+ Magicians Help Accelerate Research Into Perception

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Distractions that grab the eye — in order to mask a palmed card or coin, for example — are the crudest way to exploit brain processes. Those processes, in fact, allow for more subtle manipulations, and experienced magicians are aware of them, according to Benedict Carey's "Science Times" article on a new research study.

A recently published paper in the journal Nature Reviews Neuroscience was the project of a team of brain scientists and prominent magicians. It describes 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. What we think of as objective reality is often built on dodgy information.

The magicians included The Great Tomsoni, Mac King, James Randi, and Teller (of Penn and Teller), as well as others.

The researchers, Susana Martinez-Conde and Stephen Macknik of the Barrow Neurological Institute in Phoenix, say the study raises hope that magic might accelerate research into perception.

"Here's this art form going back perhaps to ancient Egypt," says Dr Martinez-Conde, and the neuroscience community has been unaware of its direct application to the study of perception.

According to Michael Bach, a vision scientist at Freiburg University in Germany who was not involved, "It's a marvelous paper." Magicians alter what the brain perceives by manipulating how it interprets scenes. "A distant goal of cognitive psychology would be to numerically predict this."

For example, one theory of perception holds that the brain builds representations of the world moment to moment using the senses to provide clues. These clues are then 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. Magic exposes the inseams — the "neural stitching in the perceptual curtain," writes Carey. He continues:

> Some simple magical illusions are due to relatively straightforward biological limitations. 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 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.

Attentive to sudden changes in the environment, both when something new appears and when it disappears, the visual cortex experiences an after-discharge when something suddenly disappears, and a ghostly image lingers for a moment.

The Great Tomsoni takes advantage of this in a spectacular trick. He has an assistant appear on stage in a white dress. He tells the audience he will magically change the color of her dress to red.

First, he does this by shining a red light on her, an obvious ploy that he treats as a joke. But then the red light flicks off, the house lights go up and the woman's dress is now indeed red!

The secret: in the split second after the red light goes off, the red image lingers in the audience's brains for about 100 milliseconds, covering the image of the woman. This is just enough time for the white dress to be stripped away, revealing a red one underneath.

Drs Martinez and Macknik once hosted a conference in Las Vegas, at which pickpocket performer and co-author Apollo Robbins took advantage of a similar effect on the sensory nerves of the wrist.

A man in the audience came up on stage and while bantering with Robbins, lost possession of his wristwatch, his wallet and several other items. At one point, just before slipping off the timepiece, Mr Robbins clutched the man's hand while doing a coin trick — lowering the sensory threshold on the wrist.

[The paper, with links to videos of Mr Robbins's performance is at **http://www.nature.com/nrn/journal/vaop/ncurrent/full/nrn2473.html**.]

Dr Bach was in the audience, and called the trick neat, as well as new to him. The grasp, he said, left "a sort of somatosensory afterimage, so that the loss of the watch stays subthreshold" in the victim.

And the visual cortex resolves clearly only what is at the center of vision; the periphery is blurred, and this is likely one reason the eyes are always in motion — to gather snapshots to construct a wider, coherent picture.

Similarly, for cognition: the brain focuses conscious attention on one thing at a time, regardless of where they eyes are pointing. In imaging studies, neuroscientists have found evidence that the brain suppresses activity in surrounding visual areas when concentrating on a specific task. Preoccupied in this way, the brain may not consciously register actions witnessed by the eyes.

Magicians have many ways of exploiting this property. Jokes, stagecraft and drama can hold and direct thoughts and attention away from what the hand is doing.

Even small, apparently trivial movements can mask breathtaking maneuvers. Teller explains how a magician might get rid of a card palmed in his right hand by quickly searching his pockes for a pencil. "I pat both pockets, find a pencil, reach out and hand it to someone, and the whole act becomes incidental; if the audience is made to read intention — getting the pencil, in this case — then that action disappears, and no one remembers you put your hand in your pocket.

"You don't really see it, because it's not a figure anymore, it has become part of the background."

So the magician's skill becomes the ability to frame relevant maneuvers as trivial. Done poorly, says Teller, "the actions immediately become suspicious, and you instantly click that something's wrong."

David Blaine is a magician and performance artist who started doing magic at the age of four. He quickly learned that he didn't need any drama or special effects.

"A strong and effective way to distract somebody is to directly engage the person" with eye contact or other interaction, he says. "That can act on the subconscious like a subtle form of hypnosis."

sole source: Benedict Carey's 8/12/08 article in Science Times (which is found every Tuesday in the New York Times). ***www.nytimes.com***

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