

# Contents

Preface	vii
Acknowledgments	viii
Chapter 1. Elimination Theory	1
1.1. Elimination Theory in the 18th and 19th Centuries	1
1.2. Elimination Theory in the 20th Century	16
1.3. Elimination Theory in the 21st Century (by Carlos D’Andrea)	33
Chapter 2. Numerical Algebraic Geometry	45
2.1. Numerical Issues and Linear Algebra	45
2.2. Homotopy Continuation and Applications	60
2.3. Applications of Sampling in Numerical Algebraic Geometry (by Jonathan Hauenstein)	75
Chapter 3. Geometric Modeling	89
3.1. Geometry of Modeling	89
3.2. Algebra of Modeling	105
3.3. Rees Algebras, Syzygies, and Computational Geometry (by Hal Schenck)	121
Chapter 4. Rigidity Theory	137
4.1. Geometry of Rigidity	137
4.2. Combinatorics of Rigidity	152
4.3. Polynomial Methods and Rigidity Theory (by Jessica Sidman)	162
Chapter 5. Chemical Reaction Networks	179
5.1. The Classical Theory of Chemical Reactions	179
5.2. Toric Dynamical Systems	193
5.3. Algebraic Methods for the Study of Biochemical Reaction Networks (by Alicia Dickenstein)	211
Illustration Credits	223
Bibliography	225
Index	243