

CONTENTS

| | | |
|--|--|-----------|
| Preface | ix | |
| 1 | Introduction | 1 |
| | <i>An Imaginary Scholar</i> | 4 |
| | <i>The Darwinian Distraction</i> | 8 |
| | <i>Two Kinds of Science</i> | 11 |
| | <i>Everything Evolves: The Second Science Is Everywhere</i> | 14 |
| Part I Setting the Stage for the Second Science | | 19 |
| 2 | The Evolution of Evolutionary Thinking | 21 |
| | <i>The Deep Roots of Evolutionary Ideas in Biology</i> | 23 |
| | <i>The Deep Roots of Evolutionary Ideas in the Social Sciences</i> | 28 |
| | <i>Biology Since Darwin</i> | 31 |
| | <i>Cultural Evolution Since Darwin</i> | 38 |
| | <i>Lessons from the Evolution of Evolutionary Thinking</i> | 43 |
| 3 | Evolution at Many Levels | 45 |
| | <i>Evolutionary Systems</i> | 48 |
| | <i>The Evolutionary Soundboard</i> | 49 |
| | <i>Populations, Entities, and Success</i> | 52 |
| | <i>Evolution at Multiple Levels</i> | 58 |
| | <i>The Pragmatic Second Scientist</i> | 64 |

| | |
|--|---|
| Part II The Second Science | 67 |
| 4 | Where Does New Stuff Come from, and How Is It Passed on Through Time? 69 |
| | <i>Variants Are Generated and Inherited in Many Ways</i> 73 |
| | <i>The Evolutionary Soundboard, Part I: Variation Generation</i> 76 |
| | <i>The Evolutionary Soundboard, Part II: Inheritance</i> 85 |
| | <i>Taking Variation and Inheritance Seriously</i> 87 |
| 5 | Selection, “Natural” and Otherwise 89 |
| | <i>Selection: Systematic Differential Success</i> 92 |
| | <i>The Evolutionary Soundboard, Part III: Differential Success—Selection</i> 97 |
| | <i>Selection Is Complex . . . but Simple</i> 108 |
| 6 | Randomness and Movement 109 |
| | <i>Drift</i> 111 |
| | <i>Movement</i> 120 |
| | <i>Completing the Evolutionary Soundboard</i> 126 |
| Part III The Second Science in Action | 129 |
| 7 | Harnessing and Directing Evolution 131 |
| | <i>The Evolution of Artificial Intelligence</i> 133 |
| | <i>Artificial Life and Genetic Engineering</i> 139 |
| | <i>Memetic Engineering</i> 143 |
| 8 | Tipping Points and Major Transitions 150 |
| | <i>Balls Roll Downhill</i> 152 |
| | <i>Ecosystems</i> 157 |
| | <i>Cultural Norms</i> 159 |

| | |
|--|-----|
| <i>Major Transitions in Evolution over the Long Term</i> | 163 |
| <i>Complex Adaptive Systems</i> | 168 |
| 9 <i>Diversity and Globalization</i> | 171 |
| <i>What Is Diversity?</i> | 173 |
| <i>Causes of Diversity</i> | 175 |
| <i>Geographic Patterns of Diversity</i> | 178 |
| <i>Diversity Change in the Anthropocene</i> | 181 |
| <i>Valuing Diversity</i> | 188 |
| <i>The Consequences of Diversity: Bonus or Penalty?</i> | 190 |
| 10 <i>The Future of the Second Science</i> | 198 |
| <i>Overcoming the Darwinian Distraction</i> | 202 |
| <i>The Faculty of Evolutionary Sciences</i> | 204 |
| <i>Choosing to See Commonalities or Differences</i> | 206 |
| <i>Did the Second Science Come First?</i> | 208 |
| <i>The Future of the Second Science</i> | 210 |
| <i>Notes</i> | 211 |
| <i>Sources</i> | 215 |
| <i>References</i> | 227 |
| <i>Index</i> | 241 |