Contents

Preface ix Acknowledgments xi Sources xiii	
Introduction 1	
I Philosophical Perspectives on Emergence 7	
Introduction to Philosophical Perspectives on Emergence	
1 The Rise and Fall of British Emergentism 19Brian P. McLaughlin	
2 On the Idea of Emergence 61 Carl Hempel and Paul Oppenheim	
3 Reductionism and the Irreducibility of Consciousness 69 John Searle	
4 Emergence and Supervenience 81 Brian P. McLaughlin	
5 Aggregativity: Reductive Heuristics for Finding Emergence William C. Wimsatt	99
6 How Properties Emerge 111 Paul Humphreys	
7 Making Sense of Emergence 127 Jaegwon Kim	
8 Downward Causation and Autonomy in Weak Emergence Mark A. Bedau	155

vi Contents

9 Real Patterns 189 Daniel C. Dennett
II Scientific Perspectives on Emergence 207
Introduction to Scientific Perspectives on Emergence
10 More Is Different: Broken Symmetry and the Nature of the Hierarchical Structure of Science 221 P. W. Anderson
11 Emergence 231 Andrew Assad and Norman H. Packard
12 Sorting and Mixing: Race and Sex 235 Thomas Schelling
13 Alternative Views of Complexity 249 Herbert Simon
14 The Theory of Everything 259 Robert B. Laughlin and David Pines
15 Is Anything Ever New? Considering Emergence 269 James P. Crutchfield
16 Design, Observation, Surprise! A Test of Emergence 287Edmund M. A. Ronald, Moshe Sipper, and Mathieu S. Capcarrère
17 Ansatz for Dynamical Hierarchies 305 Steen Rasmussen, Nils A. Baas, Bernd Mayer, and Martin Nillson
III Background and Polemics 335
Introduction to Background and Polemics
18 Newtonianism, Reductionism, and the Art of Congressional Testimony Stephen Weinberg
19 Issues in the Logic of Reductive Explanations 359 Ernest Nagel
20 Chaos 375 James P. Crutchfield, J. Doyne Farmer, Norman H. Packard, and Robert S. Shaw
21 Undecidability and Intractability in Theoretical Physics 387 Stephen Wolfram

Contents vii

22 Special Sciences (Or: The Disunity of Science as a Working Hypothesis) 395 Jerry Fodor

23 Supervenience 411

David Chalmers

24 The Nonreductivist's Troubles with Mental Causation 427 Jaegwon Kim

Annotated Bibliography 447 About the Authors 455 Index 459