

TABLE OF CONTENTS

EDITORIAL INTRODUCTION	XIII
PREFACE TO THE FIRST EDITION	XV
PREFACE TO THE SECOND, ENLARGED EDITION	XVII
ACKNOWLEDGMENTS	XXI

PART I. PHILOSOPHICAL PROBLEMS OF THE METRIC OF SPACE AND TIME

<i>Chapter 1.</i>	Spatial and Temporal Congruence in Physics: A Critical Comparison of the Conceptions of Newton, Riemann, Poincaré, Eddington, Bridgman, Russell, and Whitehead	3
	A. Newton	4
	B. Riemann	8
	C. Poincaré	18
	D. Eddington	24
	E. Bridgman	41
	F. Russell	44
	G. Whitehead	48
<i>Chapter 2.</i>	The Significance of Alternative Time Metrizations in Newtonian Mechanics and in the General Theory of Relativity	66
	A. Newtonian Mechanics	66
	B. The General Theory of Relativity	77
<i>Chapter 3.</i>	Critique of Reichenbach's and Carnap's Philosophy of Geometry	81
	A. The Status of "Universal Forces"	81
	B. The "Relativity of Geometry"	98
<i>Chapter 4.</i>	Critique of Einstein's Philosophy of Geometry	106
	A. An Appraisal of Duhem's Account of the Falsifi-	

	ability of Isolated Empirical Hypotheses in Its Bearing on Einstein's Conception of the Interdependence of Geometry and Physics	106
	I. The Trivial Validity of the D-Thesis	111
	II. The Untenability of the Non-Trivial D-Thesis	114
	B. The Interdependence of Geometry and Physics in Poincaré's Conventionalism	115
	C. Critical Evaluation of Einstein's Conception of the Interdependence of Geometry and Physics: Physical Geometry as a Counter-Example to the Non-Trivial D-Thesis	131
<i>Chapter 5.</i>	Empiricism and the Geometry of Visual Space	152
<i>Chapter 6.</i>	The Resolution of Zeno's Metrical Paradox of Extension for the Mathematical Continua of Space and Time	158

PART II. PHILOSOPHICAL PROBLEMS OF THE
TOPOLOGY OF TIME AND SPACE

<i>Chapter 7.</i>	The Causal Theory of Time	179
	A. Closed Time	197
	B. Open Time	203
<i>Chapter 8.</i>	The Anisotropy of Time	209
	A. Is There a Thermodynamic Basis for the Anisotropy of Time?	209
	I. The Entropy Law of Classical Thermodynamics	219
	II. The Statistical Analogue of the Entropy Law	236
	B. Are There Non-Thermodynamic Foundations for the Anisotropy of Time?	264
<i>Chapter 9.</i>	The Asymmetry of Retrodictability and Predictability, the Compossibility of Explanation of the Past and Prediction of the Future, and Mechanism vs. Teleology	281
	A. The Conditions of Retrodictability and Non-Predictability	281
	B. The Physical Basis for the Anisotropy of Psychological Time	289

C. The Bearing of Retrodictability and Non-Predictability on the Compossibility of Explainability and Predictability	290
I. Evolutionary Theory	300
II. The Paresis Case	303
III. The Barometer Case	309
D. The Controversy Between Mechanism and Teleology	311
<i>Chapter 10.</i> Is There a "Flow" of Time or Temporal "Becoming"?	314
<i>Chapter 11.</i> Empiricism and the Three-Dimensionality of Space	330
PART III. PHILOSOPHICAL ISSUES IN THE THEORY OF RELATIVITY	
<i>Chapter 12.</i> Philosophical Foundations of the Special Theory of Relativity, and Their Bearing on Its History	341
A. Introduction	341
B. Einstein's Conception of Simultaneity, Its Prevalent Misrepresentations, and Its History	342
C. History of Einstein's Enunciation of the Limiting Character of the Velocity of Light <i>in vacuo</i>	369
D. The Principle of the Constancy of the Speed of Light, and the Falsity of the Aether-Theoretic Lorentz-Fitzgerald Contraction Hypothesis	386
E. The Experimental Confirmation of the Kinematics of the STR	397
F. The Philosophical Issue Between Einstein and His Aether-Theoretic Precursors, and Its Bearing on E. T. Whittaker's History of the STR	400
<i>Chapter 13.</i> Philosophical Appraisal of E. A. Milne's Alternative to Einstein's STR	410
<i>Chapter 14.</i> Has the General Theory of Relativity Repudiated Absolute Space?	418
<i>Chapter 15.</i> Philosophical Critique of Whitehead's Theory of Relativity	425
BIBLIOGRAPHY FOR THE FIRST EDITION	429

PART IV. SUPPLEMENTARY STUDIES 1964-1973

1. Supplement to Part I

<i>Chapter 16.</i> Space, Time and Falsifiability (First Installment)	449
Abstract	449
Introduction	450
Criteria for Intrinsicness vs. Extrinsicness of Metrics and of Relations on Manifolds: Contents	457
1. Singly and Multiply Extended Manifolds	458
2. Intrinsicness vs. Extrinsicness of Metrics, Metrical Equalities, and Congruences	468
3. What are the Logical Connections, if any, between Alternative Metrizable, Intrinsic Metric Amorphousness, and the Convention-ladenness of Metrical Comparisons?	547
4. Intrinsicness and Extrinsicness of a Relation on a Manifold	563
<i>Chapter 17.</i> Can We Ascertain the Falsity of a Scientific Hypothesis?	569
1. Introduction	569
2. Purported Disproofs of Hypotheses in Biology and Astronomy	572
3. Is it NEVER Possible to Falsify a Hypothesis Irrevocably?	585
<i>Chapter 18.</i> Can an Infinitude of Operations Be Performed in a Finite Time?	630

2. Supplement to Part II

<i>Chapter 19.</i> Is the Coarse-Grained Entropy of Classical Statistical Mechanics an Anthropomorphism?	646
1. Introduction	646
2. Entropy Change and Arbitrariness of the Partitioning of Phase Space	648
3. What is the Physical Significance of the Triple Role of the Entropy for the Entropy Statistics in the Class U ?	659

4. Do the Roles of Human Decision and Ignorance
Impugn the Physical Significance of the Entropy
Statistics for the Class U ? 663

3. *Supplement to Part III*

<i>Chapter 20.</i>	Simultaneity by Slow Clock Transport in the Special Theory of Relativity	666
	Introduction (co-authored with Wesley C. Salmon)	666
	1. Summary	670
	2. Examination of Ellis and Bowman's Account of Nonstandard Signal Synchronizations	671
	3. The Philosophical Status of Simultaneity by Slow Clock Transport in the Special Theory of Relativity	683
<i>Chapter 21.</i>	The Bearing of Philosophy on the History of the Special Theory of Relativity	709
	1. History and Pedagogy of the Light Principle	711
	2. Contraction and Time-Dilation Hypotheses	715
	3. Summary	726
<i>Chapter 22.</i>	General Relativity, Geometrodynamics and Ontology	728
	1. Introduction	728
	2. The Philosophical Status of the Metric of Space-Time in the General Theory of Relativity	730
	3. The Ontology of Empty Curved Metric Space in the Geometrodynamics of Clifford and Wheeler	750
	4. The Time-Orientability of Space-Time and the 'Arrow' of Time	788
APPENDIX		804
INDEX OF PERSONAL NAMES – Compiled by Mr. Theodore C. Falk		857
INDEX OF SUBJECTS – Compiled by Mr. Theodore C. Falk		865