

Contents

1 Galen and the Beginnings of Western Physiology	1
1.1 Introduction.....	1
1.2 Brief Biography.....	3
1.3 Physiology in Ancient Greece.....	3
1.4 Physiology of the Galenical School.....	6
1.5 Galen’s Legacy.....	9
1.6 Andreas Vesalius and the Rebirth of Anatomy and Physiology.....	10
1.7 Michael Servetus and His Assertion of the Pulmonary Transit of Blood.....	13
1.8 William Harvey and the Beginnings of Modern Physiology.....	14
References.....	15
2 Ibn Al-nafis, the Pulmonary Circulation, and the Islamic Golden Age	17
2.1 Introduction.....	17
2.2 Islamic Science in the Eighth to Sixteenth Centuries.....	18
2.3 Ibn Al-Nafis.....	19
2.4 Pulmonary Circulation.....	20
2.5 Note on Sources.....	23
References.....	24
3 Torricelli and the Ocean of Air: The First Measurement of Barometric Pressure	25
3.1 Torricelli’s Great Insight: The Ocean of Air.....	25
3.2 Galileo’s View on the Force of a Vacuum.....	28
3.3 Gasparo Berti’s Experiment with a Long Lead Tube.....	29
3.4 Weighing the Air.....	31
3.5 The Decrease of Barometric Pressure with Altitude.....	32
3.6 Demonstration of the Enormous Force that can be Developed by the Barometric Pressure.....	33
3.7 Subsequent Studies of the Effects of Reducing the Barometric Pressure.....	35
References.....	35

4 Robert Boyle's Landmark Book of 1660 with the First Experiments on Rarified Air	37
4.1 The Setting	38
4.2 The Man	39
4.3 The Book	40
4.4 The Pump	42
4.5 The Experiments	46
4.6 Conclusion	52
References	53
5 The Original Presentation of Boyle's Law	55
Appendix	59
References	60
6 Robert Hooke: Early Respiratory Physiologist, Polymath, and Mechanical Genius	61
6.1 Introduction	61
6.2 Brief Biography	62
6.3 Air Pump and the First Experiments on Rarified Air	64
6.4 Artificial Ventilation	64
6.5 Human Decompression Chamber	65
6.5.1 Micrographia	67
6.6 Mechanical Inventions	70
6.7 Architecture	73
6.8 Diary	74
References	75
7 Marcello Malpighi and the Discovery of the Pulmonary Capillaries and Alveoli	77
7.1 The Man	77
7.2 Discovery of the Pulmonary Capillaries	79
7.3 Discovery of the Alveoli	82
7.4 Insect Respiration	83
7.5 Embryological Studies	85
7.6 Botanical Studies	87
7.7 Other Studies	88
7.8 Malpighi's Difficulties	88
7.9 Note on Sources	90
References	90
8 Stephen Hales: Neglected Respiratory Physiologist	91
References	97
9 Joseph Black, Carbon Dioxide, Latent Heat, and the Beginnings of the Discovery of the Respiratory Gases	99
9.1 Introduction	99

9.2	Brief Biography.....	100
9.3	The Chemistry of Alkalis and Carbon Dioxide.....	102
9.4	Latent Heat.....	107
9.5	Joseph Black and James Watt.....	109
	References.....	111
10	Carl Wilhelm Scheele, the Discoverer of Oxygen, and a Very Productive Chemist.....	113
10.1	Introduction.....	113
10.2	Brief Biography.....	115
10.3	The Discovery of Oxygen.....	116
10.4	Scheele's Other Discoveries.....	121
10.5	Scheele's Death.....	122
	References.....	123
11	Joseph Priestley, Oxygen, and the Enlightenment.....	125
11.1	Introduction.....	125
11.2	Brief Biography.....	127
11.3	First Production of Oxygen.....	129
11.4	Oxygen is Produced by Green Plants.....	133
11.5	Who Discovered Oxygen?.....	134
11.6	Other Gases Discovered by Priestley.....	135
11.7	Two Revolutionaries: Lavoisier and Priestley.....	136
11.8	Priestley's Contributions to Electricity.....	137
11.9	Priestley and the Enlightenment.....	138
	References.....	139
12	The Collaboration of Antoine and Marie-Anne Lavoisier and the First Measurements of Human Oxygen Consumption.....	141
12.1	Introduction.....	141
12.2	Antoine Lavoisier's Contributions to Respiratory Physiology.....	143
12.3	Contributions of Marie-anne Lavoisier.....	146
12.4	Personal Backgrounds of Antoine and Marie-anne Lavoisier.....	156
	References.....	158
13	Henry Cavendish (1731–1810): Hydrogen, Carbon Dioxide, Water, and Weighing the World.....	161
13.1	Introduction.....	161
13.2	Hydrogen.....	163
13.3	Carbon Dioxide.....	166
13.4	Composition of Atmospheric Air.....	166
13.5	Composition of Water.....	167
13.6	Electricity and Heat.....	167
13.7	Density of the Earth.....	168
	References.....	170

14 Humphry Davy, Nitrous Oxide, the Pneumatic Institution, and the Royal Institution..... 173

14.1 Introduction..... 173

14.2 Early Years 174

14.3 The Pneumatic Institution 175

14.4 The Royal Institution..... 179

14.5 Further Chemical Researches..... 182

14.6 Davy Safety Lamp..... 183

14.7 Later Years and Michael Faraday..... 183

References..... 185

15 Denis Jourdanet (1815–1892) and the Early Recognition of the Role of Hypoxia at High Altitude..... 187

15.1 Introduction..... 187

15.2 Brief Biography..... 190

15.3 Jourdanet’s High Altitude Studies..... 192

15.4 Aerotherapy..... 196

15.5 Criticism of the Claim by Jourdanet and Bert that Hypoxia is the Critical Factor in the Physiological Responses to High Altitude..... 198

15.6 Relations between Jourdanet and Bert in Their Later Years 199

References..... 200

16 Centenary of the Anglo-American High Altitude Expedition to Pikes Peak..... 203

16.1 Acute Mountain Sickness..... 208

16.2 Alveolar Gases During Acclimatization..... 208

16.3 Arterial PO₂ and Comparisons with the Alveolar Values..... 209

16.4 Respiratory Gas Exchange During Rest and Exercise 210

16.5 Periodic Breathing..... 210

16.6 Estimates of Blood Circulation Rate..... 210

16.7 Blood Studies 211

16.8 Principal Factors in the Process of Acclimatization..... 211

16.9 Contributions of Mabel Purefoy Fitzgerald (1872–1973)..... 212

16.10 Conclusion..... 215

References..... 216

17 Alexander M. Kellas and the Physiological Challenge of Mt. Everest..... 219

References..... 233

18 T. H. Ravenhill and His Contributions to Mountain Sickness..... 235

18.1 Family and Early Years 236

18.2 High-Altitude Studies..... 238

18.3	War Experiences.....	245
18.4	Post World War I and Archeology.....	246
18.5	Painting.....	248
18.6	Conclusion.....	249
	References.....	251
19	George I. Finch and His Pioneering Use of Oxygen for Climbing at Extreme Altitudes.....	253
19.1	Use of Oxygen at High Altitude Before 1921.....	254
19.2	Early History of G. I. Finch.....	255
19.3	Preparations for the Expedition of 1921.....	257
19.4	Expedition of 1922.....	263
19.5	1924 and After.....	266
	Appendix 1.....	268
	Appendix 2.....	269
	Appendix 3.....	271
	References.....	272
20	Joseph Barcroft's Studies of High Altitude Physiology.....	273
20.1	Introduction.....	273
20.2	Glass Chamber Experiment of 1920.....	274
20.3	Toxicity of Hydrocyanide Gas.....	279
20.4	International High Altitude Expedition to Cerro De Pasco, Peru ...	280
20.5	Exercise at Extreme Altitude While Breathing 100% Oxygen.....	285
	References.....	288
21	The Physiological Legacy of the Fenn, Rahn and Otis School.....	289
21.1	Introduction.....	289
21.2	Unlikely Beginnings.....	290
21.3	The Initial Research Topic.....	291
21.4	Pulmonary Gas Exchange.....	296
21.5	Pulmonary Mechanics.....	298
	References.....	302
22	The Physiological Challenges of the 1952 Copenhagen Poliomyelitis Epidemic and a Renaissance in Clinical Respiratory Physiology.....	305
22.1	The Poliomyelitis Epidemic.....	307
22.2	The Renaissance in Clinical Respiratory Physiology During the 1950s.....	314
	Appendix.....	319
	Postscript.....	321
	References.....	322

23 Historical Aspects of the Early Soviet/Russian Manned Space Program 325

23.1 Tsiolkovsky, An Early Russian Space Visionary..... 326

23.2 Wernher von Braun and Peenemünde 328

23.3 Sergei Korolev, the Principal Architect of the Soviet/
Russian Manned Space Program..... 330

23.4 Flight of the Dog Laika, the First Living Creature in Space..... 334

23.5 Flight of Yuri Gagarin, the First Human Being in Space 336

23.6 Alexei Leonov Performs the First Extravehicular Activity 339

23.7 Salyut and Mir, the First Permanently Manned Space Station 340

Appendix 341

References 341



<http://www.springer.com/978-1-4939-2361-8>

Essays on the History of Respiratory Physiology

West, J.B.

2015, XIV, 342 p. 129 illus., 14 illus. in color., Hardcover

ISBN: 978-1-4939-2361-8