Oxidative Photosynthetic Carbon Cycle 222**
 The oxygenation of ribulose 1,5-bisphosphate sets in motion the C_2 oxidative photosynthetic carbon cycle 224
 Photorespiration is linked to the photosynthetic electron transport chain 227

Inorganic Carbon–Concentrating Mechanisms 228

- Inorganic Carbon–Concentrating Mechanisms: The C_4 Carbon Cycle 229**
 Malate and aspartate are the primary carboxylation products of the C_4 cycle 229
 The C_4 cycle assimilates CO_2 by the concerted action of two different types of cells 229
 Bundle sheath cells and mesophyll cells exhibit anatomical and biochemical differences 231
 The C_4 cycle also concentrates CO_2 in single cells 232

Light regulates the activity of key C_4 enzymes 234

Photosynthetic assimilation of CO_2 in C_4 plants demands more transport processes than in C_3 plants 234

In hot, dry climates, the C_4 cycle reduces photorespiration 234

Inorganic Carbon–Concentrating Mechanisms: Crassulacean Acid Metabolism (CAM) 235

Different mechanisms regulate C_4 PEPCase and CAM PEPCase 237

CAM is a versatile mechanism sensitive to environmental stimuli 237

Accumulation and Partitioning of Photosynthates—Starch and Sucrose 238

CHAPTER 9

Photosynthesis: Physiological and Ecological Considerations 243

The Effect of Leaf Properties on Photosynthesis 245

Leaf anatomy and canopy structure maximize light absorption 245

Leaf angle and leaf movement can control light absorption 248

Leaves acclimate to sun and shade environments 249

Effects of Light on Photosynthesis in the Intact Leaf 250

Light-response curves reveal photosynthetic properties 250

Leaves must dissipate excess light energy 252

Absorption of too much light can lead to photoinhibition 255

Effects of Temperature on Photosynthesis in the Intact Leaf 256

Leaves must dissipate vast quantities of heat 256

There is an optimal temperature for photosynthesis 257

Photosynthesis is sensitive to both high and low temperatures 257

Photosynthetic efficiency is temperature-sensitive 258

Effects of Carbon Dioxide on Photosynthesis in the Intact Leaf 259

Atmospheric CO_2 concentration keeps rising 259

CO_2 diffusion to the chloroplast is essential to photosynthesis 260

CO_2 imposes limitations on photosynthesis 261

How will photosynthesis and respiration change in the future under elevated CO_2 conditions? 264

CHAPTER 10

Translocation in the Phloem 269

Patterns of Translocation: Source to Sink 270

Pathways of Translocation 271

Sugar is translocated in phloem sieve elements 272

Mature sieve elements are living cells specialized for translocation 272

Large pores in cell walls are the prominent feature of sieve elements 274

Damaged sieve elements are sealed off 275

Companion cells aid the highly specialized sieve elements 276

Materials Translocated in the Phloem 276

Phloem sap can be collected and analyzed 277

Sugars are translocated in a nonreducing form 278

Other solutes are translocated in the phloem 278

Rates of Movement 280

The Pressure-Flow Model, a Passive Mechanism for Phloem Transport 280

An osmotically generated pressure gradient drives translocation in the pressure-flow model 281

Some predictions of pressure flow have been confirmed, while others require further experimentation 282

There is no bidirectional transport in single sieve elements, and solutes and water move at the same velocity 283

The energy requirement for transport through the phloem pathway is small in herbaceous plants 283

Sieve plate pores appear to be open channels 284

Pressure gradients in the sieve elements may be modest; pressures in herbaceous plants and trees appear to be similar 284

Phloem Loading 285

Phloem loading can occur via the apoplast or symplast 285

Abundant data support the existence of apoplastic loading in some species 287

Sucrose uptake in the apoplastic pathway requires metabolic energy 287

Phloem loading in the apoplastic pathway involves a sucrose- H^+ symporter 288

Phloem loading is symplastic in some species 288

The polymer-trapping model explains symplastic loading in plants with intermediary-type companion cells 288

Phloem loading is passive in several tree species 290

Phloem Unloading and Sink-to-Source Transition 290

Phloem unloading and short-distance transport can occur via symplastic or apoplastic pathways 290

Transport into sink tissues requires metabolic energy 291

The transition of a leaf from sink to source is gradual 292

Photosynthate Distribution: Allocation and Partitioning 294

Allocation includes storage, utilization, and transport 294

Various sinks partition transport sugars 295

Source leaves regulate allocation 295

Sink tissues compete for available translocated photosynthate 297

Sink strength depends on sink size and activity 297

The source adjusts over the long term to changes in the source-to-sink ratio 298

Transport of Signaling Molecules 298

Turgor pressure and chemical signals coordinate source and sink activities 298

Proteins and RNAs function as signal molecules in the phloem to regulate growth and development 299

Plasmodesmata function in phloem signaling 299

CHAPTER 11

Respiration and Lipid Metabolism 303

Overview of Plant Respiration 303

Glycolysis 306

Glycolysis metabolizes carbohydrates from several sources 307

The energy-conserving phase of glycolysis extracts usable energy 309

Plants have alternative glycolytic reactions 310

In the absence of oxygen, fermentation regenerates the NAD^+ needed for glycolytic ATP production 310

The Oxidative Pentose Phosphate Pathway 311

The oxidative pentose phosphate pathway produces $NADPH$ and biosynthetic intermediates 313

The oxidative pentose phosphate pathway is redox-regulated 313

The Tricarboxylic Acid Cycle 314

Mitochondria are semiautonomous organelles 314

Pyruvate enters the mitochondrion and is oxidized via the TCA cycle 315

The TCA cycle of plants has unique features 317

Mitochondrial Electron Transport and ATP Synthesis 318

The electron transport chain catalyzes a flow of electrons from $NADH$ to O_2 318

The electron transport chain has supplementary branches 320

ATP synthesis in the mitochondrion is coupled to electron transport 321

- Transporters exchange substrates and products 322
- Aerobic respiration yields about 60 molecules of ATP per molecule of sucrose 324
- Plants have several mechanisms that lower the ATP yield 324
- Short-term control of mitochondrial respiration occurs at different levels 326
- Respiration is tightly coupled to other pathways 328

Respiration in Intact Plants and Tissues 329

- Plants respire roughly half of the daily photosynthetic yield 329
- Respiratory processes operate during photosynthesis 329
- Different tissues and organs respire at different rates 330
- Environmental factors alter respiration rates 331

Lipid Metabolism 332

- Fats and oils store large amounts of energy 333
- Triacylglycerols are stored in oil bodies 333
- Polar glycerolipids are the main structural lipids in membranes 334
- Membrane lipids are precursors of important signaling compounds 334
- Storage lipids are converted into carbohydrates in germinating seeds, releasing stored energy 336

CHAPTER 12

Signals and Signal Transduction 341

Temporal and Spatial Aspects of Signaling 342

Signal Perception and Amplification 343

- Signals must be amplified intracellularly to regulate their target molecules 344
- Ca²⁺ is the most ubiquitous second messenger in plants and other eukaryotes 344
- Changes in the cytosolic or cell wall pH can serve as second messengers for hormonal and stress responses 345
- Reactive oxygen species act as second messengers mediating both environmental and developmental signals 347

Hormones and Plant Development 347

- Auxin was discovered in early studies of coleoptile bending during phototropism 349
- Gibberellins promote stem growth and were discovered in relation to the “foolish seedling disease” of rice 349
- Cytokinins were discovered as cell division–promoting factors in tissue culture experiments 351
- Ethylene is a gaseous hormone that promotes fruit ripening and other developmental processes 351
- Abscisic acid regulates seed maturation and stomatal closure in response to water stress 351
- Brassinosteroids regulate floral sex determination, photomorphogenesis, and germination 352
- Salicylic acid and jasmonates function in defense responses 353
- Strigolactones suppress branching and promote rhizosphere interactions 353

Phytohormone Metabolism and Homeostasis 353

- Indole-3-pyruvate is the primary intermediate in auxin biosynthesis 354
- Gibberellins are synthesized by oxidation of the diterpene *ent*-kaurene 354
- Cytokinins are adenine derivatives with isoprene side chains 355
- Ethylene is synthesized from methionine via the intermediate ACC 355
- Abscisic acid is synthesized from a carotenoid intermediate 355
- Brassinosteroids are derived from the sterol campesterol 356
- Strigolactones are synthesized from β -carotene 358

Signal Transmission and Cell–Cell Communication 358

Hormonal Signaling Pathways 359

- The cytokinin and ethylene signal transduction pathways are derived from the bacterial two-component regulatory system 359
- Receptor-like kinases mediate brassinosteroid signaling 360

- The core ABA signaling components include phosphatases and kinases 362
- Plant hormone signaling pathways generally employ negative regulation 362
- Protein degradation via ubiquitination plays a prominent role in hormone signaling 362
- Plants have mechanisms for switching off or attenuating signaling responses 363
- The cellular response output to a signal is often tissue-specific 363
- Cross-regulation allows signal transduction pathways to be integrated 363

CHAPTER 13

Signals from Sunlight 369

Plant Photoreceptors 372

- Photoresponses are driven by light quality or spectral properties of the energy absorbed 372
- Plant responses to light can be distinguished by the amount of light required 375

Phytochromes 375

- Phytochrome is the primary photoreceptor for red and far-red light 375
- Phytochrome can interconvert between Pr and Pfr forms 376

Phytochrome Responses 377

- Phytochrome responses vary in lag time and escape time 377
- Phytochrome responses fall into three main categories based on the amount of light required 378
- Phytochrome A mediates responses to continuous far-red light 379
- Phytochrome regulates gene expression 380

Blue-Light Responses and Photoreceptors 380

- Blue-light responses have characteristic kinetics and lag times 381

Cryptochromes 381

- Blue-light irradiation of the cryptochrome FAD chromophore causes a conformational change 382

- The nucleus is a primary site of cryptochrome action 382

- Cryptochrome interacts with phytochrome 382

Phototropins 383

- Phototropism requires changes in auxin mobilization 384
- Phototropins regulate chloroplast movements 384
- Stomatal opening is regulated by blue light, which activates the plasma membrane H⁺-ATPase 385

The Coaction of Phytochrome, Cryptochrome, and Phototropins 386

Responses to Ultraviolet Radiation 387

CHAPTER 14

Embryogenesis 391

Overview of Embryogenesis 393

Comparative Embryology of Eudicots and Monocots 393

- Morphological similarities and differences between eudicot and monocot embryos dictate their respective patterns of development 394
- Apical–basal polarity is maintained in the embryo during organogenesis 396
- Embryo development requires regulated communication between cells 398
- Auxin signaling is essential for embryo development 400
- Polar auxin transport is mediated by localized auxin efflux carriers 401
- Auxin synthesis and polar transport regulate embryonic development 404
- Radial patterning guides formation of tissue layers 404
- The protoderm differentiates into the epidermis 405
- The central vascular cylinder is elaborated by cytokinin-regulated progressive cell divisions 405

Formation and Maintenance of Apical Meristems 406

- Auxin and cytokinin contribute to the formation and maintenance of the RAM 406

SAM formation is also influenced by factors involved in auxin movement and responses 407

Cell proliferation in the SAM is regulated by cytokinin and gibberellin 408

CHAPTER 15

Seed Dormancy, Germination, and Seedling Establishment 411

Seed Structure 412

Seed anatomy varies widely among different plant groups 412

Seed Dormancy 415

There are two basic types of seed dormancy mechanisms: exogenous and endogenous 415

Non-dormant seeds can exhibit vivipary and precocious germination 416

The ABA:GA ratio is the primary determinant of seed dormancy 417

Release from Dormancy 419

Light is an important signal that breaks dormancy in small seeds 419

Some seeds require either chilling or after-ripening to break dormancy 419

Seed dormancy can be broken by various chemical compounds 420

Seed Germination 421

Germination and postgermination can be divided into three phases corresponding to the phases of water uptake 421

Mobilization of Stored Reserves 423

The cereal aleurone layer is a specialized digestive tissue surrounding the starchy endosperm 423

Seedling Establishment 425

The development of emerging seedlings is strongly influenced by light 425

Gibberellins and brassinosteroids both suppress photomorphogenesis in darkness 426

Hook opening is regulated by phytochrome, auxin, and ethylene 426

Vascular differentiation begins during seedling emergence 427

Growing roots have distinct zones 427

Ethylene and other hormones regulate root hair development 428

Lateral roots arise internally from the pericycle 428

Cell Expansion: Mechanisms and Hormonal Controls 430

The rigid primary cell wall must be loosened for cell expansion to occur 430

Microfibril orientation influences growth directionality of cells with diffuse growth 431

Acid-induced growth and cell wall yielding are mediated by expansins 432

Auxin promotes growth in stems and coleoptiles, while inhibiting growth in roots 433

The outer tissues of eudicot stems are the targets of auxin action 433

The minimum lag time for auxin-induced elongation is 10 minutes 434

Auxin-induced proton extrusion loosens the cell wall 434

Ethylene affects microtubule orientation and induces lateral cell expansion 435

Tropisms: Growth in Response to Directional Stimuli 435

Auxin transport is polar and gravity-independent 436

The Cholodny–Went hypothesis is supported by auxin movements and auxin responses during gravitropic growth 437

Gravity perception is triggered by the sedimentation of amyloplasts 438

Gravity sensing may involve pH and calcium ions (Ca^{2+}) as second messengers 439

Phototropins are the light receptors involved in phototropism 440

Phototropism is mediated by the lateral redistribution of auxin 440

Shoot phototropism occurs in a series of steps 441

CHAPTER 16**Vegetative Growth and Senescence 445****The Shoot Apical Meristem 445**

The shoot apical meristem has distinct zones and layers 446

Leaf Structure and Phyllotaxy 447

Auxin-dependent patterning of the shoot apex begins during embryogenesis 448

Differentiation of Epidermal Cell Types 450

A specialized epidermal lineage produces guard cells 451

Venation Patterns in Leaves 452

The primary leaf vein is initiated in the leaf primordium 452

Auxin canalization initiates development of the leaf trace 452

Shoot Branching and Architecture 454

Auxin, cytokinins, and strigolactones regulate axillary bud outgrowth 454

The initial signal for axillary bud growth may be an increase in sucrose availability to the bud 456

Shade Avoidance 457

Reducing shade avoidance responses can improve crop yields 458

Root System Architecture 458

Plants can modify their root system architecture to optimize water and nutrient uptake 458

Monocots and eudicots differ in their root system architecture 458

Root system architecture changes in response to phosphorus deficiencies 459

Plant Senescence 461

During leaf senescence, nutrients are remobilized from the source leaf to vegetative or reproductive sinks 462

The developmental age of a leaf may differ from its chronological age 462

Leaf senescence may be sequential, seasonal, or stress-induced 463

The earliest cellular changes during leaf senescence occur in the chloroplast 464

Reactive oxygen species serve as internal signaling agents in leaf senescence 464

Plant hormones interact in the regulation of leaf senescence 465

Leaf Abscission 467

The timing of leaf abscission is regulated by the interaction of ethylene and auxin 467

Whole Plant Senescence 469

Angiosperm life cycles may be annual, biennial, or perennial 469

Nutrient or hormonal redistribution may trigger senescence in monocarpic plants 470

CHAPTER 17**Flowering and Fruit Development 473****Floral Evocation: Integrating Environmental Cues 474****The Shoot Apex and Phase Changes 474**

Plant development has three phases 475

Juvenile tissues are produced first and are located at the base of the shoot 475

Phase changes can be influenced by nutrients, gibberellins, and epigenetic regulation 476

Photoperiodism: Monitoring Day Length 476

Plants can be classified according to their photoperiodic responses 477

Photoperiodism is one of many plant processes controlled by a circadian rhythm 479

Circadian rhythms exhibit characteristic features 479

Circadian rhythms adjust to different day–night cycles 481

The leaf is the site of perception of the photoperiodic signal 482

Plants monitor day length by measuring the length of the night 482

Night breaks can cancel the effect of the dark period 482

Photoperiodic timekeeping during the night depends on a circadian clock 483

A coincidence model links oscillating light sensitivity and photoperiodism 484

Phytochrome is the primary photoreceptor in photoperiodism 486

Vernalization: Promoting Flowering with Cold 487

Long-distance Signaling Involved in Flowering 488

Gibberellins and ethylene can induce flowering 489

Floral Meristems and Floral Organ Development 490

The SAM in Arabidopsis changes with development 491

The four different types of floral organs are initiated as separate whorls 491

Two major categories of genes regulate floral development 492

The ABC model partially explains the determination of floral organ identity 492

Pollen Development 494

Female Gametophyte Development in the Ovule 495

Functional megaspores undergo a series of free nuclear mitotic divisions followed by cellularization 495

Pollination and Double Fertilization in Flowering Plants 496

Two sperm cells are delivered to the female gametophyte by the pollen tube 497

Pollination begins with adhesion and hydration of a pollen grain on a compatible flower 497

Pollen tubes grow by tip growth 497

Double fertilization results in the formation of the zygote and the primary endosperm cell 498

Fruit Development and Ripening 498

Arabidopsis and tomato are model systems for the study of fruit development 498

Fleshy fruits undergo ripening 500

Ripening involves changes in the color of fruit 500

Fruit softening involves the coordinated action of many cell wall-degrading enzymes 501

Taste and flavor reflect changes in acids, sugars, and aroma compounds 502

The causal link between ethylene and ripening was demonstrated in transgenic and mutant tomatoes 502

Climacteric and non-climacteric fruits differ in their ethylene responses 503

CHAPTER 18

Biotic Interactions 507

Beneficial Interactions between Plants and Microorganisms 509

Other types of rhizobacteria can increase nutrient availability, stimulate root branching, and protect against pathogens 509

Harmful Interactions of Pathogens and Herbivores with Plants 510

Mechanical barriers provide a first line of defense against insect pests and pathogens 511

Specialized plant metabolites can deter insect herbivores and pathogen infection 513

Plants store constitutive toxic compounds in specialized structures 514

Plants often store defensive chemicals as nontoxic water-soluble sugar conjugates in specialized vacuoles 517

Inducible Defense Responses to Insect Herbivores 519

Plants can recognize specific components of insect saliva 519

Phloem feeders activate defense signaling pathways similar to those activated by pathogen infections 520

- Jasmonic acid activates defense responses against insect herbivores 520
- Hormonal interactions contribute to plant–insect herbivore interactions 521
- JA initiates the production of defense proteins that inhibit herbivore digestion 521
- Herbivore damage induces systemic defenses 522
- Long-distance electrical signaling occurs in response to insect herbivory 522
- Herbivore-induced volatiles can repel herbivores and attract natural enemies 524
- Herbivore-induced volatiles can serve as long-distance signals within and between plants 525
- Insects have evolved mechanisms to defeat plant defenses 526

Plant Defenses against Pathogens 526

- Microbial pathogens have evolved various strategies to invade host plants 526
- Pathogens produce effector molecules that aid in the colonization of their plant host cells 527
- Pathogen infection can give rise to molecular “danger signals” that are perceived by cell surface pattern recognition receptors (PRRs) 528
- R proteins provide resistance to individual pathogens by recognizing strain-specific effectors 528
- The hypersensitive response is a common defense against pathogens 530
- A single encounter with a pathogen may increase resistance to future attacks 531

Plant Defenses against Other Organisms 531

- Some plant parasitic nematodes form specific associations through the formation of distinct feeding structures 531
- Plants compete with other plants by secreting allelopathic secondary metabolites into the soil 533
- Some plants are biotrophic pathogens of other plants 533

CHAPTER 19 Abiotic Stress 537

Defining Plant Stress 538

- Physiological adjustment to abiotic stress involves trade-offs between vegetative and reproductive development 539

Acclimation versus Adaptation 540

Environmental Stressors 541

- Water deficit decreases turgor pressure, increases ion toxicity, and inhibits photosynthesis 541
- Salinity stress has both osmotic and cytotoxic effects 543
- Temperature stress affects a broad spectrum of physiological processes 543
- Flooding results in anaerobic stress to the root 544
- Light stress can occur when shade-adapted or shade-acclimated plants are subjected to full sunlight 544
- Heavy metal ions can both mimic essential mineral nutrients and generate ROS 545
- Combinations of abiotic stresses can induce unique signaling and metabolic pathways 545
- Sequential exposure to different abiotic stresses sometimes confers cross-protection 547
- Plants use a variety of mechanisms to sense abiotic stress 547

Physiological Mechanisms That Protect Plants against Abiotic Stress 548

- Plants can alter their morphology in response to abiotic stress 548
- Metabolic shifts enable plants to cope with a variety of abiotic stresses 549
- Heat shock proteins maintain protein integrity under stress conditions 549
- Membrane lipid composition can adjust to changes in temperature and other abiotic stresses 550
- Chloroplast genes respond to high-intensity light by sending stress signals to the nucleus 551
- A self-propagating wave of ROS mediates systemic acquired acclimation 551
- Abscisic acid and cytokinins are stress-response hormones that regulate drought responses 552

Plants adjust osmotically to drying soil by
accumulating solutes 553

Epigenetic mechanisms and small RNAs provide
additional protection against stress 555

Submerged organs develop aerenchyma tissue in
response to hypoxia 556

Antioxidants and ROS-scavenging pathways protect
cells from oxidative stress 558

Exclusion and internal tolerance mechanisms
allow plants to cope with toxic metal and
metalloid ions 559

Plants use cryoprotectant molecules and antifreeze
proteins to prevent ice crystal formation 560

Glossary G-1

Illustration Credits IC-1

Index I-1