

Book Review

There's More to Seeing than Meets the Eye

Humphreys, G.W., & Bruce, V. (1989).

Visual cognition: Computational, experimental and neuropsychological perspectives.

Hove & London: Erlbaum, 352 pp.

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To the uninitiated, a book about vision that barely mentions eyes would seem like an odd beast indeed. Understanding how eyes work, however, has not solved such basic problems in vision as how we recognize shapes, how we know what objects we are looking at or how we recognize faces. These problems, together with the study of how objects and spatial relations are mentally represented in perception and imagery, form the core of a new field called Visual Cognition. This new area has progressed to the point where undergraduate courses (and jobs!) are now offered in Visual Cognition. Humphreys and Bruce's new book, *Visual Cognition: Computational, experimental and neuropsychological perspectives*, is intended as an introduction and overview of the field that would be suitable for use as a text in such courses, as well as for graduate students and researchers.

Recent progress in Visual Cognition has benefited from the interdisciplinary perspective provided by Cognitive Science, and Humphreys and Bruce's book reflects this diversity. Work from each of three perspectives, computational, experimental and neuropsychological, is discussed as it becomes relevant to each topic. The computational approach emphasizes analysis of the goals of a visual system (e.g., recognizing an object or finding one's way around, or catching flies if you are a frog) and the constraints imposed by the way the world works (e.g., how surfaces reflect light). The aim is to specify ways of achieving the goals given the information available, and the resulting models may be implemented on computers to test their performance. This approach has had remarkable success in modelling early visual processes such as edge detection, stereopsis and shape from shading (see Marr, 1982). However, progress on how we recognize what we see, a problem that is at the interface between perception and cognition, has been slower. The

second approach is experimental and includes traditional psychophysical studies of visual processing as well as more recent attempts to determine whether the representations and algorithms proposed in computational models apply to human visual processing. The third approach, Cognitive Neuropsychology, is concerned with how visual processing breaks down following brain damage. Humphreys and Bruce note that each approach has its limitations and they emphasize the value of having converging evidence from different methodologies.

Humphreys and Bruce's book is the second with the title *Visual Cognition*. The first, edited by Steven Pinker, appeared in 1985 and consisted of articles reprinted from a special issue of *Cognition*. Pinker characterised the central issues in Visual Cognition as the recognition of shapes and the mental representation of objects and spatial relations in perception and imagery. Humphreys and Bruce attempt a broader coverage. The chapter headings indicate the areas covered: An introduction to methods for studying visual cognition, Seeing static forms, Visual object recognition, Dynamic aspects of vision (a little on movement perception and a lot on masking effects), Visual attention, Visual memory and imagery, and Visual processing in reading.

For the most part the book is well written and provides a coherent account of the research findings without glossing over problems and inconsistencies. The early chapters on methodology, seeing static forms and recognizing objects are excellent. The coverage of topics such as object recognition and attention is comprehensive and impressively up-to-date. However, not all the chapters are so successful. The final chapter on reading was very dull, possibly because consideration of the visual components of reading in the absence of a linguistic analysis is not very enlightening about either reading or vision. Their conclusion, that different processes are involved in reading and object recognition, is trivially obvious (certainly from a computational perspective), and no hint is given about how a consideration of the differences might be of any theoretical interest.

The treatment of imagery was also disappointing. Imagery research is central to Visual Cognition and generated a major theoretical debate in the 1970s. The question was whether all mental representations are propositions or abstract de-

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scriptions (e.g., Pylyshyn, 1973), or whether some representations (e.g., images) are analogical or intrinsically spatial and bear a less arbitrary relation to what they represent (Shepard, 1978)? Clearly the nature of mental representations is central to the question of how we recognize things. Unfortunately, Humphreys and Bruce adopt the straw person *picture model* of imagery and they present Pylyshyn's arguments against the picture model of imagery without mentioning that no serious imagery researcher (e.g., Finke, Kosslyn, Shepard) adopts such a model and without presenting any of the many convincing counterarguments (see e.g., Kosslyn & Pomerantz, 1977). Their implication that imagery theorists are committed to a physical resemblance interpretation of analogical representations ("Do we really want to explain Paivio's results by saying that our representation of an elephant is physically larger than our representation of a mouse?", Humphreys & Bruce, p209) is a travesty of the imagery position. As Shepard (1978) pointed out early in the debate, images do not represent spatial or other properties by any direct physical resemblance — images of Granny Smiths aren't themselves green or round! The idea that images resemble the objects they represent (the picture model) rapidly gave way to the view that images resemble percepts. Unfortunately the important work that is being done in this central area of Visual Cognition is not discussed (for reviews see Farah, 1988; Finke & Shepard, 1986).

To write the first overview of a new field is surely a difficult task, and although I have detailed some negative aspects, for the most part

the authors succeed in giving an intelligent and intelligible account of the important issues and research findings. As a text, however, it (and others by Erlbaum, e.g., Ellis & Young, 1988) offers none of the extras like chapter outlines, summaries and extra reading lists that make a book more digestible for students. It also has a large number of typos. In its present form, *Visual Cognition* would be more useful as supplementary reading for a traditional Cognition or Perception course that emphasized topics in Visual Cognition, than as the main text of a course. Perhaps a second edition will improve its suitability as an undergraduate text.

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