

Contents

<i>Preface</i>	<i>page</i> xiii
<i>Acknowledgements</i>	xv
1. Introduction	1
2. Reductionism and the Nature of Explanations	18
2.1 The Mechanism of Action Potentials in Neurotransmission	21
2.2 Explanatory Heteronomy	24
2.3 Laws and Natural Kinds	29
2.4 Functions and Functional Explanation	35
2.5 Multiple Realization and the New Reductionism	41
Summary	49
3. Discovery: Solving Biological Problems	51
3.1 Molecular Genetics: Dduced from Experiments?	55
3.2 Mendelian Genetics: Resolving Anomalies	63
3.3 The Urea Cycle: Intelligible to Reason	73
3.4 Is There a Logic of Generation?	82
Summary	86
4. Scientific Inference: Testing Hypotheses	88
4.1 The Oxidative Phosphorylation Controversy in Biochemistry	91
4.2 Experimental Tests of Mitchell's Theory	96
4.3 Underdetermination and Duhem's Problem	101
4.4 Reconstitution and Closure	106
4.5 Why Biochemists Are Not Bayesians	108
4.6 Arguing from Error	113

Contents

4.7 The Control Experiment	118
Summary	126
5. Experimental Systems: A Life of Their Own?	127
5.1 Experimental Systems as Functional Units of Research	131
5.2 Ox-Phos Revisited	136
5.3 The Role of Epistemic Norms	143
5.4 Local Settings versus Universal Standards	149
Summary	153
6. Model Organisms: Of Flies and Elephants	154
6.1 The Molecularization of <i>Drosophila</i>	157
6.2 Model Organisms as “Systems of Production”	164
6.3 The Shortcomings of Technological and Economic Metaphors	169
6.4 Preparative Experimentation	174
6.5 “Right Choices” or Co-Construction?	176
6.6 What Can be Learned from Studying Model Organisms?	179
Summary	186
7. Reference and Conceptual Change: Out of Mendel’s Garden?	188
7.1 The Gene Concept in Flux	194
7.2 Changing Modes of Reference	203
7.3 Classical and Molecular Genes in <i>Drosophila</i>	215
7.4 Biological Variability, Essentialism, and Floating Reference	223
Summary	227
8. Developmental Biology and the Genetic Program: Explaining Ontogeny	229
8.1 A Critique of Developmental Systems Theory	232
8.2 Pattern Formation in <i>Drosophila</i>	243
8.3 The Concept of Information in Developmental Biology	248
8.4 Is DNA a Master Molecule?	256
Summary	263
9. Scientific Realism: In Search of the Truth	266
9.1 Realism about What?	268
9.2 The “Miracle Argument”	274
9.3 The Experimentalist Argument	278

Cambridge University Press

978-0-521-82945-8 - Philosophy of Experimental Biology

Marcel Weber

Table of Contents

[More information](#)

Contents

9.4 The Argument from Independent Determinations	281
9.5 Experimental Artifacts: Lessons from the Mesosome	287
Summary	294
<i>Notes</i>	297
<i>Bibliography</i>	321
<i>Index</i>	349