

Lecture 4: Recognition and Identification

Dr. Tony Lambert

Reading:

UoA text, Chapter 5, *Sensation and Perception*
(especially pp. 141-151)

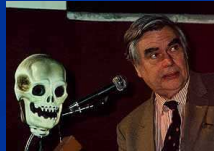
Perception as unconscious inference

- Hermann von Helmholtz (19C)
- Richard Gregory (1970's)
- Perception often goes beyond the immediate sensory information
- Influence of background knowledge and context

The problem of perceiving depth

Richard Gregory 1966

"We are given tiny distorted upside-down images in the eyes, and we see separate solid objects in surrounding space. From the patterns of stimulation on the retinas we perceive the world of objects, and this is nothing short of a miracle!"

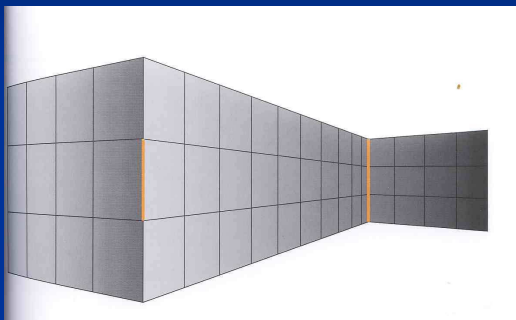


Perception as unconscious inference

- Analogy with scientific discovery – evidence & hypothesis

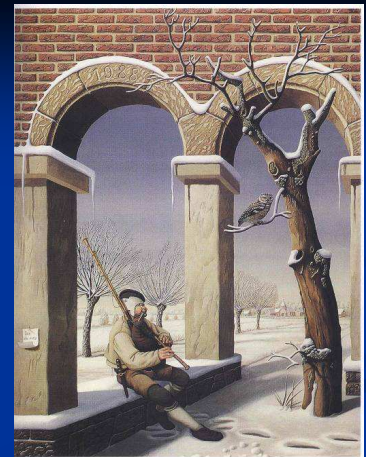
PERCEPTION 15 HYPOTHESIS

Visual Illusions



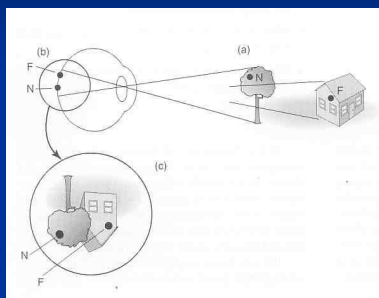
Illusions involving paradox:

local perceptual hypotheses vs. overall interpretation



The problem of perceiving depth

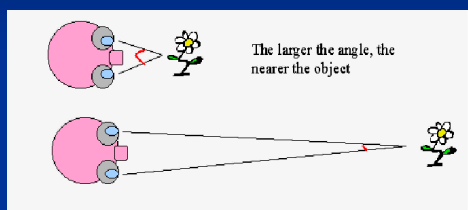
- Image on retina is 2D
- But the world is in 3D !!



The problem of 3D perception

- Perceptual system (i.e. the brain) uses cues in the 2D image to infer 3D layout of a scene
- Perception as a process of unconscious inference
 - Hermann von Helmholtz
- Binocular depth cues
- Monocular depth cues

Binocular convergence

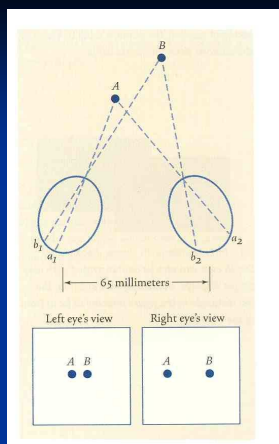


Only comes into play when viewing relatively close objects (less than 3 m)

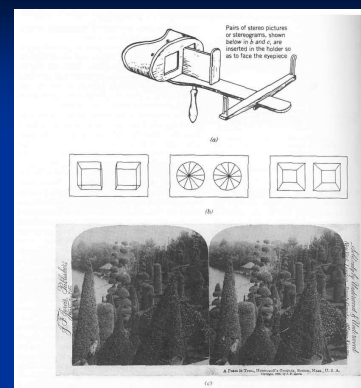
Binocular disparity

- Each eye gets a slightly different view of the world
- This is called **binocular disparity**
- The brain uses this disparity to compute relative distance

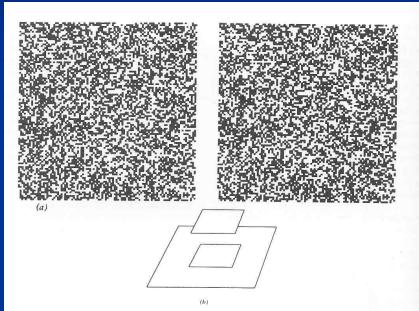
Binocular disparity



Stereoscope (Viewmaster)



Random Dot Stereograms (Julesz)



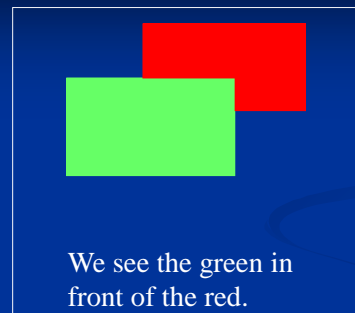
Monocular cues

- You can judge depth reasonably well with only one eye
- There are actually more monocular than binocular cues
- Also known as pictorial depth cues

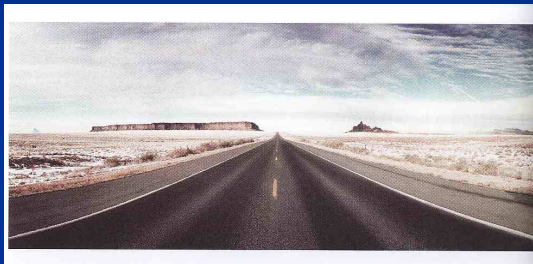
Seeing depth with one eye

- Wesley Walker – blind in one eye from birth
- Played ‘wide receiver’ for New York Jets for 13 years

Interposition or occlusion



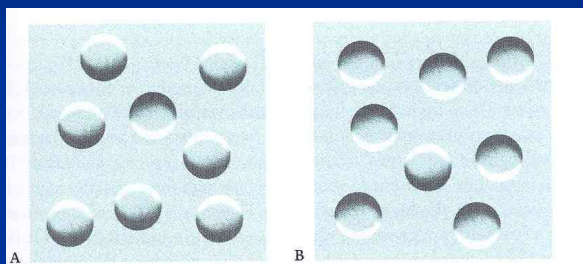
Linear Perspective



Linear perspective

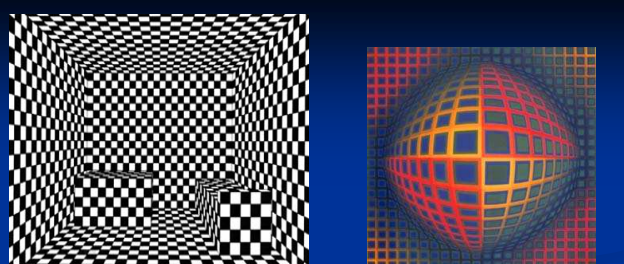
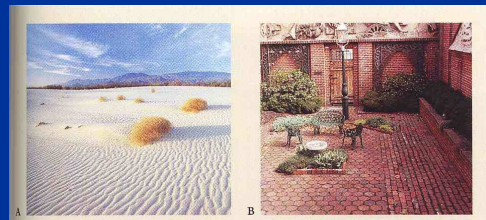
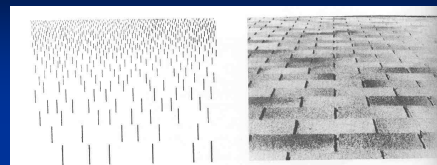
- ‘Discovered’ by 15C Italian architect
 - More realistic paintings
- Enthusiastically adopted by Renaissance artists

Shading and lighting



Perceptual system assumes that light is from above

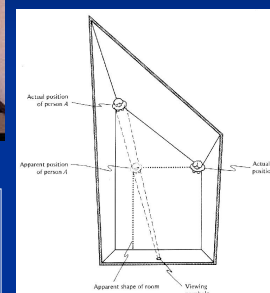
Texture Gradients



Effect of changes in texture gradients



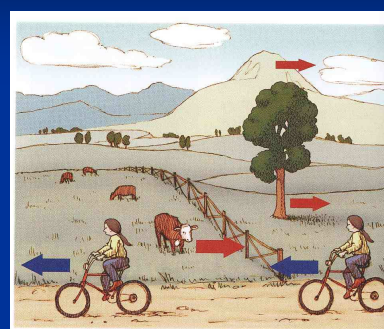
The Ames Room
Linear perspective cue
vs. familiar size cue



Depth perception & motion

- Motion parallax
 - If you move your head from side to side, near objects move more than far objects
- Distant object hardly move at all
- This gives an important clue to depth

Motion parallax



Recognising Faces

- The fusiform face area (FFA)
 - A special brain system for faces?
- Prosopagnosia
 - *The man who mistook his wife for a hat*
- Brain imaging & the fusiform face area
 - Kanwisher *et al.* Face recognition vs. houses & hands

Identifying gaze direction

- Friesen & Kingstone 1998
 - If someone is gazing in one direction do we automatically look there too?
 - The answer seems to be 'Yes' !

Gaze direction & reflexive attention

Fast responses

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Slow responses

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Summing Up

- Perception as unconscious inference
- Perceiving depth & motion
- Perception of faces & automatic response to gaze direction