

TABLE OF CONTENTS

<i>How to use this book</i>	xv	The bigger picture	73
1 Introduction	1	Recommended reading	74
Introduction	1	Short-answer questions	74
Neuroethology: The synthesis of neurobiology and ethology	2*	Essay questions	74
Choosing the right level of simplicity	2	Advanced topic	75
Quantifying behavior: A prerequisite for neuroethological research	4	4 Orienting movements	76
Finding the right model system	5	Introduction	76
Summary	7	Key concepts	76
The bigger picture	8	Model system: Taxis behavior in <i>Paramecium</i>	77
Recommended reading	8	Model system: Geotaxis in vertebrates	83
Short-answer questions	8	Summary	88
Essay questions	8	The bigger picture	89
Advanced topic	9	Recommended reading	89
2 Fundamentals of neurobiology	10	Short-answer questions	89
Introduction	10	Essay questions	90
Cellular and subcellular composition of nervous systems	10	Advanced topic	90
Physiology and ionic basis of the electrical properties of neurons	15	5 Active orientation and localization	91
Synapses	25	Introduction	91
Sensory systems	34	Key concepts	91
Neurobiological approaches in neuroethology	35	Model system: Echolocation in bats	93
Summary	44	Summary	110
The bigger picture	46	The bigger picture	111
Recommended reading	46	Recommended reading	111
Short-answer questions	46	Short-answer questions	111
Essay questions	48	Essay questions	112
Advanced topic	48	Advanced topic	112
3 The study of animal behavior and its neural basis: A brief history	49	6 Neuronal control of motor output	114
Introduction	49	Introduction	114
The roots of the study of animal behavior	49	Key concepts	114
The new era in the study of animal behavior	51	Model system: Escape swimming in toad tadpoles	119
Relating neuronal activity to behavior:		Summary	129
The establishment of neuroethology	66	The bigger picture	130
Summary	72	Recommended reading	130
		Short-answer questions	131
		Essay questions	131
		Advanced topic	132

7 Neuronal processing of sensory information	133	Anatomical localization of biological clocks	219
Introduction	133	Summary	222
Key concepts	133	The bigger picture	222
Model system: Recognition of prey and predators in the toad	140	Recommended reading	223
Model system: Directional localization of sound in the barn owl	149	Short-answer questions	223
Summary	164	Essay questions	224
The bigger picture	166	Advanced topic	224
Recommended reading	166		
Short-answer questions	167		
Essay questions	167		
Advanced topic	168		
8 Sensorimotor integration	169	11 Large-scale navigation: Migration and homing	225
Introduction	169	Introduction	225
Key concepts	170	Key concepts	225
Model system: The jamming avoidance response of the weakly electric fish <i>Eigenmannia</i>	171	Genetic control of migratory behavior	227
Reflections on the evolution of the jamming avoidance response	187	Homing	229
Summary	187	Approaches to study animal migration and homing	231
The bigger picture	188	Mechanisms of long-distance orientation in birds	232
Recommended reading	189	Homing in salmon	245
Short-answer questions	189	Summary	254
Essay questions	190	The bigger picture	256
Advanced topic	190	Recommended reading	256
		Short-answer questions	256
		Essay questions	257
		Advanced topic	258
9 Neuromodulation: The accommodation of motivational changes in behavior	192	12 Communication	259
Introduction	192	Introduction	259
Key concepts	193	Key concepts	259
Structural reorganization	193	Model system: The neuroethology of cricket song	263
Biochemical switching	200	Model system: The development of bird song	281
Summary	205	Summary	292
The bigger picture	206	The bigger picture	294
Recommended reading	206	Recommended reading	295
Short-answer questions	207	Short-answer questions	295
Essay questions	207	Essay questions	296
Advanced topic	207	Advanced topic	296
10 Circadian rhythms and biological clocks	209	13 Cellular mechanisms of learning and memory	298
Introduction	209	Introduction	298
Key concepts	209	Key concepts	298
Temperature compensation of free-running periods	211	Model system: The cell biology of an implicit memory system—sensitization in <i>Aplysia</i>	301
Entrainment of biological clocks by environmental cues	212	Model system: The cell biology of an explicit memory system—the hippocampus of mammals and birds	308
Molecular nature of the clock	215	New neurons for new memories	315

Summary	322
The bigger picture	323
Recommended reading	323
Short-answer questions	324
Essay questions	325

Advanced topic	325
Glossary	327
Bibliography	332
Index	345