Sculpting the Impossible: Solid Renditions of Visual Illusions

Artists find mind-bending ways to bring visual illusions called impossible figures into three-dimensional reality.

FOREWORD

By Jessica L. Otte, University of Texas at Austin, and Maria A. Scherer, University of California, Berkeley

Several contemporary sculptors have become known for their challenging reimagining of impossible figures — forms that, in mathematics, are impossible to construct in three-dimensional space. The sculptures of Japanese artist Shigeo Fukuda, for example, are inspired by the work of M.C. Escher, who created impossible figures as optical illusions in his prints. These works often challenge the mind's ability to perceive and interpret the world around us, defying the rules of physics as we know them.

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Impossible Figures

The impossible triangle (also called the Penrose Triangle or the "tribar") was first created in 1934 by Oscar Reutersvärd. Penrose, the famous mathematical physicist, attended a lecture by the artist M. C. Escher in 1954, which inspired him to rediscover the impossible triangle. Penrose (who at the time was unfamiliar with the work of Reutersvärd, Piranesi and other previous discoverers of the impossible triangle) drew illusion in its now most familiar form, and published his observations in the British Journal of Psychology in 1958, in an article coauthored 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.
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Impossible Figures

The "Elusive Arch," by Dejan Todorović of the University of Belgrade, Serbia, shows a new impossible figure. The left-hand portion of the figure appears as three shiny oval tubes. The right-hand portion appears to be three alternating pairs of shallow matte ridges and grooves. The bright streaks on the figure's surface are seen as either 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, as the local 3-D interpretations defy the laws of illumination.
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Homage to the Impossible

Escher's "Belvedere" showcases columns that switch walls between their bases and capitals, a straight ladder whose base rests inside the building yet nevertheless enters the building from the outside at its top, and a sitting man holding an impossible cube. Mathieu Hamaekers, a Belgian mathematician, created a homage to "Belvedere" that features a real-life impossible cube.
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“Crazy Crate”

Hans Schepker has built outstanding sculptures of impossible objects, such as this "Crazy Crate." Click to the next side to find out how he did it.
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Resolution to Schepker's "Crazy Crate"

Another view of the "Crazy Crate" shows the method behind the madness. Notice that the illusion only works 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. In order to perceive the illusion, the view must be carefully staged and choreographed or else the audience will fail to see the "impossible" sculpture.
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Impossible Triangle

An industrial sized version of the "Impossible Triangle" in Perth, Australia, created by artist Brian McKay in collaboration with architect Ahmad Abas. How did they do that? Find out in the next slide.
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How to Make the Impossible Triangle

These additional images show the component elements of McKay's take on the illusion.
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Impossible Triangle Revisited

Another impossible triangle (now in Ophoven, Belgium), with a different resolution altogether. Again, the viewer’s location relative to the object is critical. Now you know why there are various physical ways to achieve any particular impossible object.
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If Escher Can Do It, Legos Can, Too

M. C. Escher's "Relativity" appears here as a 3-D representation made with Lego blocks (no trick photography... it's all real), by Andrew Lipson and Daniel Shiu. You can also learn about their fascinating construction details.
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Ascending and Descending

M. C. Escher's "Ascending and Descending" Lego rendition by Lipson and Shiu.
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One-Man Band

"Enco," by Japanese artist Shigee Fukuda, uses similar principles to represent a pianist and violinist in the same sculpture when viewed from two vantage points.
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"Underground Piano"

Depending on where you stand, you can see the mirror image of a pile of piano parts as a beautiful whole instrument, also by Shigeo Fukuda.
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"Lunch With a Helmet On"

Shigeo Fukuda welded together 848 forks, knives and spoons to make "Lunch With a Helmet On." In this case, Fukuda cleverly resolves the illusion by placing a light at the critical vantage point, making the motorcycle obvious only in the shadow cast by the utensil pile.
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Imelda’s Dream Come True

Imelda Marcos, widow of the former Philippines dictator Ferdinand Marcos, was infamous for her shoe collection, but also for quotes such as this: "People say I'm extravagant because I want to be surrounded by beauty. But tell me, who wants to be surrounded by garbage?" Well Imelda, now you can be surrounded by both, courtesy of artists Tim Noble and Sue Webster. The collaborators create beautiful pieces made from rubbish. The image on the left, "Dead White Trash (With Gulls), 1998," depicts the duo as the shadow cast from a pile of garbage taken from six months of their own consumption. Similarly to Fukuda, these artists have placed the light source at the critical vantage point, and made the viewing of the sculpture based on its shadow. The image on the right is "Real Life Is Rubbish, 2002," created with the artists' studio refuse.