

# PSYC100 GENERAL PSYCHOLOGY PERCEPTION

# Lecture Outline

- What is perception?
- Gestalt Psychology
- Depth perception
- Perceptual consistency
- Illusions
- Theories of visual perception

# What is perception?

- Perception is the *organisation* and *interpretation* of incoming sensory information to form inner representations of the external world.
- We don't perceive 'reality' at all but only how our brain *interprets* it (Macknik & Martinez-Conde, 2014).
- Ehrenfels (1890) claimed that many groups of stimuli acquire a pattern quality that is greater than the sum of their parts.
  - E.g. Melody. If you hear the notes of a song played individually, they're just separate sounds. But when played together in sequence, they form a recognizable melody with a unique quality
- Gestalt Psychology argues that our brain organizes sensory information—like shapes, sounds, or images—into meaningful wholes.
  - E.g. face

# What is perception?

- **Distal stimulus** – the object you are looking at
- **Proximal stimulus** – the pattern of stimulation that hits the retina
- While the distal stimulus is constant, the proximal stimulus varies.
- A major issue for perception is how your perception remains constant when the proximal stimulation is so variable.

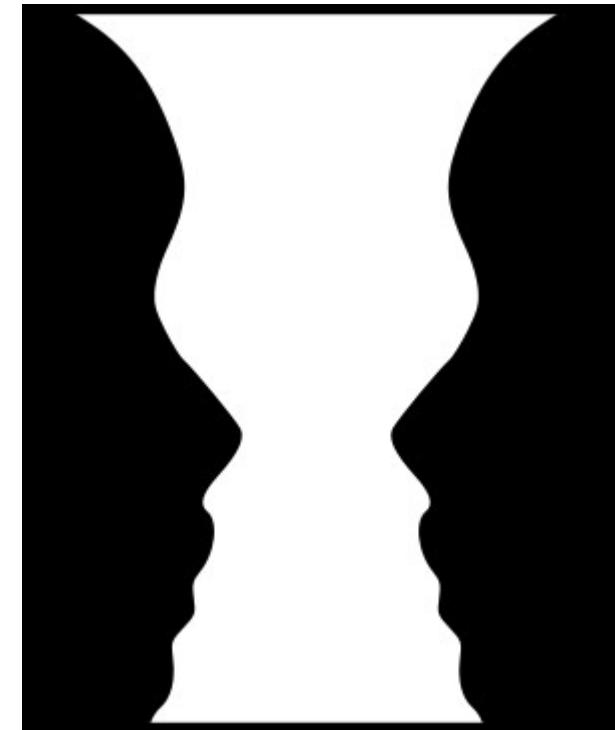
# Gestalt principles of perceptual organization

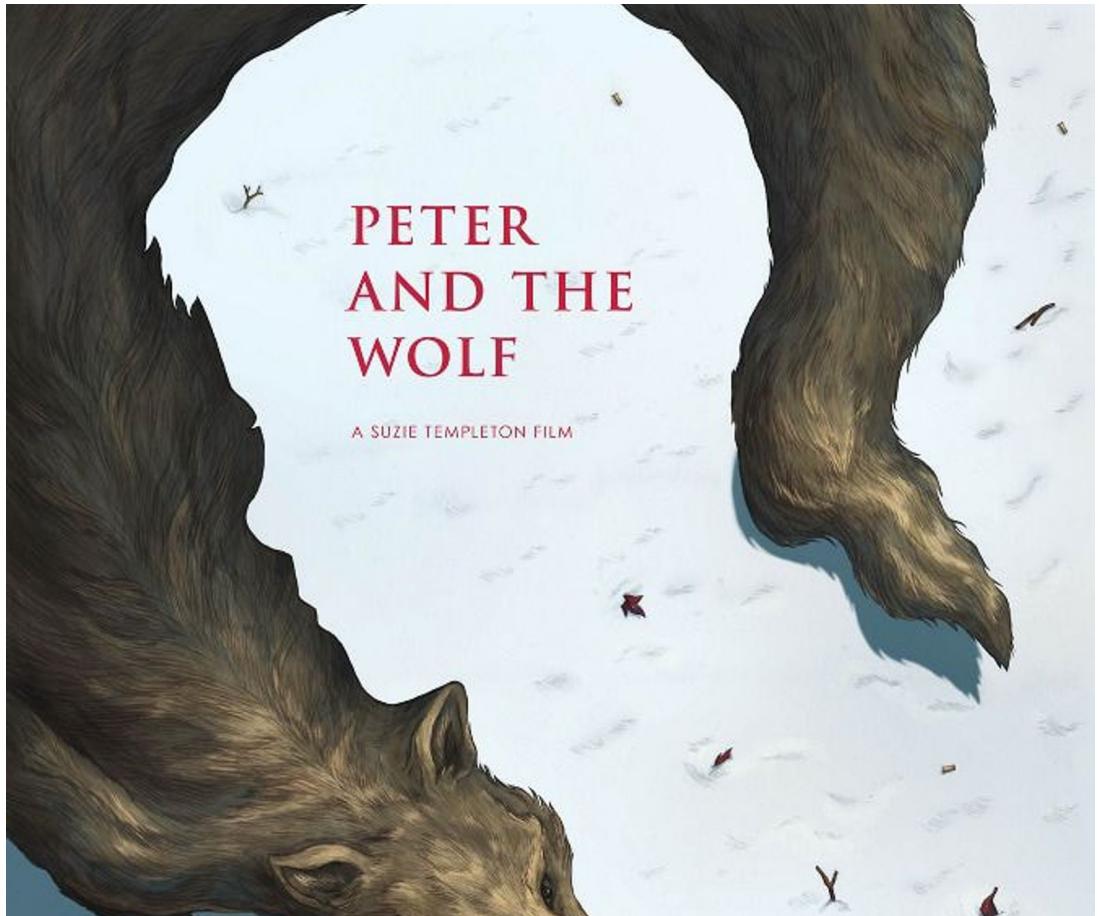
1. Figure-ground separation
2. Proximity
3. Closure
4. Similarity
5. Continuity
6. Symmetry

\* 2-6 are called Laws of perception

# Figure-ground separation

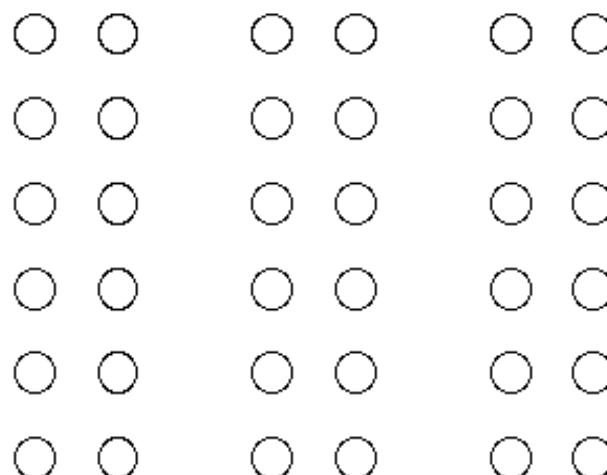
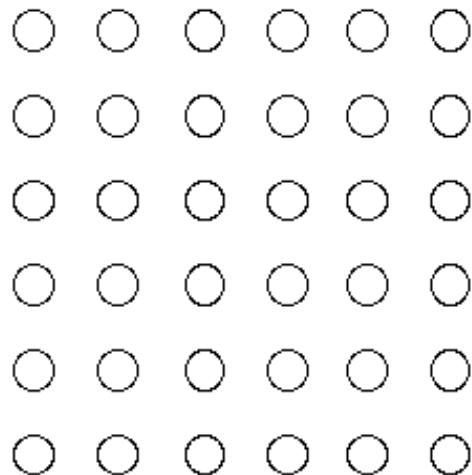
The first perceptual task when confronted with an object (or *figure*) is to recognise it. To do this, we must perceive the figure as being distinct from its surroundings (or *ground*).





# Proximity

Occurs when elements are placed close together. They tend to be perceived as a group.



The Gestalt principle of proximity suggests that you see (a) one block of dots on the left side and (b) three columns on the right side.

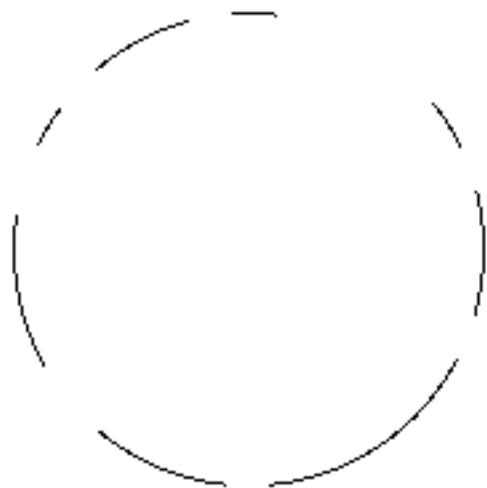


**21<sup>st</sup> june, happiest day of 2013**

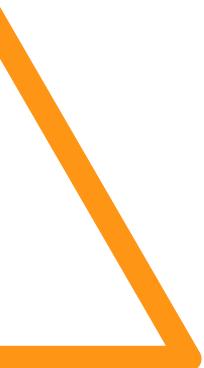
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# Closure

We tend to complete incomplete forms and generally fill in the gaps

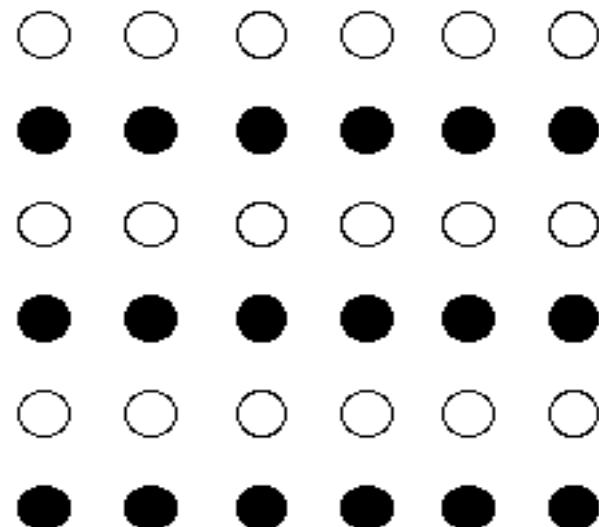


Closure suggests that we will perceive a complete circle and rectangle rather than a series of segments.



# Similarity

Similar parts of a form are more likely to be perceived as belonging together than parts that are dissimilar.



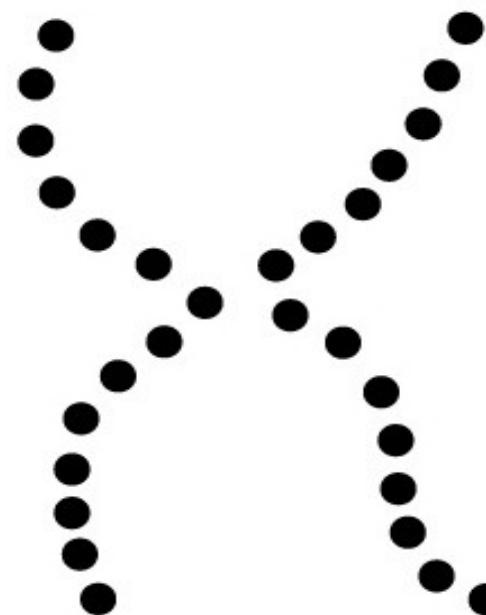
When looking at this array of dots, we likely perceive alternating rows of colours. We are grouping these dots according to the principle of similarity.



# Continuity

We group stimuli into forms that follow continuous lines or patterns.

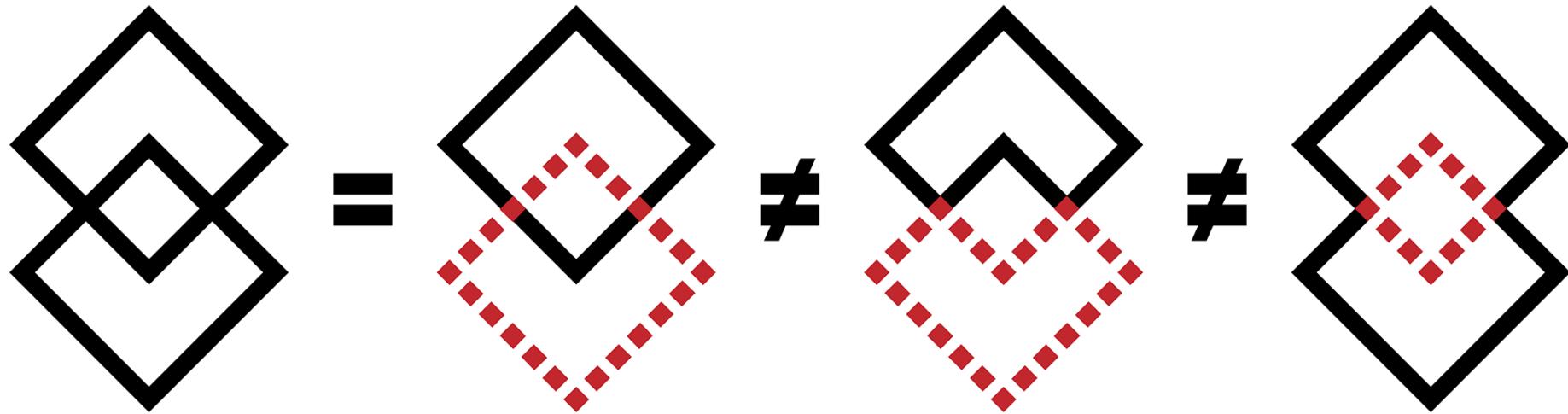
Good continuation would suggest that we are more likely to perceive this as two overlapping lines, rather than four lines meeting in the center.





# Symmetry

- Elements that are symmetrical to each other tend to be perceived as a unified group.
- Similar to the law of similarity, this rule suggests that objects that are symmetrical with each other will be more likely to be grouped together than objects not symmetrical with each other.



We see these shapes as two overlapping diamonds instead of as two touching corner bricks or an octahedron with a square in the middle.



# Depth perception

- Depth perception is the ability to see things in a 3-dimensional way and to judge distance.
- We use depth cues to gather information on the images we see. These cues are monocular and binocular cues.
- Binocular cues involve both eyes and rely on their working together, while monocular cues are available to each eye separately.



Predator vs Pray

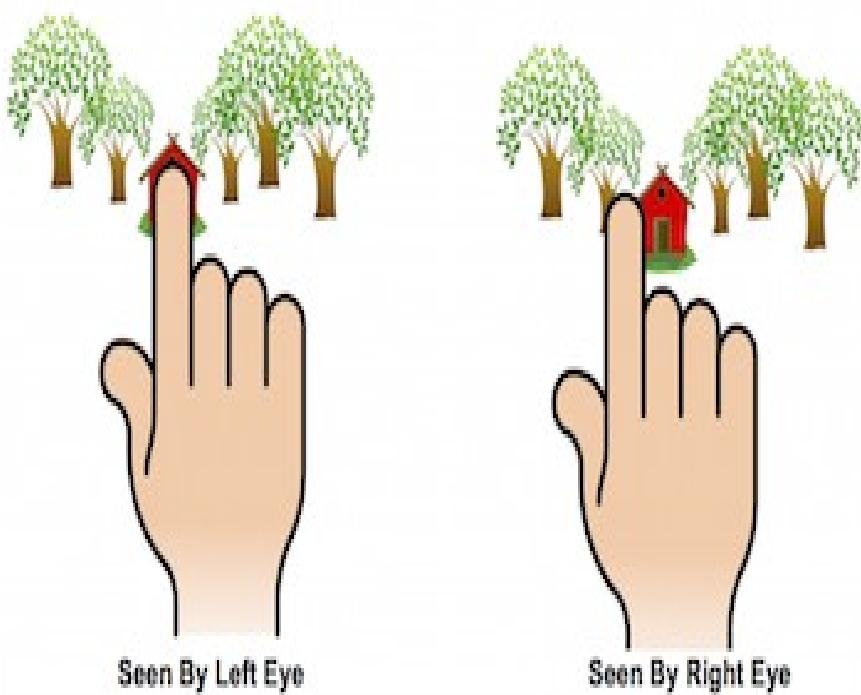
# Non-pictorial cues

Nonpictorial cues involve the physical functioning of the eyes and brain rather than interpreting visual patterns in a scene. They include:

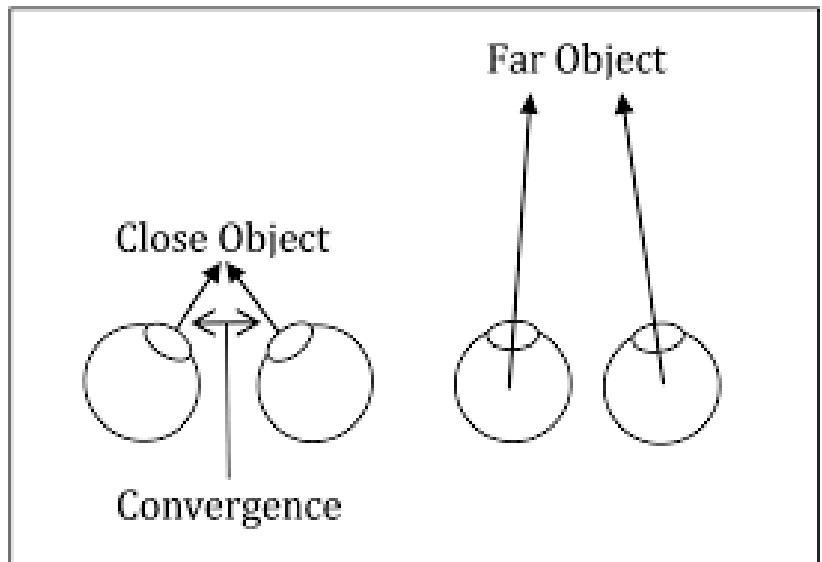
**Retinal Disparity (Binocular Cue):** The slight difference in the images projected on each retina due to the eyes' horizontal separation. The brain uses this disparity to estimate depth, especially for objects within a few meters.

**Convergence (Binocular Cue):** The inward rotation of the eyes to focus on a nearby object. The degree of convergence (angle of eye movement) provides the brain with information about an object's distance.

# Retinal disparity



# Convergence



# Pictorial cues

- These refer to features of the visual field itself (rather than to the eyes), and **are all also monocular.**

**1. Relative Size:** Objects that are farther away appear smaller than similar objects that are closer.



# Pictorial cues

## 2. Interposition

**(Occlusion):** When one object partially blocks another, the blocked object is perceived as farther away.



# Pictorial cues

## 3. Linear Perspective:

Parallel lines (e.g., railroad tracks) appear to converge as they recede into the distance, signaling depth.



# Pictorial cues

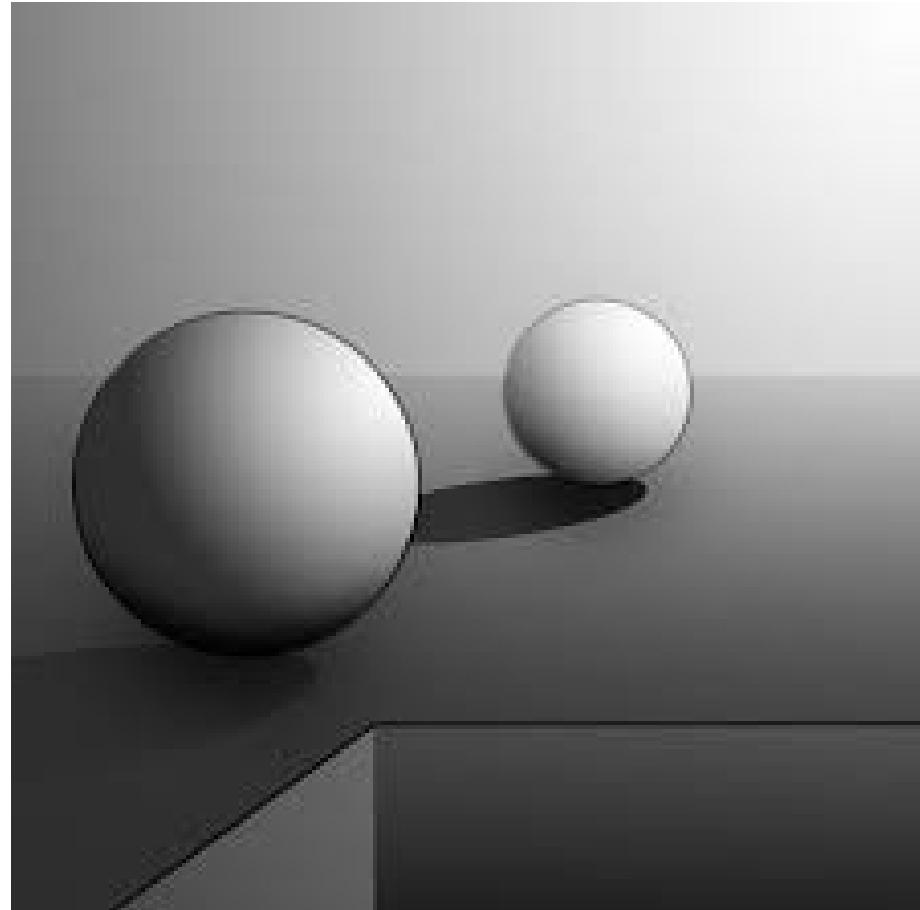
## 4. Texture Gradient:

Textures appear denser and less detailed as they get farther away.



# Pictorial cues

**5. Light and Shadow:** The way light falls on objects creates shadows that indicate their shape and position in 3D space.



# Pictorial cues

## 6. Aerial Perspective:

Distant objects appear hazier or less vivid due to atmospheric scattering of light, suggesting greater distance.



# Pictorial cues

**7. Relative Height:** Objects higher in the visual field (closer to the horizon) are perceived as farther away, especially in landscapes.



# Perceptual consistency

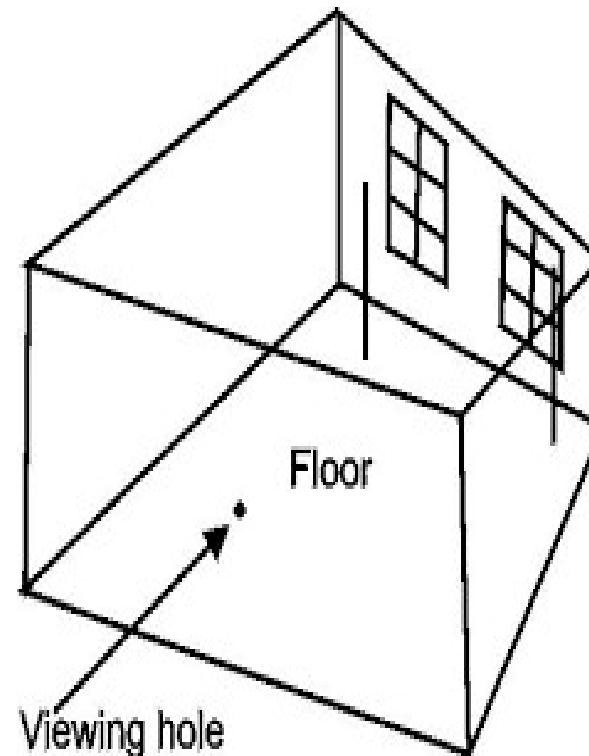
- The ability to perceive an object as unchanging, despite changes in the sensory information that reaches our eyes, is called *perceptual constancy*.
  - Size constancy
  - Shape constancy
  - Brightness constancy
  - Colour constancy
  - Location constancy

# Size constancy

The brain perceives an object's size as constant, even though its retinal image changes with distance. For example, a person appears the same size whether they are 5 or 50 feet away, despite the retinal image being smaller at a distance (Ramachandran and Rogers-Ramachandran, 2004).



# Ames Room (Ames, 1946)



In the Ames room, the walls, floor, and ceiling are trapezoidal, not rectangular. Your brain interprets both corners as being at the same distance, even though one is farther away.

# Shape constancy

An object's shape is perceived as consistent, even when viewed from different angles, which alters its retinal projection. For example, a door appears rectangular whether viewed head-on or at an angle, where it projects a trapezoid on the retina.

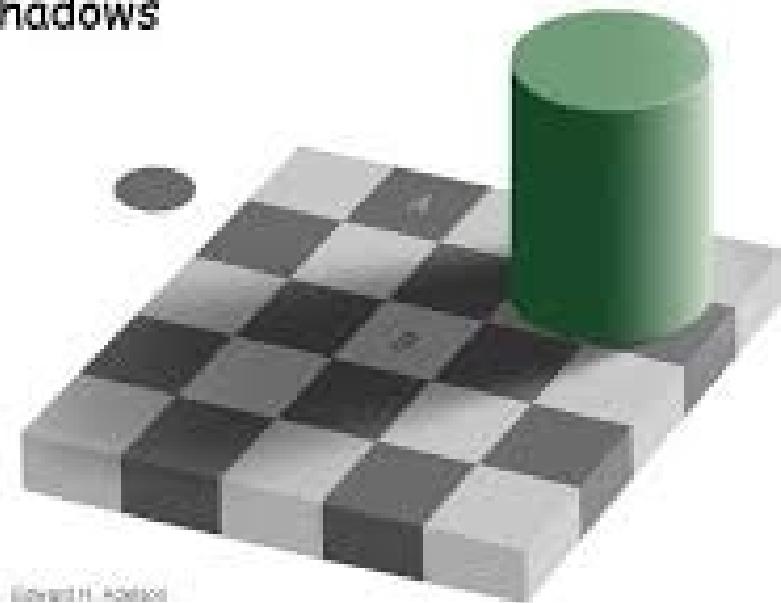


**5.20 Shape constancy** When we see a door at various slants from us, it appears rectangular even though its retinal image is often a trapezoid.

# Brightness constancy

Objects are perceived as having consistent brightness, even when illumination changes. For example, a white shirt appears equally white in bright sunlight or dim shade, despite differences in light intensity reaching the retina.

Shadows



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# Colour constancy

The brain perceives an object's colour as stable under different lighting conditions. For example, a red apple looks red in sunlight or under fluorescent light, even though the wavelengths reflected change.



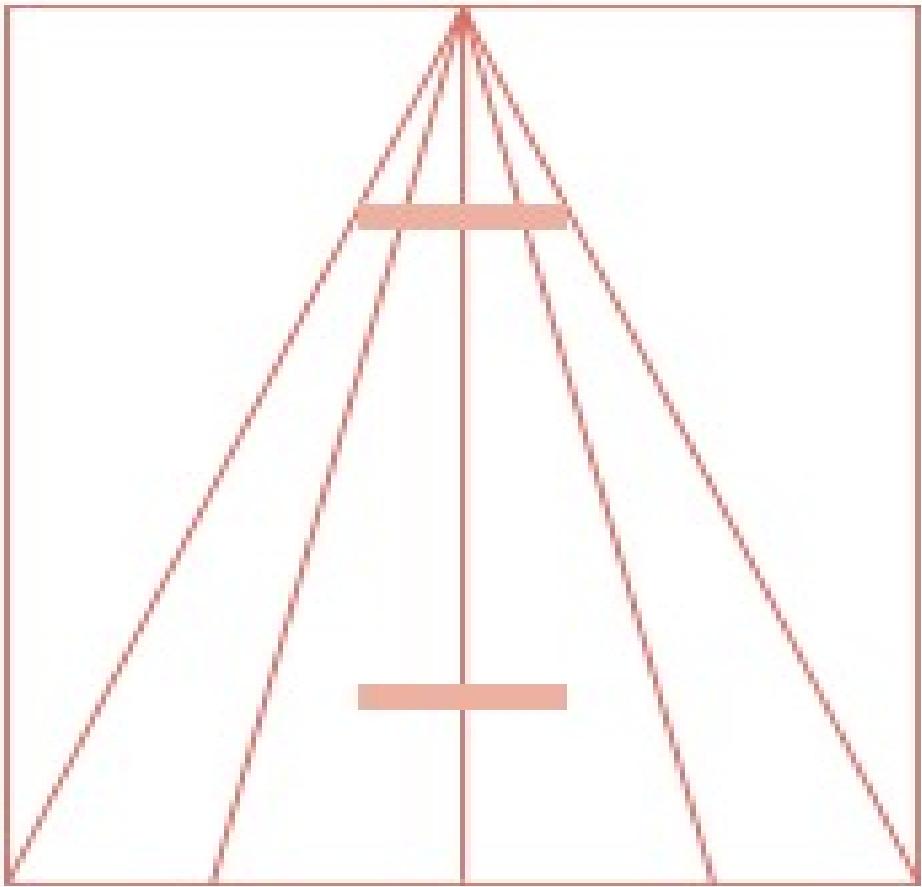
# Location constancy

- Moving our heads around produces a constantly changing pattern of retinal images, yet we don't perceive the world as spinning around. This is because *kinaesthetic*

# Illusions

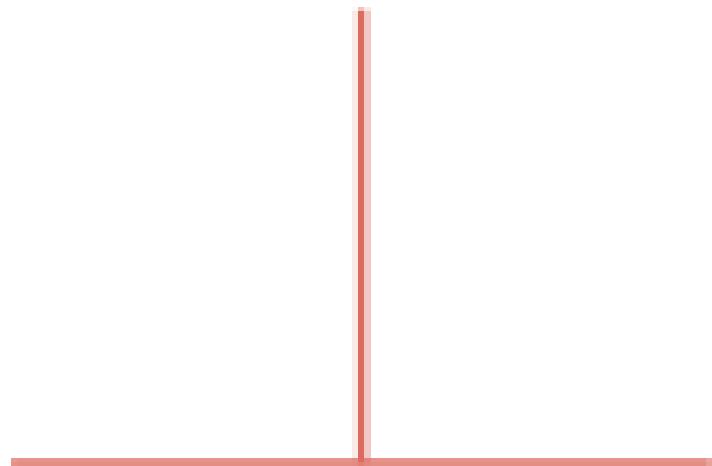
- These offer examples of how perception can be wrong and how what we see is not the truthful reflection of what's out there
- Perception is based not only on the stimulus but also knowledge and experience
- The Ponzo illusion
- The Horizontal-Vertical illusion
- The Muller-Lyer illusion
- The Poggendorf illusion
- Titchener's circles

# The Ponzo Illusion



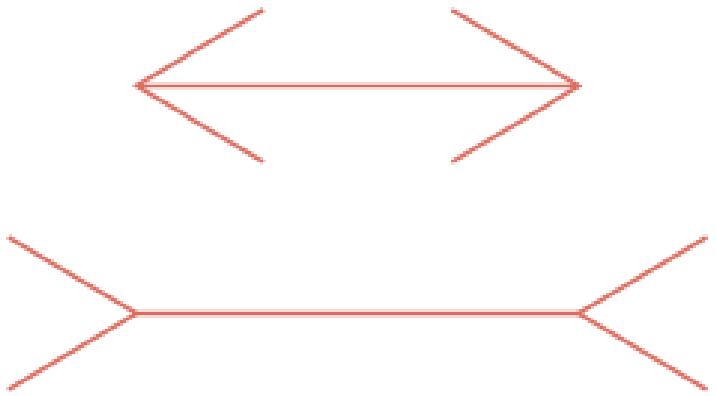
The horizontal bar at the top is seen as being longer than the horizontal line at the bottom, even though they're both the same length.

# The Horizontal-Vertical Illusion



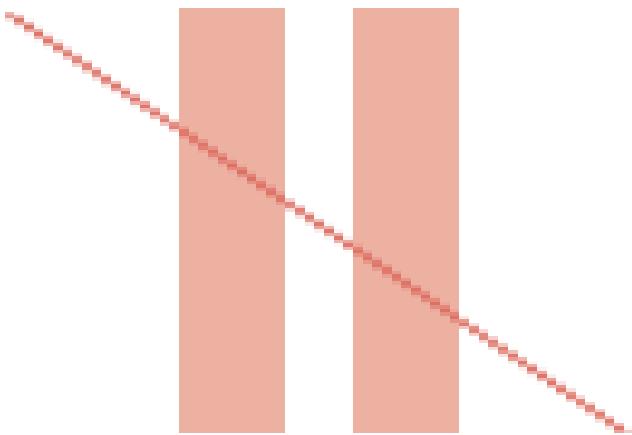
The vertical line appears longer than the horizontal line – even though they're of equal length.

# The Muller-Lyer Illusion



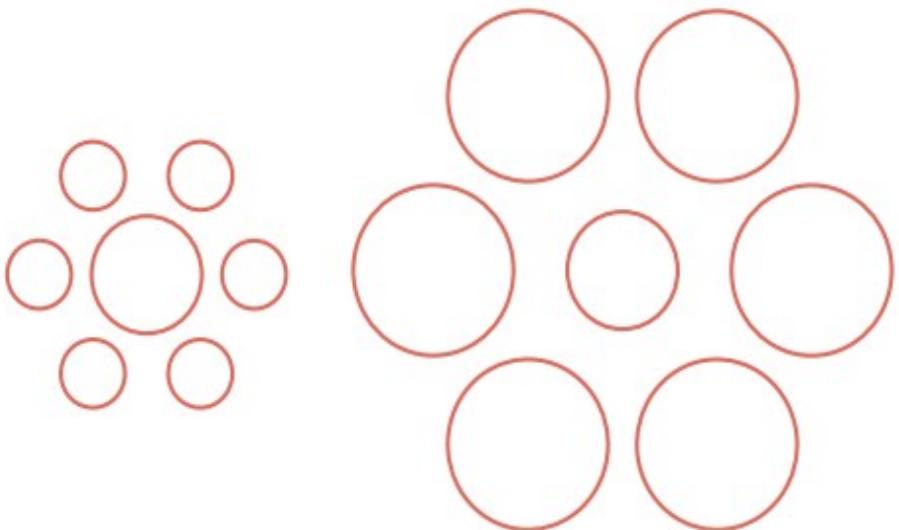
The line with the outgoing fins appears to be longer than the line with the ingoing fins, but in fact they're the same length.

# The Poggendorf Illusion



Seems like the segments of the diagonal line are offset, even though they're not.

# Titchener's circles



The central circle in the left-hand group is seen as being larger than the central circle of the right-hand group, but they're both the same size.

# Theories of Visual Perception

1. **Gestalt Theory** (as discussed - "the whole is greater than the sum of its parts.")
2. **Constructivist Theory** (Gregory, 1966) - perception is an active, constructive process. The brain uses sensory input, prior knowledge, and expectations to build an interpretation of the visual world. Perception is driven by higher-level cognitive processes, such as memory, experience, and context. For instance, we recognize a blurry image as a face because we've seen faces before.  
*e.g. When reading messy handwriting, your brain uses context and prior knowledge of words to decipher the text, even if some letters are unclear.*

# Theories of Visual Perception

**3. Ecological Theory (Gibson, 1966)** - perception is direct and does not require complex cognitive processing. The environment provides all the information needed for perception through "affordances" (cues about how objects can be used). Gibson's theory emphasizes the interaction between organisms and their environment, focusing on real-world, ecological contexts rather than lab-based stimuli.

e.g. *When walking through a forest, you perceive the ground's texture and slopes directly, allowing you to navigate without consciously analyzing every step.*

<b>Aspect</b>	<b>Gibson's Direct (Ecological) Theory</b>	<b>Gregory's Constructivist (Indirect) Theory</b>
<b>Key assumptions</b>	Perception is direct and bottom-up; we "pick up" invariant information from the environment without needing inferences.	Perception is indirect and top-down; the brain constructs perceptions by testing hypothesis based on sensory data and prior knowledge.
<b>Role of environment</b>	Central; the optic array provides rich, unambiguous information (e.g., affordances) that specifies what actions are possible.	Provides incomplete or ambiguous sensory input, which must be supplemented by cognitive processes.
<b>Role of cognition</b>	Minimal; perception happens as a result of direct resonance with the environment.	Essential; involves active interpretation using past experiences, expectations, and inferences.
<b>Explanation of illusions</b>	Occur due to insufficient or artificial environmental information (e.g., in lab settings), not cognitive errors.	Result from misapplied hypotheses or perceptual errors based on prior knowledge (e.g., size illusions from depth cues).

# Theories of Visual Perception

While Gregory's constructivist ('top-down') and Gibson's direct ('bottom-up') approaches may appear to contradict each other, it's possible to see them as **complementary**. According to Harris (1998): "*Perception is not just a single task but ... contributes in many different ways to everyday life ... Some of these ... are obviously more difficult than others and it seems likely that some can be accomplished directly, as Gibson maintained, whilst others may require sophisticated internal knowledge and are thus better described by the indirect approach.*"

# Lecture summary

- What is perception?
- Laws of perception
- Depth perception: pictorial and non-pictorial cues
- Principles of constancy
- Illusions
- Ecological and Constructivist theories of visual perception