


CHAPTER 4




How do we see the world?

Sensation and Perception

CLASS OBJECTIVES

- In this chapter we explore sensation and perception, the vital processes by which we connect with and function in the world.
 - What is sensation?
 - Why do we each see things differently?
 - Can my eyes really play tricks on me?



Sensation

- *Sensation* is the process where our sensory organs relay information to our brain.
 - This is how our brain receives sensory information

Sensation

- Human sensory capabilities go well beyond the basic five senses (sight, sound, taste, smell, touch).
 - We are sensitive not merely to touch but to a considerably wider set of stimuli—pain, pressure, temperature, vibration.

- Vision has two subsystems—relating to day and night vision.
- The ear is responsive to information that allows us not only to hear but also to keep our balance.

Why do we see things so differently?

- Two people witness the same event...how well do they report the same version of what happened?
- Perception is a purely psychological process that reflects how we see the world.
 - Perception is how an organism interprets the sensory information and gives it meaning.



Receptor cells in our eyes record (*sense*) a sleek silver object in the sky, but they do not “see” a jet plane.

Recognizing that object as a plane is *perception*.

Top-Down Vs. Bottom-Up

- In *bottom-up processing*, sensory receptors register information about the external environment and send it up to the brain for interpretation.
- Bottom-up processing means taking in information and trying to make sense of it

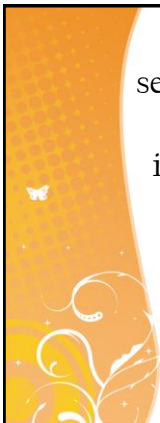
- In contrast, *top-down processing* starts with cognitive processing in the brain.
- In top-down processing we begin with some sense of what is happening and apply that framework to incoming information from the world.
- Bottom-up and top-down processing work together in sensation and perception to allow us to function accurately and efficiently



Why do we perceive the world?


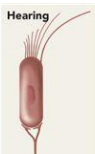








From an evolutionary perspective, the purpose of sensation and perception is adaptation that improves a species' chances for survival.

- An organism must be able to sense and respond quickly and accurately to events in the immediate environment, such as the approach of a predator, the presence of prey, or the appearance of a potential mate.



All sensation begins with sensory receptors, specialized cells that detect stimulus information and transmit it to sensory nerves and the brain

Sensory receptors are the openings through which the brain and nervous system experience the world.

	Human Sensory Organs				
Sensory Receptor Cells					
Type of Energy Reception	Photoreception: detection of light, perceived as sight	Mechano-reception: detection of vibration, perceived as hearing	Mechano-reception: detection of pressure, perceived as touch	Chemoreception: detection of chemical stimuli, perceived as smell	Chemoreception: detection of chemical stimuli, perceived as taste
Sense Organ	 Eyes	 Ears	 Skin	 Nose	 Tongue

How do we Measure this?

- Psychophysics focuses on the relationship between physical stimuli and a person's experience.
- Thresholds-
 - A dividing line where things become different

- Absolute Threshold is defined as the lowest intensity at which a stimulus can be detected 50 percent of the time.

- The lower the absolute threshold, the greater the sensitivity.

Approximate Absolute Thresholds for Humans

Sensory Modality	Absolute Threshold
Vision	Candle flame seen at 30 miles on a clear, dark night
Hearing	Tick of a watch under quiet conditions at 20 feet
Taste	1 teaspoon of sugar in 20 gallons of water
Smell	1 drop of perfume diffused into the entire volume of a large apartment
Touch	Wing of a fly or bee falling on a person's cheek from a distance of 1 centimeter

Source: Based on Galanter, 1962.

Difference Threshold

- Psychologists also investigate the degree of *difference* that must exist between two stimuli before the difference is detected.
- The smallest difference between two stimuli that people can perceive 50 percent of the time.
- AKA, the Just Noticeable Difference (JND)

Can sensations that occur below our absolute threshold affect us without our being aware of them?





Can advertisers control us?

- *Subliminal perception* refers to the detection of information below the level of conscious awareness.
- In 1957, James Vicary, an advertising executive, announced that he was able to increase popcorn and soft drink sales by secretly flashing the words "EAT POPCORN" and "DRINK COKE" on a movie screen in a local theater.




These claims were a hoax, but people have continued to wonder whether behavior can be influenced by stimuli that are presented so quickly that we cannot perceive them.

Studies have shown that the brain responds to information that is presented below the conscious threshold, and such information can influence behavior

Signal Detection Theory

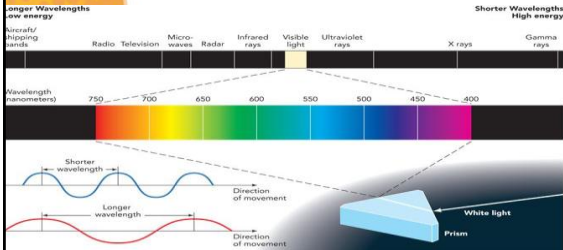
- Signal detection theory focuses on decision making about stimuli under conditions of uncertainty.
- In signal detection theory, detection of sensory stimuli depends on a variety of factors besides the physical intensity of the stimulus and the sensory abilities of the observer
 - Decision criterion can change, depending on such factors as fatigue, expectation, and the potential significance of the stimulus.



The Visual System

When you see the beautiful colors of a fall day, what your eyes and brain are responding to is really the differences in light reflected from the various colorful leaves. Our ability to detect visual stimuli depends on the sensitivity of our eyes to differences in *light*.

Vision is the interpretation of the electromagnetic spectrum in terms of amplitude and wavelength



The diagram illustrates the electromagnetic spectrum, categorized into bands: Radio, Television, Micro-waves, Radar, Infrared rays, Visible light, Ultraviolet rays, X rays, and Gamma rays. The visible light spectrum is shown as a rainbow with wavelength markers in nanometers (750, 700, 650, 600, 550, 500, 450, 400). Below the spectrum, a diagram shows a prism dispersing white light into its constituent colors, with labels for 'Shorter wavelength' and 'Longer wavelength' corresponding to the color spectrum.

On your own! Please be sure to review the following material!

Please review the structure of the eye and visual processing in the brain (p.111-115).

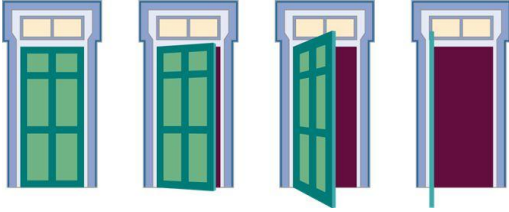
Perceiving *visual stimuli* means organizing and interpreting the fragments of information that the eye sends to the visual cortex.

Information about the dimensions of what we are seeing is critical to this process. Among these dimensions are *shape, depth, motion, and constancy*.

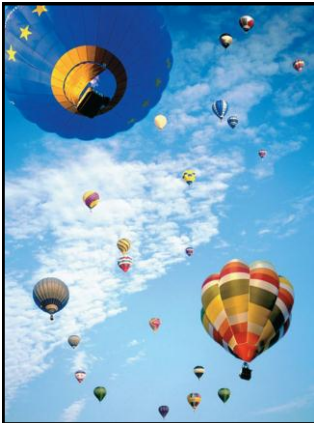
Visual Constancy

- Our tendency to perceive objects as keeping their shape, size, and color.
- *Shape Constancy* is our ability to recognize a shape despite its orientation.
- Even though the retinal image of the object changes as you walk, you still perceive the objects as having the same shape

Shape Constancy



Regardless of the angle, we still perceive all the doors as rectangles



- Size Constancy is our ability to recognize that an object remains constant in size regardless of its distance to the observer

Visual Perception

- Gestalt psychology emphasizes that we perceive objects as well-organized patterns rather than separate component parts.

- "The whole is more than the sum of the parts"



Optical Illusions

Can my eyes play tricks on me?

The image contains two optical illusions. On the left is a car wheel with a five-spoke design. On the right is a brick wall with a person standing on top. The wall is drawn with perspective, but the bricks are arranged in a way that creates a 3D effect, making it look like a solid block rather than a flat wall.

Do we really just see what we want to?

- Read the following sentence once:
- Finished files are the result of years of scientific study combined with the experience of many years

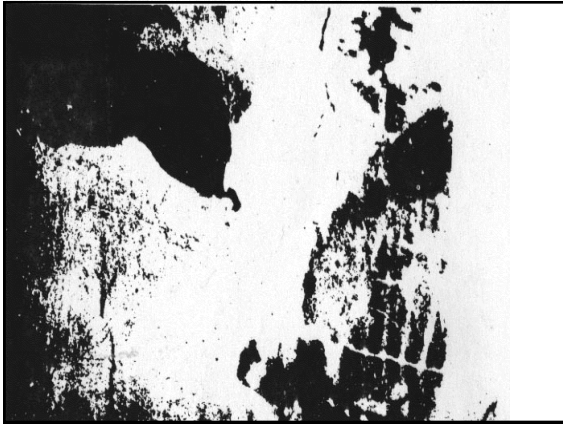
- How many F's did you count? Three? Wrong there are six! It's no joke! Read again:
- FINISHED FILES ARE THE RESULT OF YEARS OF SCIENTIFIC STUDY COMBINED WITH THE EXPERIENCE OF YEARS
- What we see is not always accurate!
- Why? It seems that the brain cannot correctly process the word 'OF'.

Figure-ground perception

- Our visual system simplifies the visual scene into a figure.
- And a ground which is everything else and forms the background.
- Look closely at the next picture for an example of this.

Figure and Ground





Closure

- When a familiar figure is interrupted, we imagine the rest of the figure
- The figure we imagine completes what we already see in a way that is simple, symmetrical, or consistent with past experience

Is what I see just all in my head?

- Read the following passage OUTLOUD:
- According to a research at Cambridge University, it doesn't matter in what order the letters in a word are, the only important thing is that the first and last letter be at the right place. The rest can be a total mess and you can still read it without problem. This is because the human mind does not read every letter by itself, but the word as a whole

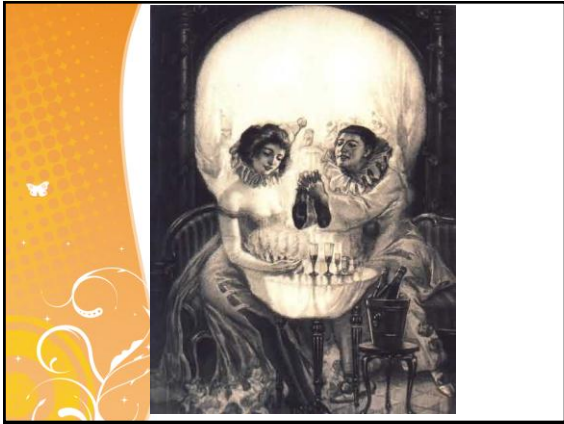


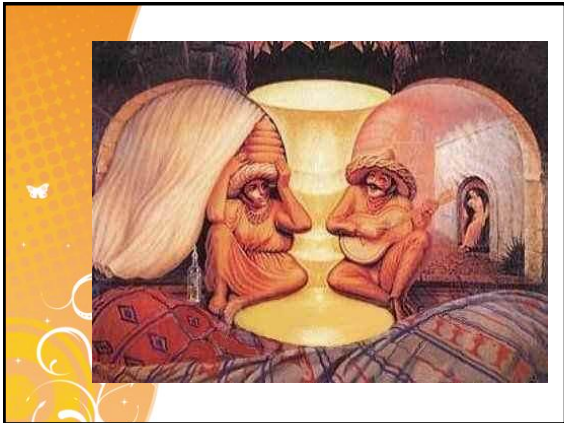
Reversible Figures

- Stimuli that can be perceived in more than one way
 - Is this the foreground or the background?

Eskimo or Indian head?

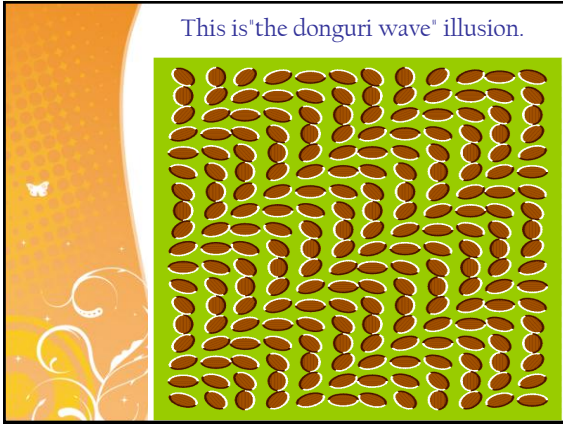
Old Woman or Young Lady?

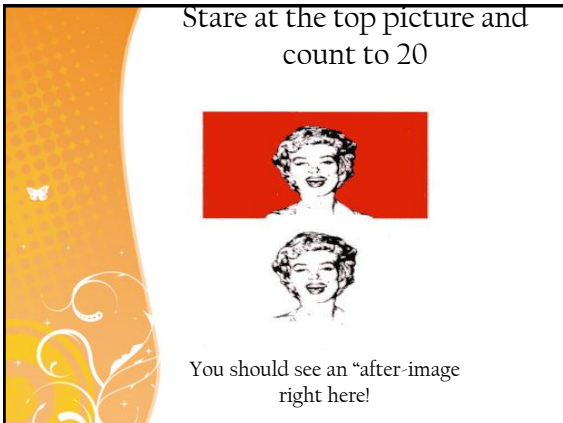


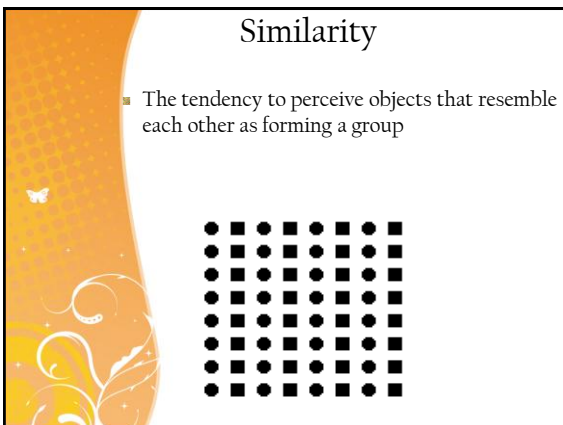


Count the Black Dots...
good luck ☺

A 10x10 grid of black squares. Each square contains a white dot. The dots are arranged in a pattern that is difficult to count accurately. To the left of the grid is a decorative orange and white border with a butterfly and floral motifs.







- Illusions occur when we misinterpret information.

- The following illusion is called the “*Motion Aftereffect Phenomenon*” click on the picture to try it!

