

[Paths to Dark Energy](#)

Theory and Observation

Bearbeitet von
Gene Gilbert Byrd, Arthur D. Chernin, Pekka Teerikorpi, Mauri Valtonen, Gene Byrd

1. Auflage 2012. Buch. XII, 416 S. Hardcover

ISBN 978 3 11 025854 7

Format (B x L): 17 x 24 cm

Gewicht: 836 g

[Weitere Fachgebiete > Physik, Astronomie > Angewandte Physik > Astrophysik](#)

schnell und portofrei erhältlich bei


DIE FACHBUCHHANDLUNG

Die Online-Fachbuchhandlung beck-shop.de ist spezialisiert auf Fachbücher, insbesondere Recht, Steuern und Wirtschaft. Im Sortiment finden Sie alle Medien (Bücher, Zeitschriften, CDs, eBooks, etc.) aller Verlage. Ergänzt wird das Programm durch Services wie Neuerscheinungsdienst oder Zusammenstellungen von Büchern zu Sonderpreisen. Der Shop führt mehr als 8 Millionen Produkte.

Contents

Preface	v
1 The start of the paths	1
1.1 Newton's absolute space and time	1
1.2 Light versus absolute space and time	2
1.3 Space-time events and intervals	4
1.4 Space-time measurements and Lorentz transformations	6
1.5 The Minkowski diagram	8
2 General Relativity: apparent acceleration of gravity	15
2.1 Gravitation as an apparent force	15
2.2 Principle of Equivalence	16
2.3 Lagrangians and motion of bodies	17
2.4 Integrals of motion	18
3 Tests of General Relativity	20
3.1 The Schwarzschild metric and the gravitational redshift	20
3.2 Orbits in General Relativity	24
3.2 Deflection of light	30
4 Curved space in cosmology	36
4.1 Non-Euclidean geometries	36
4.2 Curvature of 3-space	39
5 Finite versus infinite universe in space and time	49
5.1 Observation of an isotropic universe	49
5.2 A finite universe in time	49
5.3 The age of the universe via its "oldest objects"	50
5.4 Observational discovery of the expanding universe	54
5.5 Problems with the Hubble constant and the age of the universe	62
6 Cosmology and the "first appearance" of dark energy	66
6.1 A first formulation of dark energy: Einstein's finite static universe	66
6.2 Cosmological redshift and Friedmann's evolving universes	68
6.3 The Hubble constant in the Friedmann standard model	71

7	Einstein's equations, critical density and dark energy	77
7.1	Introduction	77
7.2	The path to Einstein equations with the cosmological constant	77
7.3	Interpretations of the cosmological constant	85
8	Model Universes	88
8.1	Friedmann equation	88
8.2	The Einstein-de Sitter universe (critical density Friedmann case with no dark energy)	90
8.3	The de Sitter universe (introduction dark energy with no matter). . .	93
8.4	The Concordance Model (both matter and dark energy so $k = 0$) . .	93
8.5	Testing via the small scale Newtonian limit.	97
8.6	Newtonian cosmology and the " k " parameter	100
9	Dark energy discovered	103
9.1	The era of zero-Lambda models.	103
9.2	Cosmological angular-diameter distance estimates	104
9.3	Cosmological standard candle distance estimates	108
9.4	More luminous standard candles	109
9.5	Observational discovery of dark energy	112
9.6	Type Ia supernovae redshifts and distances vs uniform expansion . .	114
9.7	Could it be some problem with the standard candle method?	118
9.8	Modified gravity theories	120
10	Relics: cosmic microwave background (CMB) photons and neutrinos	123
10.1	The prediction and discovery of the CMB	123
10.2	The Big Bang components	124
10.3	The early radiation-dominated universe.	127
10.4	Properties of cosmic microwave background radiation	130
10.5	Why a CMB thermal spectrum?	134
10.6	Relic neutrinos and Ω	145
11	Baryonic matter	148
11.1	Why matter and not also anti-matter?	148
11.2	Big Bang Nucleosynthesis prediction and processes	151
11.3	Baryon nucleosynthesis abundances and cosmological implications	153
11.4	The baryon content of cosmic systems.	155
11.5	The Lyman alpha forest	156
12	Discovering dark matter	161
12.1	Dark matter in the Milky Way disk near the Sun	161
12.2	Dark matter discovery in clusters via the Virial Theorem	164

12.3	Subclusters in rich clusters of galaxies	169
12.4	Dark matter discovery in clusters via the cluster gas	171
12.5	Dark matter in the Milky Way disk and its halo	175
12.6	Dark matter discovery inside disk galaxies via rotation curves . . .	180
12.7	Dark matter discovery in the Local Group	182
12.8	Dark matter in binary Galaxy systems	185
12.9	Dark matter discovery via gravitational lensing	188
12.10	Dark matter in different scales	202
12.11	The importance and nature of dark matter versus baryonic matter	204
13	Dark matter and baryonic structures	206
13.1	Newton's concept of gravitational instability	206
13.2	Basic hydrodynamics	207
13.3	Jeans Criterion	210
13.4	Jeans Criterion for collisionless dark matter gas	215
13.5	Jeans Criterion in the expanding universe	220
13.6	Evolution of density perturbations	226
13.7	Jeans mass in the early universe	229
13.8	Free streaming in dark matter	232
13.9	Dark matter perturbations	233
13.10	Dark matter drag	236
13.11	Termination of gravitational instability	237
13.12	Dark matter and baryonic structures	238
14	Dark energy and gravitating matter from structure in the universe	249
14.1	Introduction	249
14.2	Describing structure in the CMB radiation	249
14.3	The Power Spectrum	256
14.4	Perturbations of the gravitational potential	262
14.5	Harrison-Zeldovich spectrum of density perturbations	264
14.6	Perturbations and CMB	266
14.7	The cosmic horizon at CMB emission	268
14.8	The origin of peaks in CMB angular size spectrum	270
14.9	Cosmological parameters from CMB peaks: additional primary observations	273
14.10	Spatial Correlations of Galaxies	278
14.11	The CMB and the baryon acoustic oscillation (BAO) spectrum . .	286
14.12	The dark energy equation of state: is dark energy density a function of time?	290
14.13	Dark energy determined from gravitational lensing of the CMB . .	292
14.14	Cosmic 3D space: finite or infinite?	293

15	The local path to dark energy	300
15.1	A gravitating system within dark energy: the zero-gravity radius .	300
15.2	Dynamical structure of a gravitating system within dark energy. .	305
15.3	Dark energy and determination of mass in systems of galaxies. . .	309
15.4	Towards local measurement of dark energy	313
15.5	The Hubble law and dark energy	316
15.6	Redshift asymmetry as signature of dark energy.	320
16	Cosmological inflation	328
16.1	Physics of the vacuum	328
16.2	Why does the universe expand?	332
16.3	Why is the universe uniform?	336
16.4	Scalar fields	339
16.5	Equation of motion.	341
16.6	Reheating after inflation	344
16.7	Density perturbations and gravitational waves	344
17	Cosmic internal symmetry	346
17.1	Time-independent parameters of the Metagalaxy	346
17.2	The Friedmann integrals	348
17.3	The physics behind COINS	352
17.4	Coincidence problem.	356
17.5	Dicke's flatness problem and solutions	358
17.6	Big numbers.	361
17.7	Extra dimensions?.	362
17.8	New naturalness	368
17.9	Protogalactic perturbations	369
	Bibliography	373
	Index	394