

Contents

Part I Fluid Dynamics in Action

1 Airborne Creatures	3
Birds	5
Bats	16
Flying Insects	18
Seeds.....	19
Land Animals	21
Conclusion.....	22
Notes.....	23
2 Human Innovation	25
The Kite.....	27
Sports.....	29
Man on Land	37
Man in Water.....	37
Conclusion.....	42
Notes.....	42
3 Aquatic Creatures	45
Lift	45
Blubber	46
Swim Bladder	47
Air in the Lungs.....	48
Oil in the Liver	50
Cartilaginous Skeleton	50
Movement.....	50
Gravity	51
Water Column.....	51

Thrust	52
Resistance.....	53
Overcoming Resistance.....	56
High Swimming Speeds.....	56
Streamlining	56
Skin Surface and Dermal Denticles.....	59
Porpoising and Free-Riding Behaviors	59
Schooling.....	60
Conclusion.....	60
Notes.....	61

Part II Evolution of Theory

4 Hydrodynamic Theorists	65
Aristotle Through Hero: Early Theorists.....	65
da Vinci Through Lagrange: Fluid Dynamics.....	69
Fulton Through Taylor: Principles in Action	76
Notes.....	83
5 Aerodynamic Theorists	85
Into the Air: Early Theorists.....	85
Into the Air: Non-winged Flight.....	90
Into the Air: Winged Flight	93
Into Space	101
Notes.....	104

Part III Scale Model Testing Begins

6 William Froude	109
William Froude.....	110
Froude's Early Work	112
The Admiralty Experiment Works at Torquay	115
Plans for the Works	115
The Equipment	122
The Models.....	125
Initial Tests	125
The HMS <i>Greyhound</i> Trials	128
Conclusion.....	129
Notes.....	131
7 David Watson Taylor	135
David Watson Taylor.....	136
The Experimental Model Basin.....	137
The Models.....	142
Making the Models.....	143

Results Reported in the 1900 Report.....	144
Work with Elmer Sperry.....	146
The Suction of Vessels	147
The Titanic Investigation	147
The Speed and Power of Ships.....	148
Aeronautics.....	151
NACA	153
Awards	153
Taylor and Froude	154
Conclusion.....	155
Suction in Narrow Channel	155
Notes.....	156
8 Early Aviators	159
Machinery.....	159
The Whirling Arm.....	160
The Wind Tunnel.....	163
Theory	165
Notes.....	177
9 The Wright Brothers.....	179
The Wright Approach.....	180
An Interest in Flight Awakens	180
And So They Begin	183
Lilienthal's Data and the Need for Model Testing	186
Testing Begins	187
Wind Tunnel Tests	189
The Balances	190
Airfoils	191
Back to Kitty Hawk.....	193
After Success.....	194
Conclusion.....	195
Notes.....	195
10 Rocketmen.....	199
Konstantin Tsiolkovsky.....	199
Robert Goddard.....	203
Unwanted Attention	205
Goddard and Oberth.....	206
Lucky Lindy to the Rescue	207
Hermann Oberth.....	208
It <i>Is</i> Rocket Science	210

Conclusion	217
Notes	218
 Part IV Model Testing Today	
11 Computational Fluid Dynamics	223
Virtual Testing.....	224
Methodology	224
CFD at Universities.....	225
What Is Modeled?	225
More than Ships, Planes, and Rockets	226
Scale Models.....	227
Notes	227
Glossary	229
References	237
Author Index.....	243
Subject Index.....	247

Modeling Ships and Space Craft

The Science and Art of Mastering the Oceans and Sky

Hagler, G.

2013, XIV, 249 p. 112 illus., 11 illus. in color., Softcover

ISBN: 978-1-4614-4595-1