

## BOOK REVIEWS

### What Have i-pods Gotta Do With It?

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*Neuroscience* (Fourth Edition). Dale Purves, George J. Augustine, David Fitzpatrick, William C. Hall, Anthony-Samuel LaMantia, James O. McNamara, and Leonard E. White (Eds.). 2007. Sunderland, MA: Sinauer Associates, 810 pp., \$102.00 (HB).

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From time to time, most of us realize that one form of technology or another has passed us by. When this happens, we must sooner or later bite the bullet and choose whether to be left in the dust, or whether to get with the program, be it text messaging, or surfing the web on the cell, or replacing the old CD player with an i-pod. Similarly, five, ten, twenty years after graduate school, most of us occasionally catch ourselves using terms or concepts that we no longer truly fully understand. For those of us in the field of clinical neuropsychology, this is most likely to occur when we interface with the fast-paced world of neuroscience research.

If you struggle with this problem, you may consider picking up the fourth edition of *Neuroscience*. Although this book was originally intended as a text for medical, biomedical, and undergraduate neuroscience courses, it can also serve as a wonderful refresher for (and, in the case of some topics, an introduction to) a variety of neuroscience concepts that are of considerable interest to clinical neuropsychologists.

#### General overview

*Neuroscience* is a remarkably well-organized and well-written text. It is highly accessible and easy to follow, which is impressive given the amount of detail and depth it provides. Each step of the way, explanations of complex concepts are accompanied by easy-to-follow graphics that on the one hand enhance deep understanding, and, on the other, make it easy to even just browse or skim. The book does an excellent job of bridging between molecular and molar levels of analysis, between basic and clinical science, and between the big picture and discrete detail. In other words, it keeps you grounded and allows you to understand how basic processes relate to cognition, emotion, and behavior, as well as to various forms of dysfunction.

The text consists of 31 chapters, the first of which is a brief overview of methods used for the study of the nervous

system. The remaining 30 chapters are divided into five units: (1) Neural Signaling, (2) Sensation and Sensory Processing, (3) Movement and its Central Control, (4) The Changing Brain, and (5) The Complex Brain Functions. In addition, the book includes an Appendix that contains a *Survey of Human Neuroanatomy*, as well as an *Atlas of the Human Nervous System*. And last but not least, there are two electronic resources. In particular, there is an open-access *Companion Website*, as well as a *free* download of *Sylvius 4*, an interactive atlas and visual glossary of human neuroanatomy by Mark Williams, Leonard E. White, and Andrew C. Mace. A more detailed review of individual sections follows.

*The first chapter* introduces the reader to the various techniques used in neuroscience. This chapter truly is just an introduction to these techniques, but provides a nice overview of the variety of areas that come together in neuroscience research, including genetics, molecular biology, brain imaging, and structural and functional analysis of the brain.

The first larger unit, *Neural Signaling*, contains seven chapters in which every aspect of communication on cellular and sub-cellular levels is addressed. Additionally, this unit also has a chapter on synaptic plasticity, which represents a new feature of the fourth edition of this text. However, the thoroughness with which the topic of neural signaling is treated does not imply a level of complexity that would be beyond the grasp of most ordinary mortals. Instead, it reflects the careful, in-depth treatment that *facilitates* comprehension of these concepts. Complex processes, such as voltage-dependent membrane permeability, the differences between ligand- and voltage-gated channels, molecular signaling *within* neurons, or long-term *versus* short-term synaptic plasticity are transformed into easy-to-follow explanations, enhanced by superb graphics and helpful analogies to common, every-day situations. And in case you are concerned about becoming lost in the labyrinth of the microscopic level of analysis, no worries: Molec-

ular meets molar in every chapter, as the relevance of various molecular processes to daily functioning, psychopathology, or CNS disorders is made clear.

The second unit, *Sensation and Sensory Processing*, contains seven chapters that cover the obvious: Somatosensory processing and proprioception, pain, vision, hearing, the vestibular system, and the chemical senses. However, owners of prior editions should be aware that most of these chapters have been considerably revised and updated. Additionally, several interesting topics are included, such as how stereograms work, the possibility of pheromone communication among humans, and a review of research on the ability of dogs to smell cancer. This unit again treats all topics thoroughly, offering excellent explanations of the inner workings of individual sensory systems, enhanced by a multitude of helpful graphics. While this unit does a very nice job of connecting basic science with clinical disorders caused by peripheral sensory damage, one slight disappointment of this unit is its somewhat cursory review of CNS disorders of sensory processing, such as cortical blindness or deafness, and loss of smell due to brain injury or degenerative disorders.

The third unit, *Movement and Its Central Control*, consists of six chapters that together represent one of the more comprehensive treatments of this topic offered by textbooks of this kind. This unit includes not only chapters on skeletal motor control, but also chapters on eye movements and sensory motor integration, as well a visceral motor control. Comprehensive discussions of fast growing areas of research, such as the mapping of the basal ganglia circuitry and the functions of the cerebellum, are also included, with an entire chapter devoted to each. You will also find some unexpected topics, such as the role of the reticular formation in movement. As was the case in prior units, the text seamlessly navigates the interface between basic and clinical sciences, and between simple and complex “preparations.” Thus, on the one hand, you will read about the motor systems of a leech, a lobster, and a lamprey, and, on the other, about all the usual suspects of movement disorders, such as Parkinson’s disease, Huntington’s disease, amyotrophic lateral sclerosis, prion diseases, and congenital cerebellar dysfunction.

The fourth unit, *The Changing Brain*, consists of four chapters, one of which (“Repair and regeneration in the nervous system”) represents a new feature of this edition. This unit covers all forms of brain change, including prenatal brain development, brain changes in response to experience, and brain changes in response to damage. The range, as well as depth, of coverage is again phenomenal. If you specialize in developmental disorders, you will find both the classics and the cutting-edge research on genetic and teratogenic mechanisms of abnormal development. If you specialize in acquired brain dysfunction, you will be able to read about the ins and outs of what determines whether a neuron will live or die, and how or why it repairs itself. And if you are simply interested in understanding more about how the trillions upon trillions of synapses can possibly organize themselves in a meaningful, adaptive fashion, you will find up-to-date research about growth cones, chemo-

affinity, neurotrophins, and other neurobiologic factors, as well as how these interact with genes and the environment.

The fifth and final unit, *Complex Brain Functions*, may at first blush appear to be a sadly inadequate review of higher cortical functions, the bread and butter of clinical neuropsychology. However, upon a closer inspection, this unit does not pretend to be a primer for neuropsychologists. Instead, it examines complex brain functions through a lens that is sufficiently different from that of neuropsychology, promising to be an eye-opening read for most. By the same token, it deals with processes that dove-tail with neurocognitive assessment, such as the sleep cycle, emotional processing, and human sexuality.

*The Companion Website.* The review of this text would not be complete if it did not address the Companion Website. This Website includes a number of helpful resources for readers, including summaries, key terms, animations, and flashcards for each chapter. These are available free of charge and without a password, making them accessible and user-friendly. This website is available to anyone, regardless of whether or not they purchased the book, so if you are interested, visit the following: <http://www.sinauer.com/neuroscience4e/>.

### **Neuroscience as a textbook for graduate and undergraduate teaching.**

This book is pitched by the publishers primarily for undergraduate courses, which is probably an appropriate level if offered by biology or neuroscience departments and/or used as part of pre-med course work. However, for psychology students, this text is probably better suited for graduate instruction, or for upper level undergraduate courses taken by students who have already taken other course work in this general area, such as Brain and Behavior, Physiological Psychology, or Cognitive Neuropsychology. In particular, in a typical 15-week semester, students would need to cover two chapters a week, which, without any prior background in biological psychology, may be a stretch.

Regardless, students are bound to find this text very user-friendly and easy to follow, especially given the very useful on-line resources. In addition to summaries, animations, and flash-card to facilitate learning, on-line quizzes are available that can be used by students to check their own knowledge and to prepare for exams, or by instructors as a supplement to exams. In all, this is an excellent text, especially when used at the appropriate undergraduate or graduate level.

### **Neuroscience as a handbook for clinical neuropsychologists**

So what have i-pods gotta do with it? Not much, except that listening to mine enhanced my reading pleasure. And while I have yet to pick up text-messaging or surfing the web on my cell, I am definitely keeping a copy of *Neuroscience* on my desk, along with Lezak et al., Strauss et al., and all the other classics.