Brave Futures: Illusion

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May 11, 2009

Magic and the Brain: Teller Reveals the Neuroscience of Illusion

One of the first tricks in Penn and Teller's Las Vegas show begins when Teller—the short, quiet one—strolls onstage with a lit cigarette, inhales, drops it to the floor, and stamps it out. Then he takes another cigarette from his suit pocket and lights it.

No magic there, right? But then Teller pivots so the audience can see him from the other side. He goes through the same set of motions, except this time everything is different: Much of what just transpired, the audience now perceives, was a charade, a carefully orchestrated stack of lies. He doesn't stamp out the first cigarette—he palms it, then puts it in his ear. There is no second cigarette; it's a pencil stub. The smoke from the first butt is real, but the lighter used on the pencil is actually a flashlight. Yet the illusion is executed so perfectly that every step looks real, even when you're shown that it is not.

Penn and Teller demonstrate the seven basic principles of magic.

The trick is called Looks Simple, and the point is that even a puff on a cigarette, closely examined, can disintegrate into smoke and mirrors. "People take reality for granted," Teller says shortly before stepping onstage. "Reality seems so simple. We just open our eyes and there it is. But that doesn't mean it is simple."

For Teller (that's his full legal name), magic is more than entertainment. He wants his tricks to reveal the everyday fraud of perception so that people become aware of the tension between what is and what seems to be. Our brains don't see everything—the world is too big, too full of stimuli. So the brain takes shortcuts, constructing a picture of reality with relatively simple algorithms for what things are supposed to look like. Magicians capitalize on those rules. "Every time you perform a magic trick, you're engaging in experimental psychology," Teller says. "If the audience asks, 'How the hell did he do that?' then the experiment was successful. I've exploited the efficiencies of your mind."

Now that on-the-job experimentation has taken an academic turn. A couple of years ago, Teller joined a coterie of illusionists and tricksters recruited by Stephen Macknik and Susana Martinez-Conde, researchers at the Barrow Neurological Institute in Phoenix, Arizona, to look at the neuroscience of magic. Last summer, that work culminated in an article for the journal Nature Reviews Neuroscience called "Attention and Awareness in Stage Magic." Teller was one of the coauthors, and its publication was a signal event in a field some researchers are calling magicology, the mining of stage illusions for insights into brain function.

"Tricks work only because magicians know, at an intuitive level, how we look at the world," says Macknik, lead author of the paper. "Even when we know we're going to be tricked, we still can't see it, which suggests that magicians are fooling the mind at a very deep level." By reverse-engineering these deceptions, Macknik hopes to illuminate the mental loopholes that make us see a woman get sawed in half or a rabbit appear out of thin air even when we know such stuff is impossible.

"Magicians were taking advantage of these cognitive illusions long before any scientist identified them," Martinez-Conde says.

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