are a primary focus. Apparent discrepancies arising from animal models suggesting beneficial effects of estrogen on cognitive performance paired with increased risk of Alzheimer's disease in postmenopausal women are addressed, and relevant literature from basic science research on estrogen neuroprotective and neurodegenerative effects at the cellular level to epidemiological studies in humans are discussed. Related research in neuroimaging and psychiatry are also included. However, one does not need an in-depth understanding of these diverse disciplines in order to come away from the book with a comprehensive understanding of the science and theoretical models involved. Although little time is spent on neuropsychological issues, the book should be of interest to anyone who does clinical assessment or research involving women. The effects of estrogen on cognitive performance are complex, as this book makes clear, and the information contained within this volume is relevant to the field of neuropsychology.

Chapter 1, "Preclinical Data Relating to Estrogen's Effects on Cognitive Performance" by Robert B. Gibbs, nicely summarizes preclinical data relating to estrogen and progesterone effects in the brain and on cognitive performance. Estrogen-mediated effects in the hippocampus and on cholinergic and serotonergic systems are described and well-summarized. Research using rodent models, in which ovariectomized animals were given estrogen replacement, resulted in improved cognitive performance compared to untreated ovariectomized animals; these studies are well described and create a basis for discussions in later chapters of the cognitive effects of estrogen in humans. Dose-dependent and time-dependent effects are also revealed, and the potential relevance to human hormone replacement studies is explained.

In Chapter 2, "Short-lived Effects of Hormone Therapy on Cognitive Function," Eva Hogervorst discusses human epidemiological studies, especially the Women's Health Initiative Memory Study (WHIMS), which investigated hormone replacement therapy and cognitive decline in elderly women. As the WHIMS data failed to support previous findings of improved cognitive performance following hormone therapy, Hogervorst lays out various potential reasons for the discrepant findings. Much time is spent discussing potential confounds in prior studies, a discussion that is interesting from an experimental design point of view. Various alternative treatment regimens also are described, such as selective estrogen receptor modulators and phytoestrogens.

Structural and functional brain imaging data related to the effects of estrogen are addressed in Chapter 3, "Clinical Data From Structural and Functional Brain Imaging on Estrogen's Effects in The Central Nervous System," by Daniel G.S. Silverman, Cheri L. Geist, and Natalie L. Rasgon. This chapter begins with brief, clear descriptions of various PET and MRI procedures, and then outlines findings from glucose metabolism (FDG), cerebral blood flow (O-15 water), volumetric, and functional MRI studies in healthy premenopausal women, healthy elderly women, and women with Alzheimer's disease. Unfortunately, very little research has been done in this area, and the chapter's brevity is a reflection of this lack of research. Research into differences in brain activation during the different phases of the menstrual cycle are also described, as these differences are possibly due to differences in hormone levels.

Psychiatric issues related to estrogen and hormone replacement therapy are included and discussed in Chapter 4, "Clinical Data on Estrogen's Effects on Mood," by Natalie L. Rasgon, Laurel N. Zappert, and Katherine E. Williams. Estrogen affects serotonin receptor expression, and therefore mood, and can be used in conjunction with serotonin reuptake inhibitors in the treatment of mood disorders. As women who have a history of major depressive disorder may experience clinical mood symptoms, adjunctive treatment with hormones like estradiol are helpful.

Chapter 5, "Preclinical Efforts to Develop Effective Neuroserms for the Brain," by Roberta Diaz Brinton and Liquin Zhao, and Chapter 6, Basic and Clinical Data on the Effects of Serms on Cognition by Kristine Yaffe, Pauline M. Maki and Peter J Schmidt, discuss research on the development and effects of NeuroSERMs (selective estrogen receptor modulators). NeuroSERMs are alternatives for estrogen therapy that are currently being developed. As estrogen appears to have protective effects on healthy neurons and deleterious effects on damaged neurons, some research groups are investigating estrogen alternatives that may have desired advantageous effects on the aging female brain without the deleterious effects outside the brain.

The Effects of Estrogen on Brain Function is well-written and well-edited. For anyone interested in understanding the complexities of estrogen actions in the brain or the potential risks and benefits of estrogen therapy, this book is a good place to start. The book is not long—only six chapters—and is a relatively fast read. A basic understanding of biology and neuroscience are necessary; beyond that, the authors explain the intricacies well.

Can we develop a "Dream Catcher Test?": A Novel Approach to the Study of Consciousness

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Inner Presence: Consciousness as a Biological Phenomenon, by Antti Revonsuo. 2006. Cambridge, Massachusetts, MIT Press, 473 pp., $55.00 (HB).

Reviewed by George P. Prigatano, Ph.D., ABPP-CN, *Department of Clinical Neuropsychology, Barrow Neurological Institute, St. Joseph's Hospital and Medical Center, Phoenix, Arizona.*

In his Prologue, Antti Revonsuo describes the main task of his book: "To depict a biological research program on consciousness." (pg. xviii). He is interested in drawing upon proven research strategies to describe how we can study consciousness from a biological perspective that would allow us to ultimately answer the question: "What the place of the subjective psychological reality is in the physical universe?" (pg. xvi). In short, why has consciousness as a biological reality emerged to aid the process of evolution?

He comments: "I fear that the problem of consciousness will never be resolved all of a sudden by constructing a single philosophical argument, no matter how witty, nor by running a single brain imaging experiment, no matter how ingenious. Instead of such isolated attempts, an overall scientific research program is needed that provides a general philosophical and empirical framework, the big picture, to which the problem of consciousness can be firmly anchored, and consequently, taken apart bit by bit and thereby solved, step by step. After all, that is how biological science has succeeded in solving other great mysteries of nature which once seemed eternal and irreconcilable." (pg. xviii). Revonsuo's book: *Inner Presence: Consciousness as a Biological Phenomenon* attempts to do just that. He argues that science can explain consciousness if it goes about this task in a systematic manner. It must begin with the philosophical assumption that consciousness is real and is a biological phenomenon. From a philosophical perspective, he therefore argues for biological realism as the basis for studying consciousness.

Next, he argues that the explanation of consciousness requires a unified research program. Fragmented research studies which are not a part of a research program, he suggests, frequently are a "dead-end." The research program must be based on clearly articulated assumptions about how to approach the task. One assumption is that an explanation in the biological sciences is fundamentally different than an explanation in physics. The second assumption is that biological explanations require a multilevel explanation model. He notes that in biology the "multilevel explanation" is the rule for explaining complicated phenomena. He emphasizes that biological phenomena must be studied at different levels of organization. Only when these different levels of organization can be integrated does true understanding of the phenomena emerge. A clear strength of his book and of his approach is reflected in Figure 1.8 (reproduced here). It outlines his approach to the scientific study of consciousness which has considerable merit.

Studies dealing with human consciousness must approach the problem from at least three different perspectives. One perspective is to understand what brain structures and physiological events are involved in producing consciousness at different stages of human development. This is the "backward-looking explanation." The study of consciousness also requires a thorough analysis of the biological subcomponents that make consciousness possible in the "here and now." This would include an analysis of how different brain regions interact with one another via neurotransmitter events and emerging physiological properties that make a phenomenological experience possible. This is the "downward-looking explanation." Finally, the scientific study of consciousness must also approach the question of what is the role of consciousness for overall brain function. How does it facilitate, for example, learning and memory? How does it influence the development of language? How does it help the organism deal with the environment more effectively? This is the "upward-looking explanation," and ultimately attempts to answer the very broad but important question of the role of consciousness in a physical universe.

This book would be worth reading just on the basis of these few ideas, but in fact, it presents many more interesting concepts. The author reviews, for example, how the biology of visual perception and its various disorders, the technology behind virtual reality, and present-day neuroscience studies on consciousness may help provide insights as to how to approach the problem of consciousness at the different levels that were outlined in Figure 1.8. However, the most intriguing part of this book is the author's suggestion that scientific studies of dreams may provide a means for understanding how subjective experiences emerge in the non-sleep state. Revonsuo emphasizes that "discovering consciousness in the brain will require that we are capable of constructing a multilevel theoretical model of the phenomenological level and its mechanisms." (pg. 298). He notes that it is in precisely the state of dreaming that there is a phenomenological state that potentially could be studied from the multilevel model that he proposed in Fig-

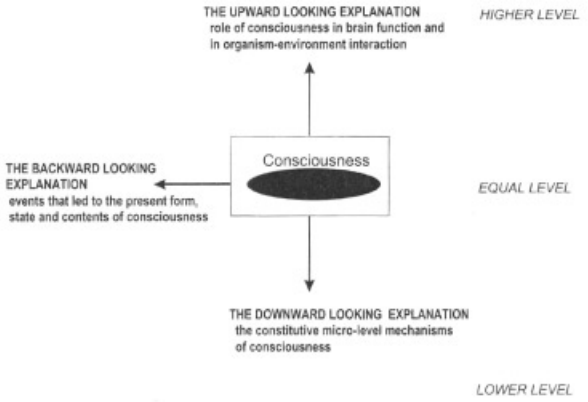

Figure 1.8
The multilevel model of consciousness. The complete explanatory model should include a description of consciousness itself (the explanandum) and then link it to the causal networks surrounding the explanandum.

Fig. 1. Reproduced with permission from MIT Press (*Inner Presence: Consciousness as a Biological Phenomenon*, by Antti Revonsuo, 2006, p. 26, Fig. 1.8).

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ure 1.8. One could ask the question: what are the brain events that make dreaming possible? What is the purpose of dreaming? What are the micro-level mechanisms responsible for the phenomenological experience of a dream? This is a fascinating approach to the problem of consciousness. He states, if we could develop a "dream catcher test" (pg. 300), we could then make a quantum leap in understanding the biology of subjective phenomenological experience. His explanation of how this can actually be done is somewhat laborious and at times difficult to follow, but basically he has this to say.

Imagine that we have a "brain team" and a "dream team." The brain team would collect data in the laboratory. It would study the neuroanatomical, neurophysiological, and neurochemical substrates of dream images. A dream team would also exist that could quantify what the actual subjective images were in the context of any given dream and how they interact. He then goes on to suggest that "the task for both teams is to construct, from the different sources of data available for each team, a full-scale, multimodality, 3D computer animation of the dream events that unfolded just prior to awakening the subject, and exactly as they were experienced by the subject. Both teams work independently, without knowing anything about each other's work. The resulting dream models will portray—in as much detail as possible, and as closely resembling the subject's original experience as possible—the dream setting, the objects, persons, and interactions present in the dream; and the temporal progression of the dream events" (pg. 302). In other words, by taking the knowledge that emanates from the neurosciences and biology and combining it with knowledge that would come from the psychological description of a person's dream, one could bring these two bodies of information together and integrate different levels of knowledge. This would allow us to predict, from a biological perspective, what is experienced as a phenomenological state during dreaming in a given subject. While this is a fascinating idea, it is one that still remains difficult to imagine as to exactly how this would be done. Moreover, the relevance of specific dream images for a given individual with a unique psychosocial history is not adequately considered by Revonsuo. For example, one person may dream being on a large ocean liner that has no side rails, but is moving slowly out to the open sea. It may stimulate in that individual a sense of excitement and wonder regarding the future. For another individual, the same visual images might produce anxiety and worry about falling off of the ocean liner into the sea. The same mental/visual image of an ocean liner without side rails moving into the open sea could carry with it completely different psychodynamic meanings and affective experiences. This is not adequately considered when attempting to apply the "dream catcher test" to the study of consciousness. It is, from the point of view of this reviewer, the major weakness of Revonsuo's innovative approach.

Nevertheless, the strength of this book is in helping us "think outside of the box" and seriously consider developing a research program that encourages scientists to coordinate their efforts to approach the study of human subjective experience (i.e., consciousness) from multiple levels, which have as their goal convergent information which leads to predictive validity. Anyone interested in the problem of impaired self-awareness after brain injury will enjoy reading Revonsuo's *Inner Presence: Consciousness as a Biological Phenomenon*.

RECENT AND RELEVANT

DOI: 10.1017/S1355617707240470

An Introduction to Cognitive Psychology: Processes and Disorders, Second Edition. 2006. By David Groome with Nicola Brace, Hazel Dewart, Graham Edgar, Helen Edgar, Anthony Esgate, Richard Kemp, Graham Pike, and Tom Stafford. New York: Psychology Press, 449 pp., $16.95 (PB).

Disorders of Volition. 2006. Natalie Sebanz and Wolfgang Prinz (Eds.). Cambridge, MA: The MIT Press, 493 pp., $50.00 (HB).

Stuttering and Cluttering: Frameworks for Understanding and Treatment. 2006. By David Ward. New York: Psychology Press, 436 pp., $39.95 (HB).

What Causes ADHD? Understanding What Goes Wrong and Why. 2006. By Joel T. Nigg. New York: Guilford Press, 422 pp., $42.00 (HB).

Military Psychology. Carrie H. Kennedy and Eric A. Zillmer (Eds.). New York: Guilford Press, 400 pp., $45.00 (HB).

Hot Thought: Mechanisms and Applications Of Emotional Cognition. 2006. By Paul Thagard. Cambridge, MA: The MIT Press, 301 pp., $36.00 (HB).