The mystery of the moon illusion: Exploring size perception by H Ross, C Plug; Oxford University Press, Oxford, 2002, 277 pages, £29.95 (US $50.00) ISBN 0 19 850862 X

The moon illusion is that the horizon moon looks larger than the zenith moon. This is such a startling illusion that for a long time people were sure there was some optical magnification of the horizon moon. When that was disproved, the mystery became how to explain the illusion. Ross and Plug comprehensively review the history and modern work on every theory (I counted 37), but the mystery remains. Ross and Plug note that the moon illusion is just one example of celestial illusions, including larger appearance of the sun and constellations when near the horizon. They review the (defunct) physical explanations of these illusions and also rule out any explanation within the optics of the eyes. They conclude that the explanation must lie within our perceptual systems.

The most popular modern theory is that when the moon is low it is seen as far (from the abundance of cues showing the distance of the horizon), yet when the moon is high it is seen as near (from the dearth of distance cues of the sky). Because the moon has a constant visual angle, it must specify a larger object near the horizon than at zenith. But the major problem with this theory is that people judge the horizon moon as closer than the zenith moon, exactly the opposite of what the theory requires.

Researchers have long assumed that visual angle is sensed directly and accurately, and that size and distance are perceived. Ross and Plug highlight that visual angle is also perceived, and that in the case of the moon illusion it could be misperceived. They recognise that any perceived enlargement of the visual angle of the moon is conditioned by various other factors (such as contrast, luminance, colour, eye position, and observer's posture) adding to or subtracting from the illusion.

The only other recent book on the moon illusion is that edited by Hershenson (1989). Ross and Plug's book is far more scholarly, and has the integrated feel that Hershenson's collection lacked. Ross and Plug's historical research is so comprehensive that they can use historical observers as a separate sample when assessing perceptual facts about the illusion. (Regrettably, most of the historical data seem to demonstrate that one's theory essentially biases one's perceptions, making the reader pleased when Ross and Plug review work using modern experimental techniques with large samples of observers!) Ross and Plug think and write refreshingly clearly. The only minor annoyance is the use of endnotes. Rather than making the text run smoothly, as I suppose was the intention, the endnotes distract from the text as the reader flips to the back of the book to read them, usually to find only citations.

The endnotes make me think that the publisher hoped this book would appeal to people who buy general-interest science books. If so, Ross and Plug will disappoint their publisher, but not readers of Perception. If you want the latest word on the moon illusion, or you want your institutional library to have it, this book is for you.

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Reference
Hershenson M, 1989 The Moon Illusion (Lawrence Erlbaum Associates, Hillsdale, NJ)
These category-specific deficits have become an important locus of discussion of some of the most far-reaching debates in the cognitive sciences: empiricism vs nativism, domain-specificity vs domain-generality, connectionist vs representational theories of mind, and more. This landmark volume presents the state of the art in research on category-specific deficits, and shows how data from these interesting and unusual deficits have been brought to bear on debates about the organisation of knowledge in the brain.

Although category-specific deficits have been known since the 1940s, the current wave of interest was sparked by the work of Warrington and colleagues (Warrington and McCarthy 1983; Warrington and Shallice 1984) showing that the ability to recognise living things could be selectively impaired, leaving recognition of nonliving things intact, and that the inverse dissociation could also occur. From the start, Warrington and colleagues noted that the cleavage between living and nonliving was not perfect: musical instruments and vehicles, for example, sometimes dissociate along with living things. As the present volume shows, however, such anomalies are exceptions that can shed light on the underlying causes of the dissociations.

This volume presents theories of category-specific deficits that come in two basic flavours. These map at least approximately onto two major world views currently prevalent in the cognitive sciences. One kind of theory—what Santos and Caramazza call the domain-specific theory—posits that what manifests itself as a category-specific deficit is the result of damage to some underlying system or systems that are also intrinsically category-specific in nature, ie that treat information about living and nonliving things differently because they were designed to do so. Santos and Caramazza suggest that there may be at least three distinct domains of knowledge, each having evolved because of specific task demands posed over evolutionary history (animals, foods, and tools/artifacts). Several chapters in the volume review developmental, comparative, and clinical data in support of this proposal.

The second kind of theory is what might be called a ‘domain-general’ or ‘byproduct’ theory. Byproduct theories attribute category-specific deficits to impairments of systems that are not, in themselves, category-specific: ie that are not designed to treat exemplars of different categories in systematically different ways. For example, the Warrington and Shallice (1984) ‘sensory/functional’ hypothesis, generally regarded as the standard and perhaps most promising explanation of category-specific deficits, holds that the identification of living things relies more on perceptual information that does the identification of artifacts, for which ‘functional’ information is more important. This difference can result in category-specific impairments even if there is no specific system for each category. In their chapter, Humphreys, Riddoch, and Forde use clinical data to test this idea, as well as the further idea that high degrees of perceptual overlap between living things can result in category-specific deficits when perceptual knowledge systems are impaired, leading to increased inability to differentiate between perceptually similar category members.

It is interesting to note that, at least in this volume, proponents of byproduct theories tend to be more interested in modeling proximate causes of deficits than are proponents of evolutionary, domain-specific theories, who are more interested in ultimate causes. For example, connectionist models and artificial lesion studies are a popular means of demonstrating that deficits can arise even when knowledge is contained in an undifferentiated database, as long as there are correlations between category membership and type of information encoded (questions of ultimate causation, such as why those correlations might exist, whether they originate in the world or in the mind, and why the mind might have evolved to exploit them, are regarded as secondary). Several chapters adopt this modeling approach in interesting and innovative ways. Further chapters explore the issues of brain localisation and the organisation of knowledge in normal cognitive development.

The strengths of the volume lie in its in-depth coverage of the available data on category-specific deficits, including clinical, developmental, cognitive, and comparative perspectives, and in the dialectic nature of the volume, with each chapter presenting data in support of a particular theory while attempting to rule out alternative theories presented in other chapters. One comes away from the volume with a good perspective on the state of the art in category-specific deficit research, with a sense of what is known, and with a sense of the key issues that remain to be resolved. This would be an excellent text for a graduate seminar, and will be important reading for students and researchers in many fields, including perception, neuroscience, cognitive development, evolutionary psychology, and philosophy of mind.
If the volume has a weakness, it is perhaps the lack of a bird's eye view of the category-specificity debate from the perspective of cognitive science in general. Many of the chapters discuss the philosophical issues raised by category-specific deficits, but often in terms internal to the debate itself. This focus on the trees at the expense of the forest is a missed opportunity, for within this debate we see, in microcosm, the debates with which the entire field of psychology is struggling: How much ‘specialised machinery’ does the mind contain? How much of the mind’s content comes from the world, and how much from the design of the mind itself? And perhaps most importantly, when faced with empirical data about cognitive processes, what counts as the most parsimonious explanation of it?

With regard to the last question, no matter how it turns out, the debate over category-specific deficits will make an interesting case study for future historians of science. In their preface, Forde and Humphreys remark: “[The hypothesis] that category-specific impairments emerge after brain damage because we have separate category-specific recognition systems in brain and mind ... is arguably the most intuitive and parsimonious explanation for these cases” (p.xviii). In contrast, Farah et al (1996) have called the same explanation an “a priori implausible hypothesis” (although their data, in that paper, favoured it). We are reaching a state where modeling is sophisticated enough to account for almost any data, and we are left to decide between models on the basis of what seems most ‘believable’, where believability is cashed out in raw intuition. Presumably, the a priori implausibility to which Farah et al refer has to do with the idea that anything as specialised as a living/nonliving distinction could have evolved. To the intuition of an evolutionist, there is nothing implausible about this at all. Indeed, the opposite is true: that there should exist no specialised machinery that allows an organism to reliably distinguish between a rock, a conspecific, and a predator seems unlikely. In this debate as elsewhere in the cognitive sciences, one side's domain-genericity is the other side's evidence of design. To an evolutionist, for example, the loss of the ability to recognise vehicles along with living things makes sense because any system designed to systematically pick out living things in the world must utilise cues that reliably distinguished such items from others in ancestral environments, and objects (such as cars) that happen to possess such cues will therefore be systematically picked out by mistake. To an empiricist, this same evidence suggests that the underlying system cannot be specialised for living things, because it lumps cars and living things together. The debate over face recognition reflects a parallel struggle over the same issues, with face-like effects for non-face stimuli in cognitive tasks and localisation studies being interpreted differently by proponents of ‘general-purpose’ and ‘special-purpose’ theories (see, eg, Gauthier et al 2000; Kanwisher 2000). As always, parsimony is a matter of theory-laden perception, and the reader of this volume will experience many a Necker-cube-like flip. Although it remains to be seen which configuration of the cube will end up being the stable one, one hopes that phenomena such as category-specific deficits will force us to rethink what we mean by ‘parsimony’ in the cognitive sciences, and perhaps to see that ultimate and proximate explanations need not always conflict.

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All books for review should be sent to the publishers marked for the attention of the reviews editor. Inclusion in the list of books received does not preclude a full review.
