

Book Review

The Asymmetrical Brain

Kenneth Hugdahl and Richard J. Davison (Editors)

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This volume is the second edition of a previous book entitled *Brain Asymmetry* by the same editors. However, only 5 of the 39 previous authors return, while 16 of the 21 chapters are completely new. In my opinion, this is a positive sign, as it represents an expansion of interest in hemispheric asymmetries as the field of cognitive neuroscience has evolved. There are sections now that include results using neuroimaging and brain stimulation. The introductory section on animal models and basic functions is also a welcome addition. By including these new sections, the volume is much more comprehensive and should appeal to an even wider audience than the previous edition.

This expansion is also encouraging, given the tendency for many in cognitive neuroscience research to focus on one area of the brain without regard for hemispheric differences. Inattention to hemispheric asymmetries when it occurs is perhaps understandable in order to make the story simpler, but puzzling, because these asymmetries are the norm rather than the exception.

Brain asymmetry is nowhere more obvious than on a neurology ward. Language, perceptual organization, spatial abilities, attention, memory, emotion, decision making, personality, and so on, are more likely to be disrupted from damage to one or the other hemisphere. The asymmetries are seldom subtle and typically affect activities of everyday life. For anyone who has observed these differences, it is refreshing to read a book such as *The Asymmetrical Brain* with chapters that discuss a variety of issues that have intrigued researchers of hemispheric laterality for generations.

Nevertheless, I wonder how one covers such a broad topic under one cover in light of the explosion of new findings revealing the functional significance of more precisely defined areas throughout the brain. As technological advances, such as neuroimaging, have led to theories about relatively small brain regions, such as place and face areas within the fusiform gyrus or shape and color areas within the temporal cortex, one wonders how dividing the brain in half fits in. A publisher could easily develop a series of collected volumes with titles reflecting hemispheric asymmetries in many different

regions of interest (e.g., fusiform gyrus, inferior parietal lobe dorsolateral prefrontal cortex, etc.). Alternatively, titles might capture asymmetric functions (e.g., face processing, perceptual organization, emotional valence, depression, etc.). There are many different asymmetric functions, and editing a single volume on brain asymmetry seems something akin to editing a single volume on the brain. With such a large menu to choose from, how does an editor decide what to include? I approached the review of *The Asymmetrical Brain* with this question in mind and with a huge appreciation for how difficult the job must be.

I began by making a list of the various topics covered by the chapters included in this collection. Three themes (Vision, Audition, and Emotion) make up the bulk of the volume. Four chapters are devoted to asymmetries in the visual system of the cortex from birds (Gunturkun) to humans (Banich; Laeng, Chris, & Kosslyn; Saron, Foxe, Schroeder, & Vaughan). Three chapters focus on audition (Hugdahl; O'Leary; Zatoree) and four on emotion (Berridge, Espana, & Stalnaker; Coan & Allen; Heller, Koven, & Miller; Pizzagalli, Shackman, & Davidson). There is one chapter concerning the origins of handedness (Beaton), one on the hippocampus as a potential source for lateralization (Tang), and five discussing asymmetries related to different neurobiological conditions (Bruder—depression; Eckert & Leonard—dyslexia; Green, Sergi, & Kern—schizophrenia; Habib & Robichon—dyslexia; Lasseonde & Sauerwein—callosal agenesis). The volume also includes two chapters on methods and analysis techniques (Friston—functional neuroimaging; Pascual, Leone, & Walsh—transcranial magnetic stimulation) and one on anatomical asymmetries (Jancke & Steinmetz). For someone seeking examples of excellent work on hemispheric asymmetries, with in depth discussions of how different experts in the field approach selected topics and implications of findings for selected questions, the book offers valuable reading. For those seeking a conclusive summary, the volume may fall short.

Despite this limitation, any serious student of hemispheric asymmetries will find critical, scholarly, and in-depth discussions of fascinating work. For instance, for

someone like myself who studies attentional disorders in humans, Gunturkun's chapter on visual asymmetries in birds was a pleasant surprise. Birds have no connections between hemispheres, and each eye projects only to one hemisphere. They are born and live their entire lives with split brains, a handy fact that has allowed researchers to address how light may influence asymmetric development, what interventions can change them and why they may be present in the first place.

It is interesting to ponder the work with birds in relation to Banich's later chapter suggesting that the function of the corpus callosum is to support emergent properties, especially when stimulus complexity is too high for one hemisphere to handle. Reading these two chapters next to that of Lassonde and Sauerwin on the consequences of agenesis of the corpus callosum provides much food for thought.

One of the more consistent hemispheric differences reported in the literature is a right hemisphere preference for music and a left hemisphere preference for language. In his contribution, Zatorre makes the increasingly accepted argument that it is not the category of the stimulus (language vs. music, or even speech vs. pitch) that is important. Rather, it is the computational properties of the mechanisms engaged to optimize performance. His ideas and data fit very well with the growing evidence that relative values for early basic features are processed differently by the two hemispheres.

In the remaining two chapters on audition, the focus is on dichotic listening methods. These contributions nicely update (Hugdahl) and expand (O'Leary) the implications of ear advantages for hemispheric lateralization (O'Leary). They complement each other and suggest a resolution to at least some of the inconsistent functional imaging data in this literature.

The topic of brain asymmetries of emotion is well represented throughout. Emotions are a fundamental motivating factor that clearly affect just about everything we do, and understanding how emotions are instantiated in the brain is of obvious practical and clinical

importance. Effects of emotional valence and arousal are discussed by Heller et al. with an emphasis on their influence on cognition. The contribution of Coan and Allan provides an outstanding review of frontal EEG asymmetries and how these may act as markers for the development of depression and anxiety disorders. These chapters are especially revealing when juxtaposed with evidence for asymmetric dopamine influences (Berridge et al.) but somewhat puzzling in the context of Bruder's discussion of differential frontal and parietal asymmetries in depressive disorders. The chapter by Pizzagalli et al. provides several caveats when studying emotion and may help resolve some of the inconsistencies within this literature.

Other chapters attempt to account for a wide variety of functional asymmetries, arguing that they may arise from a basic source. For instance, Tang suggests a central role of functional asymmetries of the hippocampus and points to its strong interconnections with much of the cortex, while Laeng et al. emphasize fundamental differences in spatial representations in vision. Both offer theories of hemispheric asymmetries that throw a wide cloth and may overgeneralize but are nevertheless interesting.

Other contributions round out this volume by providing useful discussions of selected methods and analyses with examples of applications for favorite research topics. Overall, the volume would provide a good addition to the libraries of anyone who studies hemispheric asymmetries. Perhaps it will also remind those seeking the functional significance of their favorite bits of the brain that brain asymmetries are the rule, not the exception. It is precisely because brain asymmetries are nearly everywhere we look that any one volume can only provide a glimpse of this very interesting aspect of brain function.

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