Table of Contents

| Foreword | V |
|----------|--------|
| Roald Ho | ffmann |

Preface IX Christoph Meinel

List of Contributors XVII

Disciplines, Research Fields, and their Boundaries I

Carsten Reinhardt

References and Notes 13

- 1. Research Fields and Boundaries in Twentieth-Century Organic Chemistry 14
 Peter J. T. Morris, Anthony S. Travis, and Carsten Reinhardt
- 1.1 Physical Organic Chemistry 14
- 1.2 Physical Instrumentation and Organic Chemistry 20
- 1.3 Bioorganic Chemistry 29
- 1.4 Conclusion 38
 References and Notes 38

Part 1

Theoretical Chemistry and Quantum Chemistry

- 2. Theoretical Quantum Chemistry as Science and Discipline: Some Philosophical Remarks on a Historical Issue 45 Nikos Psarros
- 2.1 The Quarrel of the Faculties 45
- 2.2 Theoretical Quantum Chemistry: Establishing a New Science in the Twentieth Century 46
- 2.3 Giovanni Battista Bonino: Pioneer of the New Science and Founder of a New Discipline in Italy 48
- 2.4 Jean Barriol: The French Version 49
 References and Notes 50
- 3. Issues in the History of Theoretical and Quantum Chemistry, 1927–1960 51

 Ana Simões and Kostas Gavroglu
- 3.1 Introduction 51



| xıv | Table of Contents | |
|-----|-------------------|---|
| | 3.2 | Re-thinking Reductionism or the Chemists' Uneasy Relation with Mathematics 51 |
| | 3.3 | Convergence of Diverging Traditions: Physics, Chemistry, and Mathematics 56 |
| | 3.4 | The Role of Textbooks in Building a Discourse for Quantum Chemistry 62 |
| | 3.5 | The Ontological Status of Resonance 64 |
| | 3.6 | The Status of the Chemical Bond 68 |
| | 3.7 | The Impact of Computers in Quantum Chemistry: the Split of the Community 70 References and Notes 72 |
| | 4. | Giovanni Battista Bonino and the Making |
| | ٠. | • |
| | | of Quantum Chemistry in Italy in the 1930s 75 Andreas Karachalios |
| | 4.1 | Introduction 75 |
| | 4.2 | Early Career 76 |
| | 4.3 | Bonino and the Beginning of Infrared Spectroscopy in Italy 77 |
| | 4.4 | The Scientific and Political Context 79 |
| | 4.5 | Scientific Contacts in Germany and Austria, 1931–1934 83 |
| | 4.6 | Early Contributions to Quantum Chemistry 86 |
| | 4.7 | Bonino's Place within Contemporary Research 89 |
| | 4.8 | The Advent of Group Theory in Bonino's Work 90 |
| | 4.9 | Bonino's Quantum Mechanical Concept of Coordination 92 |
| | 4.10 | Encroaching Political Developments 94 |
| | 4.11 | Conclusion 98 |
| | | References and Notes 99 |
| | 5. | Between Disciplines: Jean Barriol and the Theoretical Chemistry Laboratory in Nancy 105 Marika Blondel-Mégrelis |
| | 5.1 | Inspirations 106 |
| | 5.2 | Mathematics 108 |
| | 5.3 | Quantum Chemistry 110 |
| | 5.4 | Pragmatism III |
| | 5.5 | Foundations 112 |
| | 5.6 | Experiment 114 |
| | 5.7 | Jean Barriol's Theoretical Chemistry 115 References and Notes 117 |
| | | |

Part II

From Radiochemistry to Nuclear Chemistry and Cosmochemistry

- 6. From Radiochemistry to Nuclear Chemistry and Cosmochemistry 121

 Xavier Roqué
- 6.1 Physical Evidence in Chemical Disciplines 122

| 6.2 | Identification and Production 124 | |
|----------|--|--|
| 6.3 | Natural Versus Artificial Elements 126 | |
| 6.4 | Discipline Dynamics 127 | |
| | References and Notes 129 | |
| 7. | The Discovery of New Elements and the Boundary | |
| | Between Physics and Chemistry in the 1920s and 1930s. | |
| | The Case of Elements 43 and 75 131 | |
| . | Brigitte Van Tiggelen | |
| 7.1 | Rhenium: A Success 132 | |
| 7.2 | A Failure: Masurium 137 | |
| 7.3 | A Comparison: From Hunting to Breeding 139 | |
| 7.4 | The End of a Research Tradition 140 | |
| | References and Notes 142 | |
| 8. | The Search for Artificial Elements and the Discovery of Nuclear Fission 146 | |
| | Ruth Lewin Sime | |
| | References and Notes 158 | |
| 9. | From Geochemistry to Cosmochemistry: | |
| | The Origin of a Scientific Discipline, 1915–1955 160 | |
| | Helge Kragh | |
| 9.1 | Introduction 160 | |
| 9.2 | Nineteenth-Century Backgrounds 161 | |
| 9.3 | Chemists, Element Formation, and Stellar Energy 164 | |
| 9.4 | Victor Moritz Goldschmidt and the Transition from Geo- to Cosmochemistry 169 | |
| 9.5 | Geochemistry and the Shell Model of Nuclear Structure 175 | |
| 9.6 | Chemistry in Space 176 | |
| 9.7 | Chemical Cosmogony and Interstellar Molecules 178 | |
| 9.8 | The Emergence of Cosmochemistry 180 | |
| 9.9 | Conclusion 183 | |
| | References and Notes 183 | |
| | Part III | |
| | Solid State Chemistry and Biotechnology | |
| 10. | Between the Living State and the Solid State: | |
| | Chemistry in a Changing World 193 | |
| | Peter J. T. Morris | |
| 10.1 | Biotechnology and the Myth of a Recent "Biotech Revolution" 194 | |
| 10.2 | Polymer Science 195 | |
| 10.2 | At the Boundaries 196 | |
| 10.3 | A Composite Field of Research 198 | |
| 10.7 | 11 Composite Field of Research 190 | |

| | ΚVI | Table | of Conten | t |
|--|-----|-------|-----------|---|
|--|-----|-------|-----------|---|

| xvı | XVI Table of Contents | |
|-----|-----------------------|--|
| • | 10.5 | Conclusion 200 |
| | | References and Notes 200 |
| | 11. | Biotechnology Before the "Biotech Revolution": Life Scientists, Chemists and Product Development in 1930s—1940s America 201 Nicolas Rasmussen |
| | 11.1 | Hormones: "Master Molecules" of Life Between the Wars 203 |
| | 11.2 | Pharmaceuticals in Peace and War 210 |
| | 11.3 | Conclusion 218 |
| | | References and Notes 224 |
| | 12. | Polymer Science: From Organic Chemistry to an |
| | | Interdisciplinary Science 228 |
| | | Yasu Furukawa |
| | 12.1 | Macromolecular Chemistry as a New Branch of Organic |
| | | Chemistry 229 |
| | 12.2 | From Macromolecular Chemistry to Polymer Science: Staudinger, Mark, |
| | | and the Naming of a Discipline 231 |
| | 12.3 | The Rise of Polymer Physics 233 |
| | 12.4 | The Biological Nexus 237 |
| | 12.5 | The Problem of Interdisciplinary Science 238 |
| | 12.6 | Polymer Science versus Macromolecular Science: Continuing |
| | | Strife 240 |
| | | References and Notes 241 |
| | 13. | At the Boundaries: Michael Polanyi's Work on Surfaces and the Solid State 246 |
| | | Mary Jo Nye |
| | 13.1 | Polanyi on Scientific Ideals and Scientific Practice 246 |
| | 13.2 | The Potential Theory of Adsorption, 1914–1932 248 |
| | 13.3 | Diffraction and the Solid State 250 |
| | 13.4 | Rewards and Recognition in the Scientific Community 252 |
| | | References and Notes 254 |
| | 14. | The New Science of Materials: A Composite Field of Research 258 Bernadette Bensaude-Vincent |
| | 14.1 | From Metallurgy to Solid State Physics 259 |
| | 14.2 | From Reinforced Plastics to Composite Materials 262 |
| | 14.3 | From Composite to Complex Structures Through Biomimetics 266 |
| | 14.4 | A Future for Chemists? 267 |
| | | References and Notes 269 |
| | | |

Index 271