SOUTHERN OHIO Museum

Optical Illusions

An optical illusion is when visually perceived images differ from objective reality.

Family of Birds by Octavio Ocampo

There are two major categories of optical illusions: cognitive illusions & physiological illusions.

Cognitive Illusions: False perceptions that play on the viewer's knowledge and assumptions about the world, often resulting from unconscious inferences. Cognitive Illusions include, but are not limited to, some types of optical illusions. Examples of Cognitive optical illusions are literal illusions, ambiguous illusions, paradox illusions and distorting illusions.

My Wife & My Mother in Law by W. E. Hill

Literal Illusions: An image created by smaller images that are in no way related to the larger overall image created.

Ambiguous Illusions: Pictures or objects that can "switch" between alternate interpretations, often referred to as reversible figures. When there are two ways to view a picture, the brain can only entertain one at a time.

Paradox Illusions: Include impossible objects or situations that appear realistic in their depiction.

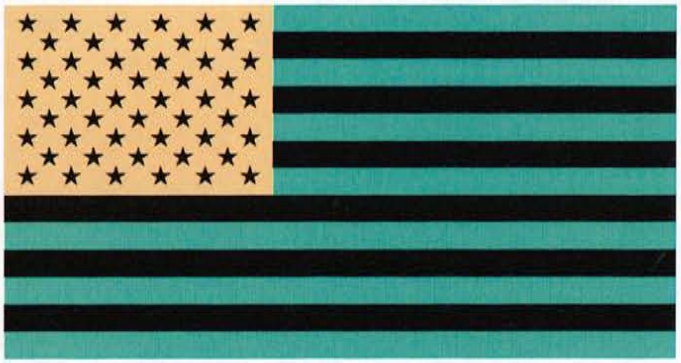
Distorting Illusions (Geometric Illusions): Distortions of size, length, position or curvature. These illusions are derived from the processing of 2 dimensional information into 3 dimensional images, resulting in faulty perception. These illusions are often based on the context effect. This category includes anamorphic images.

Context Effect: Contextual information influences the perception of size. This is often based on position and is exploited in popular photography where tourists can be seen "holding up" the Eiffel Tower or the Leaning Tower of Pisa.

Anamorphosis: A distorted projection or perspective requiring the viewer to use special devices or occupy a specific vantage point to reconstitute the image.

Physiological Illusions: Effects on the eyes or brain because of overstimulation or competing stimuli, such as brightness, color, position, size or movement that alters perception. Examples include afterimages, contrast effects and color effects. Much of the stimuli that produce physiological illusions are relevant to traditional artists, as well as those involved with Op Art.

Negative Afterimage: Caused when the eye's photoreceptors adapt to overstimulation and lose sensitivity. Negative afterimages replace the light areas of the original image with dark and vice versa, and also replace colors with their opposites.



Stare at the Center of the Image for 30 Seconds
Creates Negative Afterimage in True Color

Contrast Effects: Results of the way the human visual system processes contrast information. Contrast effects include black & white along with color images. Examples include simultaneous contrast, successive contrast, reverse contrast, and chromatic induction.

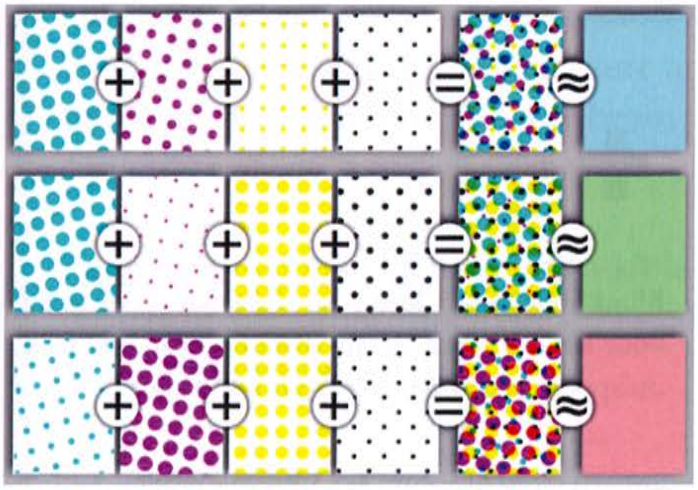
Simultaneous Contrast: The tendency of the visual appearance of a surface color to be influenced by adjacent and interspersed colors. The exact same color will appear different (brighter, darker or a different hue) on two different colored backgrounds. This accounts for why paint appears a different color on the artist's palette than in the painting.

Successive Contrast: The color of an afterimage influences the apparent color of objects viewed subsequently to the stimulus.

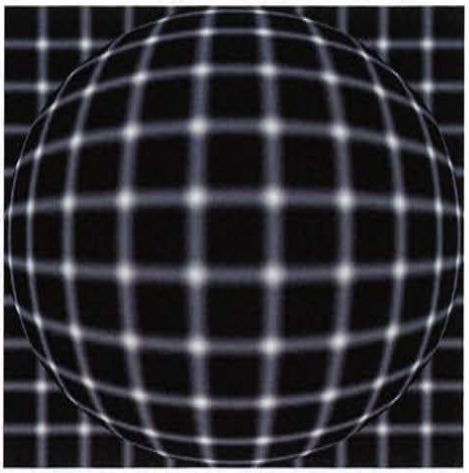
Reverse Contrast (Assimilation): When areas of color are closely interspersed, surfaces change appearance by moving towards the color of the interspersed area. Colors may also appear to spread into or become assimilated into neighboring areas.

Chromatic Induction: Viewing two colors at the same time influences both of their appearances. There is a tendency for colors to induce the appearance of a tint of their color in neighboring areas.

Color Quantization (Dithering): A color reproduction technique in which dots or pixels are arranged in a way that allows more colors to be perceived than are actually used. Similar to Pointillism in art, dithering allows for printing full color images from 3 or 4 colors, color television from just red, green & blue light. This is also similar to halftone printing used in newspapers and comic books.



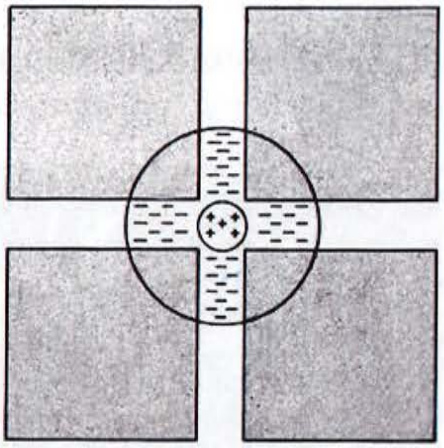
Proposed Explanations of Physiological Optical Illusions



Explanations of Optical Illusions are still hotly debated, as the human visual perception process is still not fully understood. There is no satisfactory explanation for illusory motion.

Compression in Visual Processing: Believed to impact perception and contribute to the creation of optical illusion. There are around 125 million receptors on the retina. There are around 1 million retinal ganglion cells which communicate with the visual cortex in the brain. This results in a compression ratio of 125:1 for light stimuli before information reaches the brain.

Lateral Inhibition: The capacity of an excited neuron or receptor to inhibit its neighbors. It is thought that lateral inhibition helps us detect the edges of objects and explains the phenomena of the perception of non-extant dots at the intersection of the grid optical illusion.



Lateral Inhibition Explanation for Dark Dots at Grid Intersections

Color Contrast Theory: Certain opposing colors are enhanced by each other's presence. Lateral inhibition occurs not only in black & white, but also in red & green and yellow & blue contrast.

Blind Spot: The area of the retina with no photoreceptors because it is occupied by the optic nerve.

Blind Spot Test: Close your right eye. Look at the + with your left eye. At a certain distance from you face, the dot will disappear because it is in your blind spot.

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