within the German literature, notably that of Lichtheim and Kussmaul, predicted present day information processing models. In addition, they point out Quadfasel's role in bringing the European literature and, specifically, Kurt Goldstein's work and observations to the attention of Norman Geschwind, suggesting that this exposure helped to shape Geschwind's career and the subsequent directions of behavioral neurology today.

Part II consists of five chapters covering the primary domains, or areas of concern for language processes, in aphasia. This section provides a nicely balanced treatment across topics, including: fluency (chapter 2 by Greenwald, Nadeau, and Gonzalez Rothi); phonology (chapter 3 by Nadeau); word retrieval (chapter 4 by Wilshire and Croslett); the semantic system (chapter 5 by Raymer and Gonzalez Rothi); and grammar and agrammatism (chapter 6 by Chatterjee and Maher). The contributors capture our current understanding of cognitive processes in language and aphasia, including neurologic instantiation, and the evidence providing theoretical bases for treatment. They are highly readable and comprehensive. Each chapter would make an excellent reading assignment for students in speech-language pathology or neuropsychology involving the study of aphasia. Within this section, the reader may find Nadeau's chapter on phonology (chapter 3) somewhat difficult to navigate through, despite being provided an "interim summary" part way through. This chapter, as well as his later chapter (chapter 12), requires a basic knowledge of parallel distributed processing (PDP). It may be helpful to have read the PDP Research Group's original articles for background. There are also a couple of minor distractions: Nadeau's frequent use of first person references ("I," "my") in these chapters might diminish the objectivity one expects in scientific writing and phonetic symbol representation is not always accurate. These small issues aside, Nadeau's proposed "combination conduction aphasia" and "dual-network mechanisms" underlying speech, and his discussion of the application of Hebbian learning notions to connectionist theory deserve consideration and critical analysis.

Part III addresses behavioral disorders frequently associated with aphasia including: dyslexia (in chapter 7 by Greenwald); agraphia (in chapter 8 by Ripcsak and Beeson), apraxia of speech (in chapter 9 by McNeil, Doyle, and Wambaugh), and limb apraxia (in chapter 10 by Ochipa and Gonzalez Rothi) and, finally, Blonder discusses language use, or pragmatics, in aphasia (chapter 11). As was the case in the previous section, these chapters are well-written, clear, and balanced with respect to the authors efforts to apply a clinical focus to cognitive theory and research across these behavioral areas. Again, each chapter is excellent on its own merit and a terrific resource for clinicians and students.

The topics and material reviewed in Parts II and III provide a nice staging for Part IV, in which "emerging alternative approaches" are introduced beginning with Nadeau's review of connectionists models (chapter 12) and Fischler's attention and resource allocation (chapter 13), followed by two chapters (14 and 15) by Crosson focusing specifically on how mechanisms in attention and working memory support language. The last section, Part V ("Practical Considerations"), contains an excellent, stand alone chapter (chapter 15) by Kearns on the principles and applications of single subject research designs. Kearns' chapter is a nice addition to this text and should be required reading for students.

This text brings together a stellar group of contributors, each a known scholar in the areas in which they write and each connecting theory to practice. Although other texts have attempted to do something similar, the beauty of the present text lies with the consistent quality of the contributions and the consistent adherence to two themes, or more accurately, to two questions: What is the evidence for the underlying cognitive processes of language and aphasia? and How might that evidence provide scientific bases for treatment of aphasia and related disorders? These are the questions to which many of us seek answers and this text makes an important contribution to that quest.

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Attention as a Visual Cognitive Process

The Attentive Brain. R. Parasuraman (Ed.). 2000. Cambridge, MA: The MIT Press. 577 pp., $90.00 (HB), 42.00 (PB).

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We have come a long way since the first decades of the 20th century when psychologists were enjoined from speaking of "attention" because, according to the behaviorist thought police, it was a mentalistic, ephemeral concept that could not be observed directly. Nor were psychologists properly able to discuss disorders of attention or brain mechanisms,

https://doi.org/10.1017/S1355617702255381 Published online by Cambridge University Press

as these were the province of medicine and physiology. Nevertheless, the problem remained for the pioneer clinical psychologists of that era: there were persons who had difficulties with attention and concentration, focusing their mind, keeping distracting stimuli from interfering with their work and shifting their focus of attention. At that time, there were few methods to quantify these impairments and little understanding of their etiology.

In the last decades of the 20th century, the study of attention has become not only respectable, but it is a major research endeavor with psychologists leading the research aimed at understanding the processes that comprise it. Not only is attention a successful research enterprise, but it has been kidnapped by cognitive neuroscientists endeavoring to make it their exclusive domain. The kidnap victim appears to be alive and flourishing.

It has been clear for some time that attention is not a monolithic neuropsychological structure that can be assessed by a single test. The first articulations of attention into components were published by Pribram and McGuiness and by Zubin in 1975. Zubin, in particular was interested in the attention deficit seen in patients with schizophrenia, which he defined as impairment in the ability to focus, sustain, and shift. The attention deficit in schizophrenia has stimulated a lot of behavioral and electrophysiological research in the years since Kraepelin described it in 1917 (or thereabouts). This tradition is represented in this book in the chapter by Nestor and O'Donnell, which concludes with a proposal that attentional abnormalities in schizophrenia "may be due to a disturbance in an early gain mechanism arising from a circuitry disturbance related to GABAergic inhibitory interneurons." I think Zubin would have enjoyed and applauded this type of speculation.

The volume consists of a series of 23 chapters written by 43 investigators, the majority of whom are cognitive neuroscientists, or whose work leans in that direction. It is a very rich mixture of contributions, and brings the reader up to date on some of the latest and most innovative applications of imaging (fMRI), neural modeling, cortical circuit mapping and single unit recording technology to the study of attention, as well as recent theoretical discussions as to the fundamental neural nature of attention

The book is divided into four sections: I. "Introduction" (the editor's introduction); II. "Cognitive Neuroscience and Methods" (eight chapters): III. "Varieties of Attention" (nine chapters); IV. "Development and Pathologies of Attention" (five chapters). The chapters represent Parasuraman's view of important current trends in attention research. Perusing the number of citations in the Author Index gives a fair idea of the cognitive/imaging/neural network/single unit emphasis in the volume: the winners in the citation derby are Posner and Petersen, followed by Duncan, Haxby, Hillyard, Raichle, Ungerleider, Treisman, and Parasuraman.

Although all of the chapters address contemporary problems in the cognitive neuroscience approach to attention, my personal favorites, i.e., those chapters that may have the most relevance and immediate interest for neuropsychologists, would be the following: Webster and Ungerleider's description of the classical and influential (Ungerleider–Mishkin) account of the dorsal *versus* ventral processing streams in the visual system: the "where" *versus* the "what;" Luck and Girelli's introduction to ERP methods; Swick and Knight's review of cortical lesions and attention; Marrocco and Davidson's chapter on the neurochemistry of attention; Posner and Digirolamo's discussion of executive attention (which also refers to the circuitry disturbance in GABAergic inhibitory interneurons, originally proposed by Benes, in relation to the anterior cingulate gyrus); Rafal's striking demonstration of neglect in a stroke patient; and the chapter by Parasuraman, Warm, and See on brain systems of vigilance.

I wish that the volume had had more material on the attention disturbance seen in seizure disorders; this is a fruitful source of clinical material and of possible insights into the regulation of consciousness and attention (especially in relation to the "absence" epilepsies). Also, there is neglect of auditory attention/inattention and its ramifications. Impairment in auditory processing in school children is probably more common and more of a public health problem than impairment in visual attention. The basis of much of the attention research described in this volume (albeit elegant and state-of-the-art) is the study of eye movements, orientation, and the neuroanatomy of the visual system. However, aside from Fischler's chapter on attention and language, there is no treatment of auditory information processing. Finally, there is little discussion of practical tools for the assessment of attention disturbance in the clinic. Swanson et al. devote approximately one page to this in their chapter on ADHD.

The book is to be recommended especially for all those who are interested in current cognitively based approaches to the phenomenon of attention. It is likely, however, that many of those persons may already be familiar with much of the work in the volume. Nevertheless, this is a valuable compendium of that approach, and a very useful source of discussions and references to the cognitive neuroscience approach to the study of attention.

Parasuraman, in his introduction, offers the following:

> "No claim is made that cognitive neuroscience will resolve all issues that have been debated by attention researchers. The explosion of cognitive neuroscience research on attention has led to a number of fundamental advances in knowledge. But many conceptual and methodological issues remain uncertain and controversial. This volume attempts to describe not only the advances but also the areas of disagreement or uncertainty, so as to serve as a springboard for further research."

I agree with this assessment, and believe that the editor's goal has been achieved very successfully.

https://doi.org/10.1017/S1355617702255381 Published online by Cambridge University Press