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Toward an Understanding of the Human Frontal Lobes

A Review of

The Human Frontal Lobes: Functions and Disorders

by Bruce L. Miller and Jeffrey L. Cummings (Eds.)

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Reviewed by

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This encyclopedic book about the frontal lobes has a very different cast of characters than most books on the frontal lobes. Although a few familiar names, such as Joaquin Fuster, Jordan Grafman, and David Lewis have contributed chapters, many other familiar names, such as Patricia Goldman-Rakic, Brenda Milner, Michael Petrides, Tim Shallice, Marsel Mesulam, Robert Knight, Mark D'Esposito, Jonathan Cohen, Amy Arnsten, Harvey Levin, Art Shimamura, and Antonio Damasio are notably absent. In some ways that is a good thing, as this volume makes a contribution by addressing topics often overlooked in other books on the frontal lobes.

This volume does indeed provide a miniencyclopedia on the frontal lobes. There are sections of six to eight chapters each on the neuro-anatomy, neurochemistry and neuro-physiology, neuro-psychology, neuro-logical diseases, and psychiatric diseases of the frontal lobe. In the neurochemistry section, for example, besides including chapters on the usual suspects (dopamine and norepinephrine, the two neurotransmitters whose function in the frontal lobe has received the most attention), there are also chapters on serotonin and acetylcholine. Unfortunately, however, sometimes the chapters contain little information about the frontal lobe, as if in attempting to include topics not usually discussed in relation to the frontal lobe, there was little information concerning the frontal lobe to discuss. Some chapters are superficial: Although their section headings are enticing, the chapters themselves provide little depth or subtlety. A few chapters are already dated.

For example, the discussion of object versus spatial processing in the chapter titled "Memory and the Frontal Lobes" by Yener and Zaffos gives one the impression that Area 46 is specialized for the memory of spatial information and Area 45 is specialized for the memory of object memory, as Wilson, O'Scalaidhe, and Goldman-Rakic proposed in 1993, although the authors note that some nonspatial information is processed in Area 46. The truth is that there is now a wealth of data, from a large number of studies, showing that both Area 45 and Area 46 subserved memory for both spatial and object information, summarized in review papers, such as those by Petrides (1996), Owen (1997), D'Esposito, Aguirre, Zarhan, Ballard, Shin, and Lease (1998), Owen, Herrod, Menon, Clark, Downey, Carpenter, et al. (1999), and in excellent studies that have not yet made it into review papers, such as Rainer, Assad, and Miller (1998). See also the special issue of *NeuroImage*, edited by Cohen (2000). There is no regional differentiation in prefrontal cortex for memory of what and where

information that parallels the regional differentiation for the sensory processing of what and where information in the visual system, contrary to the attractive proposal put forward by Wilson et al. (1993). There is some lateralization of these functions, however, with right prefrontal cortex being specialized more for the processing of spatial information. Also, posterior to Area 46, in the frontal eye fields (Area 8), there is a small locus that is consistently activated on visual spatial working memory tasks (e.g., see reviews by D'Esposito et al., 1998, and by Smith & Jonides, 1999). It is this kind of detail and subtlety that are largely absent from the present volume.

A definite strength of the book is the excellent figures and tables. Two chapters particularly stand out in this regard: "Frontal-Subcortical Circuits" by Chow and Cummings and "Neuro-imaging and Activation of the Frontal Lobes" by Grady. Chow and Cummings provide excellent tables on the dysfunctions associated with disorders of different regions within the frontal lobe, the afferent and efferent connections of the various frontal-subcortical circuits, and the disorders associated with the various frontal-subcortical circuits. Grady has done a yeoman's job of summarizing in table form the enormous number of neuro-imaging studies of frontal lobe function. She has done a great service to the field in pulling all of this information together and presenting it so succinctly and clearly.

Another strength of the book is the clinical detail and the number and diversity of disorders discussed. In the section on neurological diseases of the frontal lobe, for example, there are chapters on vascular diseases of the frontal lobes, frontal lobe tumors, lewy body disorders, infectious, inflammatory, and demyelinating disorders of the frontal lobes, extrapyramidal disorders and frontal lobe function, frontotemporal dementia, psychosurgery, and traumatic brain injury. Surprisingly, however, the psychiatry section contains no chapter on attention deficit hyperactivity disorder.

This book serves an important niche as a reference book, to be pulled off the shelf if you want a quick, thumbnail description on a select topic or if you want to locate reference articles on a particular topic related to the frontal lobes. For those looking for a book with which they can curl up or for an in-depth introduction to the frontal lobes, other books would serve them better. The strength of *The Human Frontal Lobes: Functions and Disorders* is breadth rather than depth.

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