Art Knows What Science Finds Out

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On magic tricks and the science of perception:

In a paper published last week in the journal Nature Reviews Neuroscience, a team of brain scientists and prominent magicians described how magic tricks, both simple and spectacular, take advantage of glitches in how the brain constructs a model of the outside world from moment to moment, or what we think of as objective reality.

For the magicians, including The Great Tomson (John Thompson), Mac King, James Randi, and Teller of Penn and Teller, the collaboration provided scientific validation, as well as a few new ideas.

For the scientists, Susanna Martinez-Conde and Stephen Macknik of the Barrow Neurological Institute in Phoenix, it raised hope that magic could accelerate research into perception. “Here’s this art form going back perhaps to ancient Egypt, and basically the neuroscience community had been unaware” of its direct application to the study of perception, Dr. Martinez-Conde said.

“It’s a marvelous passer,” Michael Bach, a vision scientist at Freiburg University in Germany who was not involved in the work, said in an e-mail massage. Magicians hold what the brain perceives by manipulating how it interprets scenes, Dr. Bach said, “and a distant goal of cognitive psychology would be to numerically predict this.”

One theory of perception, for instance, holds that the brain builds representations of the world, moment to moment, using the senses to provide clues that are fleshed out into a mental picture based on experience and context. The brain uses neural tricks to do this: approximating, cutting corners, instantaneously and subconsciously choosing what to “see” and what to let pass, neuroscientists say. Magic exposes the insides, the neural stitching in the perceptual curtain.

Some simple magical illusions are due to relatively straightforward biological limitations. Consider spoon bending. Any 7-year-old can fool her younger brother by holding the neck of a spoon and rapidly tilting it back and forth, like a mini teeter-totter gone haywire. The spoon appears curved, because of cells in the visual cortex called end-stopped neurons, which perceive both motion and the boundaries of objects, the authors write. The end-stopped neurons respond differently from other motion-sensing cells, and this slight differential warps the estimation of where the edges of the spoon are.

The visual cortex is attentive to sudden changes in the environment, both when something new appears and when something disappears. Dr. Martinez-Conde said. A sudden disappearance causes what neuroscientists call an after-discharge: a ghostly image of the object lingers for a moment.

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