

Discovering Artificial Economics

How Agents Learn and
Economies Evolve

David F. Batten



Westview Press

A Member of the Perseus Books Group

<i>List of Illustrations and Tables</i>	ix
<i>Preface</i> •	xiii
<i>Credits</i>	xvii
<i>Acknowledgments</i> "	xix

1 Chance and Necessity 1

"Wetting" the Appetite, 1
 Sandpiles, Self-Organization, and Segregation, 10
 Power Laws and Punctuated Equilibria, 19
 Bulls, Bears, and Fractals, 24
 Stasis and Morphogenesis, 29
 On Learning Curves, 39

I

2 On the Road to Know-Ware 45

What Is Knowledge? 45
 Finding the Road to Know-Ware, 50
 The Age of Deception, 53
 Seeing the Light at the El Farol, 62
 The Emergence of Cooperation, 67
 Coevolutionary Learning, 76

3 Sheep, Explorers, and Phase Transitions 81

The Fallacy of Composition, 81
 Irreducible Interactions, 85
 Getting Well Connected, 92
 Sheep and Explorers, 105
 Are You an Inductive Graph Theorist? III -8

4 *The Ancient Art of Learning by Circulating* 117

Pirene's Hypothesis, 117

The Mees Analysis, 120

Learning by Circulating, 125

Big Buttons and a Critical Thread, 134

Ephemeral Entrepots, 137

5 *Networks, Boosters, and Self-Organized Cities* 139

The Shortest Network Problem, 139

Pirene Again? 144

Selective Urban Growth', 146

One Great Metropolis, 154

Networking Futures, 157

City-Size Distributions Obey Power Laws, 162

Artificial Cities, 170

6 *Traffic Near the Edge of Chaos* 177

The Driver's Dilemma, 177

In Whose Best Interests? 183

Sheep, Explorers, and Bounded Rationality, 187

Cellular Congestion, 190

Coevolutionary Learning in Congested Traffic, 195

Edge-of-Chaos Management, 200

7 *Coevolving Markets* 209

Are Stock Markets Efficient? 209

Pattern Recognizers, 213

Scaling the Market's Peaks, 218

Fibonacci Magic, 222

Market Moods, 229'

Reading the Market's Mind, 233

How Markets Learn, 241

8 Artificial Economics 247

Limits to Knowledge, 247

Adaptive Agents and the Science of Surprise, 250

The New Age of Artificial Economics, 257

Growing a Silicon Society, 259

Some Final Words, 265

Notes 269*References* 287*Index* 297