Art and Formal Research: 12 Examples of Kinetic Illusions in Op Art

Art at the core of research: 12 examples of kinetic illusions in Op Art

by David E. Girel - 2007-09-26

In one way or another, the Op Art movement of the 1950s and 1960s engendered a new way of seeing color, space, and light. The visual elements in this movement, which the artists created through optical means, continue to fascinate viewers, as in the works of Bridget Riley and Victor Vasarely. The works of some Op Art artists have been reevaluated and re-exhibited in recent years. This article focuses on the artists who were active during this period and who have had a lasting influence on the field of art.

The article begins with an introduction to the history of Op Art, followed by a discussion of the various techniques used by the artists to create their illusions. The article includes a variety of images and examples of the artists' work, such as Bridget Riley's "Reversal" and Victor Vasarely's "Pulse." The text also includes a brief discussion of the historical context in which these artists worked, including the influence of modernism and the development of abstract art.

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The article concludes with a section on the impact of the Op Art movement on contemporary art and design, illustrating how these illusions continue to influence the way artists and designers create and perceive visual images.
Art as Visual Research: 12 Examples of Kinetic Illusions in Op Art

Art and neuroscience combine in creating fascinating examples of illusory motion.

By Susana Martinez-Conde and Stephen L. Macknik

MacKay Rays
This illusion, created in 1957 by neuroscientist Donald M. MacKay (then at King's College London in England), shows that simple patterns of regular or repetitive stimuli, such as radial lines (called "MacKay rays") can induce the perception of shimmering or illusory motion at right angles to those of the pattern. To see the illusion, look at the center of the circle and notice the peripheral shimmering.
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November 19, 2008

BBC Wallboard
This illusion has its origin as a chance observation. MacKay first observed this effect on the wallboard of a BBC studio: the broadcasting staff had been annoyed by illusory shadows running up and down blank strips between columns of parallel lines.
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The Enigma Illusion

Op artist Isia Leviant unknowingly combined the MacKay Rays and the BBC wallboard illusion in the now classic Enigma Illusion. Several original Leviant paintings illustrating this effect hang in the San Francisco Exploratorium, including its very first version (known as the Traffic Illusion). As you view the Enigma image, notice how the concentric purple rings appear to fill with rapid circular motion, as if millions of tiny and barely visible cars were driving hell-bent-for-leather around a track. But does the illusion originate in the mind or in the eye? The evidence was conflicting until we found, in collaboration with our neuroscientist colleagues Xoana G. Troncoso and Jorge Otero-Millán, at the Barrow Neurological Institute in Phoenix, Arizona, that the illusory motion is driven by microsaccades: small, involuntary eye movements that occur during visual fixation. The precise brain mechanisms leading to the perception of the illusion are still unknown, however. One possibility is that microsaccades produce small shifts in the geometrical position of the peripheral portions of the image. The reversals in contrast that these shifts produce could then create the illusion of motion. Neuroscientist and artist Belinda Conway and his colleagues at Harvard Medical School recently showed that pairs of stimuli of different contrasts can generate motion signals in visual cortex neurons, and proposed that this neural mechanism may underlie the perception of illusory motion in certain static patterns.

The image is courtesy of Jorge Otero-Millán

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Op Art Is Alive and Well
Vision scientist Akiyoshi Kitaoka at the Ritsumeikan University in Kyoto, Japan, follows on the footsteps of the great op artists of some decades ago. Waterway Spirals is a compelling and powerful version of Leviant's Enigma. Notice the strong illusory motion along the blue spiraling stripe.
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Christmas Lights
The Christmas Lights illusion, by visual illusion artist Gianni A. Sarcone, is also based on Levián's Enigma. Notice the appearance of a flowing motion along the green-yellow stripes.
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Enigmatic Eye

Look at the center of the pupil and you will see the surrounding purple rings fill with rapid illusory motion. Neuroscientist and engineer Jorge Otero-Millan’s tribute to Lelant features the illusory motion seen in Enigma, and it also reflects the role of eye movements in the perception of the illusion.
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Most of the motion illusions featured in this slide show are potentially triggered by eye movements, both large and small. This pattern, by op artist Bridget Riley, gives the impression of fast spiraling motion as observers move their eyes around the image.
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In another tribute to Riley, vision scientist Nick Wade of the University of Dundee in Scotland created an example that features both streaming and shimmering motion, and it is reminiscent of various famous Riley artworks.

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The Ouchi Illusion

This illusion is by op artist Hajime Ouchi. Move your head back and forth as you let your eyes wander around the image and notice how the circle and its background appear to shift independently of one another. Vision scientist Lothar Spillmann at the University of Freiburg in Germany stumbled upon the illusion while browsing Ouchi’s book on Japanese Optical and Geometrical Art. Spillmann then introduced the Ouchi illusion to the vision sciences community, where it has enjoyed immense popularity.
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This illusion is a contemporary variation on the Ouchi pattern, by Kitaoka.
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More of Kitaoka's Op Art

Hatpin Uchim, by Kitaoka, dramatically demonstrates the importance of eye movements in the perception of this kinetic illusion.
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The Rotating-Tilted-Lines illusion

The Rotating-Tilted-Lines Illusion, by vision scientists Simone Gori and Karl Hamburger, then at the University of Freiburg in Germany, is a novel variation of the Enigma effect and Bridget Riley’s Blaze. To best observe the illusion, move your head closer and then farther away from your computer screen. As you approach the image, notice that the radial lines appear to rotate counterclockwise. As you move away from the image, they appear to rotate clockwise. This illusion was featured in the first edition of the Best Visual Illusion of the Year Contest (held August 23, 2005, in A Coruña, Spain).
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The Rotating-Tilted-Lines illusion
Artist Miwa Miwa’s variant of the Rotating-Tilted-Lines illusion pays homage to “Vertigo,” the classic film by Alfred Hitchcock.
Combination of the Rotating-Tilted-Lines and Enigma

Gori and Hamburger's combination of the Rotating-Tilted-Lines and the Enigma illusion is both visually arresting and a powerful demonstration of illusory motion from a static pattern. The Enigma illusion, almost three decades after its creation in 1981 by Leviant, continues to inspire visual science as well as the visual arts.