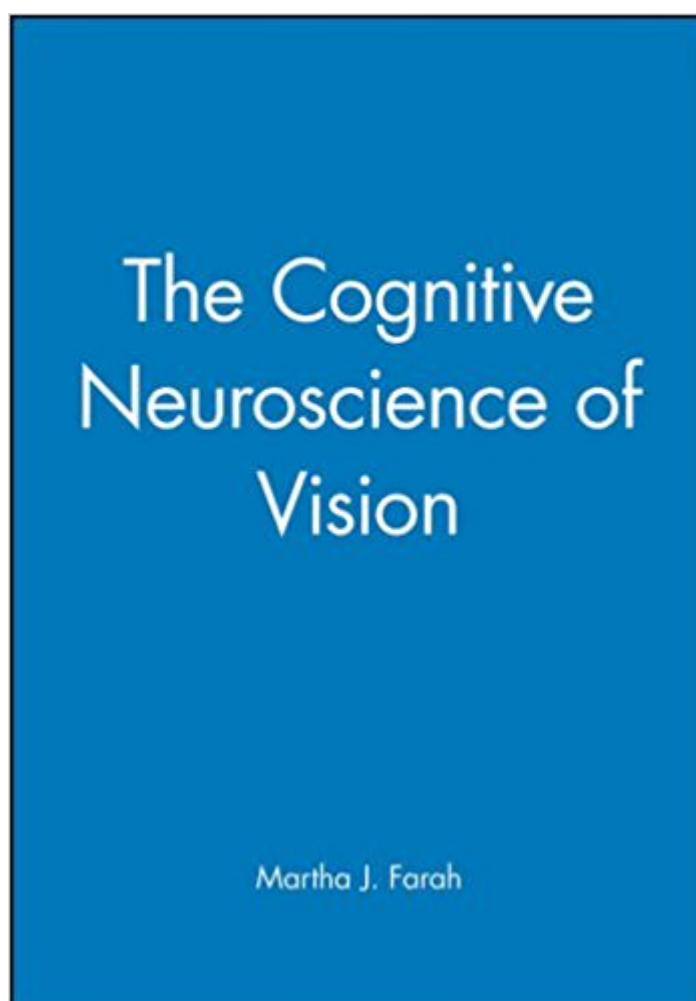


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# The Cognitive Neuroscience Of Vision (Fundamentals Of Cognitive Neuroscience)



## Synopsis

The Cognitive Neuroscience of Vision begins by introducing the reader to the anatomy of the eye and visual cortex and then proceeds to discuss image and representation, face recognition, printed word recognition, visual semantic memory and visual attention and perception.

## Book Information

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## Customer Reviews

"This is an outstanding overview of an exciting frontier of research on the mind. Farah has a gift for ingenious and original syntheses of complicated research topics, which makes this book an invaluable resource for anyone interested in how the brain lets us see," Steven Pinker, Professor, MIT, and author of *How the Mind Works* and *Words and Rules* "Farah's book gives a comprehensive account of the cognitive neuroscience of vision, filtered through the judgment and enlivened by the comments of one of its best-known contributors. An excellent and lively survey to interest and inform both students and researchers." Anne Treisman, Princeton University

In this clear and engagingly written book, Martha Farah presents the first comprehensive overview of the cognitive neuroscience of vision. Beginning with the transformation of light images into neural images within the eye, Farah traces the pro.

This book provides a very thorough description of the many synergistic mechanisms involved with

vision. While you are reading through this review right now, your brain is engaged in numerous streams and pathways of neural activity that allow you to follow and cognitively recognize and understand these words. "The Cognitive Neuroscience of Vision" describes how visual sensory input is analyzed by various visual systems to allow us to understand our environment. The book itself is not a light read. It is formatted like a textbook and is very rich in detail. In my opinion, this is a great book for those interested in how the brain analyzes the various aspects that come from visual sensory input. Farah tries to give a guided approach to visual cognition by describing the research that led to the discoveries of visual sensory analysis in the brain. Farah organizes the contents of the book in such a way that show the evolution and progression of the field of visual cognition. However, the main aspect of Farah's style that I dislike is that the figures associated with the text are not fully explained and are not juxtaposed alongside their appropriate text. The beginning of the book looks into the anatomy of the eye, specifically the retina. The story of vision is "with the retina as the starting point, and conscious awareness as the final destination." Farah explains the retina to be a "duplex retina" and the role of the division of labor between the rods and cones. Farah structures the text by first describing components of the retina anatomically and then using research findings to explain the role of the components in vision. Afterwards, Farah gives in depth descriptions of other anatomical regions involved with vision such as the lateral geniculate nucleus (LGN) and the primary visual cortex. The topic of local to global image representation is also dwelled upon. This entails how localized sensory input in the retina is globally analyzed and represented by different regions of the brain. Farah looks into how color perception and motion perception are aspects of vision that go from local to ultimately global representation. The hypothesis of two cortical vision systems necessary for this representation is addressed in that object recognition is an independent stream while object localization and attention are in another stream. Farah does a great job in reinforcing statements and ideas with actual researched evidence. Although much research is presented, Farah continuously acknowledges that there is much that science still has not yet deciphered about vision recognition. "The main problem of visual recognition is the problem of identifying a distal object using only the proximal 2-D image that arrives at the retina." Even so, scientists have narrowed five criteria that they believe are useful in object recognition: accessibility, scope, uniqueness, stability, and sensitivity. The primary conclusion that research has shown with this complexity is that "visual recognition requires that memory be searched for a representation that resembles the current stimulus input." I found the topic of face recognition very fascinating. According to scientists, humans are born to put special attention to faces rather than on other objects. "People are face experts...face recognition requires a finer

grained, or subordinate-level classification; we recognize that this is not just a face, but John's face." Farah goes into the neuropsychology and neurophysiology that pertains to face recognition in a highly detailed manner that highlights the major mechanisms proposed that allow this. The middle chapters look into word recognition and visual attention. The aspect of word recognition concerns highly specialized visual recognition systems. Farah takes a different approach and concentrates the text in describing the complexity of word recognition by using the disorder of pure alexia. Pure alexia is a condition of "impaired word recognition despite intact auditory word comprehension, intact ability to produce written language, and apparently intact recognition of visual patterns other than printed words." Farah focuses on pure alexia by asking whether or not the brain contains a dedicated reading area and gives three hypotheses underlying possible answers. The three hypotheses are the visual-verbal disconnection hypothesis, the visual impairment hypothesis, and finally the orthography-specific impairment hypothesis. This was a great approach to take for Farah in describing word recognition. The use of a specific disorder like pure alexia and stemming researched ideas from it gives the reader a depth of understanding that challenges him or herself while also being interesting. Farah uses these diseases and disorders throughout this section to allow a greater grasp of the ideas she is presenting. By first giving description of these diseases and disorders and then following with specific research that try to find the origin of cause helps show how scientists approach deciphering the complexity associated with cognition. With vision attention, the mechanisms whereby some stimuli are selected for processing rather than others are emphasized. The main proposed reason for this is because there is limited brain processing capacity. Farah looks into these processing limitations as well as neural bases of attention. The concluding chapters focus on hemispatial neglect, mental imagery, and visual awareness. These chapters look more so into the role of consciousness in visual cognition. The disorder Neglect Syndrome is used to highlight the hemispatial neglect, which involves using one hemisphere of the brain for a certain task and ignoring the use of the other hemisphere altogether. This global point-of-view segues into mental imagery and visual awareness. The role of mental imagery is very connected with the visual systems. Mental imagery involves the streams of integrating and composing visualized objects, people, and scenes from a person's memory. The chapter on visual awareness then summarizes the role of the conscience in vision. With consciousness being an intangible aspect of the brain, its relationship with vision as well as with most cognitive activities is quite difficult to research. Farah concluding with this is a great ending in my opinion. Acknowledging that science does not answer every question highlights the complexity and fascination of the brain and its cognitive abilities. In essence, I do recommend this book. However, only to readers who have

at least some background in neuroscience. Farah uses complex scientific terminology that she does not always describe aspects effectively. I believe that some of her choice of words can be highly simplified so readers can get a better understanding of her ideas. Farah entails much detail into the text, much like a textbook, but her diction can be simplified. I have a limited neuroscience background and had to look up certain terms that Farah used to fully understand the ideas presented. Another thing that I disliked was that Farah failed to mention any role that neuroplasticity may have in visual cognition. With neuroplasticity being hailed as a scientific breakthrough discovery, I think it would be appropriate to at least mention this in pioneering new ways to learn about visual cognition. Farah seems to emphasize the notion of localization of visual functions within specialized regions of the brain. This book, however, does a great job in describing the evolution of our understanding of visual cognition which may lead to newer and higher frontiers in cognitive science in general.

I have been studying cognitive neuroscience for a few years now, and because it is such a diverse field (and rapidly expanding), keeping up with all of the different sub-disciplines is a Herculean effort. Vision is probably one of the most established and complex disciplines in the cog neuro field, so it's helpful to find a book that aims to summarize it, and does so admirably well. It covers neuropsychology, psychophysics, neurobiology, and neuroimaging. Although this is by no means an authoritative volume (and perhaps could have used color plates for illustration), it serves as a good reference for non-vision scientists, beginning and intermediate students, as well as a refresher for those who may have forgotten some of the basics along the way.

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