Journal of the International Neuropsychological Society (1997), **3**, 299–301.

BOOK REVIEWS

Cognitive Science: Theory and Practice

What is Cognitive Science? Barbara Von Eckardt. 1993, Cambridge, MA: The MIT Press. 466 pp., $22.50.

Cognitive Science: An Introduction (2nd ed.), Neil A. Stillings, Steven E. Weisler, Christopher H. Chase, Mark H. Feinstein, Jay L. Garfield, and Edwina L. Rissland. 1995. Cambridge, MA: The MIT Press. 530 pp., $45.00.

Reviewed by Jennifer A. Mangels, PhD, *Rotman Research Institute, Baycrest Centre for Geriatric Care, University of Toronto, Toronto, Ontario M6A 2E1, Canada.*

In reflecting upon the relatively new field of cognitive science, a fellow researcher once said to me, "If they have to put the word science in the name, that's because it's not already obvious that it is one." Although it is generally agreed that cognitive science is an interdisciplinary venture uniting the five broad subdisciplines of cognitive psychology, linguistics, computer science, philosophy, and neuroscience, what is less clear is how research programs that typically address questions at different levels of analysis, using different research methods, might possibly achieve a unification strong enough to justify the emergence of a new science—a science that is not simply a patchwork of its subdisciplines, but perhaps a new gestalt.

In *What is Cognitive Science?*, Barbara Von Eckardt attempts to demonstrate from a philosophical standpoint that those who call themselves cognitive scientists possess a framework of shared commitments (FSC) that serves to unify researchers in the "immature" field of cognitive science and guide their work toward the common goal of understanding ANTCOG, or "adult, normal typical cognition." She evaluates this FSC along four elements common to all research frameworks: (1) a set of assumptions identifying the domain of study, (2) the basic and guiding empirical questions, (3) substantive assumptions that describe how these questions will be answered, and (4) methodological assumptions or constraints.

Some of these assumptions are relatively uncontroversial, such as the computational assumption that "the mind/brain is a computational device." This key assumption, which serves simultaneously to hold the subdisciplines of cognitive science together and set them apart from their parent disciplines, is evaluated in relation to both conventional computers and connectionist machines. Unfortunately, Von Eckardt fails to address some of the issues in cognitive science that are the source of many skeptics' complaints. For example, she ignores questions regarding the study of cognition in artificial intelligence or nonhuman animals because of their controversial nature.

To her credit, however, Von Eckardt devotes a large portion of the book to one of the most difficult issues facing cognitive science—the nature and content of mental representation. She evaluates conventional and connectionist computer models as potential "representation bearers," as well as various theories regarding how the content of representations is determined. She also discusses whether a homunculus, or interpreter, must be invoked to render these representations meaningful in the mind of the subject.

Where does neuroscience stand in relation to this framework? While neuroscience and neuropsychology are deemed valuable for constraining theories of information-processing, she proposes that a reductionist view of neural theory will never provide an explanatory or generalizable account of cognitive capacities: The lower-level analyses of neuroscience are expendable, but higher-level functional accounts are not.

Although this book may be useful for the suggested purpose of combating the criticisms of cognitive science's skeptics, it does not necessarily inform one's research. In particular, the book fails to draw parallels between the research framework and the research activity conducted by its practitioners. However, Von Eckardt concedes that those who practice cognitive science may do so without undo concern about its philosophical foundations, as long as someone else is worrying about and taking care of them. I believe Von Eckardt to be an excellent guardian.

As Von Eckardt states in her last chapter describing "challenges for the future," the future of cognitive science depends on the reorganization of academic structure such that

it is friendly to interdisciplinary discourse. *Cognitive Science: An Introduction (*2nd ed.) clearly benefits from such an institutional structure. The six authors of this book (as well as the two additional authors who contributed to the first edition) are all colleagues in the cognitive science community centered around Amherst, Massachusetts.

This more practical and empirically-based approach to describing cognitive science starts where Von Eckardt leaves off. The authors begin with the assumption that cognition can be (and may best be) studied using an information processing framework based upon algorithms operating upon representational structures. In the chapters that follow, it becomes clear how philosophy defines the nature of these structures, cognitive psychology describes the operations and behaviors they produce, neuroscience indicates constraints on the "manifestation" of these operations in the human brain, and artificial intelligence considers how these processes would be implemented in the nonhuman brain. In addition, language receives an extensive treatment across four chapters that include language acquisition, the representation of language, natural language processing, and semantics. Finally, vision processing is singled out in a separate chapter for representing an area where the cognitive science approach has been the most fruitful thus far. Each of these chapters is competently written by a researcher familiar with the major topics of investigation.

A superb textbook for both advanced undergraduate and graduate students, it is even a "good read" for more experienced cognitive scientists who wish to refresh their knowledge of fields outside their domain of expertise. Although it requires a certain level of familiarity with basic cognitive concepts, all terms are clearly defined before expanded upon. Typically, concepts are clarified with fascinating examples. For example, in the chapters on artificial intelligence (AI), representation, search, control, and learning are cleverly illustrated using three "case studies" of AI models.

As in Von Eckardt's book, the authors of this text view neuropsychology as a constraint or supplement to behavioral data and theory building. While interesting in their own right, models of neural representation do not necessarily have to overlap with computational models of the same process.

Although each chapter stands alone as an interesting and scholarly review of its topic, complete with suggested readings and references, cross-referencing between chapters is used often and helps to lend an integrated feel to the book. Indeed, a strength of this text is its dedication to demonstrating how interaction between subdisciplines can provide insight not available to a discipline in isolation. Nonetheless, all authors readily admit that complete unification would be premature. There is a ways to go before the disciplinary boundaries are erased and the patchwork quilt emerges into a new gestalt. But clearly the authors of this textbook are on the right track.

International Neurology

Guide to Clinical Neurology, by J.P. Mohr and J.C. Gautier 1996. New York: Churchill-Livingstone, 1030 pp., $99.00. ISBN 0-44-308927-2.

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Medical textbooks, while striving to maintain appropriate scientific objectivity, must of necessity reflect the views of their authors. Medicine, of course, is as much an art as a science, and clinicians develop their own interpretations of the existing scientific literature based on their clinical experience. This textbook of neurology, like others, offers an authoritative summary of current neurologic practice, but differs notably in that its perspective is distinctly international. Although a major source for this book is the American neurological tradition, primarily the approach championed by distinguished neurologists in Boston, a prominent French viewpoint is ably presented as well. Expert contributions are also included from authorities in England, Canada, Australia, Germany, Austria, Italy, Brazil, Saudi Arabia, and South Africa. The refreshing diversity of views so established is but one of many welcome features in this laudable volume.

It is a testament to the recent growth of clinical neurosciences that a book of nearly 1000 pages of text, 83 chapters, and 47 authors can still be called a "Guide" to clinical neurology. Yet this title is indeed suitable, as the material is presented in a readable fashion that stresses clinical opinion rather than exhaustive literature citation. The extensive clinical experience of the authors is buttressed, however, by a focused review of pertinent articles and books, and a particularly helpful feature is the inclusion of an annotated bibliography with each chapter. The result is a satisfying synthesis of neuroscientific information and seasoned clinical expertise. Other authorities will doubtless differ on many issues, as befits a rapidly expanding field such as neurol-

https://doi.org/10.1017/S1355617797212993 Published online by Cambridge University Press

ogy, but this account is a coherent and well reasoned exposition of how neurology can be practiced.

The book is divided into five section. The first three, on basic pathophysiology, investigative techniques, and clinical semiology, serve as a prelude to the book's central concern — a detailed, clinically oriented description of individual diseases and syndromes, in section four. Section Five consists of a useful chapter on neurological emergencies . The work thus progresses from general neuroscientific principles into specific clinical problems, a logical sequence that rewards the reader who invests the time to proceed from cover to cover. The effort expended in perusing the initial background chapters is amply repaid later as clinical details become clearer in light of the basic information. Throughout, the text is well integrated and the writing consistently good, avoiding problems that plague many multi-authored books.

The discussion of clinical entities are generally updated and comprehensive, while not overwhelming in detail. The international flavor of the book is apparent, for example, in the coverage of parasitic diseases — malaria, schistosomiasis, cysticercosis, and others — rarely seen in the United States. This emphasis should appeal particularly to members of the International Neuropsychological Society. Chapters typically cover clinical features, pathophysiology, diagnosis, and treatment in a succinct and reasonable manner. The numerous illustrations, figures, and photographs are pertinent to the text and of high quality, and reproductions of computed tomographic and magnetic resonance imaging scans are excellent. In addition, there are several attractive color plates of Doppler imaging, magnetic resonance as well as conventional angiography, single photon emission computes tomographic scans, and fundus photographs.

For neuropsychologists and others working in the area of brain-behavior relationships, much will be of interest. An informative chapter on structural brain imaging clarifies the clinical application of these powerful techniques that have so improved the identification of pathological involvement and helped to locate focal and diffuse brain lesions *in vivo*. In addition, a detailed elaboration of regional pathology is most useful, elegantly describing the neurobehavioral affiliations of cortical regions and the corpus callosum. A long and thoughtful chapter on aphasia is provided, illustrating how the classical localizationist theories are being both confirmed and modified by modern neuroimaging techniques. Discussions of stroke, the acquired immunodeficiency syndrome, and the various dementias are all instructive. Alzheimer's Disease, so frequent and challenging, receives solid attention, and the author's skepticism on the utility of tacrine reflects an opinion shared by many neurologists.

Some features of this book will be disappointing to those looking for an integration of neurology with other fields of the behavioral neurosciences. As in many neurology textbooks, virtually no space is devoted to neuropsychological assessment, despite the increasingly prominent role of neuropsychology in neurologic disorders such as dementia, traumatic brain injury, and many others. More puzzling is the fact that psychiatry is also generally given short shrift, with only passing remarks on the differentiation of psychiatric from neurologic disorders. Again, this would seem to be a notable omission in view of the current tendency of these fields to edge closer together. A relatively minor point is that no attention is devoted to the emerging field of functional magnetic resonance imaging, which may stem from the limited clinical applicability of this technique, but which is surprising because another technique mostly confined to the research arena — positron emission tomography — is covered in some detail. Finally, the generally good discussion of traumatic brain injury, so common and often problematic for neuropsychologists and other clinicians, does not acknowledge the recent trend to define concussion as a traumatically-induced alteration in mental state, rather than a head injury causing loss of consciousness. Moreover, the postconcussion syndrome is afforded comparatively little space in view of its high incidence and prevalence.

Notwithstanding these reservations, however, this is clearly an outstanding neurology textbook. For those in allied fields who seek an account of current neurologic opinion in a single volume, this one will serve admirably. Its international perspective, readability, and obvious clinical sophistication render it a desirable addition to the library of any clinician dealing with neurologic patients or researcher studying clinical aspects of the nervous system. The authors are to be commended for compiling a major scholarly work that summarizes an enormous amount of material while still managing to ensure a high likelihood that it will actually be read. In this era of information expanding at an exponential rate, a book such as this is all the more valuable.

OTHER BOOKS OF INTEREST

Parker, G. & Hadzi-Pavlovic, D. (1996). *Melancholia: A disorder of movement and mood*. New York: Cambridge University Press. 342 pp., $69.95.

Smith, L.M. & Godfrey, H.P.D. (1995). *Family support programs and rehabilitation: A cognitive-behavioral approach to traumatic brain injury*. New York: Plenum Press. 201 pp., $34.50.

https://doi.org/10.1017/S1355617797212993 Published online by Cambridge University Press