

Contents

A	The General Biology of <i>Cupiennius</i>	1
I	How it All Began	3
II	The Relatives – Who Is Who?	5
	1 The Genus	6
	2 The Species	8
	3 The Family	11
III	The Habitat	13
	1 Geographic Distribution	13
	2 Plants and Retreats	15
	3 Choice Behavior	18
	4 The Climate in the Habitat	19
IV	Daily Activity Rhythm	23
V	No Spider Without Poison	29
B	Sensory Systems	35
VI	The Special Significance of Mechanical Senses	37
VII	The Measurement of Strain in the Exoskeleton	39
	1 Occurrence and Topography of Slit Sensilla	39
	2 Terminology of Mechanics	41
	3 Functional Morphology	44
	4 Receptor Mechanisms	52
	5 Groups of Slits and Lyriform Organs	54
	6 The Position of Slit Sensilla on the Body and the Natural Stimuli	63
	7 Toward a Definition of the Adequate Stimulus	72
VIII	The Vibration Sense	73
	1 The Metatarsal Vibration Sense Organ	73
	2 Other Vibration Receptors	80
	3 A Comparison of Champions	83

IX	Trichobothria – The Measurement of Air Movement	85
	1 Topography and Structure of the Sensilla	85
	2 Stimulation by Air Movement – the Interaction Between Air and Hair	95
	3 The Physiology of the Sensory Cells	106
	4 Another Medium: Hairs in Water	109
X	Proprioception	113
	1 Slit Sense Organs	113
	2 Hair Sensilla	118
	3 Internal Joint Receptors	124
	4 Muscle Receptor Organs	127
XI	The Eyes	129
	1 Position and Structure	130
	2 Visual Optics	133
	3 “Morphological” Sensitivity	138
	4 Absolute and Spectral Sensitivity	140
XII	Chemoreception	145
XIII	Hygro- and Thermoreception: Blumenthal’s Tarsal Organ	151
	1 Hygroreception	154
	2 Thermoreception	156
C	The Central Nervous System and Its Peripheral Nerves	163
XIV	The Central Nervous System	165
	1 The General Structure of the CNS	165
	2 Neuropil Regions, Tracts, and Commissures	167
XV	The Route for Afferent Inputs to the CNS	175
	1 The Peripheral Nerves	175
	2 Projections of the Various Types of Sensilla	178
XVI	Two Visual Systems in One Brain	187
	1 The Secondary Eyes	187
	2 The Principal Eyes	197
XVII	Neurotransmitters and Neuromodulators	205
	1 Serotonin	205
	2 Octopamine	206
	3 γ -Aminobutyric Acid (GABA)	212
	4 Histamine	213
	5 Polyamine Neuropeptides	217

D	Senses and Behavior	221
XVIII	Signposts to the Prey: Substrate Vibrations	223
	1 Vibratory Signals and Their Propagation	225
	2 Discrimination Among Signals	234
	3 Orientation to a Stimulus Source	237
	4 Stimulation from Below and from Above	242
XIX	Signposts to the Prey: Airflow Stimuli	247
	1 Natural Signals	247
	2 The Response of Individual Trichobothria	252
	3 The Behavioral Response	256
	4 Details of the Turning Movement	260
	5 The Interplay of the Trichobothria: First Glimpses	262
	6 Airflow-Sensitive Interneurons	266
XX	Courtship and Vibratory Communication	269
	1 Survey	270
	2 The Vibration Receptors	271
	3 Vibratory Courtship Signals on the Plant	272
	4 How is the Courtship Signal Produced?	277
	5 Responses in the Peripheral and the Central Nervous System	283
	6 Species Identification and Reproductive Isolation	290
	7 Parental Investment	299
	8 The Releasing Mechanisms of Males and Females	300
XXI	Kinesthetic Orientation	303
	1 An Experiment	303
	2 The Involvement of Lyriform Organs	304
	3 More about Distance Orientation	307
	4 Compensation for Detours and the Question of the Precise Role of Lyriform Organs	308
XXII	Visual Targets	311
	1 The Discrimination of Visual Stimuli: AM Eyes or PM Eyes?	311
	2 Change of Gait	313
	3 The Movement of the Retina	313
XXIII	Raising the Body When Walking over an Obstacle	323
	1 The Behavior	323
	2 Joints and Muscles	325
	3 The Hairs as Triggers	325
	4 The Way into the Brain	328
	5 Motor Neurons and Interneurons	328
	6 Internal Joint Receptors as Triggers of the Plurisegmental Response	329

XXIV	Locomotion and Leg Reflexes	333
1	Locomotion	333
2	Leg Reflexes	334
3	Mechanical Stresses in the Skeleton	337
4	Energetics of Walking	345
5	<i>Cupiennius</i> on the Water	347
XXV	Swinging to a New Plant: the Dispersal of the Spiderlings	351
1	Drop and Swing	351
2	What Kind of Wind Induces the Behavior?	352
3	When Does the Dragline Break?	354
4	The Physical Model	355
5	Ecological Consequences	357
	Epilogue	359
	References	361
	Appendix (Identification Key)	381
	Subject Index	387

<http://www.springer.com/978-3-540-42046-0>

A Spider's World

Senses and Behavior

Barth, F.G.

2002, XIV, 394 p. 1043 illus., 42 illus. in color.,

Hardcover

ISBN: 978-3-540-42046-0