

Contents

CHAPTER 1	The Goal	1
	The Search for Meaning	8
	Einstein's Dream	17
CHAPTER 2	Warped Space-Time	21
	Curved Space	26
	Einstein and Warped Space-Time	29
	Extreme Warping	46
CHAPTER 3	Early Unified Field Theories	41
	Faraday, Maxwell, and the Electromagnetic Field	50
	Early Attempts at Unification	61
	Einstein's Unified Field Theory	66
CHAPTER 4	Star Death	73
	Eddington	74
	The Life Cycle of a Star	79
	Chandrasekhar and the White Dwarfs	84
	Beyond the White Dwarf	89
	Reflection	95

CHAPTER 5	The Ultimate Abyss: The Black Hole	97
	Oppenheimer and Continuing Collapse	100
	Collapse of a Star to a Black Hole	107
	Inside a Black Hole	110
	Other Types of Black Holes	112
	Searching for Black Holes	114
	Other Black Hole Candidates	118
	A Realistic Look at the Exotic Possibilities	120
	Where the Theory Breaks Down	124
	The Discovery of Evaporating Black Holes	126
	The Link between General Relativity and Quantum Mechanics	131
CHAPTER 6	The Early Universe	133
	Discovery of the Expanding Universe	134
	Back to the Big Bang	154
	The Ultimate Singularity	156
	Inflation	159
	The Hadron Era	159
	The Lepton Era	161
	The Radiation Era	161
	The Cosmic Background Radiation	162
	The Galaxy Era	166
	Reflection	168
CHAPTER 7	Cosmological Controversy	171
	The Age of the Universe	174
	The Redshift Controversy	181
	Rival Cosmologies	186
	Varying G Cosmologies and Cosmic Numbers	191
	Antimatter and Other Cosmologies	193
	Other Universes	195

CHAPTER 8	The Final Fate of the Universe	199
	The Missing Mass	201
	Other Methods of Determining if the Universe Is Open or Closed	206
	Fate of the Closed Universe	208
	Bounce	209
	Fate of the Open Universe	211
CHAPTER 9	The World of Particles and Fields	213
	Dirac's Equation	217
	The Infinities	220
	Renormalization	222
	Yukawa	230
	Gauge Theory	233
	The Weak Interactions	237
	Quantum Chromodynamics	241
	Summary and Further Subdivision	249
CHAPTER 10	A Unified Theory of the Universe	253
	Supergravity and Superstrings	263
	Twistors and Heaven (H Space)	268
CHAPTER 11	Epilogue	271
	The Future	273
	The New Einstein	274
Further Reading		277
Index		279