Stepping Stones

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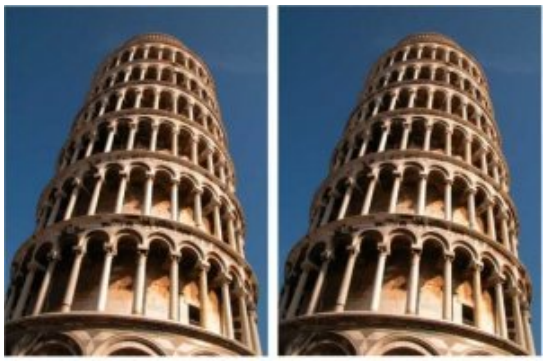
GRC Science Viz: The Neuroscience of Magic



Are these two photos the same or is there a difference?

On Wednesday, our GRC Science Viz conference had a very special treat – an evening talk given by Steph Martinez-Conde, from the Barrow Neurological Institute (in Phoenix, AZ). Authors of the book Sleights of *Scientific American*, *Nature*, and *Science,* they are both Ph.D. neurobiologists and research lab directors at various aspects of visual, sensory, and cognitive neuroscience.

Macknik and Martinez-Conde (who are a husband and wife team) collaborate with magicians and illusion in order to shed light on the way our brains work and the way that we perceive the world. First a few defi subjective perception that does not match the real world. We may see something that is not there or we m that is there, or we may see something different from what is there.

Our speakers first spent time explaining the fundamentals of the way vision works in the brain. Visual in through the pupil, is translated into neurological information in the retina, goes to the thalmus, and ther where it arrives at the visual cortex. From there, the information goes to higher levels of the brain for pr straight and accurate read. What we "see" is not always exactly what's there. In other words, the brain information (stimuli) it receives from the eyes – completing images, filling in for missing information, in the edges. And it is on this nuance that illusions rely.

In their talk, Susana and Stephen described a number of intriguing illusion effects and the neurological r illusionists...

Motion after effect. We stared at a rotating sphere within a sphere, up on the screen, for about 30 seconds to the face of the person next to us – and their faces were swirling. Really.

Rules of perspective. The way our brains see a vanishing point, where two parallel lines appear to converg railroad tracks). The image pair of the leaning tower of Pisa (at the top of this post) is a good example of m perspective. The images are identical but, to our eyes, the one on the right looks like it's leaning farther t brain, seeing the two images as a single scene. Normally if we see two adjacent towers rising at the same converge as they recede from view, due to perspective. So when we see two adjacent towers that appear t system assumes they must be diverging as they rise from view, and this is what we see. So this particula the many ways our visual system works – treating two side-by-side images as if they are part of the same

Pere Borrel del Caso - example of Trompe L'oeuil

Trompe l'oeil: An art technique involving the use of extremely realistic imagery to give the illusion of th example they showed is the cupola of the St. Ignatius of Loyola church in Rome – a ceiling painting, desig even though there is no dome. Another example is the gallery in Palazzo Spada which appears to be 26 fe only 12 feet long. They've taken advantage of the principles of perspective, making the successive borde thus making the corridor appear much longer than it is and the sculptures much larger than they actua

Change blindness. You see something, there's a disruption, and then you see it again but you don't notice the person swap illusion, constructed by the mentalist Derren Brown. In this movie, you see someone (th stranger for directions. In the midst of the action, they are interrupted by someone walking by carrying questioner is replaced by a completely different person, holding the same map. The stranger never seems when the replacement questioner is a different gender! They go ahead and give their directions to the "n hesitation. And here's another video example of the same phenomenon.

Inattentional blindness. Here is the classic movie to show demonstrate this one (I won't give it away). Th method to dissociate your center of attention from your spotlight of gaze. As a demonstration of this, put y you, arm held out straight – your thumb represents about .1% of your visual field and it is about the size That also means that you can only really accurately see with .1% of your visual field. What's the evolutic To deceive! To distract others with your gaze, to misdirect them from our interest. When you pay attent enhance your perception of that position and you suppress attention to the surrounding areas (inhibitory people who are very good at counting the basketball passes in the earlier video are more likely to miss the

Macknik and Martinez-Conde work with professional magicians, in order to study their illusions and mag the best – James Randi, Mac King, Johnny Thompson, and Penn and Teller. They see the magicians as tru constantly fine-tuning their work through experimentation with their audience. Magicians use special ef attention, memory illusions, optical illusions, and illusory correlations in their craft. And, most importa masterminds of human behavior. They regularly misdirect us using very simple techniques (beautifully instance time misdirection, top-down misdirection (intentionally distracting you with a detailed instruct (split the audience's attention), inferred motion, social cues (gave, voice, body language), and comedy (th focused attention).

Where's the quarter?

One example of a typical magician's technique they explained is the way they manipulate our smooth m and Martinez-Conde found, through their research, that when our eyes track something (the arched curv magician's hand, for instance), there's more than one type of brain cell at work. One type of neuron detec other suppresses the background. So your brain is actively suppressing parts of your visual field – ignorir in order to more effectively follow the motion. Very cool.

You can read more about Susana and Stephen's work in this special issue of Scientific American Mind, 16 recent Scientific American article, The Top Ten Illusions. You can also see them at work in this NOVA spe

Here are their “Magic Lessons for Life”:

- Magicians know that multitasking is a myth
- Magicians know that memory is fallible
- Magicians make mistakes, but they set them aside and move on
- Magicians use humor and empathy to lower your guard
- Magicians know that attention enhances one small part of the world, while suppressing everything

Their advice for us, as visualization creators:

- Don’t underestimate the importance of storyline
- Use these subtle methods to direct attention, without the observer realizing
- Make sure that everything in your visual and everything that’s being said about it are in alignmen

And as teachers, they recommend reading the book The Five Points of Magic, by the magician Juan Tam performance and relating to an audience.

In addition to their work studying magicians, Macknik and Martinez-Conde organize an annual illusion c of fun – *The Best Illustion of the Year Contest*. Held every year, since 2005, the contest brings illusions an woodwork. Anyone can submit an illusion to the contest, a panel of experts pick the top ten illusions whic event and voted upon by the audience. The contest’s website is well worth a visit – have a look at the vid illusions.

What a perfectly delightful evening!

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One Response to *GRC Science Viz: The Neurosci of Magic*

Kate
July 19, 2011 at 12:37 am

Sounds wonderful! Did you see this (sorta related... ok, not really)?

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