

Contents

1	Ultimate explanation	1
	An eightfold way	1
	Myths	4
	Creation myths	8
	Algorithmic compressibility	10
2	Laws	14
	The legacy of law	14
	The quest for unity	17
	Roger Boscovich	19
	Symmetries	22
	Infinities—to be or not to be?	26
	From strings to ‘M’	32
	A flight of rationalistic fancy	36
	Goodbye to all that	43
3	Initial conditions	44
	At the edge of things	44
	Axioms	45
	Mathematical Jujitsu	51
	Initial conditions and time symmetry	61
	Time without time	62
	Cosmological time	66
	The problem of time	76
	Absolute space and time	78
	How far is far enough?	83
	The quantum mystery of time	85
	Quantum initial conditions	88
	The great divide	90
4	Forces and particles	93
	The stuff of the Universe	93
	The copy-cat principle	95
	Elementarity	100

	The atom and the vortex	102
	A world beside itself	104
5	Constants of Nature	110
	The importance of being constant	110
	Fundamentalism	112
	What do constants tell us?	117
	Varying constants	124
	The cosmological constant	128
6	Broken symmetries	136
	The never-ending story	136
	Broken symmetry	138
	Natural theology: A tale of two tales	140
	The flaws of nature	143
	Chaos	145
	Chance	148
	The unpredictability of sex	152
	Symmetry-breaking in the Universe	154
7	Organizing principles	160
	Where the wild things are	160
	Big AL	169
	Time	173
	Being and becoming organized	176
	The arrow of time	180
	Far from equilibrium	182
	The sands of time	185
	The way of the world	188
8	Selection effects	192
	Ubiquitous bias	192
9	Is 'pi' really in the sky?	202
	In the centre of immensities	202
	The number of the rose	204
	Philosophies of mathematics	206
	What is mathematics?	212
	Mathematics and physics: An eternal golden braid	219
	The intelligibility of the world	224
	Algorithmic compressibility rides again	231
	Continuity—a bridge too far?	233

The secret of the Universe	236
Is the Universe a computer?	238
The unknowable	242
Select Bibliography	247
Index	256