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Neuroscience and Illusion

Posted by **The Situationist Staff** on May 4, 2009

magic

Laura Sanders recently wrote an interesting article, titled "SPECIALIS REVELIO! It's not magic, it's neuroscience," in *ScienceNews*. Here are some excerpts.

* * *

Skill in manipulating people's perceptions has earned magicians a new group of spellbound fans: Scientists seeking to learn how the eyes and brain perceive — or don't perceive — reality.

"The interest for magic has been there for a long time," says **Gustav Kuhn**, a neuroscientist at Durham University in England and former performing magician. "What is new is that we have all these techniques to get a better idea of the inner workings of these principles."

A recent brain imaging study by Kuhn and his colleagues revealed which regions of the brain are active when people watch a magician do something impossible, such as make a coin disappear. Another research group's work on monkeys suggests that two separate kinds of brain cells are critical to visual attention. One group of cells enhances focus on what a person is paying attention to, and the other actively represses interest in everything else. A magician's real trick, then, may lie in coaxing the suppressing brain cells so that a spectator ignores the performer's actions precisely when and where required.

Using magic to understand attention and consciousness could have applications in education and medicine, including work on attention impairments.

Imaging the impossible

Kuhn and his collaborators performed brain scans while subjects watched videos of real magicians performing tricks, including coins that disappear and cigarettes that are torn and miraculously put back together. Volunteers in a control group watched videos in which no magic happened (the cigarette remained torn), or in which something surprising, but not magical, took place (the magician used the cigarette to comb his hair). Including the surprise condition allows researchers to separate the effects of witnessing a magic trick from those of the unexpected.

In terms of brain activity patterns, watching a magic trick was clearly different from watching a surprising event. Researchers saw a "striking" level of activity solely in the left hemisphere only when participants watched a magic trick, Kuhn says. Such a clear hemisphere separation is unusual, he adds, and may represent the brain's attempt to reconcile the conflict between what is witnessed and what is thought possible. The two brain regions activated in the left hemisphere — the dorsolateral prefrontal cortex and the anterior cingulate cortex — are thought to be important for both detecting and resolving these types of conflicts.

Masters of suppression

Exactly how the brain attends to one thing and ignores another has been mysterious. **Jose-Manuel Alonso** of the SUNY State College of Optometry in New York City thinks that the answer may lie in brain cells that actively suppress information deemed irrelevant by the brain. These cells are just as important, if not more so, than cells that enhance attention on a particular thing, says Alonso. "And that is a very new idea . . . . When you focus your attention very hard at a certain point to detect something, two things happen: Your attention to that thing increases, and your attention to everything else decreases."

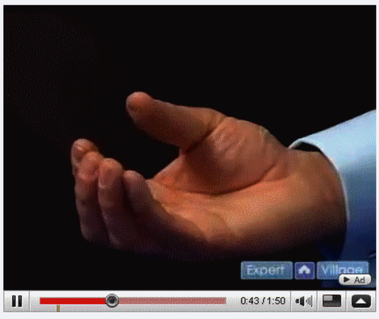
Alonso and his colleagues recently identified a select group of brain cells in monkeys that cause the brain to "freeze the world" by blocking out all irrelevant signals and allowing the brain to focus on one paramount task. Counter to what others had predicted, the team found that the brain cells that enhance attention are distinct from those that suppress attention. Published in the August 2008 Nature Neuroscience, the study showed that these brain cells can't switch jobs depending on where the focus is — a finding Alonso calls "a total surprise."

The work also shows that as a task gets more difficult, both the enhancement of essential information and suppression of nonessential information intensify. As a monkey tried to detect quicker, more subtle changes in the color of an object, both types of cells grew more active.

Alonso says magicians can "attract your attention with something very powerful, and create a huge suppression in regions to make you blind." In the magic world, "the more interest [magicians] manage to draw, the stronger the suppression that they will get."

Looking but not seeing

In the French Drop trick [see video below], a magician holds a coin in the left hand and pretends to pass the coin to the right hand, which remains empty. "What's critical is that the magician looks at the empty hand. He pays riveted attention to the hand that is empty," researcher Stephen Macknik says.



Several experiments have now shown that people can stare directly at something and not see it. For a study published in Current Biology in 2006, Kuhn and his colleagues tracked where people gazed as they watched a magician throw a ball into the air several times. On the last throw, the magician only pretended to toss the ball. Still, spectators claimed to have seen the ball launch and then miraculously disappear in midair. But here's the trick: In most cases, subjects kept their eyes on the magician's face. Only when the ball was actually at the top part of the screen did participants look there. Yet the brain perceived the ball in the air, overriding the actual visual information.

Daniel Simons of the University of Illinois at Urbana-Champaign and his colleagues asked whether more perceptive people succumb less easily to inattentional blindness, which is when a person doesn't perceive something because the mind, not the eyes, wanders. In a paper in the April *Psychonomic Bulletin & Review*, the researchers report that people who are very good at paying attention had no advantage in performing a visual task that required noticing something unexpected. Task difficulty was what mattered. Few participants could spot a more subtle change, while most could spot an easy one. The results suggest that magicians may be tapping in to some universal property of the human brain.

"We're good at focusing attention," says Simons. "It's what the visual system was built to do." Inattentional blindness, he says, is a by-product, a necessary consequence, of our visual system allowing us to focus intently on a scene.

Magical experiments

Martinez-Conde and Macknik plan to study the effects of laughter on attention. Magicians have the audience in stitches throughout a performance. When the audience is laughing, the magician has the opportunity to act unnoticed. Understanding how emotional states can affect perception and attention may lead to more effective ways to treat people who have attention problems. "Scientifically, that can tell us a lot about the interaction between emotion and attention, of both the normally functioning brain and what happens in a diseased state," says Martinez-Conde.

He expects that the study of consciousness and the mind will benefit enormously from teaming up with magicians. "We're just at the beginning," Macknik says. "It's been very gratifying so far, but it's only going to get better."

* * *

You can read the entire article here. For some related Situationist posts, see "Brain Magic," "Magic is in the Mind," and "The Situation of Illusion" or click here for a collection of posts on illusion.

Possibly related posts: (automatically generated)

- Magic is in the Mind
- Subliminal Ads on the Brain
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1. *Mediation Channel » Mediation Channel Round-up: Good Stuff Online For Mediators And Negotiators* said

   May 4, 2009 at 3:42 pm

   [...] and illusion: using magic to understand attention, consciousness in this article via The Situationist, which wonders elsewhere whether major league baseball can deter [...]

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2. *Lilian Nattel* said

   May 4, 2009 at 4:22 pm

   Sleight of brain, rather than sleight of hand.

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   - *Jon Hanson* said

     May 4, 2009 at 7:08 pm

     Well put. Thanks for your many thoughtful comments. -jon

     Reply

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