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The Neuroscience of Illusion

How tricking the eye reveals the inner workings of the brain

By Susana Martinez-Conde and Stephen L. Macknik

The Neural Correlate Society recently announced the winners of its annual Best Visual Illusion contest. To celebrate the event, *Mind Matters* invited Susana Martinez-Conde and Stephen L. Macknik, two neuroscientists who specialize in visual perception, to explain the scientific value of visual illusions. This article is the first in a new *Mind Matters* series on the neuroscience of illusions.

It's a fact of neuroscience that everything we experience is actually a figment of our imagination. Although our sensations feel accurate and truthful, they do not necessarily reproduce the physical reality of the outside world. Of course, many experiences in daily life reflect the physical stimuli that enter the brain. But the same neural machinery that interprets actual sensory inputs is also responsible for our dreams, delusions and failings of memory. In other words, the real and the imagined share a physical source in the brain. So take a lesson from Socrates: "All I know is that I know nothing."

One of the most important tools used by neuroscientists to understand how the brain creates its sense of reality is the visual illusion. Historically, visual artists as well as illusionists have used visual illusions to develop deep insights into the inner workings of the visual system. Long before scientists were studying the properties of neurons, artists had devised a series of techniques to "trick" the brain into thinking that a flat canvas was three-dimensional, or that a series of brushstrokes was actually a still life.

Visual illusions are defined by the dissociation between the physical reality and the subjective perception of an object or event. When we experience a visual illusion, we may see something that is not there, or fail to see something that is there, or even see something different from what is there. Because of this disconnect between perception and reality, visual illusions demonstrate the ways in which the brain can fail to recreate the physical world. By studying these failings, we can learn about the computational methods used by the brain to construct visual experience.

In the accompanying slide show, we will showcase several basic categories of visual illusions and what they can teach us about the brain.

[View a slide show of illusions](#)

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