Contents

List of Figures *page* viii
List of Tables x
Acknowledgments xi

Introduction 1
0.1 Singular Compositional Abduction 2
0.2 Some Philosophical Context 5
0.3 Roadmap 6

1 The Metatheory of the Project 12
1.1 Invoking Philosophical Concepts 13
1.2 An Exclusively Descriptive Account of Scientific Reasoning 18
1.3 The Recent Primary Scientific Experimental Literature 25
1.4 Explanatory and Abductive Pluralism 33
1.5 The Use of Case Studies 35
1.6 Summary 38

2 Singular Compositional Explanations 39
2.1 A Realist Conception of Explanation 40
2.2 The Ontology of Compositional Explanations 43
2.3 Representation and Compositional Relations 60
2.4 Singular Compositional Explanations as a Genus 61
2.5 Summary 65

3 Singular Compositional Explanations: Special Cases 67
3.1 Explaining Rates 67
3.2 Interpreting Experimental Results 69
3.3 Explaining the Results of Controlled Experiments 75
3.4 A Controlled Experiment with Rates 78
3.5 Summary 80

4 Singular Compositional Abduction 82
4.1 Four Features of Singular Compositional Abduction 85

Published online by Cambridge University Press

4.2 Why Some Scientists Think Singular Compositional Abduction is Truth-Conducive 99
4.3 Abductive Confirmation and HD Confirmation 101
4.4 Singular Compositional Abduction in Cognitive Science 110
4.5 The Singular versus the General 112
4.6 Summary 114

5 The Compositional Basis of Resting and Action Potentials 116
5.1 Bernstein's Membrane Theory and Its Disconfirmation 117
5.2 The Transition to a New Theory: The Examination of Potassium 122
5.3 The New Theory 125
5.4 Hodgkin and Huxley 1952 130
5.5 Summary 151

6 The Hermann Grid Illusion 152
6.1 Ludimar Hermann's Report of the Grid Illusion 153
6.2 Baumgartner's Retinal Ganglion Cell Theory 157
6.3 Development of the Retinal Ganglion Cell Theory 159
6.4 Challenges to the Retinal Ganglion Cell Hypothesis 164
6.5 Confirmation by Singular Interlevel Abduction 168
6.6 Summary 170

7 Peirce and the Neo-Peirceans 171
7.1 Peirce 172
7.2 Neo-Peirceans 180
7.3 Summary 186

8 Harman and Inference to the Best Explanation 187
8.1 IBE as Warranted Abduction 188
8.2 The Ramifications of Warrant 190
8.3 Explanatory Virtues 195
8.4 IBE is Used in Science 196
8.5 Peircean Abduction and Inference to the Best Explanation 199
8.6 Summary 200

9 Lipton and Inference to the Best Explanation 202
9.1 The Scope of Lipton's IBE 203
9.2 Causal Explanation, Contrastive Questions, and Controlled Experiments 205
9.3 Understanding and the Explanatory Virtues 214
9.4 Summary 219

10 Manipulationist New Mechanism 220
10.1 Matched Interlevel Experiments 221
10.2 Alternatives to MIE 224
10.3 Understanding Actual Interlevel Experiments 227

Published online by Cambridge University Press

10.4 The Manipulationist "Picture" of Confirmation 232
10.5 MIE as Something Other than an Account of Scientific Practice 234
10.6 Summary 237

11 Conclusion 239

References 244
Index 258

Published online by Cambridge University Press