

TABLE OF CONTENTS

Table of Contents.....	vii
Preface.....	xi
Introduction.....	1
Part I: Descartes, Newton, and the Absolute/Relational Spacetime Debate	7
Chapter 1: Newton's <i>De Gravitatione</i> Argument Against Cartesian Dynamics	9
1.1: The Two Trends in Cartesian Natural Philosophy.....	10
1.2: Newton's Argument Against Cartesian Relationalism.....	12
Endnotes	15
Chapter 2: The Structure of Spacetime Theories.....	19
2.1: Newtonian Space and Time.....	19
2.2: Galilean Relativity and Neo-Newtonian Spacetime	25
2.3: A Frame Independent Interpretation of Neo-Newtonian Spacetime.....	31
2.4: Conclusions: Newton's Argument Updated	35
Endnotes	40
Part II: Cartesian Physics.....	43
Chapter 3: The Cartesian Natural Laws.....	45
3.1: The Laws of Motion	45
3.2: The Role of "Force" in Cartesian Natural Philosophy	52
3.3: The Cartesian Natural Laws and Relational Motion	59
3.4: Appendix: Circular Inertia.....	62
Endnotes	71

Chapter 4: Matter and Substance in the Cartesian Universe.....	75
4.1: “Perfect Solidity” and the Natural Laws.....	75
4.2: Non-Idealized Conditions and the Natural Laws.....	86
4.3: Cartesian Corporeal Substance.....	90
4.4: Concluding Remarks.....	101
Endnotes	101
Chapter 5: Quantity of Motion: The Origin and Function of the Cartesian Conservation Principle.....	109
5.1: Quantity of Motion: The Contemporary Opinion.....	109
5.2: Quantity of Motion in Cartesian Natural Philosophy	111
5.3: Quantity of Motion in the Cartesian Plenum	118
5.4: Conclusions.....	128
Endnotes	129
Part III: Constructing a Cartesian Spacetime.....	135
Chapter 6: Relational Spacetime and Cartesian Dynamics	137
6.1: Cartesian Space and Motion.....	138
6.2: Cartesian Relationalism.....	142
6.3: Relationalist Strategies: Reference Frames and Absolute Structure.....	149
6.4: Dynamical Considerations.....	153
6.5: Conclusions.....	159
Endnotes	160
Chapter 7: The Kinematic Logic of Relational Transfer: An Unwritten Chapter in the History of Cartesian Motion.....	163
7.1: Introduction.....	163
7.2: The “Single Body” and “Whole Body” Displacement Hypotheses.....	165
7.3: Critical Responses to the Hypotheses	168
7.4: Final Assessment of the Hypotheses.....	172
Endnotes	174
Chapter 8: Constructing a Cartesian Dynamics Without “Fixed” Reference Frames: Collisions in the Center-of-Mass Frame	177
8.1: Descartes, Huygens, and the Center-of-Mass	

Reference Frame	178
8.2: Huygens on Conservation Laws, Impact, and Force	182
8.3: The Newtonian Reply	186
8.4: Constructing a Center-of-Mass Reference Frame	192
8.5: Conclusions	196
Endnotes	197
 Chapter 9: Constructing a Cartesian Dynamics With “Fixed” Reference Frames: The “Kinematics of Mechanisms” Theory.....	201
9.1: The Cartesian Vortex and Newton’s <i>De Gravitatione</i> Argument	203
9.2: Kinematics of Mechanisms and Cartesian Spacetime	206
9.3: Developing a Kinematics of Mechanisms Cartesian Spacetime.....	214
9.4: Invariant Universal Quantities of Motion	221
9.5: Conclusions	224
Endnotes	225
 Conclusion	227
 Bibliography.....	229
 Index.....	239

Cartesian Spacetime

Descartes' Physics and the Relational Theory of Space
and Motion

Slowik, E.

2002, XII, 252 p., Hardcover

ISBN: 978-1-4020-0265-6