Contents

Part I. The Complex Mind-Brain

Chapter 1. Dynamics, Evolution, Autopoiesis 1
1.1. Introduction 1
1.2. Attractors 3
1.3. The Genetic Algorithm 7
1.4. Magician Systems 13
1.5. Dynamics and Pattern 16

Chapter 2. The Psynet Model 21
2.1. Introduction 21
2.2. The Dual Network 22
2.3. Evolution and Autopoiesis in the Dual Network 26
2.4. Language and Logic 30
2.5. Psynet AI 33
2.6. Conclusion 38
Appendix 1: The Psynet Model as Mathematics 39
Appendix 2: Formal Definition of the Dual Network 41

Chapter 3. A Theory of Cortical Dynamics 43
3.1. Introduction 43
3.2. Neurons and Neural Assemblies 44
3.3. The Structure of the Cortex 47
3.4. A Theory of Cortical Dynamics 49
3.5. Evolution and Autopoiesis in the Brain 52
3.6. Conclusion 55

Chapter 4. Perception and Mindspace Curvature 57
4.1. Introduction 57
4.2. Producibility and Perception 58
4.3. The Geometry of Visual Illusions 61
4.4. Mindspace Curvature 68
4.5. Conclusion 71

Part II. Formal Tools for Exploring Complexity

Chapter 5. Dynamics and Pattern 73
5.1. Introduction 73
5.2. Symbolic Dynamics 74
5.3. Generalized Baker Maps 78
5.4. The Chaos Language Algorithm 81
5.5. Order and Chaos in Mood Fluctuations 86
5.6. Two Possible Principles of Complex Systems Science 98
5.7. Symbolic Dynamics in Neural Networks 100
5.8. Dynamics, Pattern and Entropy 102

Chapter 6. Evolution and Dynamics 113
6.1. Introduction 113
6.2. The Dynamics of the Genetic Algorithm 115
6.3. The Simple Evolving Ecology (SEE) Model 121
6.4. The Search for Strange Attractors 127
6.6. Evolving Fractal Music 145

Chapter 7. Magician Systems and Abstract Algebras 159
7.1. Introduction 159
7.2. Magician Systems and Genetic Algorithms 160
7.3. Random Magician Systems 161
7.4. Hypercomplex Numbers and Magician Systems 166
7.5. Emergent Pattern 172
7.6. Algebra, Dynamics and Complexity 176
7.7. Some Crucial Conjectures 178
7.8. Evolutionary Implications 182

Part III. Mathematical Structures in the Mind

Chapter 8. The Structure of Consciousness 185
8.1. Introduction 185
8.2. The Neuropsychology of Consciousness 187
8.3. The Perceptual-Cognitive Loop 190
8.4. Subverting the Perceptual-Cognitive Loop 193
8.5. The Evolution of the Perceptual-Cognitive Loop 197
8.6. Hallucinations and Reality Discrimination 199
8.7. Proprioception of Thought 204
8.8. The Algebra of Consciousness 210
8.9. Modelling States of Mind 215

8.10. Mind as Pregeometry 223
8.11. Conclusion 232

Chapter 9. Fractals and Sentence Production 235
9.1. Introduction 235
9.2. L-Systems 236
9.3. Sentence Production and Thought Production 241
9.4. L-Systems and Sentence Production 246
9.5. L-Systems and Child Language Development 252

Chapter 10. Dream Dynamics 257
10.1. Introduction 257
10.2. Testing the Crick-Mitchison Hypothesis 258
10.3. A Mental Process Network Approach 261
10.4. Dreaming and Crib Death 267

Chapter 11. Artificial Selfhood 271
11.1. Introduction 271
11.2. Autopoiesis and Knowledge Representation 272
11.3. What Is the Self? 276
11.4. Artificial Intersubjectivity 280

Chapter 12. The World Wide Brain 285
12.1. Introduction 285
12.2. The World Wide Brain in the History of Computing .. 286
12.3. Design for a World Wide Brain 288
12.4. The World Wide Brain as a New Phase in Psycho-Cultural Evolution 294

Part IV. The Dynamics of Self and Creativity

Chapter 13. Subself Dynamics 299
13.1. Introduction 299
13.2. Subselves 300
13.3. I-It and I-You 303
13.4. The Fundamental Principle of Personality Dynamics .. 307
13.5. Systems Theory as a "Bridge" 309

Chapter 14. Aspects of Human Personality Dynamics 315
14.1. Introduction 315
14.2. The Laws of Love 315
14.3. The Development and Dynamics of Masochism 332

Chapter 15. On the Dynamics of Creativity 341
15.1. Introduction 341
15.2. The Experience of Inspiration 343
15.3. The Creative Subself 346
15.4. Creative Subself Dynamics 349
15.5. Divine Inspiration and Emergent Pattern 352
15.6. Inside the Creative Subself 356
15.7. Conclusion 362

Acknowledgments 365

References 367

Index 373