

Principles of Cognitive Neuroscience

Edited by Dale Purves, Elizabeth M. Brannon, and Roberto Cabeza, et al 757 pp, \$104.95 Sunderland, MA, Sinauer Associates, 2008
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The study of cognition, or brain functions that include reasoning, language, emotions, and other complex phenomena, has long been the domain of psychology. Cognitive psychology uncovers high-level neuronal processing mechanisms through a study of mental function and behavioral responses at the level of the intact organism. However, cognitive abilities ultimately rely on the function of the molecules, cells, and neuronal networks that comprise the central nervous system. Because of the complexity of the molecular and cellular networks required for such higher-order functions, the field of neuroscience has largely focused on more elemental molecular, cellular, and network functions. Recent advances such as functional magnetic resonance imaging and transcranial magnetic stimulation have now provided an opportunity to study the molecular and cellular underpinnings of cognitive function and represent a significant opportunity to combine the fields of neuroscience and psychology.

/Principles of Cognitive Neuroscience/ provides the first substantive attempt to combine and fully document research in psychology and neuroscience on various cognitive processes. As with the current fourth edition of the */Neuroscience/* textbook edited by Purves and others, this book is suitable for a variety of expertise, from advanced undergraduates studying psychology or neurobiology to clinicians and researchers with extensive experience in cognitive psychology or the neurosciences. However, the focus of this book is pedagogical, with a target audience of students in advanced undergraduate or introductory graduate courses.

The book has 28 chapters organized into 9 sections. The first section serves as a general introduction to the organization of the nervous system, basic principles of cognitive psychology, and experimental tools used in the study of cognitive neuroscience. The remaining 8 sections each present a specific aspect of cognition and cognitive processing: sensory processing and perception, motor processing and behavior, attention, memory, emotion and social cognition, symbolic representation, executive processing, and consciousness. In addition, a fairly comprehensive summary of electrophysiology and neuronal signaling adapted from the */Neuroscience/* series is provided in the appendix.

/Principles of Cognitive Neuroscience/ is best used as a teaching tool and can be used to create lecture materials on a wide range of topics. Each chapter provides a somewhat self-contained treatment of the subject that can be combined with other chapters to provide integrated coverage within individual sections. All chapters follow a similar format, starting with a brief overview to introduce the rationale for each topic followed by individual subsections organized for the presentation of sequential topics during a lecture. The end of each chapter contains a summary of the chapter contents, followed by a bibliography that lists other textbooks, review articles, and important original research papers in the field. In addition to an organization amenable to lecture presentation, the book contains numerous well-designed and informative figures. Although many figures are complex diagrams, the labeling and layout conveys the essence of the important details without requiring readers to consult figure legends. Other features common to modern pedagogical texts are likewise provided, including a glossary of terms highlighted in boldface type; sidebars that provide information about a related topic, disease, or experimental techniques; and Web-based companion resources that include animations, online quizzes, and an interactive atlas of human neuroanatomy.

One weakness is the inability to truly integrate topics from neuroscience and psychology to address some cognitive processes. In these areas, some chapters read as completely based on findings from cognitive psychology. However, this does not reflect a lack of diligence or effort by the authors but rather the relatively recent push to incorporate neuroscience research into areas of study long dominated by psychology. For example, the chapters on emotions and emotional influence on other cognitive functions can provide

little more than the anatomical localization, determined from deficit or functional imaging studies, of various brain regions involved in these processes. Similarly, the chapter on the internal representation of time and number provides a well-integrated discussion of circadian rhythms and other neural circuits as they apply to the perception of time and timing intervals but provides little basis from the neurosciences about the internal representation of numbers and mathematics. In contrast, neuroscientists have long studied the physiological basis of visual and auditory processing within humans, primates, and other animals. Thus the chapters on visual and auditory perception provide an exceptionally balanced and integrated view of the current state of neuroscience and psychological research in these fields. In addition, the discovery of long-term changes in synaptic efficacy some 35 years ago has led to a substantial body of neuroscience research into the molecular and cellular mechanisms that underlie learning and memory. The 4-chapter section covering memory spends the entire first chapter reviewing these molecular and cellular principles; the remaining 3 chapters cover psychological findings about declarative, nondeclarative, and working memory, with well-integrated descriptions about the state of current neuroscience research in these areas.

Ultimately, */Principles of Cognitive Neuroscience/* succeeds by introducing cognitive psychologists and neuroscientists to principles from the other discipline. For example, a cognitive psychologist may have little familiarity with relevant principles from cellular and molecular neuroscience that provide a neurophysiological substrate for experimental results, and a neuroscientist may have little familiarity with findings from cognitive psychology that can provide a functional framework to develop hypotheses and interpret results from the molecular and cellular levels. Furthermore, this textbook can serve newcomers to the neurosciences or to cognitive psychology by underscoring the need to integrate rationale and methodology from both disciplines to provide a more complete understanding of cognitive processes. Therefore, I would recommend this book for any researcher in neuroscience or psychology, and I would strongly recommend it for newcomers to the study of cognitive neuroscience and for classroom instruction within this discipline.

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