

# Contents

Acknowledgements	vii
About the Editor	ix
Foreword <i>by Richard Dawkins</i>	xi
List of Contributors	xiii
1 An Introduction to Evolutionary Design by Computers <i>by Peter Bentley</i>	1
<b>SECTION 1: Evolution and Design</b>	<b>75</b>
2 The Interplay of Evolution and Insight in Design <i>by Michael French</i>	77
3 The Memetics of Design <i>by Derek Gatherer</i>	91
4 The Race, the Hurdle, and the Sweet Spot <i>by David Goldberg</i>	105
5 Exploring the Design Potential of Evolutionary Search, Exploration and Optimisation <i>by Ian Parmee</i>	119
<b>SECTION 2: Evolutionary Optimisation of Designs</b>	<b>145</b>
6 Optimisation in Mechanical Design <i>by Gordon Robinson, Mohammed El-Beltagy and Andy Keane</i>	147
7 The Optimisation of Flywheels using an Injection Island Genetic Algorithm <i>by David Eby, R. C. Averill, William F. Punch III, and Erik D. Goodman</i>	167



8	A GA-based Approach to Reliability Design <i>by Mitsuo Gen and Jong Ryul Kim</i>	191
<b>SECTION 3: Evolutionary Art</b>		<b>219</b>
9	The Mutation and Growth of Art by Computers <i>by Stephen Todd and William Latham</i>	221
10	Evolving Genetic Art <i>by Michael Witbrock and Scott Neil-Reilly</i>	251
11	Evolutionary Art and Form <i>by Andrew Rowbottom</i>	261
<b>SECTION 4: Evolutionary Artificial Life Forms</b>		<b>279</b>
12	Artificial Embryology and Cellular Differentiation <i>by Hugo de Garis</i>	281
13	Evolving Three-Dimensional Morphology and Behaviour <i>by Karl Sims</i>	297
14	Exploring Three-Dimensional Design Worlds using Lindenmayer Systems and Genetic Programming <i>by Paul Coates, Terence Broughton and Helen Jackson</i>	323
<b>SECTION 5: Creative Evolutionary Design</b>		<b>343</b>
15	Evolving Designs by Generating Useful Complex Gene Structures <i>by Mike Rosenman and John Gero</i>	345
16	The Design of Analogue Circuits by Means of Genetic Programming <i>by John Koza, Forrest H Bennett III, David Andre and Martin A. Keane</i>	365
17	Computer Evolution of Buildable Objects <i>by Pablo Funes and Jordan Pollack</i>	387
18	From Coffee Tables to Hospitals: Generic Evolutionary Design <i>by Peter Bentley</i>	405
Glossary		425
Index		435

*The colour plate section is located between pages 208 and 209.*