

Contents

Preface

page vii

Chapter 1	Process, form and pattern	1
1.1	Living at the edge of chaos	1
1.2	Process: the evolution of photosynthesis	9
1.3	Form: the origin of complex cells	19
1.4	Pattern: multicellularity in the algae	38
1.5	What is a plant?	48
1.6	Sub-aerial transmigration of plants	54
	Further reading for Chapter 1	55
Chapter 2	The genesis of form	56
2.1	Plant development	56
2.2	Plant growth and differentiation	60
2.3	The integration of developmental processes	75
2.4	Cellular determination	81
2.5	The epigenetics of plant development	87
2.6	The theory of morphospace	94
	Further reading for Chapter 2	95
Chapter 3	Endless forms?	97
3.1	The living response	97
3.2	The nature of evolutionary processes	104
3.3	Order, transformation and emergence	108
3.4	Macromutation and evolutionary novelty	112
3.5	Unity and diversity; constraint and relaxation	115
3.6	The phenotype	116
3.7	Variation and isolation	120
3.8	Conceptualising plant form	123
	Further reading for Chapter 3	133
Chapter 4	Sex, multiplication and dispersal	135
4.1	The yin and yang of reproduction	135
4.2	Sex	136
4.3	Dispersal	140
4.4	From sex to establishment	150
4.5	The dispersal mechanisms	161
4.6	The diversity of flowers	174
	Further reading for Chapter 4	190

Chapter 5	Ordering the paths of diversity	191
5.1	The phylogeny of plants	191
5.2	The non-flowering plants	197
5.3	Class Magnoliopsida – flowering plants	223
	Further reading for Chapter 5	251
Chapter 6	The lives of plants	252
6.1	Plant diversity around the world	252
6.2	Aquatic and wetland plants	254
6.3	Halophytes	260
6.4	Plant of low-nutrient conditions	269
6.5	Plants of moist shady habitats (sciophytes)	282
6.6	Epiphytes, hemi-epiphytes and vines	286
6.7	Grasslands and savannas	295
6.8	Plants of cold or hot arid habitats	299
6.9	Island floras	308
	Further reading for Chapter 6	316
Chapter 7	The fruits of the Earth	317
7.1	Exploiting plants	317
7.2	Plants for food	321
7.3	Plants for craft and fuel	332
7.4	Plants for the soul	338
7.5	The scientific improvement of plants	356
7.6	The flowering of civilisation	361
	Further reading for Chapter 7	370
Chapter 8	Knowing plants	371
8.1	The emergence of scientific botany	371
8.2	Evolutionary botany	388
8.3	Phylogeny, genetics and the New Systematics	403
8.4	The green future	419
	Further reading for Chapter 8	424
	Index	426