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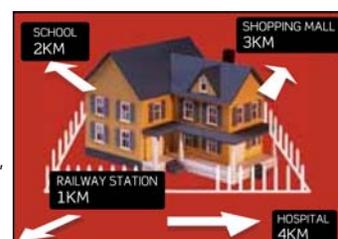
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## Discovering sleights of mind

*George Johnson attends a magic show in Las Vegas at a conference on Consciousness and comes to the conclusion that reality is virtual...*

The reason he had picked me from the audience, Apollo Robbins insisted, was that I'd seemed so engaged, nodding my head and making eye contact as he and the other magicians explained the tricks of the trade. I believed him when he told me afterward over dinner at the Venetian, that he hadn't noticed the name tag identifying me as a science writer. But then everyone believes Apollo— as he expertly removes your wallet and car keys and unbuckles your watch.

It was Sunday night on the Las Vegas Strip, where earlier this summer the Association for the Scientific Study of Consciousness was holding its annual meeting at the Imperial Palace Hotel. The organisation's last gathering had been in the staid environs of Oxford, but Las Vegas— the city of illusions, where the Statue of Liberty stares past Camelot at the Sphinx— turned out to be the perfect locale.

After two days of presentations by scientists and philosophers speculating on how the mind construes and misconstrues reality, we were hearing from the pros: James (The Amazing) Randi, Johnny Thompson (The Great Tomsoni), Mac King and Teller— magicians who had intuitively mastered some of the lessons being learned in the laboratory about the limits of cognition and attention.

### What lies beneath

"This wasn't just a group of world-class performers," said Susana Martinez-Conde, a scientist at the Barrow Neurological Institute in Phoenix who studies optical illusions and what they say about the brain. "They were hand-picked because of their specific interest in the cognitive principles underlying the magic."

She and Stephen Macknik, another Barrow researcher, organised the symposium, appropriately called the 'Magic of Consciousness'. Apollo, with the pull of his eyes and the arc of his hand, swung around my attention like a gooseneck lamp, so that it always pointed in the wrong direction. When he appeared to be reaching for my left pocket he was swiping something from the right. At the end of the act the audience applauded as he handed me my pen, some crumpled receipts and dollar bills, and my digital audio recorder, which had been running all the while. I hadn't noticed that my watch was gone until he unstrapped it from his own wrist.

A recurring theme in experimental psychology is the narrowness of perception: how very little of the sensory clamour makes its way into awareness. Earlier in the day, before the magic show, a neuroscientist had demonstrated a phenomenon called 'inattentional blindness' with a video made at the Visual Cognition Laboratory at the University of Illinois.

In the video, six men and women— half with white shirts and half with black— are tossing around a couple of basketballs. Viewers are asked to count how many times members of, say, the white team, manage to complete a pass, keeping the ball from the opposition.

I dutifully followed the instructions and was surprised when some 15 seconds into the game, laughter began to ripple through the audience. Only when I watched a second time did I see the person in the gorilla suit walking on from stage left. (The video is online at [viscog.beckman.uiuc.edu/grafs/demos/15.html](http://viscog.beckman.uiuc.edu/grafs/demos/15.html).)

Secretive as they are about specifics, the magicians were as eager as the scientists when it came to discussing the cognitive illusions that masquerade as magic: disguising one action as another, implying data that isn't there, taking

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advantage of how the brain fills in gaps— making assumptions, as ‘The Amazing Randi’ put it, and mistaking them for facts. Sounding more like a professor than a comedian and magician, Teller described how a good conjuror exploits the human compulsion to find patterns, and to impose them when they aren’t really there.

“In real life if you see something done again and again, you study it and you gradually pick up a pattern,” he said as he walked onstage holding a brass bucket in his left hand. “If you do that with a magician, it’s sometimes a big mistake.”

Pulling one coin after another from the air, he dropped them, thunk, thunk, thunk, into the bucket.

Just as the audience was beginning to catch on— somehow he was concealing the coins between his fingers— he flashed his empty palm and, thunk, dropped another coin, and then grabbed another from a gentlemen’s white hair. For the climax of the act, Teller deftly removed a spectator’s glasses, tipped them over the bucket and, thunk, thunk, two more coins fell.

As he ran through the trick a second time, annotating each step, we saw how we had been led to mismatch cause and effect, to form one false hypothesis after another. Sometimes the coins were coming from his right hand, and sometimes from his left, hidden beneath the fingers holding the bucket.

**Definition of magic**

He left us with his definition of magic: “The theatrical linking of a cause with an effect that has no basis in physical reality, but that— in our hearts— ought to.”

In his opening address, Michael Gazzaniga, the president of the consciousness association, had described another form of prestidigitation— a virtual reality experiment in which he had put on a pair of electronic goggles that projected the illusion of a deep hole opening in what he knew to be a solid concrete floor. Jolted by the adrenaline rush, his heart beat faster and his muscles tensed, a reminder that even without goggles the brain cobbles together a world from whatever it can.

“In a sense our reality is virtual,” Dr Gazzaniga said. “Think about flying in an airplane. You’re up there in an aluminum tube, 30,000 feet up, going 600 miles an hour, and you think everything is all right.”

Dr Gazzaniga is famous for his work with split-brain patients, whose left and right hemispheres have been disconnected as a last-ditch treatment for severe epilepsy. These are the experiments that have led to the notion, oversimplified in popular culture, that the left brain is predominantly analytical while the right brain is intuitive and laid-back.

**Confabulator**

The left brain, as Dr Gazzaniga put it, is the confabulator, constantly concocting stories. But mine was momentarily dumbstruck when, after his talk, I passed through a doorway inside the Venetian Resort Hotel Casino and entered an air-conditioned simulation of the Grand Canal.

My eyes were drawn upward to the stunning illusion of a trompe l’oeil sky and what I decided must be ravens flying high overhead. Looking closer, my brain discarded that theory, and I saw that the black curved wings were the edges of discs — giant thumbtacks holding up the sky. Later I was told they were automatic sprinklers, in case the clouds catch fire.

“It’s ‘The Truman Show’,” said Robert Van Gulick, a philosopher at Syracuse University, as I joined him at a table overlooking a version of the Piazza San Marco.

How could we be sure that the world outside the Venetian— outside Las Vegas itself— wasn’t also a simulation? Or that I wasn’t just a brain in a vat in some mad scientist’s laboratory?

*The New York Times*

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