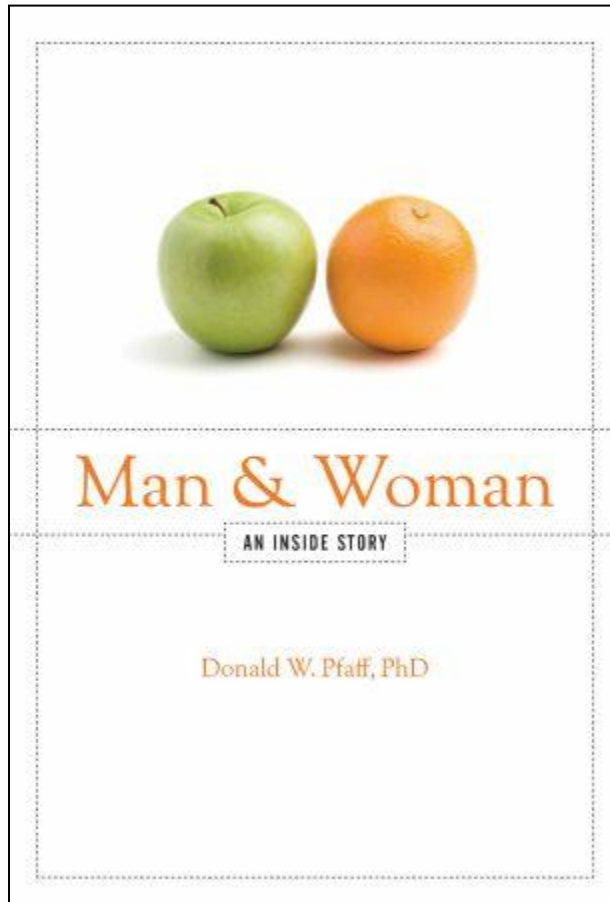


Oversimplifying Sex Differences in the Brain

Review: *Man and Woman: An Inside Story*

Reviewed by Larry Cahill, Ph.D.



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In 1966 Seymour Levine, a leading neuroendocrinologist, published a paper in *Scientific American* titled “Sex Differences in the Brain” that nicely summarized the understanding of the subject at that time. Levine mentioned only one brain region in the entire article: the hypothalamus, a relatively small, deeply positioned collection of nuclei already well established by then as a key brain region regulating hormonal action.¹ Several generations of neuroscientists since then came to believe that “sex differences in the brain” basically meant sex behaviors, sex hormones, and the hypothalamus, but had little or nothing meaningful to do with virtually everything else in the brain. The sex differences issue was, to put it bluntly, of little or no importance to the neuroscience mainstream. What is worse, for a variety of reasons, including political ones, pursuing the issue was (as one colleague from Levine’s generation told me when I began studying it) career suicide for any neuroscientist working outside the immediate domain of reproductive functions.

Abundant evidence now proves that the “mainstream” view of the sex difference issue simply could not have been more misguided. Researchers are making discoveries about sex-related influences on neural function at an almost breathtaking, and seemingly accelerating, pace. Every level of brain science has been affected, from studies of human behavior to studies of ion channels. Neural mechanisms of apoptosis, genes associated with microcephaly, sleep spindles in the EEG, brain responses to nicotine in utero, and on and on—the diversity of sex influences on brain function is striking. Those who know the literature would find it difficult to think of a single domain of brain research that remains untouched by this hugely important development. Sadly, and despite the evidence, the neuroscience mainstream retains extremely widespread and powerful biases against the sex difference issue. (If you don’t believe me, try getting a grant funded from a typical NIH study section to begin studying the topic.)

It is for these reasons that I found *Man and Woman: An Inside Story* so disappointing. Dr. Pfaff is, as he describes himself, an “insider” in the field of behavioral neuroendocrinology, a leading figure for many decades. He has earned his place among the field leaders in reproductive biology. So perhaps understandably, the view he presents of sex influences on the brain is heavily hypothalamus-centric. Indeed, the reader of chapter 4 (“Hormones and the Brain”) and chapter 5 (“Neonatal Hormones, Brain Structure, and Brain Chemistry”) could be forgiven for concluding that the field remains as firmly centered on the hypothalamus as it was in 1966.

In fairness, Pfaff later gives reasonable accounts of sex influences in a few other domains, such as aggression, social behaviors, and pain. But the book fails to capture the strikingly ubiquitous nature of sex influences on brain function. And in closing, Pfaff returns to his insider's "bottom line"—namely, that the topic of sex influences on brain function is at its biggest and most important when considering the issue of the hypothalamus and reproductive behaviors, and rapidly diminishes to seeming insignificance as one moves away from that issue. He even graphically illustrates this concept, claiming that "the farther away from reproductive biology in human behavior and human experience that we consider, the smaller and more variable any sex difference will be."

Unfortunately, I am aware of no compelling evidence to support this view, with the possible exception of sex differences in the gross anatomical size of rat brain regions. It is most unfortunate for an "insider" like Pfaff to make such an argument, as it simply reinforces one of the key deeply entrenched biases still held by many "outsiders" in neuroscience. Many neuroscientists may be wondering about the buzz they have been hearing regarding the sex difference issue. If they turn to this book for insight, they will come away thinking the field is basically about what their biases told them it was about—reproductive behaviors and the hypothalamus.

Pfaff rightly criticizes popular books before his that tilted toward overstatement (overstatement that itself produced a backlash of popular recent books basically arguing, incorrectly, that the sex difference issue is not all that important for brain science). He clearly tries to strike the right balance, and in many respects succeeds. But he, too, is not immune to such overstatement. For example, he asserts, "Sure, men have penises and women have clitori, but the mental excitement is the same." In fact, brain imaging studies suggest that different patterns of brain activation occur during sexual arousal in men and women.² He also sharply criticizes the now-famous comments by Lawrence Summers regarding the relative dearth of women in some corners of science, claiming that Summers was "wrong!" but seriously misrepresenting what Summers actually said. Even the image on the book cover (an apple and an orange) sends an oversimplistic "Mars and Venus" message.

Pfaff claims that "books written for the general public have not handled this subject well," but that is an overstatement. A more correct statement is that many such books have not handled the topic of sex influences on the brain well. Two important exceptions well worth

reading are *Brain Gender*, by Melissa Hines, and *Sex on the Brain*, by Deborah Blum. Books like these convey that optimally understanding, and caring for, both women and men demands that scientists and nonscientists alike look beyond what they “know” about sex influences on the brain and start learning the facts.

Larry Cahill, Ph.D., is a professor in the department of neurobiology and behavior at the University of California, Irvine. He has investigated brain mechanisms of emotional memory for 30 years, and understands that this research can no longer be appropriately done without careful consideration of sex influences.

References

¹ Levine, S. (1966). Sex differences in the brain. *Scientific American*, 214, 84–90.

² Rupp, H., & Wallen, K. (2008). Sex differences in response to visual sexual stimuli: A review. *Archives of Sexual Behavior*, 37, 206–218.