TABLE OF CONTENTS

PREFACE (Adolf Grünbaum)	xiii
EDITORIAL NOTE	xv
ACKNOWLEDGMENTS	xix
INTRODUCTION TO VOLUMES I AND II	1
VOLUME I : ESSAY ON THE CAUSAL THEORY OF T	IME
Part I: The Causal Theory of Time in the Works of Its Principal Representatives	
Introduction	39
I. Leibniz and the Beginnings of the Causal Theory of Time	42
1. The Relational Theory	42
2. The Causal Theory	45
II. Kant's Phenomenalist Interpretation of the Causal Theory of	
Time	51
1. General Remarks on Kant's Phenomenalism	51
2. The Causal Theory of Simultaneity	54
3. The Causal Theory of Succession	57
4. Examination of Schopenhauer's Criticism	59
5. The Plurality of Concepts of Time in Kant	65
III. Lechalas' Adaptation of the Causal Theory of Time to the	
Laws of pre-Einsteinian Physics	70
1. General Remarks on Lechalas' Theory	70
2. The Principle of Determinism, Considered as Defining the	
Temporal Order	71
3. Physical Reversibility	78
4. Psycho-Physiological Reversibility	83
5. The Epistemological Interpretation of the Causal Theory	88
IV. The Relativistic Phase of the Causal Theory of Time: The	
Axiomatic Systems of Robb and Carnap	91
1. Robb's System	91
2. Carnap's Systems	95

	3. The Epistemological Priority of the Causal Relation	98
	4. The Ontological Priority of the Causal Relation	101
V.	The Relativistic Phase of the Causal Theory of Time: The	
	Work of Reichenbach	105
	1. The Causal Theory	105
	2. Criticism of the Principle of Marking	111
	3. Criticism Continued: Subjective and Objective Time	113
	4. Criticism, Continued and Concluded: Convention and	
	Reality in the Temporal Order	123
	5. The Semi-Causal, Semi-Statistical Theory	125
	6. The Branch Hypothesis	128
	7. Conclusion	129
VI.	Russell's Causal Explanation of Duration	134
	1. The Logical Analysis of Duration	134
	2. Russell's Causal Definition	137
	3. Criticism and Comment	138
	4. Epistemological Remarks	141
	5. Conclusion	145
VII.	Alternative Approaches to Time's Arrow	147
	Introductory	147
	1. K. Gödel and S. Chandrasekhar	148
	2. G. J. Whitrow	152
	3. A. Grünbaum and O. Costa de Beauregard	153
	4. R. Schlegel and R. Swinburne	155
	5. S. Watanabe	157
	Part II : Duration and Causality	
VIII.	The Intuitive Foundations of the Knowledge of Time	163
	1. Preliminary Remarks	163
	2. Intuitive Time and Memory	166
	3. Intuitive Time and Perception	171
	4. The Continuum of Instants Attached to Intuitive Time	174
	5. Other Intuitively Knowable Aspects of Time	177
	6. The Epistemological Significance of Intuitive Time	180
IX.	Physical Time	187
	1. General Remarks on the Causal Theory of Physical Time	187
	2. Symmetrical Causality	197
	3. The Concept of Event	205

TABLE OF CONTENTS	xi
4. The Ordinal Concept	209
4.1. Coincidence	209
4.2. The Spatio-Temporal Order	210
4.3. Simultaneity	211
4.4. Succession	213
5. The First Group of Axioms	214
6. The Geometrical Concepts	216
7. The Second Group of Axioms	217
8. The Third Group of Axioms	220
9. The Time Metric	223
10. Reference Systems, Coordinates, Transformation Formulas	226
11. Inertial Systems	230
12. Optical Criteria	234
X. Non-Physical Time	237
1. Psychophysical Time: The Perceptual Method	237
2. Psychophysical Time: The Expressive Method	240
3. Psychological and Inter-Psychological Time	248
4. Universal Time	251
5. Conclusion	259
Supplement	
1. The Present Empirical Status of Psychophysical Parallelism	261
2. Conceptual Analysis of Psychophysical Parallelism	269
NOTES	286
INDEX OF NAMES	300