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OCTOBER 2024  
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## Cosmic Pareidolia

The human brain loves seeing patterns that aren't there BY PHIL PLAIT

**F**OR GENERATIONS, the idea that Mars once harbored an advanced civilization has fostered a small but devoted community of true believers. These ancient Martians built canals and cities and other great works, so the general narrative goes, but for reasons unknown died out long ago. This belief was popularized by the eccentric American astronomer Percival Lowell as early as 1894, but the core idea had an Internet-fueled resurgence in the late 20th century. It spawned a cottage industry of conspiratorial books, credulous late-night radio interviews, questionable websites and even the big-budget (if disastrously confused) 2000 movie *Mission to Mars*.

The catalyst for that sudden, late-breaking burst of public interest was an image of the Martian surface taken by an orbiter as part of the NASA Viking 1 mission in 1976. In one of the orbiter's pictures of a region called Cydonia, scientists noticed

a large mesa that bore an uncanny resemblance to a human face. Dubbed “[the face on Mars](#),” it soon attracted the attention of fringe pseudoscience enthusiasts (and, no doubt, grifters) who promoted it as some kind of monument made by extinct Martians.

To be fair, in the Viking image the landform really does look like a face, an eerie visage reminiscent of Easter Island *moai* or the Great Sphinx in Egypt. Could it be some ancient alien tribute to humanity, a memorial signifying the longing of an archaic extraterrestrial race?

Yeah, not so much—follow-up observations from later missions toting better tech, such as [the High Resolution Imaging Science Experiment \(HiRISE\) camera on NASA's Mars Reconnaissance Orbiter](#), showed exactly what those of us familiar with such things expected: [it was just a mesa](#), a big rock formation with a shape that, when viewed at low resolution from

NASA's Viking 1 orbiter photographed this region in the northern latitudes of Mars on July 25, 1976, while searching for a landing site for the Viking 2 lander. The image shows a mesa that resembles a human face (*center*), which helped to spawn a cottage industry of pseudoscientific claims about ancient Martian civilizations.

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the right angle and with the illumination just so, looked somewhat like a face.

True believers in the face on Mars had fallen prey to a psychological phenomenon called pareidolia, our brain's tendency to impose a recognizable pattern on a visual stimulus. We all are subject to it; who hasn't lain on the ground looking up at clouds to see all kinds of things in them, such as animals, common objects, fantastic beasts and, yes, faces?

Faces are incredibly common outputs of pareidolia. We see them everywhere, including in wood-grain patterns, foods, and other everyday ephemera. For instance, I once saw the face of Vladimir Lenin in my shower curtain. That was a weird day.

Our brains are wired to see faces, which isn't too surprising, seeing as how they are the main way we recognize other people. But this trait has the unintended consequence of forcing us to see faces when they aren't really there. The simplest example is the classic smiley face: it's two dots over a curved line, just about as simple a geometric construction as can be, yet you cannot not see it as a smiling face. (Incidentally, we've seen smiley faces on Mars, too.)

Nebulous stimuli are fertile ground for pareidolia, and what better place for nebulous stimuli than an actual nebula? Astronomical objects are perfect for the phenomenon; gas clouds and galaxies have just enough structure to trigger our pattern-recognition ability. Even stars in the sky make patterns that look like recognizable shapes to us; that's why we have constellations. Ever since the telescope was invented, pareidolia has ruled the way we've named what we see.

The most iconic example of all is the Horsehead Nebula. Aptly named, it looks like a cosmic chess piece seen in profile, stonically waiting for its next move. The Horsehead is in the constellation Orion and is part of the immense Orion molecular cloud complex, a sprawling collection of cold, dense gas and dust. Such clouds are star-formation factories, spawning suns that light up the material all around them. The Horsehead is an extension of dark dust silhouetted against a bank of ruddily glowing hydrogen, lit up by the massive star Sigma Orionis not too far above the horse's "head."

Another one of my favorites is a Halloween twofer: officially designated IC 2218, it's an extended cloud of dust not far from the star Rigel, a brilliant blue supergiant marking Orion's knee. The cloud reflects the star's light, and seen one way it's called the Witch Head Nebula because of its uncanny resemblance to a stereotypical witch with a long nose and pointed chin cackling into the night. But amazingly, seen rotated 90 degrees (or with your head tilted), it looks more like a ghost floating menacingly with its arms upraised and its spectral tail trailing behind.

Not to be spookily outdone in Halloween pareidolia, in 2014 the sun decided to turn into a 1.4-million-kilometer-wide jack-o'-lantern, with a false-color composite image of solar active regions forming a grimacing gourdlike visage.

I vividly remember scanning the Milky Way along the constellation of Vulpecula with binoculars in my front yard when I was a kid. My mind was boggling at the sheer number of stars visible as I slowly panned across the sky, when suddenly several brighter stars slid by, aligned in a fairly decent row. I gasped, then exclaimed, "Oh, my God, it's a coat hanger!" I was right; the Coat Hanger cluster—or Brocchi's cluster, as it's officially called—is a collection of about 10 stars arranged in a shape that really does deserve the moniker. But it's just coincidence; the stars aren't all physically associated with one another and just happen to be aligned in our line of sight.

And that's not the weirdest stellar pareidolia in the sky. NGC 2169 is a pair of open clusters, two groups of stars each born together from the same cloud of nebular material. As seen from Earth, they appear to form the numerals 3 and 7; hence the nickname "the 37 cluster." The stars are about 3,500 light-years from Earth and young—only about 11 million years old. Come to think of it, I've never seen this one for myself in the actual sky. It's located near the top of Orion's upraised arm, so perhaps this winter I'll take a shot at it with my own telescope.

Of course, not all pareidolia is so esoteric. Planets and moons have their share of familiar shapes, too, usually in the form of craters. Besides the aforementioned smiley

faces on Mars, there's also Mickey Mouse on Mercury and the iconic Tombaugh Regio, also known as the "heart" of Pluto.

The "man in the moon," however, is in my opinion a poser. I've seen various explanations for why people see a face in the moon's chaotic, giant-impact-sculpted mix of bright highlands and dark plains, but none are convincing to me. Still, around the first-quarter phase, a pair of letters appears on the moon: the Lunar X and V, shapes created by light and shadow as the sun rises over a pair of craters, illuminating their raised rims. Several other pareidolic features can be seen as well. I've always thought the huge impact crater Clavius looks like a cartoonishly surprised face.

The list goes on and on. It includes the Question Mark galaxy, the Space Invader galaxy, the Christmas Tree cluster, Rudolph the Red-Nosed Nebula, the seriously creepy MSH 15-52, which looks like a bony hand reaching across the cosmos, and the interacting galaxies Arp-Madore 2026-424, which look like an alien face. Not too many gas clouds look like geological features, but the North America Nebula is very well named.

I myself once discovered a pair of galaxies in a Hubble image that clearly appeared to look like a starship that had gone "where no one has gone before," although my attempts to name them the Enterprise Galaxies stalled out.

This all may seem like a lark, a silly bit of fun at the expense of astronomy. But it's not. Our brain is extraordinarily good at seeing patterns, and although some are fanciful and fantasy, in many cases those patterns are real, revealing fascinating physics underlying their beguiling appearance. Over the centuries we have uncovered a vast array of facts and observations about nature, and it's our ability to imagine that allowed us to make the leap, connecting many of these findings into the rules and laws of reality as we know it.

Science is imagination. We just have to be careful to not let it run away with us if we want to avoid the trap of seeing things that aren't really there. If you ever have to ask yourself whether you're seeing a gigantic sculpture of a human head or just a ragged hill on another planet, understanding pareidolia will help you face the face. ●