

Table of Contents

Preface	vii
1. Geometric Structures	1
1.1. (X, G)-structures on manifolds	1
1.2. Conformal geometry on the sphere	4
1.3. The hyperbolic space \mathbb{H}^n	11
1.4. Lie subgroups of the Möbius group	19
1.5. Structure developments and holonomy homomorphisms	22
1.6. The eight 3-dimensional geometries	25
1.7. Four-dimensional geometries	31
1.8. Geometry of orbifolds	33
Notes	39
2. Discontinuous Groups of Homeomorphisms	40
2.1. Convergence groups	40
2.2. Group action on the discontinuity set	54
2.3. Fundamental domains	62
2.4. Convex polyhedra and reflection groups	77
2.5. Discrete group action on the limit set	86
Notes	100
3. Basics of Hyperbolic Groups and Manifolds	101
3.1. Margulis's Lemma and splittings of hyperbolic manifolds	101
3.2. Injectivity radius of hyperbolic manifolds	107
3.3. Thin cusp submanifolds	111
3.4. Precisely invariant horoballs	117
3.5. Group action on the set of horoballs	121
3.6. Convex hull constructions	123
3.7. Tessellations of manifolds by ideal hyperbolic polyhedra	129

3.8. Hyperbolic arithmetics	130
3.9. Arithmetic groups generated by reflections	133
3.10. Non-arithmetic groups of Gromov and Piatetski-Shapiro	140
3.11. Fibonacci manifolds	144
Notes	151
4. Geometrical Finiteness	153
4.1. Classical finiteness for planar Kleinian groups	153
4.2. Geometrical finiteness in higher dimensions	156
4.3. Equivalent definitions of geometrical finiteness	166
4.4. Geometrically finite ends and coverings	175
4.5. Geometry of tessellations	178
4.6. Cayley graphs and geometric isomorphisms of discrete groups	191
4.7. Geometrical finiteness for discontinuity set components	204
Notes	215
5. Kleinian Manifolds	217
5.1. Basic topology related to Kleinian manifolds	217
5.2. Topological aspects of combination theorems	225
5.3. Universal groups and Poincaré Conjecture	241
5.4. Ends of Kleinian manifolds, their compactification and Ahlfors's Conjecture	244
5.5. Kleinian n -manifolds and hyperbolic cobordisms	256
5.6. Finiteness problems for Kleinian n -manifolds	276
Notes	288
6. Uniformization	289
6.1. Classical uniformization	290
6.2. Modern concepts of uniformization	291
6.3. Hyperbolization of manifolds and hyperbolic volumes	308
6.4. Uniformizable conformal structures	324
6.5. Conformal uniformization of "flat" connected sums	335
6.6. Conformal uniformization of Seifert manifolds	342
6.7. Torus sums of conformal structures	350
6.8. Canonical Riemannian metric on conformal manifolds	355
Notes	377
7. Theory of Deformations	379
7.1. Deformations of geometric structures	379
7.2. Rigidity of hyperbolic structures	392
7.3. Quasi-Fuchsian structures: bendings	408
7.4. Quasi-Fuchsian structures: cone deformations	425

7.5. Bendings along surfaces with boundaries	434
7.6. Global properties of deformation spaces	441
Notes.....	457
Bibliography	461
Index	513