

Contents

1	Introduction	1
I	Semiclassical Spacetime and Gravity	3
2	Basic Principles	5
2.1	How can you find the theory?	5
2.2	Equivalence principle, EP	6
2.3	Special relativity, SR	7
2.4	Radial structure of gravity near a mass	13
2.5	Law of energy conservation	14
2.6	Measures of observable distance	16
2.7	Objects of interaction	26
2.8	Gravity near a mass, GG	28
2.9	Dynamic volume, DV	34
2.10	Spacetime quadruple, SQ	36
3	Universal Position Factor	37
3.1	Position factor $\varepsilon_E(R)$	37
3.2	Derivation of the Schwarzschild metric	41
3.3	Universality of the position factor	43
4	Universal Quantization	47
4.1	Possible minimal portion	48
4.2	Universality of the quantization ratio	49
5	Classical Expansion of Space	57
5.1	Expansion of space	57
5.2	Derivation of the FLE	58
5.3	A solution of the flatness problem	62
5.4	Second solution of the flatness problem	63

6	Energy Density of the Gravitational Field G^*	71
6.1	Absolute value of $\rho_{gr. f.}$	71
6.2	Free fall of M	73
II	Theory of Dynamic Volume	77
7	Caused Additional Volume	79
7.1	A mass causes curvature of spacetime	79
7.2	A mass causes additional volume	83
7.3	ε_L provides a gravitational potential	89
8	Propagation of Additional Volume	93
8.1	Relative additional volume	94
8.2	Plane waves	99
8.3	Invariant and generalized dynamics	103
9	Local Formation of Volume	109
9.1	Normalized LFV	110
9.2	Formation of ε_L near a mass M	116
9.3	Invariant and generalized LFV	119
10	Geometry of the Change of Volume	121
10.1	Volume tensor	122
10.2	Non-diagonal elements	124
10.3	Rates for LFV and GFV	128
10.4	No measurement of absolute position	129
11	Formation and Propagation of Volume	131
11.1	Linear superposition	131
11.2	Energy and momentum	135
12	Global Formation of Volume	139
12.1	Globally formed volume	139
12.2	LFV can cause GFV	140
III	Fundamental Dynamics of Quanta	147
13	Stabilization of Quanta	149

14 Derivation of Quantum Postulates	153
14.1 Time evolution	153
14.2 Hilbert space	160
14.3 Observables and operators	162
14.4 Outcomes of measurements	165
14.5 Energy of a wave packet of a RGW	167
14.6 Probabilistic outcomes	179
14.7 Mixed states	190
14.8 Angular momentum and spin	194
14.9 Identical particles	194
14.10 Entanglement	196
15 Consequences of Quantum Postulates	201
15.1 Phenomena	201
15.2 Theories	202
16 On Bell's theorem	203
16.1 On Bell's inequality	203
16.2 Experimental test of Bell's inequality	206
16.3 Explanation by the dynamics of volume	210
17 Mapping theorem	215
18 Interpretation	221
18.1 Role of paradoxes	221
18.2 Delayed choice experiment	221
18.3 DV overcomes Copenhagen interpretation	226
IV Basic Dynamics of Spacetime & Gravity	227
19 Derivation of Dark Energy	229
19.1 Nature of density of volume	229
19.2 u_{vol} in a universe of volume	230
19.3 u_{vol} at another time	242
20 Dark Energy in a Homogeneous Universe	245
20.1 Spatial averages in cosmology	245
20.2 Formation and propagation of volume	247
21 Dark Energy by Heterogeneity	249
21.1 Physics of the observed discrepancy	249
21.2 Time dependence of H_0	251

21.3	Derivation of the ideal value of H_0	251
21.4	Parameter measured with a probe	253
22	Dark Energy at 'Cosmic Inflation'	269
22.1	Incompleteness of GR	269
22.2	Gravity at higher dimension	272
22.3	Phase transitions in the early universe	276
22.4	Quanta of dark energy	283
23	Derivation of GR	293
23.1	Curvature of spacetime is included in the SQ	293
23.2	Semiclassical limit via path integrals	294
23.3	Semiclassical limit at stationary action	294
23.4	Most simple action	295
24	Discussion	297
24.1	Achieved key results	297
24.2	Fulfilled criteria	302
24.3	Relations among theories	304
25	Appendix	311
25.1	Mathematical methods	311
25.2	Methods of physics	312
25.3	Universal constants	315
25.4	Glossary on volume	316
25.5	Natural units	317
25.6	Glossary	318

Hans-Otto Carmesin

Geometrical and Exact Unification of Spacetime, Gravity and Quanta

The Theory of the Dynamics of Volume is Derived from Physical Principles

2023 / 350 Seiten / 29,95 € / ISBN 978-3-96831-042-8

Verlag Dr. Köster, Berlin / www.verlag-koester.de