Perceptions of knowledge

Richard L. Gregory

iving organisms are leaky test tubes of reactions. Almost isolated from the rest of the Universe, they receive limited information for adaptive behaviour, prediction and planning. The 'proximal' senses of taste and smell directly monitor chemical interchanges, and touch detects contact and damage. But the 'distance' senses of vision and hearing are very different. They provide only indirect knowledge of what matters requiring interpretations from knowledge and assumptions, so you can read meaning into the object world.

One cannot eat, or be eaten, by the optical images in eyes. Images are useless shadows of objects until their significance is read. This process is so complex that even the most advanced artificial-intelligence computer programs are far from replicating it. Reading objects from images requires knowledge of the world of solid, interacting things. When this knowledge is not appropriate, the eyes' images may be misread, giving 'cognitive' illusions. An example is distortion in pictures that show depth by perspective. Our response to



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perspective shrinking means our brains expand features represented as distant to about the correct size, even though they lie flat on the picture plane. When the visual scaling is inappropriate, distortions are generated.

The knowledge we use when we see has come from millions of years of interacting with objects. At first, lessons of survival, such as reflex behaviour, were stored in and inherited from the genetic code. Then knowledge was gained individually, largely by pseudopodiato-hands-on exploration. As knowledge is so important, tricks of camouflage and deceit became potent biological weapons. Surely science is itself a remarkable extension of millions of years of discovery, making new sense of sensory signals. With added data from instruments, science develops general concepts that are extremely different from ancient objectknowledge. So we live in two worlds - perceptions of experience alongside conceptions of understanding - both based on knowledge and assumptions that may be wrong.

It is not easy to define 'illusion'. Illusions are departures from truths of the object world: but how can we know what these are? There are very different claims of truth by science, art, religions and the many flavours of metaphysics. Which should we accept as reference reality for recognizing illusions? Science has changed its concepts of reality many times, and science's realities grow ever further from how things appear. So we may be tempted to think of all perception as illusion. But this is no more helpful than claiming that reality is a dream — when the word 'dream' loses any meaning, and so does 'illusion'.

The familiar visual illusions in children's books and psychology texts are departures from simple measurements of lengths, curvatures and so on, of the common-sense world of appearances. Let's call this common-sense reality 'kitchen physics'. Illusions are measured by matching appearances against this common-sense 'kitchen' world, using rulers, scales, thermometers, clocks and so on, as found in kitchens. There is no reference to concepts of

physics for defining these illusions. Yet no doubt quantum physics is essential for understanding cooking.

The main lesson of illusions is that perceptions are not tied to object reality. Perceptions are guesses — predictive hypotheses — of what may be out there. They are our most intimate reality; yet as for any hypotheses, they may be wrong — especially when based on false assumptions, or generated by misleading procedures, when even visual paradoxes can be created.

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Illusion

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There are not only qualitative illusions, such as distortions, but also qualitative phenomena: especially objects spontaneously transformed into other objects, such as ducks turning into rabbits. Alternative visual hypotheses are entertained, in turn, when the brain seeks a better answer. The alternative perceptions are drawn from the inner scene of the brain; so these dynamic ambiguities reveal something of mind. They are indeed insights.

The main illusions can be classified as ambiguities, distortions, paradoxes and fictions. Perhaps these correspond to errors of language, for language might have developed from pre-human perceptual classifications of objects and actions. Could this be the 'deep structure' of language — perceptions by past species, of lost worlds, lying deep in our vision and speech today? No wonder things look confusing if our mental maps are millions of years out of date.

Laboratories of perception and illusion are familiar - as kitchens. A kitchen produces chemical reactions designed to evoke sensations and control consciousness in others as well as oneself. Measurements with kitchen instruments show a wealth of illusions. Small containers feel heavier than larger ones of the same-scale weight (with larger objects the muscles are set in expectation of a heavier weight). Some odd-shaped bottles appear to contain a greater volume. Colours affect taste. Strong tastes and smells adapt the tongue and nose so sensations change. Isn't the taste of wine affected by price? These everyday phenomena add greatly to our perceptions, though they are but illusions.

Science studies perception and illusion with methods of psycho-physics, which are more rigorous, but less varied, than cooking. Although lacking concepts of science, the cook has intimate knowledge of puzzles of mind and matter — mysteries lying in the hyphen between psycho and physics — where illusion reigns supreme. *Richard L. Gregory, Emeritus Professor of Neuropsychology, Department of Experimental Psychology, University of Bristol, Bristol BS8 1TN, UK.*

FURTHER READING

Gregory, R. L. *Eye and Brain: The Psychology of Seeing* 5th edn (Oxford Univ. Press, 1997). Gombrich, E. H. *Art and Illusion: A Study in the Psychology of Pictorial Representation* (Phaidon, London, 1960).