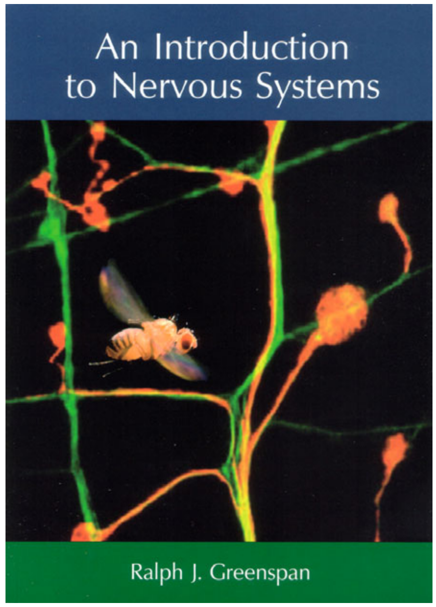
'WHY DO FLIES BUZZ?'



An Introduction to Nervous Systems

Ralph J. Greenspan

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Next time you see flies buzzing around a piece of fruit, bear in mind you are looking at a singles bar. As adults, flies have already fulfilled the 'eating' section of their life story, and the smell of fruit attracts both males and females so they can satisfy the adult urge to mate. This is how Ralph Greenspan introduces the eighth chapter of his book and is typical of the way he engages the reader into different facets of the study of invertebrate neurobiology. *An Introduction to Nervous Systems* is a personal and persuasive account of a number of stories that illustrate the ways in which studying invertebrates has yielded significant clues about how the nervous systems of all animals deal with the challenges of being an animal.

I hope that University and College libraries will buy this book and that mentors will point their undergraduate and postgraduate students towards it. On the back cover, the publisher describes it as a 'supplemental' textbook. It fills the same kind of role as short books such as Schmidt-Nielsen's *How Animals Work*, and it is a pity that more examples of this kind of short book are not available. They provide much more coherent, persuasive stories than students can gain by web-browsing. Part of the book's appeal is that it is highly selective in the topics it includes. I found it surprising how much interesting material about how brains work can be presented without getting to grips with coding and electrical signal processing. Being selective enables the author to tell a series of good tales, but does mean the book does not provide coverage of all the topics that would normally be covered in an undergraduate neuroscience course. For example, from the book I do not think you can learn much about action potential propagation or the integration of postsynaptic potentials. Indeed, one of my few complaints about the book is that dendrites receive a rather poor billing. Although 'dendrite' is adequately defined in the glossary, the word is not in the index, and dendrites are introduced by passing reference during the chapter on circadian rhythms.

There is a strong story line to the book. It deals with basic functional properties of nervous systems from an evolutionary perspective in two different ways. First, the question of how neuronal characters, including ion channels, have arisen during evolution is a recurring theme. Second, rather cleverly, Ralph Greenspan introduces a number of topics sequentially by selecting topics from organisms of increasing complexity. For example, early on, the function of voltage-gated channels is introduced through *Paramecium* behaviour. Subsequently, synaptic transmission is introduced by the shadow response of barnacles, followed by rhythmical movements through jellyfish and leeches and then by modulation and plasticity in *Aplysia* and some of its cousins. Chapters 5–7 are on Greenspan's own research animal, the fly, and deal with daily activity patterns, flying around and then courtship and mating. The book concludes with cognitive processes in bees and cockroaches. Throughout, the book makes strong points about the advantages of studying invertebrates in order to understand how brains work. The final chapter is called 'Are all brain alike? Are all brains different?' and starts with the point that all brains enable animals to deal with a 'kaleidoscope of changing conditions'. The need for changeability in brains and their components is made convincingly throughout the book. But I did find the final chapter the most disappointing. It does not get to grips with the question of why brains are the way they are – that, despite fundamental differences between different types of animals, the design problems in making a workable brain are similar, so nature has converged a number of times in using the best and most efficient strategies.

I have a few additional quibbles. Some of the illustrations are difficult to follow. For example, in figure 2.14, I found it hard to follow exactly what each molecular constituent is doing during synaptic vesicle discharge, and in figure 6.8 I could not distinguish haltere from muscles and proposed neuronal circuits. The book is essentially descriptive, so lacks much by way of explanation about experimental evidence for the mechanisms it presents. Occasionally there is a little quirkiness – I doubt if mackerel snap at jellyfish, as described in Chapter 3, or that lobsters are the major predator of *Aplysia*, as hinted in Chapter 4. But then, as often in the book, that also causes me to wonder – in this case, what the main predators are for *Aglantha* and for *Aplysia*.

I learned a lot from the book. Often, I wanted to discover more. Although references do not accompany the text, the further reading and bibliography will satisfy the requirements of the curious reader. The book would bolster study guided by one of a number of standard textbooks, as well as more detailed accounts in review articles, such as those currently heading for library shelves in *Invertebrate Neurobiology*, edited by Ralph Greenspan with Geoffrey North.

Although the border between invertebrates and vertebrates is artificial, it is justified here. A natural successor would be a second book giving the vertebrate nervous system the same inspirational treatment that *An Introduction to Nervous Systems* gives to invertebrates.

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