

DESCARTES'S MATHEMATICAL THOUGHT

by

CHIKARA SASAKI

*The University of Tokyo,
Japan*



KLUWER ACADEMIC PUBLISHERS

DORDRECHT / BOSTON / LONDON

Contents

PREFACE	vii
List of Abbreviations and A Note on the Quotation and Translation	xiv
INTRODUCTION	
René Descartes and Modern European Mathematics	1
PART 1: THE FORMATION OF DESCARTES'S MATHEMATICAL THOUGHT	11
CHAPTER 1 DESCARTES AND JESUIT MATHEMATICAL EDUCATION	13
§ 1 Descartes and the Jesuit College of La Flèche	13
§ 2 The Curriculum at La Flèche	16
§ 3 Mathematical Studies in the <i>Ratio Studiorum</i>	19
§ 4 Motives for the Teaching of Mathematics in the Jesuit Colleges .	30
CHAPTER 2 THE MATHEMATICAL THOUGHT OF CHRISTOPH CLAVIUS	45
§ 1 Descartes and Clavius	45
§ 2 The Philosophy of Mathematics of Clavius	50
§ 3 Pappus in the Works of Clavius	63
§ 4 Diophantus in the Works of Clavius	72
§ 5 Descartes's Mathematical Background before the Encounter with Beeckman	84
CHAPTER 3 THE FIRST ATTEMPT AT REFORMING MATHEMATICS	95
§ 1 "An Entirely New Science": The Idea for the Unification of Arithmetic and Geometry	95
§ 2 The Mathematics in the <i>Cogitationes privatae</i>	109
A The Plan of a Book Titled <i>Thesaurus mathematicus</i>	109
B The Mesolabe Compass	112
C The Other Mathematical Instruments	121

	D The Interest in Figurate Numbers, the Extension of the Pythagorean Theorem and Other Results	127
§ 3	The <i>De Solidorum Elementis</i>	132
	A A History of the Manuscript	132
	B Solid Geometry	133
	C Figurate Numbers	138
	D The Date of the Original Manuscript	145
§ 4	Descartes's Mathematical and Philosophical Dream of 1619	149
CHAPTER 4 THE MATHEMATICAL BACKGROUND OF THE		
REGULAE AD DIRECTIONEM INGENII 159		
§ 1	The Old <i>Algebra</i> : The First Fruit of "An Entirely New Science"	159
§ 2	The Mathematics in the <i>Regulae ad Directionem Ingenii</i>	176
	A Pure Mathematics as the Paradigm for Certainty	176
	B Algebra as the Method of Analysis	182
§ 3	<i>Mathesis Universalis</i>	189
CHAPTER 5 THE GÉOMÉTRIE OF 1637 205		
§ 1	The Pappus Problem	205
§ 2	The Composition of the <i>Géométrie</i>	225
§ 3	Descartes's Place in the Formative Period of the Modern Analytic Tradition	235
	A Plagiarism Debates with Jean Beaugrand in 1637–1638	235
	B Descartes's Acquaintance with Viète before the Composition of the <i>Géométrie</i>	245
	C The Beginning of the Tradition of Algebraic Analysis in Arabic Mathematics and the Ramean Restart	248
	D The Supposed Intermediary Adriaan van Roomen	260
	E From Viète to Descartes	270
§ 4	Beyond Cartesian Mathematics	274
INTERIM CONSIDERATION		
Descartes and the Beginnings of Mathematicism in Modern Thought 281		
PART II: THE CONCEPT OF 'MATHESIS UNIVERSALIS' IN HISTORICAL PERSPECTIVE 287		
CHAPTER 6 'UNIVERSAL MATHEMATICS' IN ARISTOTLE 289		
§ 1	Aristotle's <i>Metaphysics</i> and <i>Posterior Analytics</i>	289
§ 2	Greek Commentators: Alexander of Aphrodisias and Asclepius of Tralles	296
§ 3	Medieval Commentators: Ibn Rushd (Averroës), Albertus Magnus, Thomas Aquinas, and the Scotist Antonius Andreae	301
	A Albertus Magnus and Thomas Aquinas	301

B	Ibn Rushd (Averroës) 's Commentary on the <i>Metaphysics</i> . . .	309
C	Albert and Thomas against the Oxford 'Platonists'	312
D	The Scotist Antonius Andreae	315
§ 4	Renaissance Commentators: Agostino Nifo and Pedro da Fonseca	318
A	Agostino Nifo	318
B	The Jesuit Commentator Pedro da Fonseca	321
§ 5	The Status of Mathematics in the Aristotelian Scheme of Learning	326
 CHAPTER 7 'MATHESIS UNIVERSALIS' IN THE SIXTEENTH		
CENTURY 333		
§ 1	Proclus Diadochus and Francesco Barozzi	333
§ 2	Adriaan van Roomen	342
 CHAPTER 8 'MATHESIS UNIVERSALIS' IN THE SEVENTEENTH		
CENTURY 359		
§ 1	Reviewing Descartes's Concept of 'Mathesis Universalis' from His Philosophy of Mathematics	359
A	The Philosophy of Mathematics in the <i>Regulae ad Direc-</i> <i>tionem Ingenii</i>	359
B	The Later Philosophy of Mathematics: Mathematical Truths as Creatures of God	362
C	Descartes against the Skeptical Arguments on Mathematics: How Was the Philosophy of "Cogito, Ergo Sum" Discov- ered?	373
D	Difficulties of the Later Philosophy of Mathematics: The 'Cartesian Spiral'	386
E	The Disuse of the Concept of 'Mathesis Universalis' in the Later Writings	391
F	'Mathesis Universalis' as the Discipline of Symbolic Algebra among Other Mathematicians	394
§ 2	The Leibnizian Synthesis	398
A	'Mathesis Universalis' Extended	398
B	Leibniz's 'Logicist-Formalist' Philosophy of Mathematics . . .	405
 CONCLUSION		
Descartes and the Modern Scheme of Learning 419		
 BIBLIOGRAPHY 439		
 INDICES 468		
Name Index 468		
Subject Index 478		
Treatise Index 487		