

A Faithful Resemblance

When seeing is believing

BY SUSANA MARTINEZ-CONDE AND STEPHEN L. MACKNIK

“There are things in that [wall]paper that nobody knows but me, or ever will. Behind that outside pattern the dim shapes get clearer every day. It is always the same shape, only very numerous. And it is like a woman stooping down and creeping about behind that pattern.”

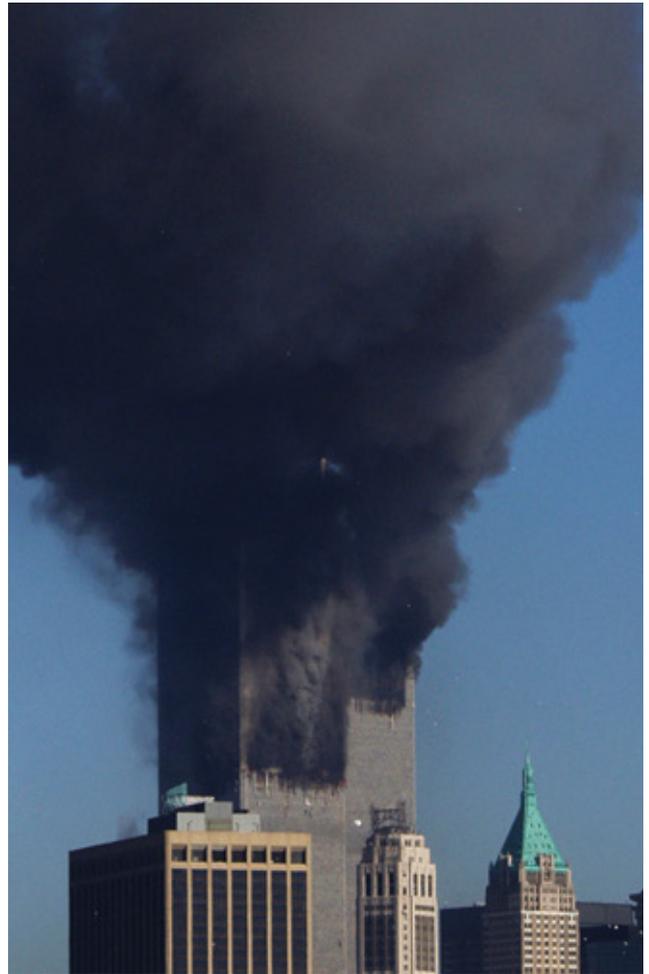
—Charlotte Perkins Gilman,
“The Yellow Wallpaper,” 1892

THE PROTAGONIST in Charlotte Perkins Gilman’s short story “The Yellow Wallpaper” suffers from the most notable case of pareidolia in fiction. Pareidolia, the misperception of an accidental or vague stimulus as distinct and meaningful, explains many supposedly paranormal and mystical phenomena, including UFO and Bigfoot sightings and other visions. In Gilman’s story, the heroine, secluded in her hideously wallpapered bedroom and having nothing with which to occupy herself, is driven to insanity—full-blown paranoid schizophrenia—by the woman behind the yellow pattern. As she descends into madness, she comes to believe that she is imprisoned by the wallpaper.

Mental disease can aggravate pareidolia, as can fatigue and sleepiness. After a recent surgery, one of us (Martinez-Conde) noticed faces everywhere, in places as unlikely as the ultrasound images of her left arm during an examination of potential postsurgical blood clots. She realized at once that the ubiquitous faces were the product of lack of sleep and the high titer of pain medication in her bloodstream, so she was more fascinated than concerned. Her doctor agreed but made a note in her file for a different drug regime in the future. Just in case. Luckily, the hospital room’s walls were bare, and there was no yellow wallpaper in sight.

Our brain is wired to find meaning. Our aptitude to identify structure and order around us, combined with our superior talent for face detection, can lead to spectacular cases of pareidolia, with significant effects in society and in culture. **M**

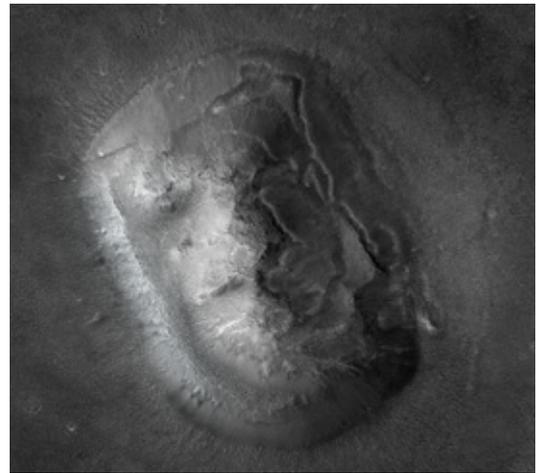
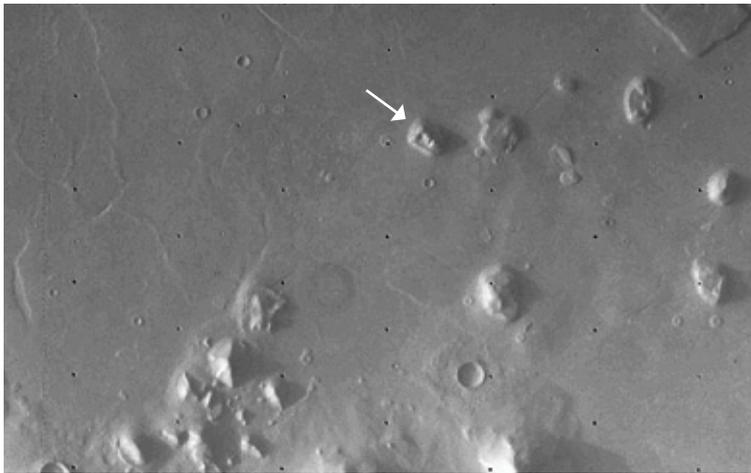
SUSANA MARTINEZ-CONDE and STEPHEN L. MACKNIK are laboratory directors at the Barrow Neurological Institute in Phoenix. They serve on *Scientific American Mind*’s board of advisers and are authors of *Sleights of Mind: What the Neuroscience of Magic Reveals about Our Everyday Deceptions*, with Sandra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



SATAN IN THE SMOKE

Photojournalist Mark D. Phillips captured the World Trade Center, engulfed in smoke and flames, seconds after the second plane attack on 9/11. Unknown to Phillips at the time, the picture, distributed by Associated Press and published on the front pages of several newspapers, contained the face of none other than the Prince of Darkness. A media frenzy ensued, and Phillips, who retired from photojournalism that same day, received more than 30,000 messages related to the “face of evil” in the murky cloud and the feelings it brought forth in the viewers.

One year later computer scientists Vladik Kreinovich and Dima Iourinski of the University of Texas at El Paso published a geometric analysis of the face in the photograph, also seen in a different image from CNN. The analysis showed that perturbations in the smoke can consist of horizontal lines (such as the “eyes” and “mouth”), and vertical lines (such as the “nose”) overlaid on a conic surface (the “head”). The scientists concluded that both the background shape (the cone) and the features on the background (horizontal and vertical lines) are naturally explained by the physics and geometry of smoke plumes emanating from fire.



THE FACE FROM SPACE

In 1976, as NASA's Viking 1 circled Mars looking for possible landing sites for its sister ship Viking 2, it spotted the likeness of a mile-wide human (or maybe Martian?) face, staring back from the Red Planet's region of Cydonia. Scientists believed that the Martian "sphinx" was one of numerous mesas around Cydonia and that unusual shadows made it look like a humongous head. Conspiracy theorists favored the alternative explanation of a government cover-up, however, and criticized NASA's unsuccessful at-

tempts to hide the remnants of an ancient Martian civilization. Eighteen years later obtaining high-resolution images of Cydonia was a priority for NASA. "We felt this was important to taxpayers," says Jim Garvin, chief scientist for NASA's Mars Exploration Program. "We photographed the Face as soon as we could get a good shot at it." In April 1998 the Mars Orbiter Camera team snapped a picture 10 times sharper than the original Viking photos, revealing the mystifying Face on Mars to be ... a mesa.



GOD SAVE THE QUEEN

Canadian banknotes issued in 1954 featured a portrait of British monarch Elizabeth II. The young queen looked majestic and serene, despite the grinning demon tucked in the curls behind her regal ear (colored red, to make it easier to see). Talk about having a royally bad hair day! Canadians were understandably appalled by what became known as the "Devil's head" or "Devil's face" series. In 1956 the Bank of Canada ordered banknote companies to darken the highlights in the queen's hair, effectively exorcising the King of Hell from Canadian currency.



HOLY TOAST

A brain region called the fusiform gyrus is responsible for our extraordinary face-detection abilities. Neurons in this area are so exquisitely attuned to sense faces in the environment that they often signal false positive results in the presence of sparse information, such as when we "see" faces in clouds, in wallpaper patterns, the front of cars or food items.

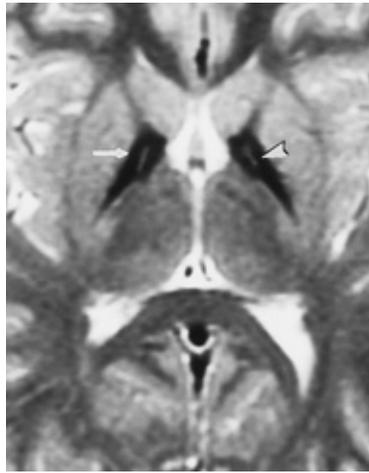
Diane Duyse of Florida had taken a small bite out of a grilled-cheese sandwich when she noticed an image burned into the bread. "I saw this lady looking back at me," she said. Ten years later the sandwich, said to bear an image of the Virgin Mary, sold on eBay for \$28,000. Pareidolia can be lucrative.

COURTESY OF NASA (Mars); GORD CARTER National Currency Collection/Currency Museum/Bank of Canada (banknotes); MIAMI HERALD, 2004 (toast)

FROM "THE EYE-OF-THE-TIGER SIGN," BY R. PAUL GUILLERMAN, IN *RADIOLOGY*, VOL. 217, DECEMBER 2000 (brain scan); ANDY GEHRIG (stockphoto (tiger)); FROM "THE FACE OF TESTICULAR PAIN: A SURPRISING ULTRASOUND FINDING," BY G. GREGORY ROBERTS AND NAJI J. TOUMA, IN *UROLOGY*, VOL. 78, NO. 3, SEPTEMBER 2011. REPRINTED WITH PERMISSION FROM ELSEVIER (ultrasound); SALVADOR DALÍ, FUNDACIÓ GALA-SALVADOR DALÍ, ARTISTS RIGHTS SOCIETY, NEW YORK, 2012 (painting)

EYE OF THE TIGER

Neurologists Péricles Maranhão-Filho and Maurice B. Vincent of the Federal University of Rio de Janeiro advocate the use of face-detection illusions as heuristics to help doctors diagnose neurological diseases. One is PKAN, or pantothenate kinase-associated neurodegenerative disease, which results from mutations in the genes encoding the enzyme responsible for the biosynthesis of coenzyme A. Typically PKAN starts during childhood, and most patients lose the ability to walk within 15 years. The brains of PKAN patients show decreased intensity of the globus pallidus (involved in motor control) from iron accumulation, with a central area of increased intensity from necrosis. The image looks decidedly feline, providing the so-called eye-of-the-tiger sign.



THE "OW! MY BALLS!" ILLUSION

Medical imaging is a new fertile ground for pareidolia. Urologists G. Gregory Roberts and Najj J. Touma of Queen's University in Ontario were shocked to discover a face, contorted in agony, in the scrotal ultrasound images (left) of a 45-year-old man afflicted with severe testicular pain. The doctors toyed with the idea that the image might be a manifestation of Min, the Egyptian god of male virility, but ultimately deemed the facial features in the benign mass accidental.

The brain's capacity to establish false links among things that are not actually connected is essential to the "paranoiac-critical method" artistic technique invented by Spanish surrealist painter Salvador Dalí. (Paranoia and pareidolia have the same etymology, from the Greek *para-* for "instead of" and *-oid*, *-ooides* or *-oidos* for "form.") In Dalí's *Slave Market with the Disappearing Bust of Voltaire*, several features in Voltaire's face are formed by the bodies of people in the scene (below).

Dartmouth College neuroscientist Ming Meng and his colleagues recently imaged the brains of observers while they viewed faces and objects that looked like faces. The left fusiform gyrus was activated by both faces and objects resembling them, whereas the right fusiform gyrus showed much stronger activation to actual faces than to look-alikes.



(Further Reading)

- ◆ Was There Satan's Face in the World Trade Center Fire? A Geometric Analysis. V. Kreinovich and D. Iourinski in *Geoinformatics*, Vol. 12, No. 2, pages 69–75; 2003.
- ◆ Neuropareidolia: Diagnostic Clues Apropos of Visual Illusions. P. Maranhão-Filho and M. B. Vincent in *Arquivos de Neuro-Psiquiatria*, Vol. 67, No. 4, pages 1117–1123; December 2009.
- ◆ The Face of Testicular Pain: A Surprising Ultrasound Finding. G. Gregory Roberts and Najj J. Touma in *Urology*, Vol. 78, No. 3, page 565; September 2011.
- ◆ Satan in the Smoke? A Photojournalist's 9/11 Story. Mark D. Phillips. South Brooklyn Internet, 2011.
- ◆ Lateralization of Face Processing in the Human Brain. Ming Meng, Tharian Cherian, Gaurav Singal and Pawan Sinha in *Proceedings of the Royal Society B*. Published online January 4, 2012.
- ◆ What's in a Face? Susana Martinez-Conde and Stephen L. Macknik in *Scientific American Mind*, Vol. 22, No. 6, pages 15–17; January/February 2012.