

Perception: Color, Vision, How We See

LIGHT is – To The Environmental Designer

The Architect and Interior Designer are interested in the environmental impact of **light**.

- creating an atmosphere
- creating a sense of space, both physically and experientially/psychologically
- describing materials and surfaces
- meeting the needs of use of the space



Designing with Light....

..... Is Perception

- An awareness of objects and other data through the medium of the senses:
 - visual perception = seeing
- Insight or intuition as an abstract quality:
 - visual perception = projecting meaning on what we see

Vision



Visual System

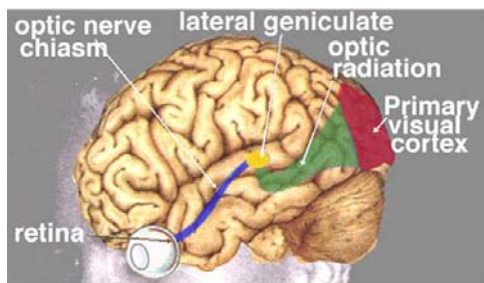
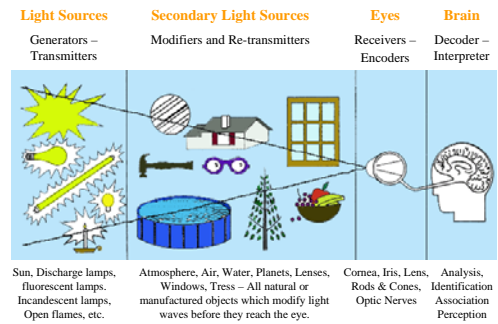
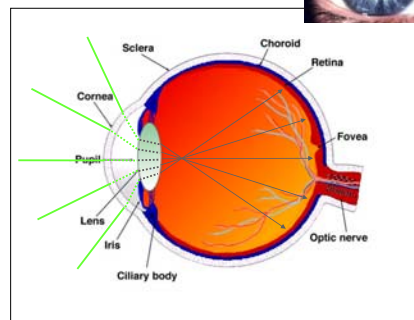


Fig. 3. The visual pathways from retina to visual cortex of the human brain.

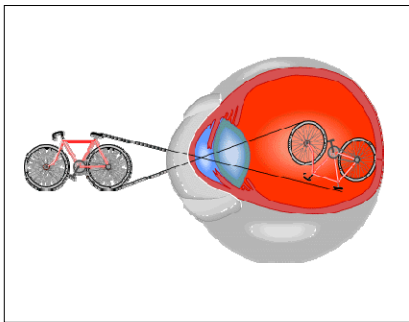
Structure of the Eye

- Cornea
- Iris
- Lens
- Retina
- Fovea



Perception: Color, Vision, How We See

Light Entering the eye is projected upside down!



Structure of the Eye

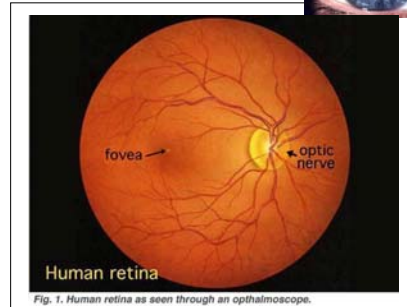
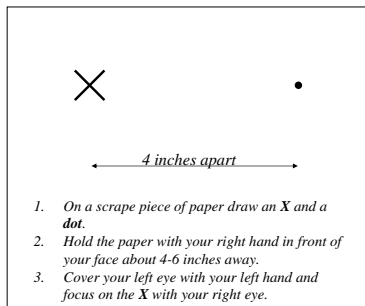


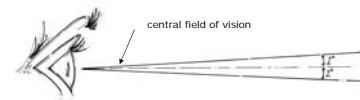
Fig. 1. Human retina as seen through an ophthalmoscope.

Find your Blind Spot



Eye's Field of Vision

- **Central field of vision:**
 - ◆ ~2 degrees above and below the direct line of sight
 - ◆ Visual acuity (ability to see detail) is best in this range
- **Peripheral area:**
 - ◆ Horizontal area to the sides of the central vision
 - ◆ Vertical areas above and below the central field of vision
- **Brightness and motion best seen in peripheral vision**



Structure of the Eye

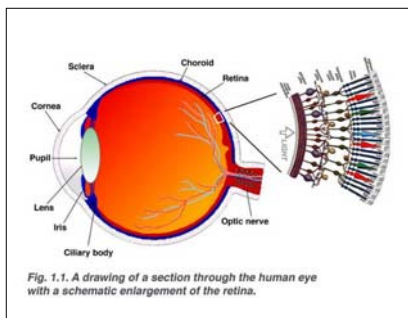
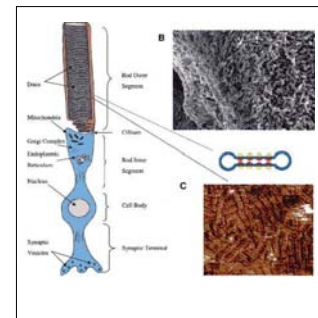


Fig. 1.1. A drawing of a section through the human eye with a schematic enlargement of the retina.

Cones and Rods

The interior back wall of the eye wall is the Retina containing light sensitive cells a photoreceptors known as **Rods** and **Cones**

- **Rods** - 120 million
principle for peripheral vision and low light levels (Scotopic Vision)
- **Cones** - 8 million
responsible for normal (Photopic vision) and for focusing on fine detail...cones also contain pigment and allow to see color...but they can differ or sensitive



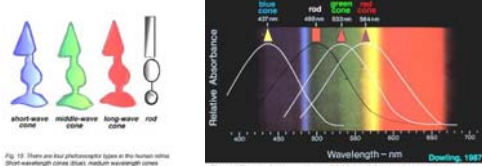
Perception: Color, Vision, How We See

Processing of Visual Information

Color Perception

this visual process provides us details regarding the color of a surface or an object

- the cones detect color.....a normal person is trichromatic...we see all colors
- Color Deficiencies in the Visual System** - color blindness



Color Vision Tests

Confusion lines form the basis of many color vision tests such as Pseudoisochromatic plates.

Pseudoisochromatic plate tests are also commonly used in the clinic to screen for color vision deficiency. Colors are carefully chosen based on the confusion lines.

The most commonly used pseudoisochromatic plate in the clinic would be the Ishihara Isochromatic plates (for screening red-green color vision deficiency) and the Tritan (F-2) plate.

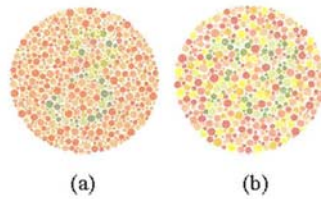


Figure 21. (a) The transformation plate of the Ishihara. Normal should see 3 while a CVD person should see 5. (b) The vanishing plate of the Ishihara. Normal should see 75 while a CVD will not read the figures correctly.

pseu-do-i-so-chro-ma-tic (s d - s -kr -m t k) adj.
Being apparently of the same color, as of certain charts used in testing colorblindness

Color Vision Tests

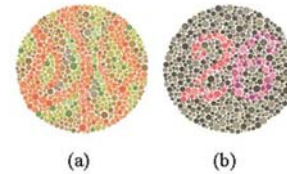


Figure 22. (a) The hidden-digit plate of the Ishihara. Normal should not see anything while a CVD person should see 5. (b) The diagnostic plate of the Ishihara. Normal should see both the 2 and the 6. Deutan type colour vision deficiency should see 2 more easily while a protan type colour vision deficiency should see the 6 more easily.

Day & Night Vision

Photopic – Day Vision (Cones vision)

The cones of the eye are of three different types. These are the primary colors (additive) in light, which are red, green, and blue.

Scotopic – Night Vision (Rods vision)

The rod is responsible for night and peripheral vision.

Mesopic - Dim Light Vision (Rod and Cone vision)

This occurs when the light levels are low but there still is the ability to see color (between .01 and 1 cd/m² adaptation luminance).

Measuring Vision

Visual Acuity (20/20 Vision)

Snellen Eye Chart: the first number is refers to the distance from the chart, the second is what a normal person can read the chart....20/20 is normal...but, 20/60 says that person could read 20 feet what normal person can read at 60 feet

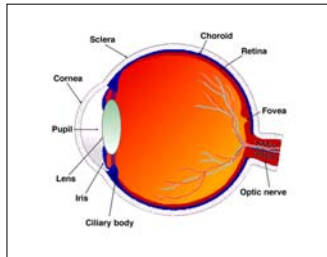
- Contrast Sensitivity
- Contrast Detection



Perception: Color, Vision, How We See

Effects of Aging

- Yellowing of the lens
- Opacity of the lens
- Less Elastic Lens
- Amount of light reaching the Retina
- Time required for Visual Process
- Visual Acuity and Sensitivity decrease



Common Defects:
Myopia: can't focus on far objects (Near-sighted)
Hyperopia: can't focus on near objects (Farsightedness)
Astigmatism: distortion in the shape of the lens
Presbyopia: lens loses its elasticity...corrected with bifocals to read near

Visibility and Visual Performance

- Contrast
- Size
- Background Luminous
- Viewing Time

Contrast

Can you read this?

Background Luminous



Size

Lighting

Viewing Time

What is the next word?

Perception: Color, Vision, How We See

Processing of Visual Information

Depth Perception

this visual process provides us details regarding the distance to an object

Your eye determines distance by 3 methods (size, moving, stereo)

- **The size a known object has on your retina** - If you have knowledge of the size of an object from previous experience, then your brain can gauge the distance based on the size of the object on the retina.

Pictorial cues...sizes of objects that you are similar with...books, chairs...light and shadow provide clues...directional light.....

- **Moving parallax** - When you move your head from side to side, objects that are close to you move rapidly across your retina. However, objects that are far away move very little. In this way, your brain can tell roughly how far something is from you.

- **Stereo vision** - Each eye receives a different image of an object on its retina because each eye is about 2 inches apart. This is especially true when an object is close to your eyes. This is less useful when objects are far away because the images on the retina become more identical the farther they are from your eyes.

Binocular Clues...seeing an object with both eyes....more information is provided...stereo vision....a one eyed person lack depth perception



Depth Perception - Binocular Cues

Binocular rivalry can be demonstrated by placing your pen between yourself and the computer screen.



Keep your eye on the tip of your pen and notice the two bars merge....

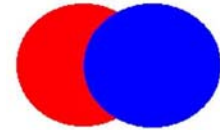
What do they form?

(You may need to slowly move the pen from the screen toward you.)

Depth Perception - Monocular Cues

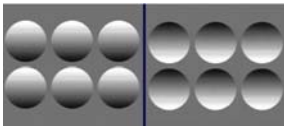


Relative Size: Retinal image size allow us to judge distance based on our past and present experience and familiarity with similar objects. As the car drives away, the retinal image becomes smaller and smaller. We interpret this as the car getting further and further away. This is referred to as size constancy. A retinal image of a small car is also interpreted as a distant car.



Interposition: Interposition cues occur when there is overlapping of objects. The overlapped object is considered further away.

Depth Perception - Monocular Cues



Light And Shade: Highlights and shadows can provide information about an objects dimensions and depth. Because our visual system assumes the light comes from above, a totally different perception is obtained if the image is viewed upside down.

Depth Perception - Monocular Cues



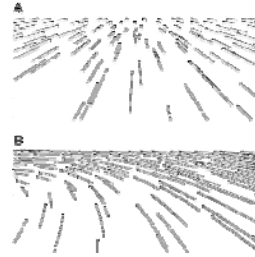
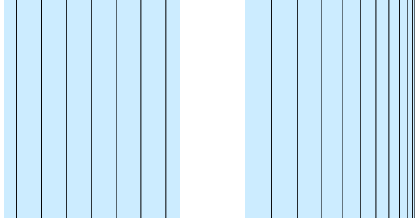
Linear Perspective: Parallel lines such as railway lines converge with increasing distance.



Aerial Perspective: Mountains in the distance appear more blue.

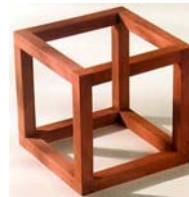
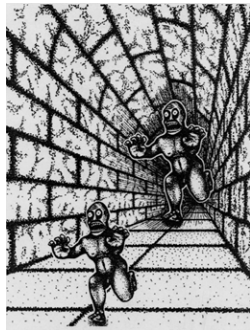
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Depth Perception



A) Radial dot flow generated from a straight-line path across a ground plane. The direction of motion can be determined by finding the focus of expansion, the point in the flow field where there is no horizontal or vertical motion. This may not be explicitly present, but can be extrapolated from the motion of other points in the image. B) Curvilinear dot flow generated from a curved path across a ground plane, also with a fixed gaze.

Monster Illusion



The balconies on this New York apartment block either appear to tilt upwards or downwards depending on the angle they are viewed from. The higher you look the stronger the appearance of the tilt

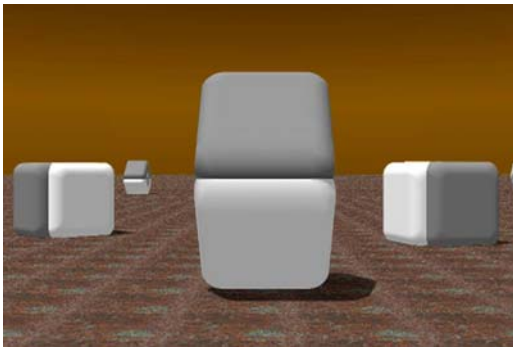
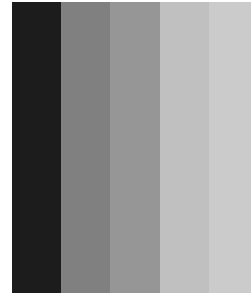
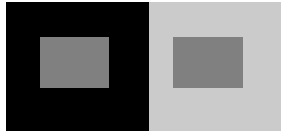
Processing of Visual Information

Brightness Perception

this visual process provides us details regarding the brightness of a surface or an object

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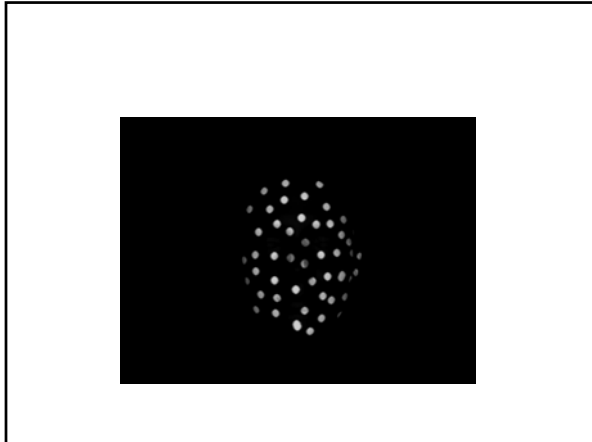
Brightness Perception



Processing of Visual Information

- **Motion Detection**
this visual process provides us details regarding the motion to an object
- Different cells respond to different type of movement...and can adapt light light levels
- Moving or static perceived movement in all directions is perceived
- Our visual system is capable of taking a series of stationary views andand appears to be a continuous moving scene...(ie individual frames in a stroboscopic manner, such as movies)
- Lamps strobe...up to 120 times a second....

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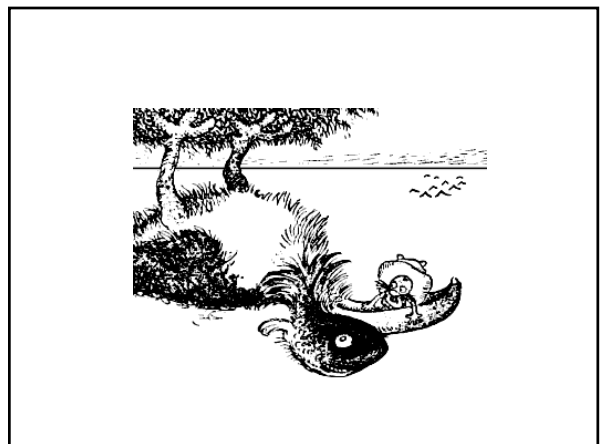
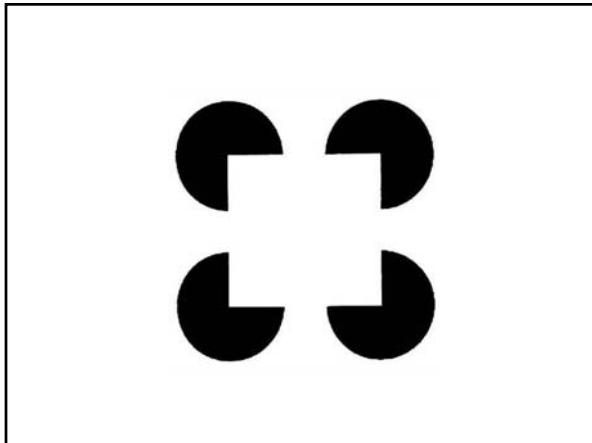


Visual Perception

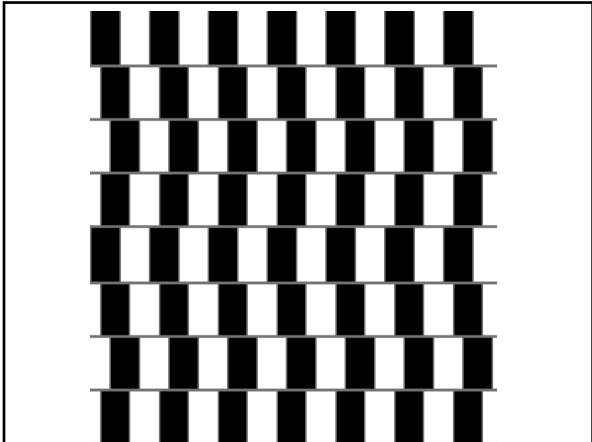
The modern view of visual perception is one of dynamic processes that go beyond the simple replication of visual information provided to the retina.

For over 80 years Gestalt psychologists have argued that the act of perception creates a Gestalt, a figure or form that is not a property of an object observed but represents the organization of sensations by the brain.

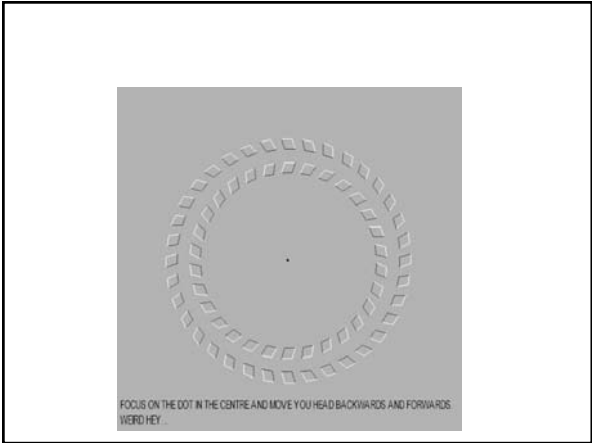
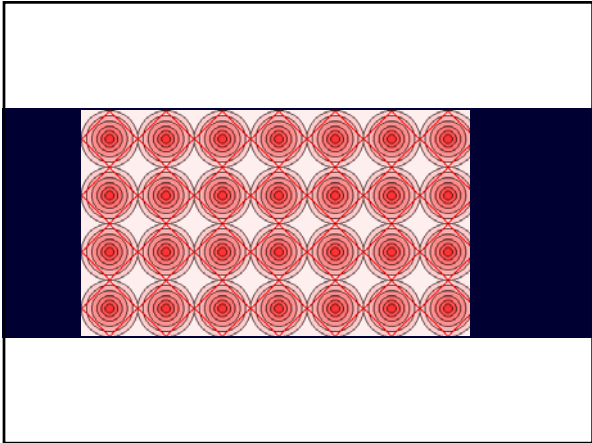
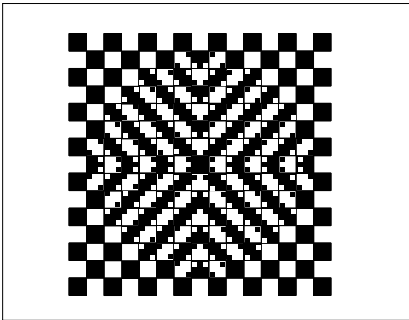
This dynamism is thought to be crucial for the performance of simple, everyday visual tasks such as the recognition of an object that is partially occluded. Thus, the study of how the brain is capable of filling in the missing pieces is an important topic; one that has most often been carried out through the use of illusory contours and optical illusions.



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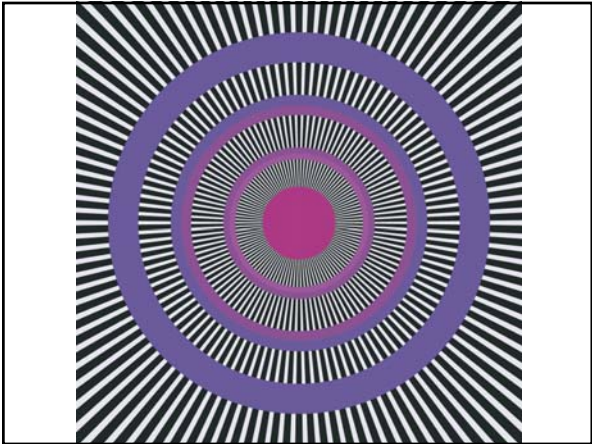
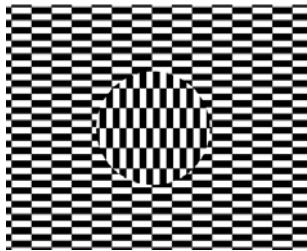


Hering illusion

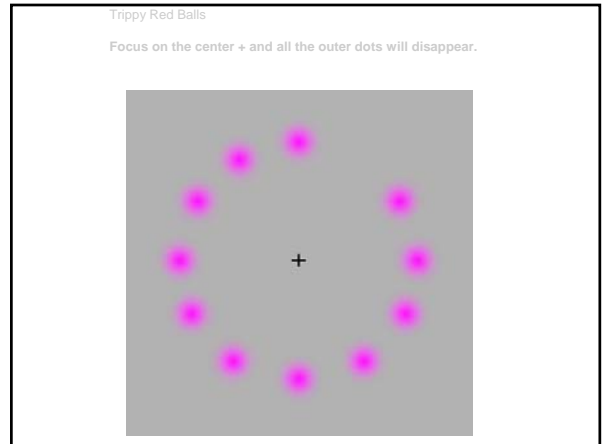
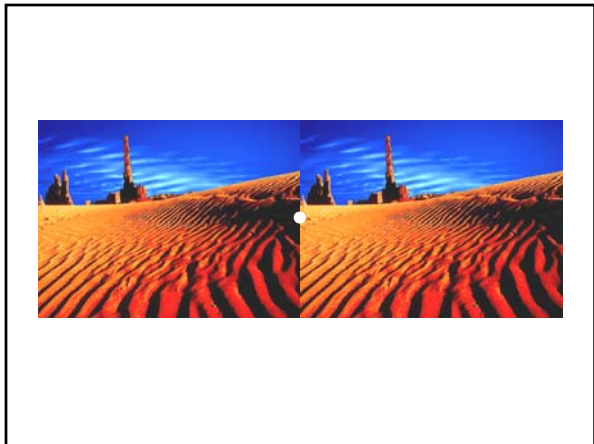
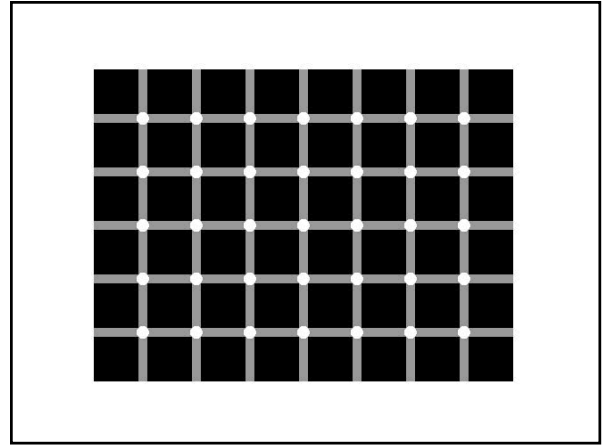
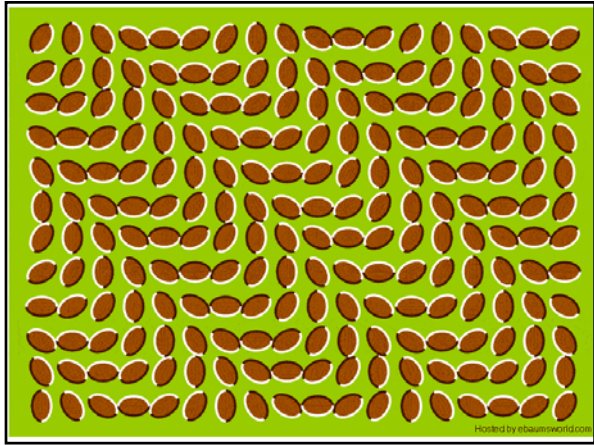
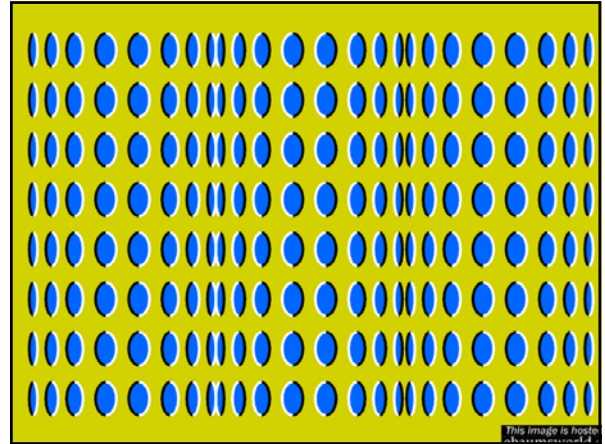
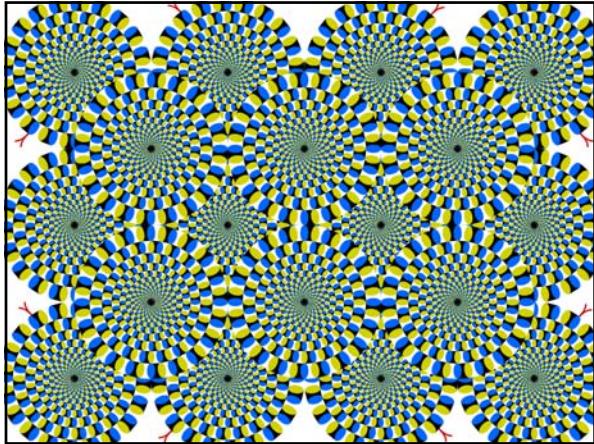


FOCUS ON THE DOT IN THE CENTRE AND MOVE YOUR HEAD BACKWARDS AND FORWARDS. YOU'LL SEE...

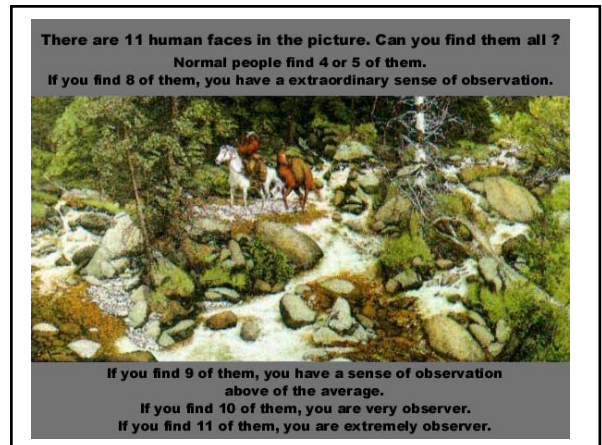
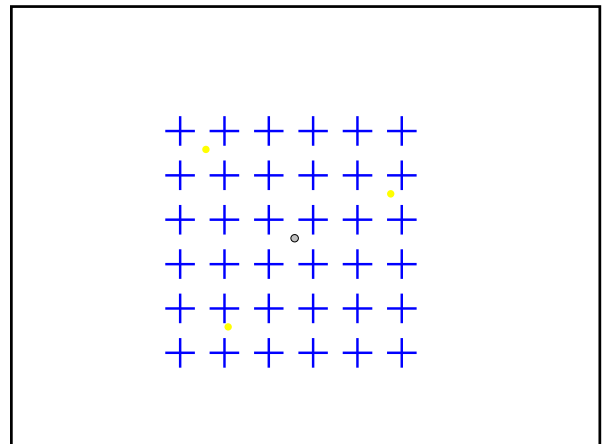
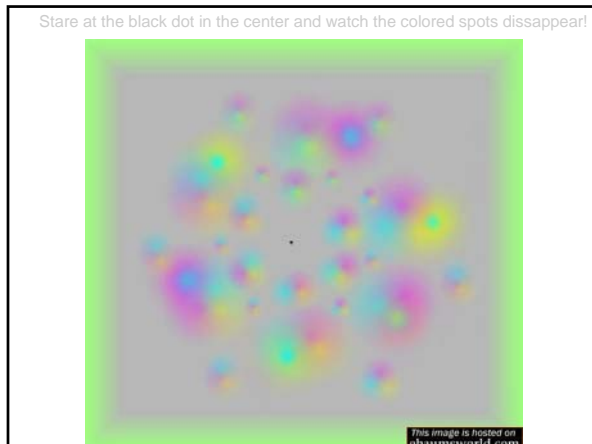
Ouchi Illusion



Perception: Color, Vision, How We See



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 the wrod as a wlohe. Such a cdonition is arppoiatly
 cllaed Typoglycemia :-)

Amzanig huh? Yaeh and yuo awlyas thought
 slpeling was ipmorantt.

Count the F's in that sentence.
 Count them ONLY ONCE!

**FINISHED FILES ARE THE RE-
 SULT OF YEARS OF SCIENTIF-
 IC STUDY COMBINED WITH
 THE EXPERIENCE OF YEARS.**

ANSWER:
 There are six F's in the sentence.
 A person of average intelligence finds three of them.
 If you spotted four, you're above average.
 If you got five, you can turn your nose at most anybody.
 If you caught six, you are a genius.