

# All Deceptions Great and Small

Does size matter? To your brain, it doesn't

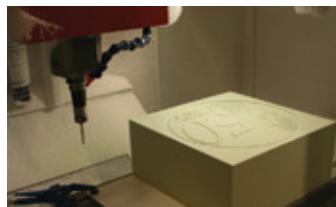
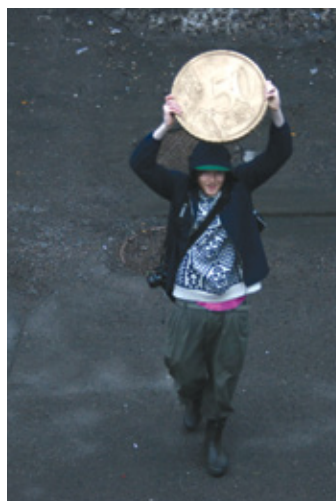
BY SUSANA MARTINEZ-CONDE AND STEPHEN L. MACKNIK

*"Judge me by my size, do you? Size matters not."*  
—Yoda, Jedi master

AS BOTH the midget in the country of Brobdingnag and the giant on the island of Lilliput, Lemuel Gulliver—the protagonist of Jonathan Swift's *Gulliver's Travels*—experienced firsthand that size is relative. As we cast a neuroscientific light on this classic book, it seems clear to us that Swift, a satirist, essayist and poet, knew a few things about the mind, too. Absolute size is meaningless to our brain: we gauge size by context. The same medium-sized circle will appear smaller when surrounded by large circles and bigger when surrounded by tiny ones, a phenomenon discovered by German psychologist Hermann Ebbinghaus. Social and psychological context also causes us to misperceive size. Recent research shows that spi-

ders appear larger to people who suffer from arachnophobia than to those who are unafraid of bugs and that men holding weapons seem taller and stronger than men who are holding tools. In this article, we present a collection of illusions that will expand your horizons and shrink your confidence in what is real. Try them out for size!

SUSANA MARTINEZ-CONDE and STEPHEN L. MACKNIK are laboratory directors at the Barrow Neurological Institute in Phoenix. They serve on *Scientific American Mind's* board of advisers and are authors of *Sleights of Mind: What the Neuroscience of Magic Reveals about Our Everyday Deceptions*, with Sandra Blakeslee, now in paperback (<http://sleightsofmind.com>). Their forthcoming book, *Champions of Illusion*, will be published by Scientific American/Farrar, Straus and Giroux.



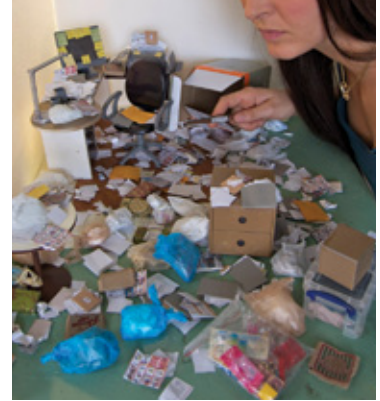
**SMALL CHANGE**  
Do you see tiny objects photographed with a macro lens? Look again. This remarkable illusion combines tilt-shift photography—in which the photographer uses selective focus and a special lens or tilted shot angle to make regular objects look toy-sized—with the strategic placement of a giant coin. Art designers Theo Tvesterás and Lars Marcus Vedeler, from the Skrekkøgle group, created the enormous 50-cent euro coin from painted and lacquered wood at a 20:1 scale.

COURTESY OF THEO TVETERÁS AND LARS MARCUS VEDELER

### BARBIE TRASHES HER DREAMHOUSE

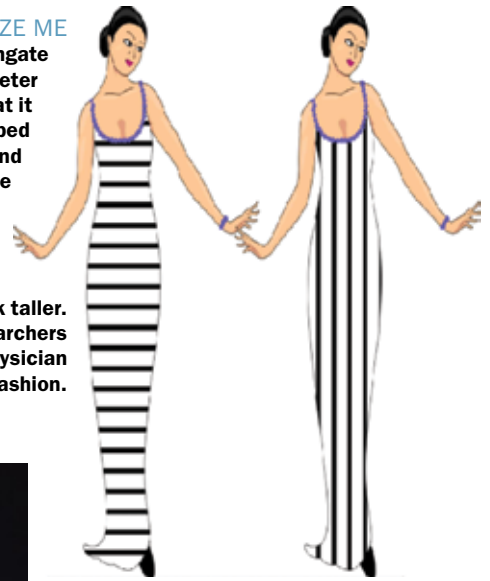
At first sight, they look like real-life scenes from the television show *Hoarders*, precleanup. In reality, they are photographs of 1:6 scale dioramas by St. Louis-born artist Carrie M. Becker. She makes the cardboard boxes, garbage bags and other trash herself. The furniture and tiny objects are from Barbie's dream house and a Japanese miniatures company called Re-Ment. Becker filths up

the rooms with actual dirt collected from the filter of a Dust-Buster, using the occasional Re-Ment meatball to simulate dog poop on the floor. When she photographs the scenes without an external reference, our brain relies on our everyday experience and assumes that the minuscule objects are life size. Only in proximity to an extraneous, actual-size object does the illusion fail.



### SUPERSIZE ME

You can look 10 pounds thinner with a well-known slimming trick: vertical lines elongate your shape and give you a more svelte appearance, right? Wrong! Vision scientists Peter Thompson and Kyriaki Mikellidou of the University of York in England say instead that it is time to ditch your vertical-striped wardrobe and invest in some horizontal-striped outfits. They found that vertical stripes on clothing make the wearer appear fatter and shorter than horizontal stripes do. Notice that the vertical-striped lady seems to have wider hips than the horizontal-striped model in the accompanying cartoons. The phenomenon is based on the Helmholtz illusion, in which a square made up of horizontal lines appears to be taller and narrower than an identical square made of vertical lines. The original report from 1867 of this illusion contained the intriguing reflection that ladies' frocks with horizontal stripes make the figure look taller. Because the remark ran counter to contemporary popular belief, the York researchers decided to put it to the test, finding that 19th-century German physicist and physician Hermann von Helmholtz did indeed have a great eye for fashion.



### FULL MOON

The full moon rising on the horizon appears to be massive. Hours later, when the moon is high overhead, it looks much smaller. Yet the disk that falls on your retina is not smaller for the overhead moon than it is for the rising moon. So why does the overhead moon seem smaller? One answer is that your brain infers the larger size of the rising moon because you see it next to trees, hills or other objects on the horizon. Your brain literally enlarges the moon to fit the context. Look for this effect the next time you see the moon in real life.



COURTESY OF CARRIE M. BECKER (top); FROM "APPLYING THE HELMHOLTZ ILLUSION TO FASHION: HORIZONTAL STRIPES WON'T MAKE YOU LOOK FATTER," BY PETER THOMPSON AND KYRIAKI MIKELLIDOU, IN *PERCEPTION*, VOL. 2, NO. 1, 2011. USED WITH PERMISSION FROM PION LTD., LONDON; WWW.PION.CO.UK (middle); BEAT GLANZMANN Corbis (bottom)



**BLOWN AWAY**

Objects project smaller images on our retinas as they move away from us, which can make it hard to decide if an item is truly small or just far away (as we see in this photograph). Forced perspective photography uses this ambiguity to great effect, while eliminating many of the habitual strategies that our brain uses to distinguish size from distance, such as stereopsis (our visual system can calculate the depth in a scene from the slight differences between our left and right retinal images) and motion parallax (as we move, objects closer to us move farther across our field of view than distant objects do).



**TALL AND VENTI**

Is your cuppa joe half empty or half full? It depends on your outlook—and on a little twist on the Jastrow illusion, named after Polish-born American psychologist Joseph Jastrow. In this classic illusion, two identical arches positioned in a certain configuration appear to have very different lengths. Magician Greg Wilson and writer and producer David Gripenwaldt realized that Starbucks coffee sleeves have the perfect shape for an impromptu demonstration of the Jastrow illusion, so now you can amaze your office mates at your next coffee break. All you need to do is align the coffee sleeves as in the accompanying photograph and—presto!—your tall cup sleeve is now venti-sized! Your brain compares the upper arch’s lower right corner with the lower arch’s upper right corner and concludes, incorrectly, that the upper sleeve is shorter than the lower sleeve. We would like to thank magician Victoria Skye for her demonstration of the Jastrow illusion with Starbucks coffee sleeves. **M**

**(Further Reading)**

- ◆ **Sleights of Mind: What the Neuroscience of Magic Reveals about Our Everyday Deceptions.** S. L. Macknik and S. Martinez-Conde, with S. Blakeslee. Henry Holt, 2010.
- ◆ **Applying the Helmholtz Illusion to Fashion: Horizontal Stripes Won’t Make You Look Fatter.** P. Thompson and K. Mikellidou in *i-Perception*, Vol. 2, No. 1, pages 69–76; 2011.
- ◆ **It Was as Big as My Head, I Swear!: Biased Spider Size Estimation in Spider Phobia.** M. W. Vasey, M. R. Vilensky, J. H. Heath, C. N. Harbaugh, A. G. Buffington and R. H. Fazio in *Journal of Anxiety Disorders*, Vol. 26, No. 1, pages 20–24; January 2012.
- ◆ **Weapons Make the Man (Larger): Formidability Is Represented as Size and Strength in Humans.** D.M.T. Fessler, C. Holbrook and J. K. Snyder in *PLoS ONE*, Vol. 7, No. 4, Article e32751; 2012.

COURTESY OF JEPPE OLSEN (top); ANTHONY ROSENBERG (stockphoto) (bottom)