

TEXTBOOK REVIEW

Behavioral Neurobiology. An integrative approach.

by Günther K. H. Zupanc

2004 Oxford University Press, 342 pages

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Günther Zupanc's *Behavioral Neurobiology* is primarily a neuroethological textbook that is based on his experiences teaching both beginners and advanced level students in neurobiology. He has produced a book that students find fascinating and clearly written.

This book is not intended as a comprehensive survey of behavioral neurobiology, but it does stimulate student interest and understanding. Behaviors are clearly explained which motivates students to explore the mechanisms that underlie the behavior. Zupanc has made an effort to use animal specialists to demonstrate important principles and to call attention to some unusual examples of behavior. For example, he uses phototoxic and galvanotoxic orientation of *Paramecium* (a single-celled organism) to introduce orienting behaviors. In our class, this led to a discussion of the importance of membrane potentials and quite naturally to the evolution of nerve cells.

This approach reminds us of the curiosities of nature and is a welcome change from the often human-centered medical approach to neurobiology. Zupanc has deliberately chosen to introduce basic concepts in an integrated fashion using wonderful natural systems from neuroethology, spanning a large range of taxa. For example, examination of the jamming avoidance of weakly electric fish provides information about behavior, tuning of receptors, neural circuitry, processing of phase and amplitude, motor control, and seasonal modulation all in one compelling story. In another chapter, he uses owl sound localization to describe anatomical pathways, coincidence detection, neural processing and coding of information. Zupanc first describes the behavioral studies and then leads students through the detailed steps involved in computing sound location.

Thomas Carew's similarly named textbook *Behavioral Neurobiology* (Sinauer, 2000) has been the gold standard in neuroethology for a few years and remains a favorite of mine (particularly for upper level seminar courses). Zupanc's book has significant overlap with Carew's text, but it is easier to read for students with very little neurobiology background. Zupanc provides more information on history and has included topics such as large-scale behaviors using the examples of migration and homing to give his book a slightly different focus. I have used both books (in different years) and certainly for my introductory class, composed mainly of first-year and sophomore students, Zupanc's book was more accessible. When students were asked at the end of the semester to comment on the book, I received opinions such as, "I liked it! Easy to read, diagrams were great tools"; "Complex

material but well structured" and "I appreciated the low price."

Zupanc's book is comprised of eleven chapters and each chapter includes summaries, recommended readings, questions, and text boxes that highlight the careers of pioneers in the field or provide additional details for key concepts. Zupanc pays homage to many of the great figures in neuroethology and shows how their contributions are important. The students appreciated the ingenuity of these famous experiments and the equipment invented, such as the Kramer locomotion compensator, a directional treadmill for crickets.

The first three chapters are introductory, giving information on neuroethology, history of the study of animal behavior, and basic concepts in neurobiology and in ethology. Each of the remaining chapters reads like a slightly simplified review paper with an emphasis on describing and correctly citing the original research. Topics include orientation (*Paramecium*, vertebrates), sensory guidance (echolocating bats), motor control (tadpole swimming), neuronal processing (toad vision, owl sound localization), sensorimotor integration (weakly electric fish), neuromodulation (fish, mice, lobsters), migration and homing (birds, salmon, turtles), communication (crickets) and learning and memory (*Aplysia*, mice).

Most of the chapters are self-contained and could be taught out of order, allowing instructors greater flexibility. I found that the portion of Chapter 3 that describes the basics of action potentials and neural signals was a little skimpy on detail and I needed to supplement the material. However, neurophysiology is clearly not intended as the main focus of the book and many resources on this topic are readily available. Neuromodulation (Chapter 8) is a topic that is often overlooked in textbooks and I believe this is a worthwhile addition. Many introductory books briefly mention neuromodulation in a section on hormones or peptide action; most advanced books on behavioral endocrinology provide enormous detail. Zupanc captures the middle ground with examples of dendritic plasticity in the electric fish and biochemical switching in the lobster stomatogastric ganglion. My students found this to be such an interesting topic that I wished the chapter was a little longer.

The figures are black and white and most are taken from original articles. While some may bemoan the lack of glitz in the illustrations, I rather liked the simplicity. The figures are clear and seem closer and true to the research with an added bonus of helping to keep the price of the

book low (about \$43). The companion website (<http://www.oup.com/uk/booksites/content/0198700563/>) provides instructors with all the figures, as well as exam questions and answers. The resources for students at this website include links to other neuroscience sites and information on historical figures.

If you are looking for a different way to introduce neuroscience, this book about the mechanisms of animal behavior across many taxa will be a useful addition to your bookshelf. Zupanc's book can be used alone or as a supplement just to provide the fun examples of how the nervous system regulates behavior.