

TABLE OF CONTENTS

CHAPTER 1.	INTRODUCTION	1
CHAPTER 2.	KINEMATIC AXIOMS FOR MINKOWSKI SPACE-TIME	7
2.1	Primitive Notions	7
2.2	Existence of Signal Functions	8
2.3	The Temporal Order Relation	9
2.4	The Triangle Inequality	12
2.5	Signal Functions are Order-Preserving	13
2.6	The Coincidence Relation. Events	14
2.7	Optical Lines	17
2.8	Axiom of the Intermediate Particle	24
2.9	The Isotropy of SPRAYS	25
2.10	The Axiom of Dimension	33
2.11	The Axiom of Incidence	35
2.12	The Axiom of Connectedness	36
2.13	Compactness of Bounded sub-SPRAYS	38
CHAPTER 3.	CONDITIONALLY COMPLETE PARTICLES	42
3.1	Conditional Completion of a Particle	42
3.2	Properties of Extended Signal Relations and Functions	44
3.3	Generalised Triangle Inequalities	47
3.4	Particles Do Not Have First or Last Instants	48
3.5	Events at Which Distinct Particles Coincide	50
3.6	Generalised Temporal Order. Relations on the Set of Events. Observers.	52
3.7	Each Particle is Dense in Itself	57

VIII

CHAPTER 4. IMPLICATIONS OF COLLINEARITY	59
4.1 Collinearity. The Two Sides of an Event	59
4.2 The Intermediate Instant Theorem	62
4.3 Modified Signal Functions and Modified Record Functions	66
4.4 Betweenness Relation for n Particles	69
CHAPTER 5. COLLINEAR SUB-SPRAYS AFTER COINCIDENCE	71
5.1 Collinearity of the Limit Particle	72
5.2 The Set of Intermediate Particles	77
5.3 Mid-Way and Reflected Particles	84
5.4 All Instants are Ordinary Instants	95
5.5 Properties of Collinear Sub-SPRAYS After Coincidence	100
CHAPTER 6. COLLINEAR PARTICLES	103
6.1 Basic Theorems	103
6.2 The Crossing Theorem	119
6.3 Collinearity of Three Particles. Properties of Collinear sub-SPRAYS.	123
6.4 Properties of Collinear Sets of Particles	132
CHAPTER 7. THEORY OF PARALLELS	147
7.1 Divergent and Convergent Parallels	148
7.2 The Parallel Relations are Equivalence Relations	164
7.3 Coordinates on a Collinear Set	172
7.4 Isomorphisms of a Collinear Set of Particles	191
7.5 Linearity of Modified Signal Functions	210
CHAPTER 8. ONE-DIMENSIONAL KINEMATICS	233
8.1 Rapidity is a Natural Measure for Speed	233
8.2 Congruence of a Collinear Set of Particles	239
8.3 Partitioning a Collinear Set of Particles into Synchronous Equivalence Classes	243
8.4 Coordinate Frames in a Collinear Set.	246

CHAPTER 9. THREE-DIMENSIONAL KINEMATICS	250
9.1 Each 3-SPRAY is a 3-Dimensional Hyperbolic Space	251
9.2 Transformations of Homogeneous Coordinates in Three-Dimensional Hyperbolic Space	256
9.3 Space-Time Coordinates Within the Light Cone	263
9.4 Properties of Position Space	271
9.5 Existence of Coordinate Frames	278
9.6 Homogeneous Transformations of Space-Time Coordinates	286
9.7 Minkowski Space-Time	290
CHAPTER 10. CONCLUDING REMARKS	300
APPENDIX 1. CHARACTERISATION OF THE ELEMENTARY SPACES	302
APPENDIX 2. HOMOGENEOUS COORDINATES IN HYPERBOLIC AND EUCLIDEAN SPACES	309
BIBLIOGRAPHY	312