

CONTENTS

Introduction *xiii*

Einstein as a Missionary of Science 1

Einstein's Booklet: *Relativity: The Special and the General Theory* 7

PART I: The Special Theory of Relativity

1. Physical Meaning of Geometrical Propositions 11
2. The System of Co-ordinates 14
3. Space and Time in Classical Mechanics 18
4. The Galileian System of Co-ordinates 21
5. The Principle of Relativity (in the Restricted Sense) 23
6. The Theorem of the Addition of Velocities Employed in Classical Mechanics 27
7. The Apparent Incompatibility of the Law of Propagation of Light with the Principle of Relativity 28
8. On the Idea of Time in Physics 32
9. The Relativity of Simultaneity 36

10. On the Relativity of the Conception of Distance 39
11. The Lorentz Transformation 41
12. The Behaviour of Measuring-Rods and Clocks in Motion 47
13. Theorem of the Addition of the Velocities.
The Experiment of Fizeau 50
14. The Heuristic Value of the Theory of Relativity 54
15. General Results of the Theory 56
16. Experience and the Special Theory of Relativity 62
17. Minkowski's Four-Dimensional Space 68

PART II: The General Theory of Relativity

18. Special and General Principle of Relativity 72
19. The Gravitational Field 76
20. The Equality of Inertial and Gravitational Mass as an Argument for the General Postulate of Relativity 80
21. In What Respects Are the Foundations of Classical Mechanics and of the Special Theory of Relativity Unsatisfactory? 85
22. A Few Inferences from the General Principle of Relativity 88
23. Behaviour of Clocks and Measuring-Rods on a Rotating Body of Reference 93
24. Euclidean and Non-Euclidean Continuum 97
25. Gaussian Co-ordinates 101
26. The Space-Time Continuum of the Special Theory of Relativity Considered as a Euclidean Continuum 106
27. The Space-Time Continuum of the General Theory of Relativity Is Not a Euclidean Continuum 109
28. Exact Formulation of the General Principle of Relativity 113

29. The Solution of the Problem of Gravitation on the Basis of the General Principle of Relativity 117

PART III: Considerations on the Universe as a Whole

30. Cosmological Difficulties of Newton's Theory 122
31. The Possibility of a "Finite" and Yet "Unbounded" Universe 125
32. The Structure of Space According to the General Theory of Relativity 131

Appendixes

1. Simple Derivation of the Lorentz Transformation (Supplementary to Section 11) (1918) 133
2. Minkowski's Four-Dimensional Space ("World") (Supplementary to Section 17) (1918) 140
3. The Experimental Confirmation of the General Theory of Relativity (1920) 142
4. The Structure of Space According to the General Theory of Relativity (Supplementary to Section 32) (1946) 153
5. Relativity and the Problem of Space (1953) 155

A Reading Companion: Thirteen Commentaries

Physics and Geometry (§§ 1–2) 180
Mechanics and Space (§§ 3–6) 182
Light Propagation and Time (§§ 7–9) 187
Light Propagation and Space (§§ 10–12 and Appendix 1) 191
Physics in Relativistic Space and Time (§§ 13–16) 193
The World of Four Dimensions (§ 17 and Appendix 2) 201
From Special to General Relativity 204

Gravitation and Inertia (§§ 18–21)	205
Acceleration, Clocks, and Rods (§§ 22–23)	209
Gravitation and Geometry (§§ 24–27)	213
Gravitation and General Relativity (§§ 28–29)	218
The Challenge of Cosmology (§§ 30–32 and Appendix 4)	222
The Relation between Theory and Experiment (Appendix 3)	226
The Changing Concept of Space (Appendix 5)	230

A History and Survey of Foreign-Language Editions

The English Translation	244
The French Translation	247
The Italian Translation	252
The Spanish Translation	256
The Russian Translation	259
The Chinese Translation	262
The Japanese Translation	266
The Polish Translation	270
The Czech Translation	273
The Hebrew Translation	276
Concluding Remarks	279

Appended Documents

A Letter from Walther Rathenau to Einstein	281
A Sample Page of Einstein's Handwriting	284
Manuscript of Appendix 3 of the Booklet	286
<i>Further Reading</i>	293
<i>Index</i>	297