

CONTENTS

I □ INTRODUCTION

- 1 Theme 1
- 2 The Irregular and Fragmented in Nature 6
- 3 Dimension, Symmetry, Divergence 14
- 4 Variations and Disclaimers 20

II □ THREE CLASSIC FRACTALS, TAMED

- 5 How Long is the Coast of Britain? 25
- 6 Snowflakes and Other Koch Curves 34
- 7 Harnessing the Peano Monster Curves 58
- 8 Fractal Events and Cantor Dusts 74

III □ GALAXIES AND EDDIES

- 9 Fractal View of Galaxy Clusters 84
- 10 Geometry of Turbulence; Intermittency 97
- 11 Fractal Singularities of Differential Equations 106

IV □ SCALING FRACTALS

- 12 Length-Area-Volume Relations 109
- 13 Islands, Clusters, and Percolation; Diameter-Number Relations 116
- 14 Ramification and Fractal Lattices 131

V □ NONSCALING FRACTALS

- 15 Surfaces with Positive Volume, and Flesh 147
- 16 Trees; Scaling Residues; Nonuniform Fractals 151
- 17 Trees and the Diameter Exponent 156

VI □ SELF-MAPPING FRACTALS

- 18 Self-Inverse Fractals, Apollonian Nets, and Soap 166
- 19 Cantor and Fatou Dusts; Self-Squared Dragons 180
- 20 Fractal Attractors and Fractal ("Chaotic") Evolutions 193

VII □ RANDOMNESS

- 21 Chance as a Tool in Model Making 200
- 22 Conditional Stationarity and Cosmographic Principles 205

VIII □ STRATIFIED RANDOM FRACTALS

- 23 Random Curds: Contact Clusters and Fractal Percolation 210
- 24 Random Chains and Squigs 224
- 25 Brownian Motion and Brown Fractals 232
- 26 Random Midpoint Displacement Curves 244

IX □ FRACTIONAL BROWN FRACTALS

- 27 River Discharges; Scaling Nets and Noises 247
- 28 Relief and Coastlines 256
- 29 The Areas of Islands, Lakes, and Cups 272

□ A BOOK-WITHIN-THE-BOOK, IN COLOR

- 30 Isothermal Surfaces of Homogeneous Turbulence 277

X □ RANDOM TREMAS; TEXTURE

- 31 Interval Tremas; Linear Lévy Dusts 280
- 32 Subordination; Spatial Lévy Dusts; Ordered Galaxies 288
- 33 Disc and Sphere Tremas: Moon Craters and Galaxies 301
- 34 Texture: Gaps and Lacunarity; Cirri and Succolarity 310
- 35 General Tremas, and the Control of Texture 319

XI □ MISCELLANY

- 36 Logic of Fractals in Statistical Lattice Physics 326
- 37 Price Change and Scaling in Economics 335
- 38 Scaling and Power Laws Without Geometry 341
- 39 Mathematical Backup and Addenda 349

XII □ OF MEN AND IDEAS

- 40 Biographical Sketches 391
- 41 Historical Sketches 405
- 42 Epilog: The Path to Fractals 422

□ LIST OF REFERENCES 425

□ ACKNOWLEDGMENTS 445

□ INDEX OF SELECTED DIMENSIONS 446

□ INDEX OF NAMES AND SUBJECTS 448

□ UPDATE ADDED IN THE SECOND PRINTING 458