

Contents

Preface

Preface	ix
Chapter 1. Introduction	1
1.1. Motivation	1
1.2. The main theorems for Haken 3-manifolds	3
1.3. The main theorems for reducible 3-manifolds	8
1.4. Examples	9
Chapter 2. Johannson's Characteristic Submanifold Theory	15
2.1. Fibered 3-manifolds	16
2.2. Boundary patterns	20
2.3. Admissible maps and mapping class groups	23
2.4. Essential maps and useful boundary patterns	28
2.5. The classical theorems	35
2.6. Exceptional fibered 3-manifolds	38
2.7. Vertical and horizontal surfaces and maps	40
2.8. Fiber-preserving maps	41
2.9. The characteristic submanifold	48
2.10. Examples of characteristic submanifolds	51
2.11. The Classification Theorem	57
2.12. Miscellaneous topological results	60
Chapter 3. Relative Compression Bodies and Cores	65
3.1. Relative compression bodies	66
3.2. Minimally imbedded relative compression bodies	69
3.3. The maximal incompressible core	71
3.4. Normally imbedded relative compression bodies	73
3.5. The normal core and the useful core	74
Chapter 4. Homotopy Types	77
4.1. Homotopy equivalences preserve usefulness	77
4.2. Finiteness of homotopy types	83
Chapter 5. Pared 3-Manifolds	87
5.1. Definitions and basic properties	87
5.2. The topology of pared manifolds	89
5.3. The characteristic submanifold of a pared manifold	92
Chapter 6. Small 3-Manifolds	97
6.1. Small manifolds and small pared manifolds	97
6.2. Small pared homotopy types	101

Chapter 7. Geometrically Finite Hyperbolic 3-Manifolds	105
7.1. Basic definitions	105
7.2. Quasiconformal deformation theory: a review	107
7.3. The Parameterization Theorem	114
Chapter 8. Statements of Main Theorems	117
8.1. Statements of Main Topological Theorems	117
8.2. Statements of Main Hyperbolic Theorem and Corollary	118
8.3. Derivation of hyperbolic results	119
Chapter 9. The Case When There Is a Compressible Free Side	121
9.1. Algebraic lemmas	122
9.2. The finite-index cases	124
9.3. The infinite-index cases	132
Chapter 10. The Case When the Boundary Pattern Is Useful	139
10.1. The homomorphism Ψ	141
10.2. Realizing homotopy equivalences of I-bundles	153
10.3. Realizing homotopy equivalences of Seifert-fibered manifolds	161
10.4. Proof of Main Topological Theorem 2	171
Chapter 11. Dehn Flips	175
Chapter 12. Finite Index Realization For Reducible 3-Manifolds	179
12.1. Homeomorphisms of connected sums	180
12.2. Reducible 3-manifolds with compressible boundary	190
12.3. Reducible 3-manifolds with incompressible boundary	191
Chapter 13. Epilogue	195
13.1. More topology	195
13.2. More geometry	197
Bibliography	207
Index	213