



MECHANISMS IN  
**PLANT**  
DEVELOPMENT

OTTOLINE LEYSER  
AND STEPHEN DAY

# Contents

Preface, viii  
Introduction, ix  
Sources for figures, xi

## **Chapter 1: An introduction to flowering plants, 1**

Alternation of generations, 1  
Gametophyte development, 1  
Development of the sporophyte, 3  
Further reading, 18

## **Chapter 2: Characteristics of plant development, 19**

Plant cells, 19  
Larger patterns, 24  
Theoretical framework for the study of developmental mechanisms, 26  
Conclusions, 27  
Further reading, 27

## **Chapter 3: Cell-intrinsic information, 29**

Lineage, 29  
Case study 3.1: Laser ablation of cells in the *Arabidopsis* root tip, 34  
Case study 3.2: Green–white–green periclinal chimeras, 36  
Case study 3.3: Mutations affecting division patterns, 39  
Relationship between age and position, 43  
Case study 3.4: Mutations affecting the rate of leaf initiation in *Arabidopsis*, 44  
Conclusions, 46  
Further reading, 46

## **Chapter 4: Primary axis development, 48**

Embryonic axes, 48  
Case study 4.1: Longitudinal axis of the *Fucus* embryo, 49  
Case study 4.2: Longitudinal axis of the *Arabidopsis* embryo, 54  
Case study 4.3: Radial axis of the *Arabidopsis* embryo, 64  
Conclusions, 71  
Further reading, 71

**Chapter 5: Axis development in the leaf and flower, 74**

Leaves, 74

Case study 5.1: Adaxial–abaxial axis of the leaf, 75

Case study 5.2: Proximodistal axis of the leaf, 84

Case study 5.3: Determinate nature of leaf development, 87

Flowers, 91

Case study 5.4: Radial axis of the flower, 92

Case study 5.5: Adaxial–abaxial axis of the *Antirrhinum* flower, 100

Conclusions, 104

Further reading, 105

**Chapter 6: Position relative to a particular cell, tissue or organ, 110**

Case study 6.1: The pattern of trichomes on the *Arabidopsis* leaf, 111

Case study 6.2: The pattern of root hairs in *Arabidopsis*, 116

Case study 6.3: Phyllotaxy, 123

Case study 6.4: Coordination of leaf and vascular development, 131

Conclusions, 134

Further reading, 134

**Chapter 7: Light, 138**

Light perception, 138

Developmental responses to light, 143

Case study 7.1: Light-induced germination, 143

Case study 7.2: Seedling etiolation and photomorphogenesis, 146

Case study 7.3: Shade escape, 151

Case study 7.4: Phototropism, 154

Case study 7.5: Photoperiodic control of flowering, 156

Conclusions, 161

Further reading, 161

**Chapter 8: Environmental information other than light, 165**

Case study 8.1: Gravitropism, 165

Case study 8.2: Thigmomorphogenesis, 172

Case study 8.3: Effects of uneven nutrient supply on root development, 177

Case study 8.4: Vernalization, 180

Conclusions, 186

Further reading, 186

**Chapter 9: The coordination of development, 190**

Case study 9.1: Initiation and maintenance of the shoot apical meristem, 191

Case study 9.2: Transition from embryonic to post-embryonic development, 200

Case study 9.3: Phase transitions in post-germination development, 203

Case study 9.4: Shoot branching, 213

Conclusions, 219

Further reading, 220

## **Chapter 10: A comparison of plant and animal development, 224**

Control of cell fate, 225

Development of pattern, 226

Consequences of autotrophy versus heterotrophy, 229

Conclusions, 230

Further reading, 230

Index, 233