

Table of contents

Preface | 7

1 The lock-and-key analogy and its influence on 20th century biochemistry | 9

- 1.1 State of the literature | 14
- 1.2 Theoretical approach: The philosophical analysis of analogies in science | 21
- 1.3 Methodology | 29
- 1.4 Outline | 33
- 1.5 Sources | 36

2 The lock-and-key analogy in Emil Fischer's program on sugar fermentation, 1890-1907 | 39

- 2.1 Origins of the concept of molecular geometry and Fischer's stereochemical approach | 43
- 2.2 Envisioning new possibilities of chemical synthesis for biology and medicine | 57
- 2.3 Discovering the stereochemical mechanism of fermentation | 62
- 2.4 The heuristic role of the lock-and-key analogy in Fischer's program | 70

3 The making of the lock-and-key model of the antibody-antigen relationship, 1886-1930 | 77

- 3.1 Paul Ehrlich's understanding of immunological specificity and the lock-and-key analogy | 79
- 3.2 Origins of Ehrlich's receptor model | 86
- 3.3 The construction of the receptor model in the realm of immunology | 93
- 3.4 Receptor model reconstruction in terms of the lock-and-key analogy | 109

- 4 Lock-and-key foundations for molecular biology:
Linus Pauling and the Caltech group, 1930-1960 | 133**
 - 4.1 Specificity: Immunochemical trends and traditions | 136
 - 4.2 A new stereochemical view of
antibody-antigen complementarity | 140
 - 4.3 Pauling's universal molecular agenda: The importance of
complementarity for biochemical reactions | 146
 - 4.4 The lock-and-key analogy in science administration and
cross-disciplinary communication at Caltech | 150
 - 4.5 Postponing a paradigm shift at Caltech? | 168
- 5 Lock-and-key-based modeling and its influence on the
development of biochemical research programs | 173**
 - 5.1 Roles of the analogy: From lock-and-key heuristics
to lock-and-key reconstruction | 177
 - 5.2 Analogical model reconstruction | 190
- 6 Concluding remarks on the construction
of analogy-based research programs | 199**

Literature | 205

Archival sources | 205

Primary sources (published) | 210

Secondary sources | 216