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# Science and Magic: After Years Apart, Together Again

Written by Elijah Wolfson | Published on February 12, 2013

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A new study outlines the connection between science and magic, exploring how magic may help us better understand the way the human mind works.



Over the years, the line between science and magic has blurred, expanded, contracted, distended, faded, and grown again. There was a time when the world's greatest scientists studied occult philosophies and Magicks—the alchemists of early Mediterranean and Western cultures and the shamans of Asia and the Americas.

Even with the advent of the Scientific Revolution, the relationship between these two fields remained strong. As Brian Schwartz, Professor of Physics and Director of the New Media Lab at City University of New York wrote in 2004, "It was a time when Science was Magic and in many cases it seemed that Magic was Science." Inventors like Tesla, Edison, and the Wright Brothers were doing the impossible: lighting the dark, flying through the air, and bending laws of physics that were heretofore unbreakable.

And, "at the turn of the 20th century, magicians were the most revered performers in the world," said Stephen Macknick, Director of the Laboratory of Behavioral Neurophysiology at Barrow Neurological Institute. After all, the world suddenly seemed magical—why shouldn't there be a truly magical few? The world was one of wonder.

As technology became commonplace in households worldwide and entertainment shifted from the stage to the screen, magicians have become less of a cultural force. But that doesn't mean there's nothing to be gleaned from the ancient art.

## The Hidden Wisdom of Magic

Macknick, together with his wife and writing partner Susana Martinez-Conde (also a neuroscientist), has been studying how science and magic intersect. Macknick and Martinez-Conde are jump-starting their research with help from the top artists in the field, such as blockbuster illusionists [Penn and Teller](#), self-proclaimed "Gentleman Thief" [Apollo Robbins](#) (one of the world's premier pickpockets), and comedy magician [Mac King](#).

"[Magicians] have been working for thousands of years," Macknick explained. "The field of cognitive neuroscience is only 30 or 40 years old."

By studying how our brains react to magic tricks, Macknick and Martinez-Conde have already discovered some interesting tidbits. For example, the duo provided evidence to support [Robbins' observation](#) that an object making a curved motion is more likely to trick or misdirect an observer than one moving in a straight line.

In 2008, the researchers joined forces with Robbins, Teller, and King to create a manifesto for how stage magic might help "elucidate the underpinnings of cognition." It was subsequently published in [Nature Reviews Neuroscience](#).

However, Macknick's [latest study](#) is something of an about-face. "Magicians felt that they had been contributing to science, but there hasn't been a two way flow of information," said Macknick. So, instead of looking at how magicians might help scientists, Teller and the neuroscientists looked at how researchers might aid magicians.

## Dissecting the Oldest Trick in the Book

Teller asked the neuroscientists to help test his theory about what may be the world's oldest magic trick: the "balls and cups" illusion. In a [2010 performance](#) of the trick, Penn and Teller (well, Penn, since Teller is silent during performances) explained that they have seen it done in every corner of the world and that there are, according to the researchers, "documented descriptions [of the trick] going back to

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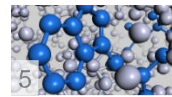
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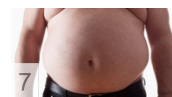
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The trick varies, but is basically this: There are three cups and up to three balls. The magician makes the balls move, magically, from cup to cup, disappear from cups and turn up elsewhere, turn into other objects, and so on. A lot of misdirection goes into the trick, to distract the viewer and keep him or her from tracking where the balls are at any given time.

Teller's theory was that a type of misdirection he devised—putting the ball on top of a turned-over cup, then tipping the cup so that it would fall off the table and presumably to the floor—would distract the viewer better than any other. So, the scientists filmed the trick six times, each time using a different misdirection maneuver:

1. The standard maneuver, in which the ball is dropped into the magician's hand
2. The standard maneuver, but with no ball actually there
3. The ball placed on the table, then surreptitiously moved to the magician's pocket
4. The ball lifted into the air, then placed in the pocket
5. The ball dropped to the floor (this was Teller's new version)
6. The ball “magically” stuck to the inside of the cup

It turns out that Teller was wrong—the falling ball was actually less tricky (i.e. distracted the viewers' gaze less effectively) than some other versions. Presumably, Teller can now hone the trick so that it better fools the average viewer.

## Watch My Eyes...No, My Hands...Anything but the Ball

More interesting, perhaps, was the additional variable the researchers threw into the mix: They also tested whether seeing Teller's face would affect how well the trick fooled viewers. The belief among many magicians, Macknick said, is that a key to success is using your gaze to direct the gaze of the audience. Macknick called this “joint attention,” and he believes it is an essential survival skill. “It's how children, for example, first interact with their parents,” he said.

But it doesn't work quite the way magicians think. In this study (and in other studies Macknick has undertaken), hiding Teller's face didn't change the viewer's ability to follow the underlying mechanics of a trick. Macknick believes that “what is important is what they are doing with their hands. We have a model in our heads about how other bodies work and we are constantly trying to figure out what bodies around us are doing.”

It's more complicated than just following hand movements, though. If you've ever seen a magic show, you know that half of any illusion is the entertainment—the patter, the humor, and the “wow” factor. In one trick, Teller threatens to throw a rabbit into a wood chipper. The audience shrieks, howls, and distracts itself, and, as a result, he can “get away with magical murder,” said Macknick.

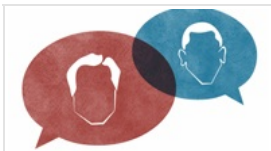
That's the next deck of cards the neuroscientists will rifle through. “We are starting to look at manipulating emotions and suppressing attention,” said Macknick—two things that magicians, it turns out, are experts at. This is just Macknick and Martinez-Conde's third paper on the subject, and they believe there are decades of research ahead of them. In the meanwhile, don't take your eye off the ball.

## Learn More:

- Read Macknick and Martinez-Conde's book, [Sleights of Mind](#)
- [The Importance of Mental Fitness](#)
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