## Contents

Preface ix
General Introduction 1
PART I Some Elementary Neuroscience
Chapter 1 The Science of Nervous Systems: A Historical Sketch 13 1.1 Introduction 13 1.2 Historical Sketch 15 Selected Readings 33
Chapter 2 Modern Theory of Neurons 35 2.1 Introduction 35 2.2 The Cellular Components of Nervous Systems 36 2.3 How Do Neurons Work? 48 2.4 Neurotransmitters and Other Neurochemicals 77 Selected Readings 97
Chapter 3 Functional Neuroanatomy 99 3.1 Introduction 99 3.2 Principal Anatomical Divisions 100 3.3 Pathways and Tracts 106 3.4 The Laminar Structure of the Cortex 117 3.5 Topographic Maps in Nervous Systems 119 3.6 Vertical Columns 131 3.7 Neural Development 137 3.8 A Brief Remark Concerning Invertebrates 144 3.9 Conclusions 145 Selected Readings 146

Chapter 4 Higher Functions: Early Work 147 4.1 Introduction 147 4.2 Cerebral Specialization and Naturally Occurring Lesions 154 4.3 Mapping the Brain by Electrical Stimulation 165 Selected Readings 168
Chapter 5 Higher Functions: Neuropsychology and Neurology 171 5.1 Introduction 171 5.2 Hemispheric Lateralization of Functions: Split-Brain Studies 174 5.3 Hemispheric Lateralization: Neuropsychological Techniques 193 5.4 Techniques for Intrahemispheric Localization of Functions 201 5.5 Imaging Techniques 217 5.6 A Sample from Neurological Studies 222 5.7 Conclusions 234 Selected Readings 235
PART II Recent Developments in the Philosophy of Science  Chapter 6 Introduction and Historical Sketch 239 6.1 Introduction 239 6.2 Early Epistemology 242 6.3 Logical Empiricism 252 6.4 What Happened to Logical Empiricism? 259 6.5 Implications for a Theory of the Mind 271 Selected Readings 276
Chapter 7 Reduction and the Mind-Body Problem 277 7.1 Introduction 277 7.2 Intertheoretic Reduction 278 7.3 Mental States and Folk Psychology 295 7.4 Conclusions 310 Selected Readings 312
Chapter 8 Are Mental States Irreducible to Neurobiological States? 315 8.1 Introduction 315 8.2 Substance Dualism 317

<ul> <li>8.3 Property Dualism and Subjective Experience 323</li> <li>8.4 Intentionality and Intertheoretic Reduction 335</li> <li>8.5 Concluding Remarks 346</li></ul>
Chapter 9 Functionalist Psychology 349 9.1 Introduction 349 9.2 Antireductionism in Functionalist Theories of the Mind 351 9.3 In Defense of Reductionism 356 9.4 The Co-evolutionary Research Ideology 362 9.5 Representations and Reduction 376 9.6 Information Processing and the Sentential Paradigm 386 9.7 Conclusions 399 Selected Readings 399
PART III A Neurophilosophical Perspective
Chapter 10 Theories of Brain Function 403 10.1 Introduction 403 10.2 In Search of Theory 407 10.3 Tensor Network Theory 412 10.4 Cartoon Story of What a Tensor Does in Sensorimotor Control 420 10.5 Tensor Network Theory and the Vestibulo-Ocular Reflex 433 10.6 Phase Space Sandwiches 441 10.7 Tensor Network Theory: Further Questions 446 10.8 What Has Motor Control Got to Do with Mental States? 450 10.9 Parallel Models of Neuronal Computation 458 10.10 The Neurobiology of an Attentional Operation 474 10.11 Concluding Remarks 478 Selected Readings 479
Chapter 11 Closing Remarks 481
Notes 483 Bibliography 491 Index 525