

# Contents

<i>List of figures and tables</i>	ix
<i>Preface to the first edition</i>	xi
<i>Preface to the second edition</i>	xv
<i>Acknowledgements</i>	xvii
 Introduction	 1
<i>Structure of the book</i>	3
 Chapter 1	 7
Ideas, change and stability in physical geography	
<i>What are ideas and how do they change?</i>	7
<i>Johannes Umbgrove and plate tectonics</i>	13
<i>Is there a history of ideas in physical geography?</i>	14
<i>What are the important concepts in physical geography?</i>	17
<i>Chaos, complexity and Earth Systems Science (ESS)</i>	28
<i>Summary</i>	30
 Chapter 2	 31
The nature of reality	
<i>What is reality?</i>	31
<i>Views of different philosophies</i>	33
<i>Case Study: Critical rationalism: an example from</i> <i>environmental reconstruction</i>	38
<i>Reality as a dialogue</i>	42
<i>Theory, reality and practice</i>	44
<i>Case Study: Myths and theories</i>	46
<i>Physical geography as historical science</i>	49
<i>Summary</i>	52
 Chapter 3	 53
Entities and classification	
<i>Introduction</i>	53
<i>What are entities?</i>	54
<i>Entities and kinds</i>	55
<i>Case Study: Species as natural kinds</i>	58



<i>Case Study: Magnitude and frequency – entities out of context</i>	60
<i>Classification</i>	64
<i>Case Study: The EU Water Framework Directive and the classification of surface water status</i>	65
<i>Case Study: Classification of soils</i>	69
<i>Events – mega entities?</i>	71
<i>Summary</i>	72

Chapter 4	Forms of explanation	73
	<i>Explanation in physical geography</i>	73
	<i>What is explanation?</i>	73
	<i>Causality</i>	75
	<i>Case Study: Necessary and sufficient conditions</i>	76
	<i>Explanatory frameworks</i>	80
	<i>Case Study: Abduction as a form of explanation in environmental reconstruction</i>	85
	<i>Case Study: Linking theory and practice</i>	89
	<i>The problems of causation</i>	91
	<i>Summary</i>	93
Chapter 5	Probing reality	95
	<i>Probing and the dialogue with reality</i>	95
	<i>Measurement systems</i>	98
	<i>Case Study: Triangulation of techniques – measurement of surface form on rocks</i>	102
	<i>Practice in physical geography</i>	104
	<i>Case Study: Linking process and form – intensive study of bedforms</i>	107
	<i>Case Study: Probing reality – fluvial flow structure</i>	109
	<i>Case Study: Multiple working hypotheses</i>	113
	<i>Summary</i>	116
Chapter 6	The field	119
	<i>What is 'field science'?</i>	119
	<i>The philosophies of fieldwork</i>	123
	<i>Case Study: Local underdeterminism and the Younger Dryas event</i>	125
	<i>'Simplifying the field' – laboratory and experimental research</i>	129
	<i>Monitoring the field</i>	132
	<i>Fieldwork as a reflective and imaginative practice</i>	132
	<i>Summary</i>	133
Chapter 7	Systems – the framework for physical geography?	135
	<i>Systems analysis in physical geography</i>	135
	<i>Application of systems thinking</i>	137



	<i>Systems and change</i>	140
	<i>Case Study: Systems and landscape sensitivity</i>	144
	<i>Summary</i>	146
Chapter 8	Change and complexity	149
	<i>Equilibrium – an ex-concept?</i>	149
	<i>Chaos and complexity – more of the same?</i>	153
	<i>Case study: Chaos theory and ecological systems</i>	156
	<i>Emergence and hierarchies – scale revisited?</i>	161
	<i>Case Study: Scale and (dis)connectivity</i>	165
	<i>Case Study: Complexity and change – landscape evolution and organisation</i>	169
	<i>Summary</i>	174
Chapter 9	Modelling	175
	<i>Conceptual approaches to modelling</i>	176
	<i>Types of models</i>	178
	<i>Case Study: Numerical modelling of Late Quaternary relative sea-level change and glacial isostatic adjustment</i>	181
	<i>Issues in modelling – bounding, parameters and uncertainty</i>	186
	<i>Case Study: GLUE and modelling – analysing uncertainty</i>	190
	<i>Summary</i>	191
Chapter 10	Physical geography and societies	193
	<i>Paradigms and social networks</i>	193
	<i>Social construction and physical geography?</i>	195
	<i>Ethics in physical geography – reflection required?</i>	196
	<i>Case Study: Fraud in physical geography?</i>	199
	<i>Physical and human geography – division or integration?</i>	201
	<i>Participatory science and physical geography</i>	203
	<i>Summary</i>	207
	<i>References</i>	209
	<i>Index</i>	229