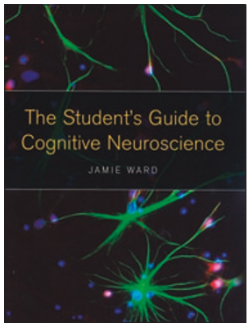
Cognitive neuroscience for beginners



The Student's Guide to Cognitive Neuroscience

By Jamie Ward

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Reviewed by Charvy Narain

The last couple of decades have seen an explosion of papers on cognitive neuroscience, but basic textbooks have been scarce. Although many books are aimed at readers who understand the basics of neuroscience, anyone who has taught a cognitive neuroscience course will have struggled to find a single textbook that covers the breadth of the topic at the right level. *The Student's Guide to Cognitive Neuroscience* lives up to its title and, despite occasional omissions and biases, does an excellent job of filling this gap.

Unusually for a textbook, this volume is small and light enough to be easily carried around, and the format encourages dipping into different chapters. Read from beginning to end, the book would form an excellent basis for a cognitive neuroscience course. A selection of chapters would work equally well as part of a larger neuroscience or psychology course.

The book begins with a brief introduction to cognitive neuroscience, which the author wisely grounds in a historical perspective. This description of the emergence of cognitive neuroscience as it is currently understood is illuminating even for those of us who have been in the field for years but who may not be familiar with the philosophical arguments that have shaped current thinking in the field.

Throughout the book, key terms are succinctly defined in boxes at the bottom of each page. However, these definitions seem somewhat idiosyncratic on occasion. For example, 'reductionism' is defined as "The belief that mind-based concepts will eventually be replaced by neuroscientific concepts." I'm not sure if most neuroscientists would subscribe to such a strong view of reductionism. Some may feel that although neural underpinnings (such as patterns of neural firing while seeing color) are essential to understanding mental events, they do not necessarily make the experience (seeing the color red) irrelevant.

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In general, the book is written from a psychologist's perspective. The first chapter, for example, concludes by asking if cognitive psychology needs the brain and if neuroscience needs cognitive psychology. Readers will be relieved to know that the answer to both questions is yes, but, for most neuroscientists, that seems likely to be a foregone conclusion. This perspective perhaps reflects the book's intended audience: cognitive neuroscience courses are more often taught in an experimental psychology curriculum rather than in medical or neuroscience programs. This is also reflected in the key terms chosen for definition: 'temporal resolution' is clearly defined, but 'psychophysics' is not.

After a basic primer on the anatomy of the brain, the book really comes into its own in the three chapters on the methods of cognitive neuroscience (EEG, MEG, brain imaging and patient studies). The author's expertise in these methods is clear. The chapter on functional imaging, for example, is excellent, explaining the technique, analysis methods and—perhaps most importantly—experimental design very well. The application of these techniques is demonstrated with case studies from the literature, showing how an experiment could be designed to answer a research question and how the results could be interpreted. Any student going on to do a functional imaging study would have a clear understanding of the issues that need to be thought through beforehand.

This section also includes a spirited defense of single-patient case studies as well as a primer on transcranial magnetic stimulation. The latter is again excellent, but there is little discussion of the problems with generalizing from case studies, and the importance of animal models in neuropsychology is given very short shrift indeed. The section on animal models is less than one page and does not reflect the immense contribution that such studies have made to our understanding of how the brain works, even though some of this research is discussed in later chapters.

The rest of the book covers specific topics, such as facial recognition, memory, and speech and language. The author manages to walk a fine line between providing a good overview and exploring substantive issues in depth. These chapters are written in an engaging style, with boxes that explore 'newsy' applications of the findings being discussed. However, existing controversies within the scientific community, which make equally interesting reading, are often ignored. For example, the discussion on facial recognition makes little mention of the debate about whether the fusiform face area is specialized for face perception or for expert visual recognition. Such controversies might serve to pique students' interest as much as discussions about fMRI studies showing activation related to romantic love. Many of these discussions may be more clearly understandable to a British audience: for example, holistic face recognition is nicely explained by the Margaret Thatcher illusion, and the importance of the hippocampus in spatial navigation is illustrated by the greater hippocampal volume of London taxi drivers.

The Student's Guide to Cognitive Neuroscience is unique in that there are no comparable textbooks aimed at this level, and it does an excellent job of providing a solid grounding in this broad field. With luck, some of the students introduced to the field by this textbook will go on to make their own contribution to cognitive neuroscience. ■