

Contents

<i>List of Figures and Tables</i>	<i>page</i> xiii
<i>Acknowledgments</i>	xv
<i>List of Abbreviations</i>	xix
Introduction: Growth, Punctuation, and Human Well-Being	i
PART I EVOLUTION AND EARTH SYSTEMS	
1 Geological Time: The Court Jester on the Platform of Life	25
<i>Tectonics, Asteroids, Plumes, Punctuation, Gaia: Revolutions in Earth Science</i>	26
<i>Evolution: From Neo-Darwinism to Complex Emergence</i>	29
<i>A Punctuated Earth Systems Synthesis</i>	36
<i>Origins: The Hadean and the Archean</i>	37
<i>The Archean/Paleo-Proterozoic Crisis</i>	38
<i>The Neoproterozoic Crisis and the Cambrian: A Snowball Earth?</i>	42
<i>Phanerozoic Super-Cycles – and Biotic Extinctions and Escalations</i>	44
<i>Mass Extinctions</i>	49
2 Human Emergence	55
<i>Into the Cenozoic Icehouse</i>	56
<i>The Court Jester in the Cenozoic: Debate and Three Kinds of Evidence</i>	58
<i>Miocene Apes and the Early Hominins</i>	62
<i>Orbital Cycles: From the 23K World to the 41K World</i>	66
<i>The 41K World and the Genus Homo</i>	70
<i>The 100K World: Homo Heidelbergensis, Archaic Homo Sapiens</i>	77
<i>Modern Humans in the 100K World</i>	83
<i>The Modern Origins Debate and a Renewed Understanding of Mortality</i>	97

	<i>Gould and Eldridge's Punctuation Meets Boserup's Intensification: Toward a New Understanding of the Upper Paleolithic</i>	104
	PART II DOMESTICATION, AGRICULTURE, AND THE RISE OF THE STATE	109
3	Agricultural Revolutions	121
	<i>Energy</i>	123
	<i>Changing Climates: The End of the Pleistocene</i>	130
	<i>New Climate Science, New Archaeological Science</i>	134
	<i>Human Adaptation at the Bølling-Allerød Warming: The Mesolithic</i>	136
	<i>The Younger Dryas and the Early Holocene: Cereal Domestication in the Northern Mid-Latitudes</i>	144
	<i>Early Holocene Warming and Tropical Domestications Into the Mid-Holocene: Final Domestications and First Dispersals</i>	154
4	The Mid-Holocene, the Late Neolithic, and the Urban-State Revolution	165
	<i>The Emergence of Modern Global Climates: The Mid-Holocene Transition</i>	166
	<i>The Mid-Holocene Crisis and the Rise of the State</i>	183
	<i>Neolithic Intensification: The Secondary Products Revolution</i>	191
	<i>China and Mesopotamia in the Neolithic–Bronze Age Transition</i>	194
5	Human Well-Being from the Paleolithic to the Rise of the State	213
	<i>Human Health in the Paleolithic</i>	213
	<i>The Neolithic Demographic Transition</i>	216
	<i>Civilizational Stresses in the Neolithic</i>	220
	<i>Fertility and Mortality in the Neolithic</i>	225
	<i>Fertility, Mortality, and the Origins of Complex Societies: The Case of Southwest Asia</i>	229
	PART III ANCIENT AND MEDIEVAL AGRARIAN SOCIETIES	243
6	Stasis and Growth in the Epoch of Agrarian Empires	261
	<i>Getting Ahead, Running in Place, Falling Behind</i>	261
	<i>Population Growth and Dark Ages</i>	269
	<i>Endogenous Degradations?</i>	272
	<i>Late Holocene Climate Reversals</i>	276
	<i>Disease and Epidemics</i>	279
	<i>Energy: Innovation, Labor, and Slavery</i>	281
	<i>Punctuations</i>	285

7	Optimum and Crisis in Early Civilizations, 3000–500 BC	288
	<i>The Old World Bronze Age: Expansions and Crises,</i>	
	3000–1000 BC	288
	<i>The Preclassical Crisis and the Age of Iron, 1200–300 BC</i>	300
	<i>A Global View on Optimum and Crisis</i>	306
	<i>Human Health in the Bronze Age Optimum and the Iron</i>	
	Age/Preclassical Crisis	312
8	A Global Antiquity, 500 BC–AD 542	317
	<i>The Problem of Growth in Antiquity</i>	317
	<i>China, Iron, and Rotary Power</i>	318
	<i>Global Antiquity: Numbers and Climate</i>	322
	<i>The Rise of Rome</i>	328
	<i>The Fall of Rome?</i>	339
9	The Global Dark and Middle Ages, AD 542–1350	350
	<i>Climate Reversals in the Tropics and the North</i>	351
	The Dark Ages, AD 400–900	351
	The Medieval Climate Anomaly, AD 900–1275	358
	<i>Population and Health in the Old World Dark and Middle Ages</i>	360
	<i>Growth and Crisis in the Medieval World, 1000–1350</i>	362
	Southern Asia	363
	North America	364
	China and Mongolia	367
	Into the Little Ice Age	370
	Europe	372
	<i>The Little Ice Age and the Black Death</i>	380
	PART IV INTO THE MODERN CONDITION	393
10	Climate, Demography, Economy, and Polity in the Late Medieval–Early Modern World, 1350–1700	413
	<i>Population in and beyond the Third Age of Epidemics, 1300–1800</i>	414
	<i>The Question of Growth and Divergence</i>	417
	<i>The Aftermath of the Third Age of Epidemics</i>	423
	<i>Emerging European Empires, New World Depopulation</i>	429
	<i>The Little Ice Age, New World Depopulation, and the Origins of the African Slave Trade</i>	438
	<i>The Little Ice Age and Early Modern Eurasia</i>	444
	<i>Early Modern England in the Age of Empire, the Little Ice Age, and the Seventeenth-Century Crisis</i>	451
	<i>The Seventeenth-Century English Energy Revolution</i>	459
11	Global Transformations: Atlantic Origins, 1700–1870	467
	<i>The End of the Little Ice Age and the Beginning of Modern Population Growth, 1700–1860s</i>	468

	<i>The Beginnings of the Modern Anthropocene</i>	476
	<i>Industrial Revolutions</i>	479
	<i>The First Industrial Revolution</i>	483
	<i>Emissions and Atmosphere, 1800–1880</i>	495
12	<i>Launching Modern Growth: 1870 to 1945</i>	500
	<i>Urbanization, a New Political Economy, and the Second Industrial Revolution</i>	500
	<i>Atlantic Cities and the First Wave: Environmental Crisis and Social Reform</i>	502
	<i>The Second Industrial Revolution</i>	509
	<i>The Demographic Revolution, 1800–1945</i>	513
	<i>1914–1945: A World in Crisis, Growth on Hold</i>	518
	<i>Environmental Impacts, 1870–1945: The Second Wave</i>	524
13	<i>Growth beyond Limits: 1945 to Present</i>	529
	<i>The Demographic Revolution, Part II: 1945 to Present</i>	530
	<i>The Age of High Growth and a Third Industrial Revolution?</i>	
	<i>The World Economy, 1945 to Present</i>	534
	<i>Environmental Impacts, 1945 to Present: Confronting the Third Wave</i>	543
	<i>The Modern Anthropocene</i>	553
	<i>Coda: A Rough Journey into an Uncertain Future</i>	559
	<i>Malthus Vindicated?</i>	560
	<i>Deniers, Pessimists, and Pragmatists</i>	570
	<i>Data Bibliography: Full Citations for Data Used in Figures and Tables</i>	581
	<i>Index</i>	593