In Brief

Remembering what wasn't there…

Human memory is neither a camera nor a tape recorder – almost everyone has imagined 'remembering' something that never took place, and when witnesses do so in court, problems arise. Work on so-called false memories has shown that when people are asked to think of common objects, but without being shown a picture of them, they sometimes later falsely remember seeing a picture. In recent work using event-related potentials to study brain activity associated with false memories, Gonsalves and Paller presented names of objects with or without corresponding images [Gonsavles, B. and Paller, K.A. (2000) *Nat. Neurosci.* 3, 1316–1321]. In a subsequent test, subjects had to recall whether the name was accompanied by a picture. When no picture was presented during the memorization phase, brain activation in occipital and parietal cortex was higher when subjects later misremembered having seen a picture. Because these brain areas are associated both with visual perception and visual mental imagery, these findings lend credence to the notion that confusion between mental and visual images can lead to false visual memories. *MW*

Logical learning

How do we generalize from just a few examples? The problem of inductive learning, which has fascinated philosophers from David Hume to Nelson Goodman, is also an important question in experimental psychology and artificial intelligence. Empirical work on human learning of 'Boolean concepts' (logical combinations of true/false variables) has shown that some concepts are much more difficult to learn than others. Some studies have shown that concepts involving 'OR' are harder than ones involving 'AND' relationships, and other studies have shown that relationships such as 'XOR' (exclusive OR) are the hardest of all. A recent model put forward by Feldman [Nature (2000) 407, 630–633] not only elegantly systematizes these past results, but also makes predictions that have been experimentally confirmed. Feldman proposes that Boolean complexity is one variable responsible for learning difficulty – defined as the length of the shortest logical expression equivalent to the concept. Together with a second variable, 'parity', complexity correlates with a significant fraction of human learning performance on a vast array of multi-variable Boolean concepts, many of which have never been studied before. *MW*

2001 – A Controversy

The Royal Institution Christmas Lecture, intended to promote public awareness of science, is not an obvious source of controversy. Yet this year the millennial predictions of cybernetics professor Kevin Warwick (Reading University, UK) thrust the Lecture into the media limelight. The controversy centres on Warwick's vision of a robotic future in which humans play second fiddle to their machine 'successors'. Furthermore, he believes that this development is to be welcomed! Not surprisingly, some researchers in artificial intelligence have expressed misgivings about these views. In particular the Society for the Study of Artificial Intelligence and the Simulation of Behaviour (SSAISB) believes that Warwick ignores significant remaining problems in the quest to build intelligence and emotion, and to simulate humanlike behaviour in machines, and says that his view is in marked contrast to the consensus. Their opinion was expressed in *The Times Higher Educational Supplement* (22nd/29th December 2000) after the Royal Institution received a number of complaints from the AI community about the planned Christmas Lecture. Undaunted by his critics, Warwick believes that machines exhibit their own distinct form of intelligence and that people and machines are bound to merge – at least partially – to form 'cyborgs'. Indeed, he is planning to lead the way personally by receiving an electronic brain implant that will allow direct communication between his nervous system and computers. Meanwhile, the debate is set to continue with the SSAISB planning a conference on emotion, creativity, consciousness and society with the aim of restoring a view that balances, as they see it, the potential of computers and robots with their limitations. *DPB*

Bottom-up or top-down?

A key neurocognitive question concerns the relationship between 'higher' and 'lower' brain areas. The prevailing view is that lower areas, such as primary visual cortex, filter information about aspects of the visual scene and higher areas, such as inferotemporal cortex, integrate this information. Ahisaar and Hochstein, however, propose precisely the opposite scheme [presented at the 4th Annual Meeting of the Psychonomic Society, New Orleans. 12–16 November 2000; and *Vis. Res.* (2000) 40, 1349–1364]. Based on visual search experiments, their theory states that higher areas conduct an initial analysis over a large region of visual space. When specific, fine-grained information is required, higher areas use primary visual cortex as a 'look up table' to find the information they require. In other words, lower areas do not send undifferentiated signals to secondary cortex but, rather, higher areas decide what they want from lower areas. This 'reverse-hierarchy theory' explains some confusing learning effects. Some types of visual learning , but not all, generalize to other parts of the visual field. Ahissar and Hochstein propose that the extent of generalization reflects the cortical level at which learning occurred. The role of attention in learning and search therefore needs to be reconsidered – attention might not select *locations* in visual space but instead select the spatial scale (and thus the cortical level) at which learning occurs. *HJB*

The contours of reality

Ever since Gestalt psychologists asked how the human visual system organizes the retinal image into a coherent perception of reality, vision researchers have studied one of the most fundamental aspects of perceptual organization: grouping of points of light into whole objects. Classically, grouping has been thought to occur 'early' in the stream of visual processing, associating picture elements by low-level properties such as two-dimensional orientation and shape. However, Palmer and Nelson have recently shown that grouping can occur later [*Percept. Psychophys.* (2000) 62, 1321–1331] and takes into account higher-level features, such as illusory contours (like those in the well-known Kanisza triangle). When the same display could be grouped differently by low- and high-level features, observers relied more often on the high-level features – which, paradoxically, were not immediately present in the image but had to be computed by the visual system at an earlier stage. *MW*

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