

Contents

| | |
|--|------------|
| Preface | vii |
| Reader's Advisory | ix |
| 1 What Is a Manifold? | 3 |
| 1.1 Polygons and Surfaces | 4 |
| 1.2 Hyperbolic Surfaces | 7 |
| 1.3 The Totality of Surfaces | 17 |
| 1.4 Some Three-Manifolds | 31 |
| 2 Hyperbolic Geometry and Its Friends | 43 |
| 2.1 Negatively Curved Surfaces in Space | 45 |
| 2.2 The Inversive Models | 53 |
| 2.3 The Hyperboloid Model and the Klein Model | 64 |
| 2.4 Some Computations in Hyperbolic Space | 74 |
| 2.5 Hyperbolic Isometries | 86 |
| 2.6 Complex Coordinates for Hyperbolic Three-Space | 98 |
| 2.7 The Geometry of the Three-Sphere | 103 |
| 3 Geometric Manifolds | 109 |
| 3.1 Basic Definitions | 109 |
| 3.2 Triangulations and Gluings | 118 |
| 3.3 Geometric Structures on Manifolds | 125 |
| 3.4 The Developing Map and Completeness | 139 |
| 3.5 Discrete Groups | 153 |
| 3.6 Bundles and Connections | 158 |
| 3.7 Contact Structures | 168 |
| 3.8 The Eight Model Geometries | 179 |
| 3.9 Piecewise Linear Manifolds | 190 |
| 3.10 Smoothings | 193 |

| | | |
|----------|---|------------|
| 4 | The Structure of Discrete Groups | 209 |
| 4.1 | Groups Generated by Small Elements | 209 |
| 4.2 | Euclidean Manifolds and Crystallographic Groups . . | 221 |
| 4.3 | Three-Dimensional Euclidean Manifolds | 231 |
| 4.4 | Elliptic Three-Manifolds | 242 |
| 4.5 | The Thick-Thin Decomposition | 253 |
| 4.6 | Teichmüller Space | 258 |
| 4.7 | Three-Manifolds Modeled on Fibered Geometries . . . | 277 |
| | Glossary | 289 |
| | Bibliography | 295 |
| | Index | 301 |