

# Contents

<b>Introduction</b>	<b>1</b>
<b>1 The Birth of Science</b>	<b>5</b>
1.1 The Erasure of the Scientific Revolution . . . . .	5
1.2 On the Word “Hellenistic” . . . . .	10
1.3 Science . . . . .	15
1.4 Was There Science in Classical Greece? . . . . .	21
1.5 Origins of Hellenistic Science . . . . .	27
<b>2 Hellenistic Mathematics</b>	<b>31</b>
2.1 Precursors of Mathematical Science . . . . .	31
2.2 Euclid’s Hypothetico-Deductive Method . . . . .	39
2.3 Geometry and Computational Aids . . . . .	41
2.4 Discrete Mathematics and the Notion of Infinity . . . . .	44
2.5 Continuous Mathematics . . . . .	45
2.6 Euclid and His Predecessors . . . . .	48
2.7 An Application of the “Method of Exhaustion” . . . . .	49
2.8 Trigonometry and Spherical Geometry . . . . .	52
<b>3 Other Hellenistic Scientific Theories</b>	<b>57</b>
3.1 Optics, Scenography and Catoptrics . . . . .	57
3.2 Geodesy and Mathematical Geography . . . . .	65
3.3 Mechanics . . . . .	70
3.4 Hydrostatics . . . . .	73
3.5 Pneumatics . . . . .	75
3.6 Aristarchus, Heliocentrism, and Relative Motion . . . . .	78
3.7 From the Closed World to the Infinite Universe . . . . .	86
3.8 Ptolemaic Astronomy . . . . .	89

<b>4 Scientific Technology</b>	<b>95</b>
4.1 Mechanical Engineering . . . . .	96
4.2 Instrumentation . . . . .	98
4.3 Military Technology . . . . .	105
4.4 Sailing and Navigation . . . . .	112
4.5 Naval Architecture. The Pharos . . . . .	115
4.6 Hydraulic and Pneumatic Engineering . . . . .	118
4.7 Use of Natural Power . . . . .	123
4.8 The Antikythera Mechanism . . . . .	128
4.9 Heron's Role . . . . .	130
4.10 The Lost Technology . . . . .	137
<b>5 Medicine and Other Empirical Sciences</b>	<b>143</b>
5.1 The Birth of Anatomy and Physiology . . . . .	143
5.2 Relationship Between Medicine and Exact Sciences . . . . .	145
5.3 Anatomical Terminology and the Screw Press . . . . .	150
5.4 The Scientific Method in Medicine . . . . .	151
5.5 Development and End of Scientific Medicine . . . . .	156
5.6 Botany and Zoology . . . . .	158
5.7 Chemistry . . . . .	165
<b>6 The Hellenistic Scientific Method</b>	<b>171</b>
6.1 Origins of Scientific Demonstration . . . . .	171
6.2 Postulates or Hypotheses . . . . .	174
6.3 Saving the Phainomena . . . . .	175
6.4 Definitions, Scientific Terms and Theoretical Entities . . . . .	179
6.5 Episteme and Techne . . . . .	185
6.6 Postulates and the Meaning of "Mathematics" and "Physics" . . . . .	187
6.7 Hellenistic Science and Experimental Method . . . . .	194
6.8 Science and Orality . . . . .	196
6.9 Where Do Clichés about "Ancient Science" Come From? . . . . .	197
<b>7 Some Other Aspects of the Scientific Revolution</b>	<b>203</b>
7.1 Urban Planning . . . . .	203
7.2 Conscious and Unconscious Cultural Evolution . . . . .	209
7.3 The Theory of Dreams . . . . .	214
7.4 Propositional Logic . . . . .	218
7.5 Philological and Linguistic Studies . . . . .	221
7.6 The Figurative Arts, Literature and Music . . . . .	224
<b>8 The Decadence and End of Science</b>	<b>231</b>
8.1 The Crisis in Hellenistic Science . . . . .	231
8.2 Rome, Science and Scientific Technology . . . . .	235
8.3 The End of Ancient Science . . . . .	240

<b>9 Science, Technology and Economy</b>	<b>243</b>
9.1 Modernism and Primitivism . . . . .	243
9.2 Scientific and Technological Policy . . . . .	245
9.3 Economic Growth and Innovation in Agriculture . . . . .	249
9.4 Nonagricultural Technology and Production . . . . .	253
9.5 The Role of the City in the Ancient World . . . . .	257
9.6 The Nature of the Ancient Economy . . . . .	260
9.7 Ancient Science and Production . . . . .	263
<b>10 Lost Science</b>	<b>269</b>
10.1 Lost Optics . . . . .	269
10.2 Eratosthenes' Measurement of the Meridian . . . . .	273
10.3 Determinism, Chance and Atoms . . . . .	277
10.4 Combinatorics and Logic . . . . .	281
10.5 Ptolemy and Hellenistic Astronomy . . . . .	282
10.6 The Moon, the Sling and Hipparchus . . . . .	286
10.7 A Passage of Seneca . . . . .	293
10.8 Rays of Darkness and Triangular Rays . . . . .	296
10.9 The Idea of Gravity after Aristotle . . . . .	302
10.10 Tides . . . . .	305
10.11 The Shape of the Earth: Sling or Ellipsoid? . . . . .	309
10.12 Seleucus and the Proof of Heliocentrism . . . . .	311
10.13 Precession, Comets, etc. . . . .	315
10.14 Ptolemy and Theon of Smyrna . . . . .	317
10.15 The First Few Definitions in the <i>Elements</i> . . . . .	320
<b>11 The Age-Long Recovery</b>	<b>329</b>
11.1 The Early Renaissances . . . . .	329
11.2 The Renaissance . . . . .	335
11.3 The Rediscovery of Optics in Europe . . . . .	344
11.4 A Late Disciple of Archimedes . . . . .	349
11.5 Two Modern Scientists: Kepler and Descartes . . . . .	355
11.6 Terrestrial Motion, Tides and Gravitation . . . . .	360
11.7 Newton's Natural Philosophy . . . . .	365
11.8 The Rift Between Mathematics and Physics . . . . .	379
11.9 Ancient Science and Modern Science . . . . .	385
11.10 The Erasure of Ancient Science . . . . .	388
11.11 Recovery and Crisis of Scientific Methodology . . . . .	391
<b>Appendix</b>	<b>399</b>
<b>List of Passages</b>	<b>403</b>
<b>References</b>	<b>419</b>
<b>General Index</b>	<b>435</b>