

Our useful inability to see reality

There's some deviant thinking behind perception, discovers **Douwe Draaisma**.

Enlightenment thinker John Locke (1632–1704) held that the human mind is a blank slate at birth, ready to be written over by sensory experience. Over the centuries, this idea of information flowing 'outside in' has lost much of its appeal, with experiments making it clear that perception involves dozens of mechanisms, actively shaping stimuli rather than passively receiving them.

In *Deviate*, neuroscientist Beau Lotto presents a complete reversal of the Lockean stance. To him, it is the human mind that imposes meaning on our perceptions: the true blank slate is the outside world. Even more provocative is his argument that we operate with versions of reality that have literally nothing to do with what is 'out there' in a physical sense. In an entertaining series of analyses, demonstrations and reflections, he drives home the point that perception, broadly taken, is not what our eyes and ears tell us; it is what our brain makes us see and hear.

This is a radical philosophy of perception. It raises an intriguing question about the evolutionary history of our perceptual apparatus. If evolution is truly "the most rigorous, exhaustive research and development and product-testing process on our planet", as Lotto has it, then to survive at all, surely our senses must have given our ancestors and us a trustworthy representation of reality? Lotto's answer is an emphatic no: "We don't see reality — we only see what was useful to see in the past." Much like a London Underground map, our perceptual brain doesn't offer an accurate spatial representation; rather, it helps us to navigate in a safe and efficient way.

So, visual illusions — such as the Moon looking larger when it is closer to the horizon — aren't really illusions if our perceptual apparatus didn't evolve to see actual spatial relationships. Tellingly, machines devised to recognize visual patterns are also susceptible to illusions when they are programmed in a way that emulates the structure of the human brain.

Deviate is not your conventional handbook of perception. It has little on the anatomy of the eye or mechanisms of hearing. The senses are like the keyboard of a computer: they provide access, and the real job is done elsewhere. Lotto

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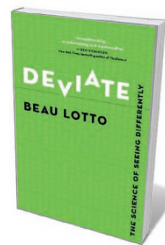
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Seeing isn't necessarily believing.

points out that for each neural connection that projects information from the eyes to the primary visual fields in the occipital lobes at the back of the brain, there are ten connections back from the brain to the eyes. Moreover, the neural networks that make sense of what we 'see' are fed by a relatively small stream of information from the eyes. About 90% comes from other parts of the brain, allowing us to recognize faces, identify danger or read a sentence such as 'W at ar ou rea in ?' despite the omitted letters. That you probably didn't read that as 'What are you dreaming?' is the result of priming your attention to a context of reading. What enters the eye is often an insignificant part of the story.

These networks provide the brain with flexibility and — in cases of blindness or



Deviate: The Science of Seeing Differently
BEAU LOTTO
Hachette: 2017.

deafness — with compensation. Lotto mentions, for instance, the late Ben Underwood, a blind US teenager who used echolocation, clicking his tongue and using the echoes of the sound to navigate, and even to cycle and play sports.

Lotto's idea that perception includes a multitude of assumptions, built-in or learnt, allows him to take on board a range of subjects not usually associated with the topic. For instance, confirmation bias — noticing evidence that affirms one's world view, but disregarding contradictory evidence — is conventionally taken to be a cognitive phenomenon. Like hindsight bias, it contributes to preconceived ideas that keep us locked into a narrow perspective on our personal and social reality. This is why the book is called *Deviate*, and Lotto has inspiring things to say about discoveries and acts of creativity resulting from 'deviant' ways of thinking.

Deciphering the Rosetta Stone is a case in point. Comparing the stone's trilingual scripts in the nineteenth century, Jean-François Champollion unlocked the code of Egyptian hieroglyphs by hypothesizing that they were not symbolic characters representing concepts, but instead referred to the phonetic sounds of a spoken language (A. Robinson *Nature* **483**, 27–28; 2012).

With Lotto's pervasive evolutionary perspective comes a lot of fight or flight, adapt or die, and escaping from predators. It leaves the reader wondering whether there could be any perception — aesthetic pleasures such as listening to music — not in the service of survival. At times, Lotto seems to overstate his case, for instance when he writes that Igor Stravinsky reshaped "the cortex of culture" by composing the ballet *The Rite of Spring*.

Towards the end, *Deviate* begins to take an unusually broad view of perception, including discussions of the Ebola epidemic, religion, the financial crisis, the salutary effects of living abroad, government policy towards universities and the need for new concepts of leadership. Lotto's neuroscience tends to the expansive. Still, his discussions are balanced by many astute observations, such as: "Our species has been so successful not in spite of our inability to see reality but because of it." ■

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