

Sculpting the Impossible: Solid Renditions of Visual Illusions

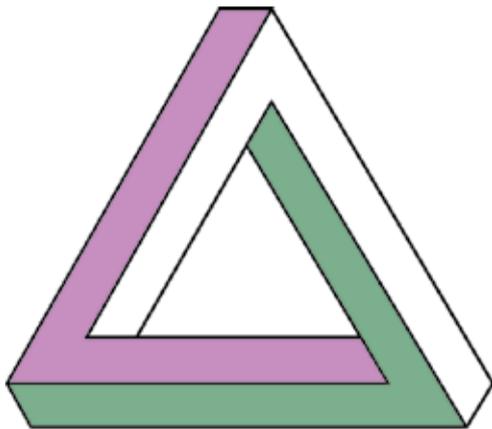
Artists find mind-bending ways to bring impossible figures into three-dimensional reality

BY STEPHEN L. MACKNIK AND SUSANA MARTINEZ-CONDE

IN AN IMPOSSIBLE FIGURE, seemingly real objects—or parts of objects—form geometric relations that physically cannot happen. Dutch artist M. C. Escher, for instance, depicted reversible staircases and perpetually flowing streams. Mathematical physicist Roger Penrose drew his famously impossible triangle, and visual scientist Dejan Todorović of the University of Belgrade in Serbia created a golden arch that won him third prize in the 2005 Best Illusion of the Year Contest. These effects challenge our hard-earned perception that the world around us follows certain, inviolable rules. They also reveal that our brains construct the feeling of a *global* percept—an overall picture of a particular item—by sewing together multiple *local* percepts. As long as the local relation between surfaces and objects follows the rules of nature, our brains don't seem to mind that the global percept is impossible.

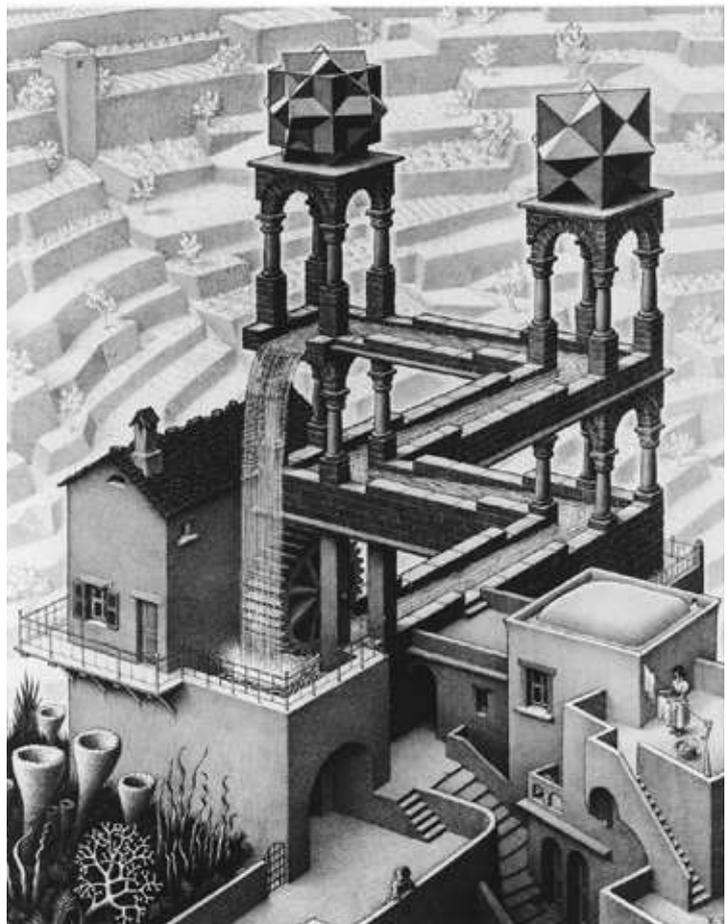
Several contemporary sculptors recently have taken up the challenge of creating impossible art. That is, they are interested in shaping real-world 3-D objects that nonetheless appear to be impossible. Unlike classic monuments—such as the Lincoln Memorial in Washington, D.C.—which can be perceived by either sight or touch, impossible sculptures can be interpreted (or *misinterpreted*, as the case may be) only by the visual mind.

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PENROSE TRIANGLE

The impossible triangle (also called the Penrose triangle or the tribar) was first created in 1934 by Oscar Reutersvärd. Penrose attended a lecture by Escher in 1954 and was inspired to rediscover the impossible triangle. Penrose (who at the time was unfamiliar with the work of Reutersvärd, Giovanni Piranesi and other previous discoverers of the impossible triangle) drew the illusion in its now most familiar form (*above*) and published his observations in the *British Journal of Psychology* in 1958, in an article co-authored with his father, Lionel. In 1961 the Penroses sent a copy of the article to Escher, who incorporated the effect into *Waterfall*, one of his most famous lithographs (*right*).



IMPOSSIBLE ARCH

Elusive Arch, by Todorović, shows a new impossible figure. The left-hand part of the figure appears as three shiny oval tubes. The right-hand part looks corrugated, with three alternating pairs of shallow matte ridges and grooves. The bright streaks on the figure's surface are seen either as highlights at the peaks and troughs of the tubes or as inflections between grooves. Determining the direction of the apparent illumination falling on the figure is difficult: it depends on whether we interpret the light as falling on a receding or an expanding surface. Further, determining the exact position and shape of the transition region near the center of the arch is maddening, because the local 3-D interpretations defy the laws of illumination. For more about the arch, see <http://illusioncontest.neuralcorrelate.com/2005/elusive-arch>.



HOMAGE TO ESCHER

Escher's *Belvedere* (left) showcases columns that switch walls between their bases and capitals, a straight ladder whose base rests inside the building yet nonetheless enters the building from the outside at its top, and a sitting man holding an impossible cube. Mathieu Hamaekers, a Belgian mathematician and sculptor, created an homage to *Belvedere* that features a real-life impossible cube. This photograph (below) shows the artist holding the sculpture *Upside Down*, built in 1985.



COURTESY OF DEJAN TODOROVIĆ University of Belgrade (arch); M. C. ESCHER'S BELVEDERE © 2011 THE M. C. ESCHER COMPANY-HOLLAND. ALL RIGHTS RESERVED. WWW.MCESCHER.COM (Escher lithograph); COURTESY OF MATHIEU HAMAEEKERS (cube)

(illusions)



IMPOSSIBLE BOX

Hans Schepker has built outstanding sculptures of impossible objects, such as this *Crazy Crate* made from glass (above left). Other views of the crazy crate show the method behind the madness (above center and right). Notice that the illusion works only from

a specific vantage point. At any other angle, the illusion fails. Scientists refer to this as the accidental view, but there is nothing accidental about it. To perceive the illusion, the view must be carefully staged and choreographed, or else the audience will fail to see the “impossible” sculpture.

AND THE WINNER IS ...

For several years, Italian sculptor Guido Moretti has donated copies of his *Three-Bar Cube* and other impossible sculptures as trophies for the Best Illusion of the Year Contest. Depending on your vantage point, *Three-Bar Cube* can appear to be a cube, a solid structure or an impossible triangle. For more information, see <http://illusioncontest.neuralcorrelate.com/trophies>.



INDUSTRIAL-SIZE TRIANGLE

Artist Brian McKay created a giant version of the impossible triangle (below left) in Perth, Australia, in collaboration with architect Ahmad Abas. How did they do that? A photograph taken from another angle (below right) reveals the trick.



COURTESY OF HANS SCHEPKER (glass boxes); COURTESY OF GUIDO MORETTI (WWW.GUIDOMORETTI.IT) (cube sculptures); COURTESY OF BJØRN CHRISTIAN TØRRISSEN (BJORNFREE.COM) (triangles)