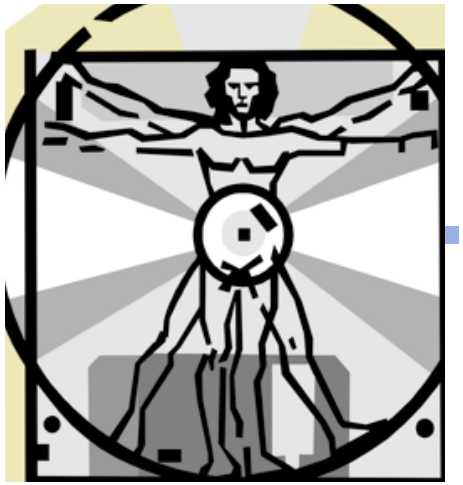


Constancy & Illusions

Do You Believe in Magic…

Overview

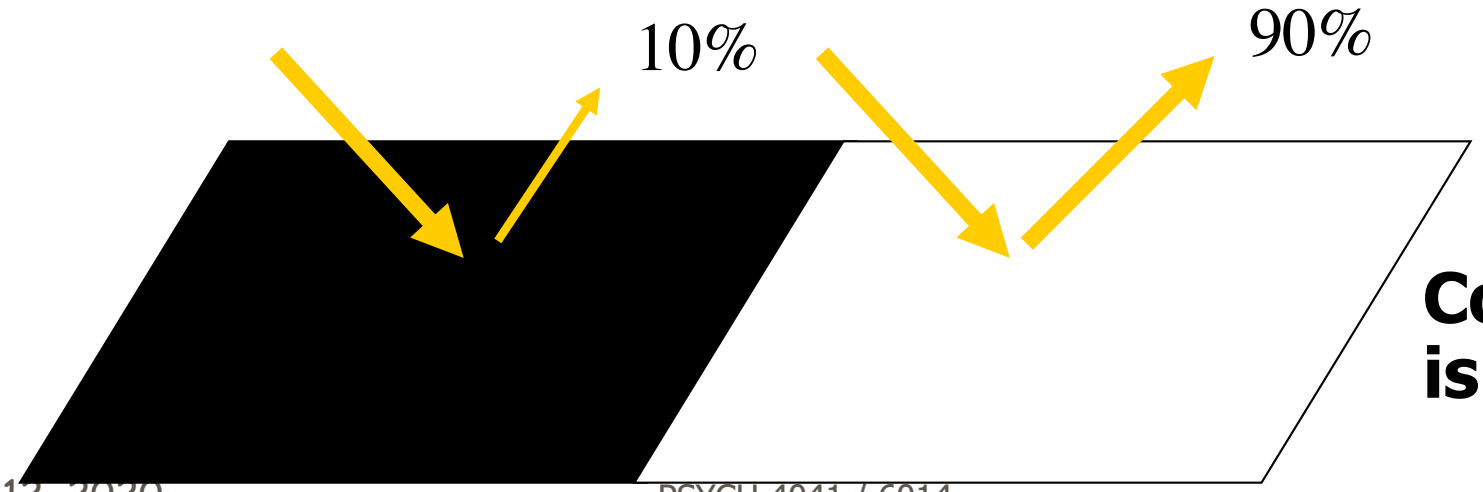
- Constancy
- Illusions
- Upcoming

Constancy

- Intro
  - Despite great variations, we perceive the world as largely constant
  - Heuristics help us simplify our world
  - Constancies are the result of several of these heuristics
  - Illusions are often consistencies (or heuristics) gone wrong

Constancy

- Lightness Constancy
  - Lightness of an object appears constant, even in changing lighting
    - e.g. snow in daylight, snow in shadows, still white
    - e.g. coal in the sunshine is still black
  - Albedo
    - *Proportion* of reflected light remains constant



Context is key!!

Constancy, cont'd

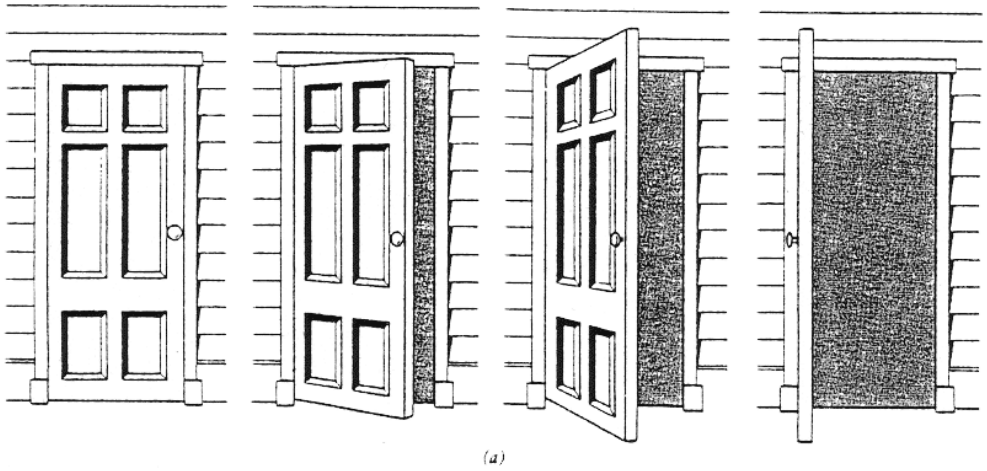
- Size Constancy
  - Objects of a known size tend to be perceived as unchanged in size when they change distance
    - e.g. people seen from 5 story building
    - Note: "within limits"
  - Emmert's Law

$$Size_{(perceived)} = Size_{(retinal)} \times Distance_{(perceived)}$$

  - Limits of size constancy
    - Great distances do not support constancy
    - Not surprising

Constancy, cont'd

- Shape Constancy
  - Object is seen to have the same shape, despite different retinal shapes
    - Other cues provide context (doors, windows, etc.)
  - We tend to see objects and assume depth



Constancy, cont'd

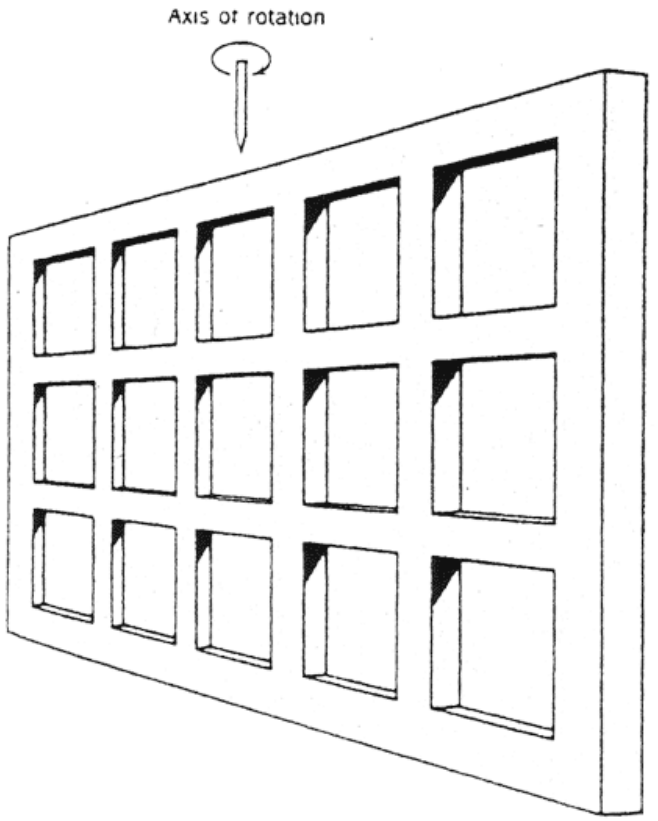
- Summary of Constancy
  - Constancy enables perceptual world to correspond to physical world
  - Helps us survive
  - Under some conditions, these (beneficial) heuristics break down
  - Result is illusions

Illusions

- Visual illusions are often the result of heuristic perceptual processes trying to deal with rare, ambiguous, or contrived stimuli
- Countless illusions (will see just a few)
- Note that experience is often partly to blame for illusory perception
  - "garden path"

Ames Illusions

- Trapezoidal window
  - Assumed rectangularity
  - Actual trapezoidal shape
  - Assume regular object that is rotated, rather than irregular object



  - Demo:

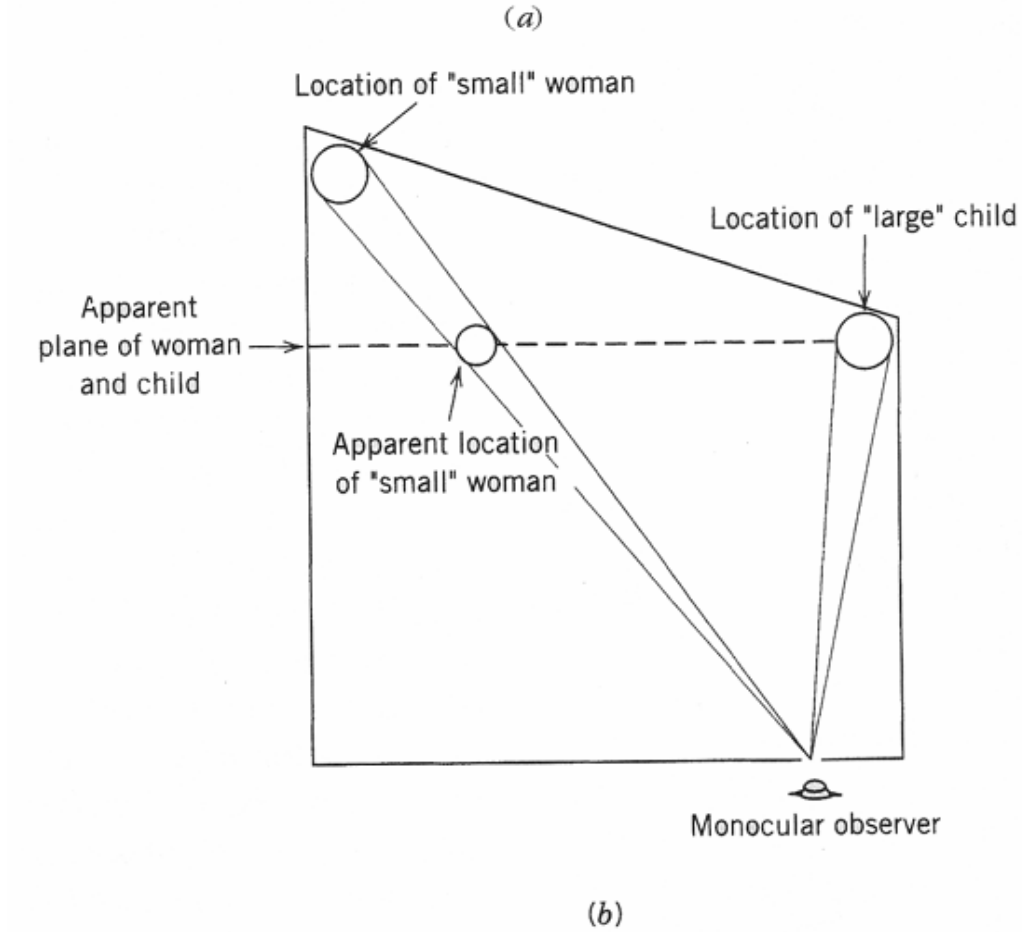
https://www.youtube.com/watch?v=cVepIZLepVc

Ames Illusions, cont'd

- Ames room
  - Assume rectilinear room--actually very unusual!

Ames Illusions, cont'd

- Ames room

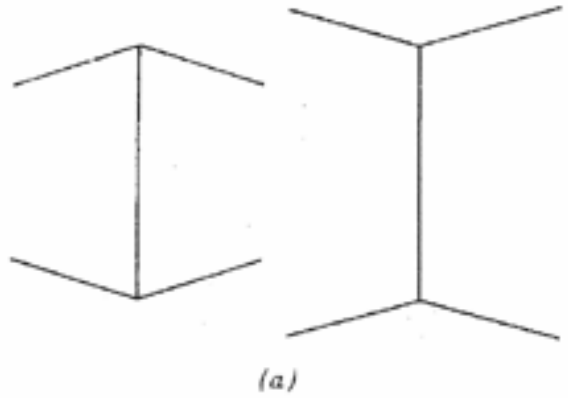


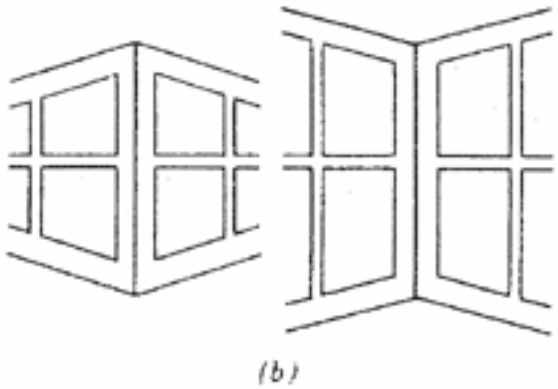
Moon Illusion

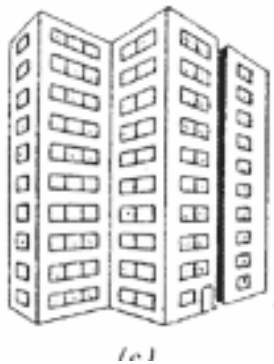
- Moon near horizon appears larger
- Possible explanations
  - Angle of regard
    - Eye position relative to body
    - Not supported by physiology
  - Apparent distance
    - Since perc'd size is proportional to perc'd distance, then if perc'd distance were greater for the horizon moon it would seem larger
    - But… distance paradox
  - Others
    - e.g. "relative size hypothesis"

Muller-Lyer Illusion

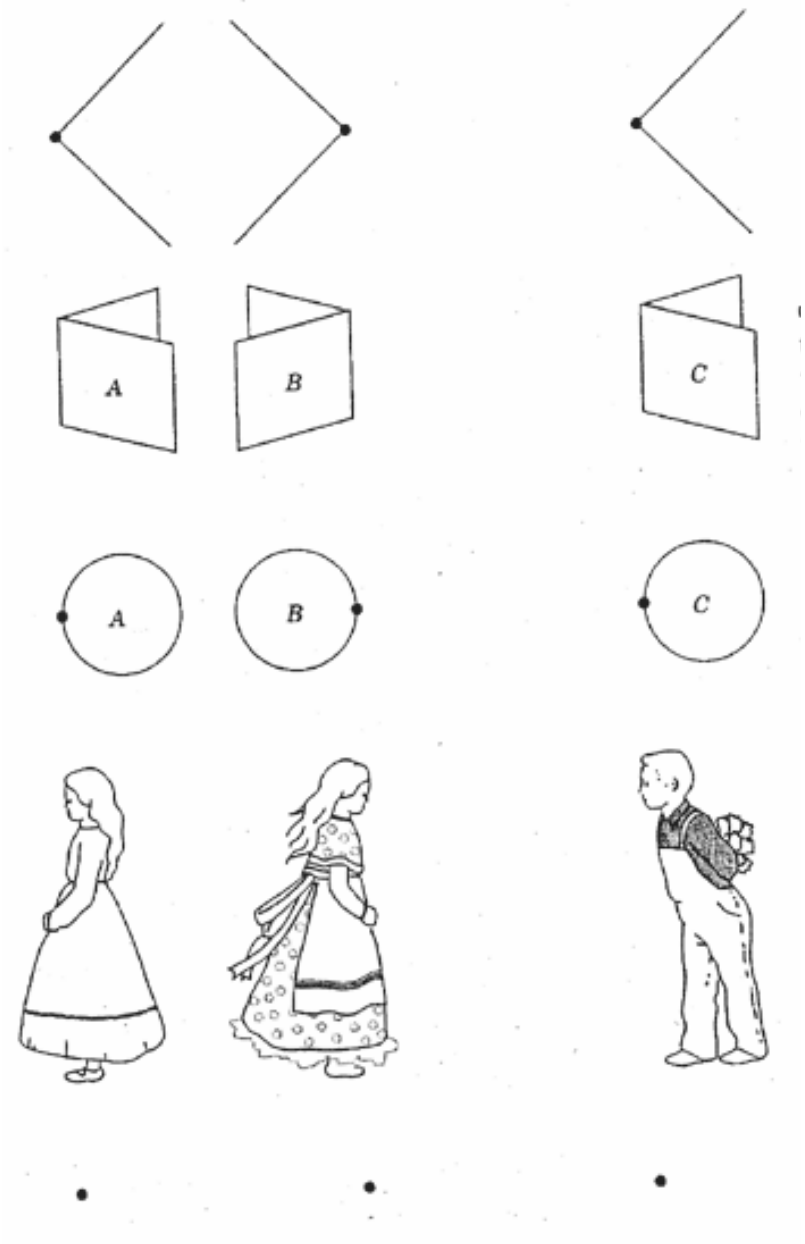
- Lines of equal length appear different, depending on arrow-head context
  - Spatial cues "force" depth interpretation (?)





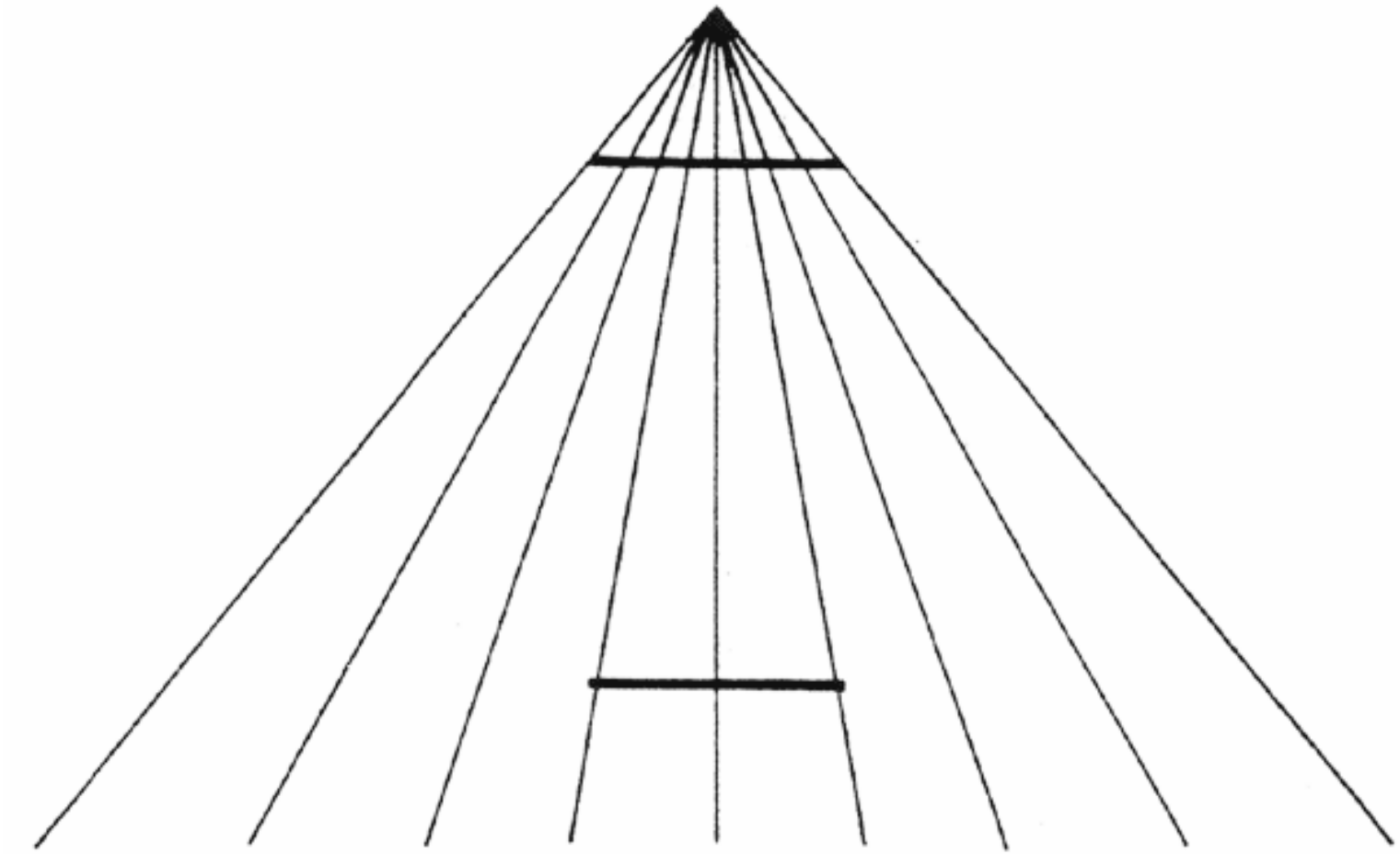


Muller-Lyer Illusion



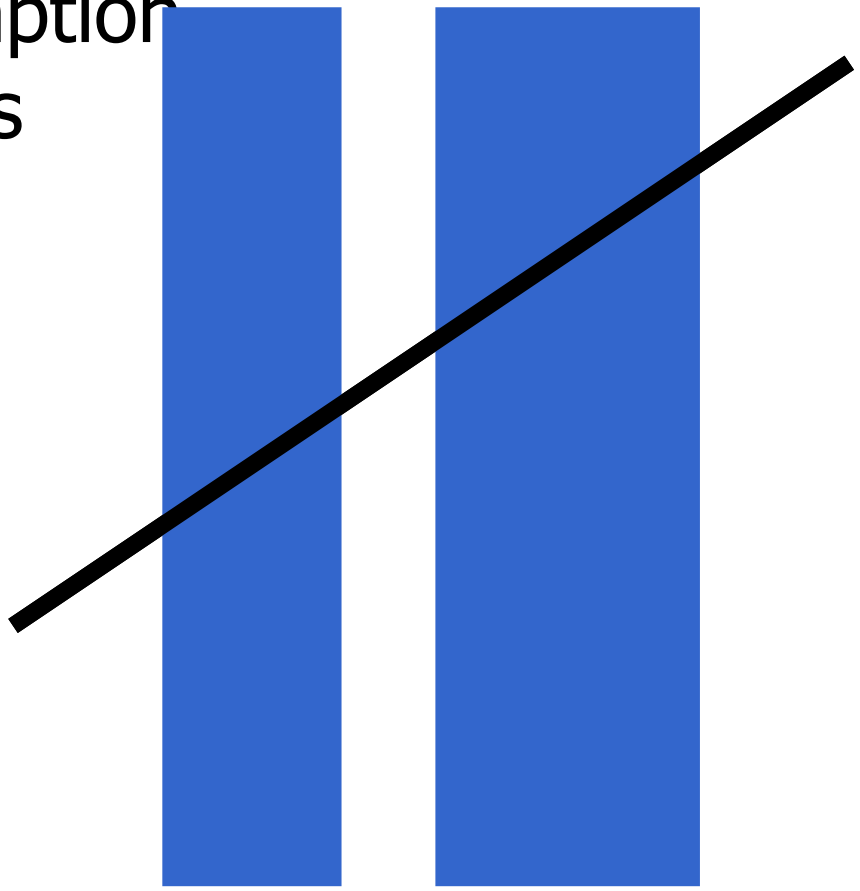
Ponzo Illusion

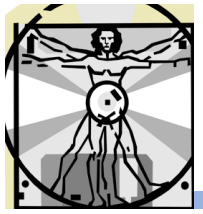
- Perspective (depth) cues dominate and cause errors in size judgments



Poggendorff Illusion

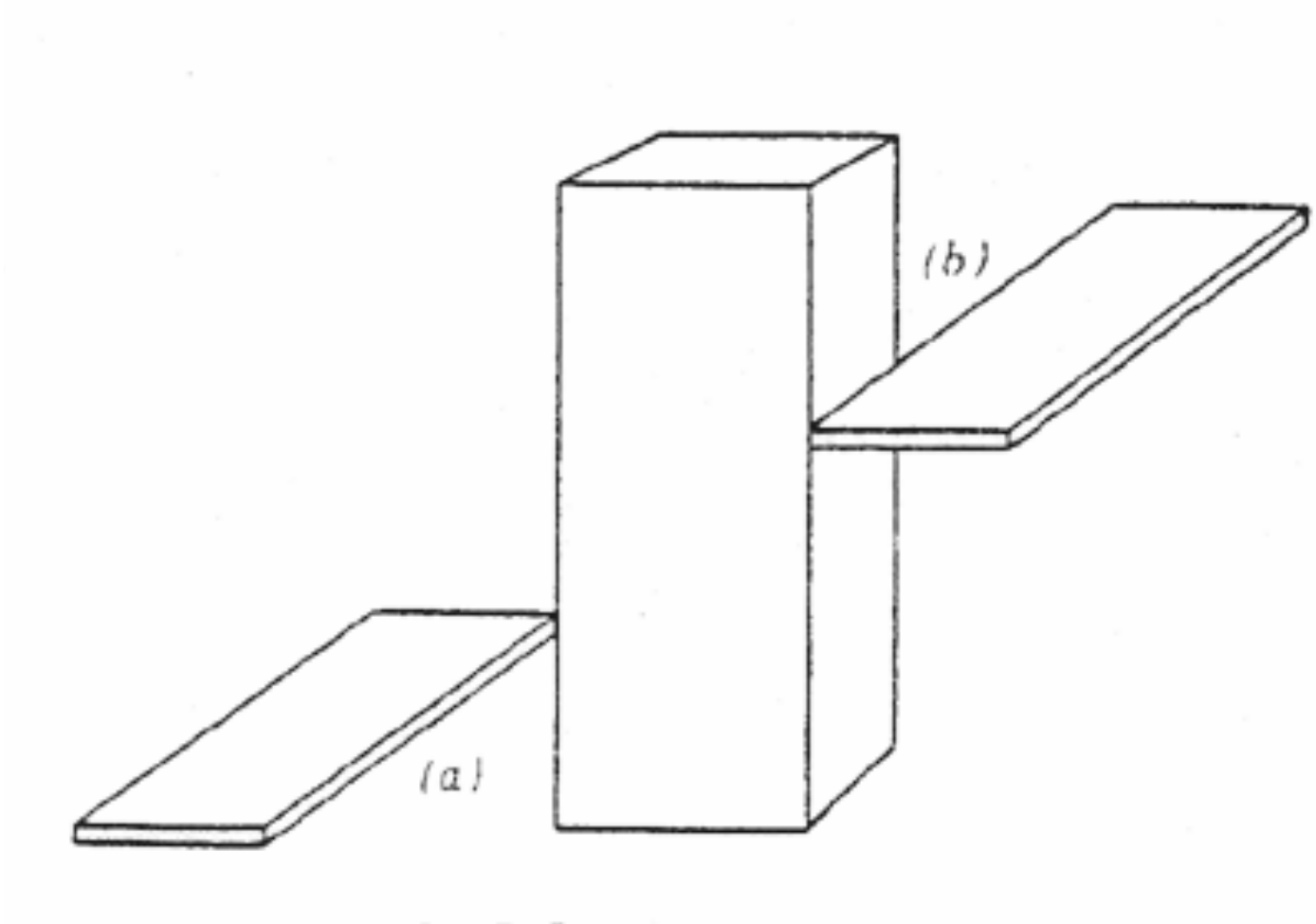
- Colinear line segments appear misaligned
  - Perhaps due to assumption about depth of objects
  - Perspective constancy could explain some examples of this illusion (but not all)





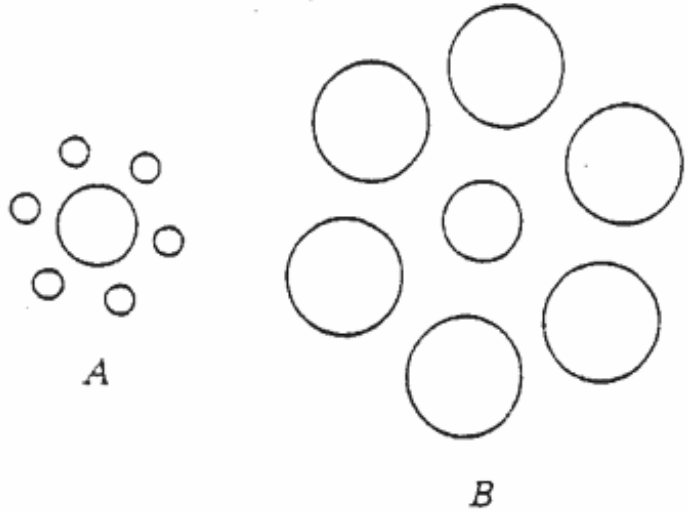
Poggendorff Illusion

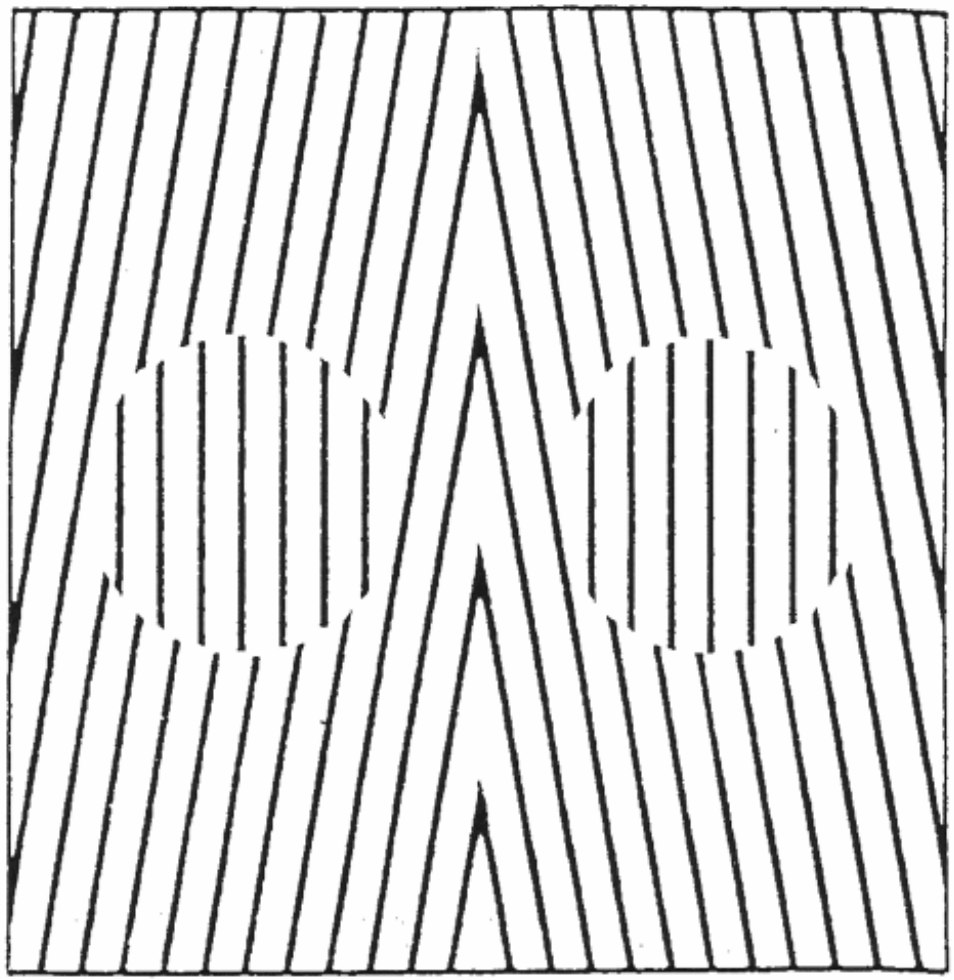
- Context can make it worse (or better)

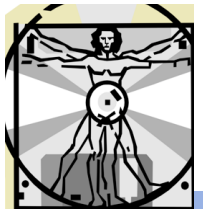


Contrast Illusions

- Surrounding objects (context) affects our judgment of size, alignment, color, etc.

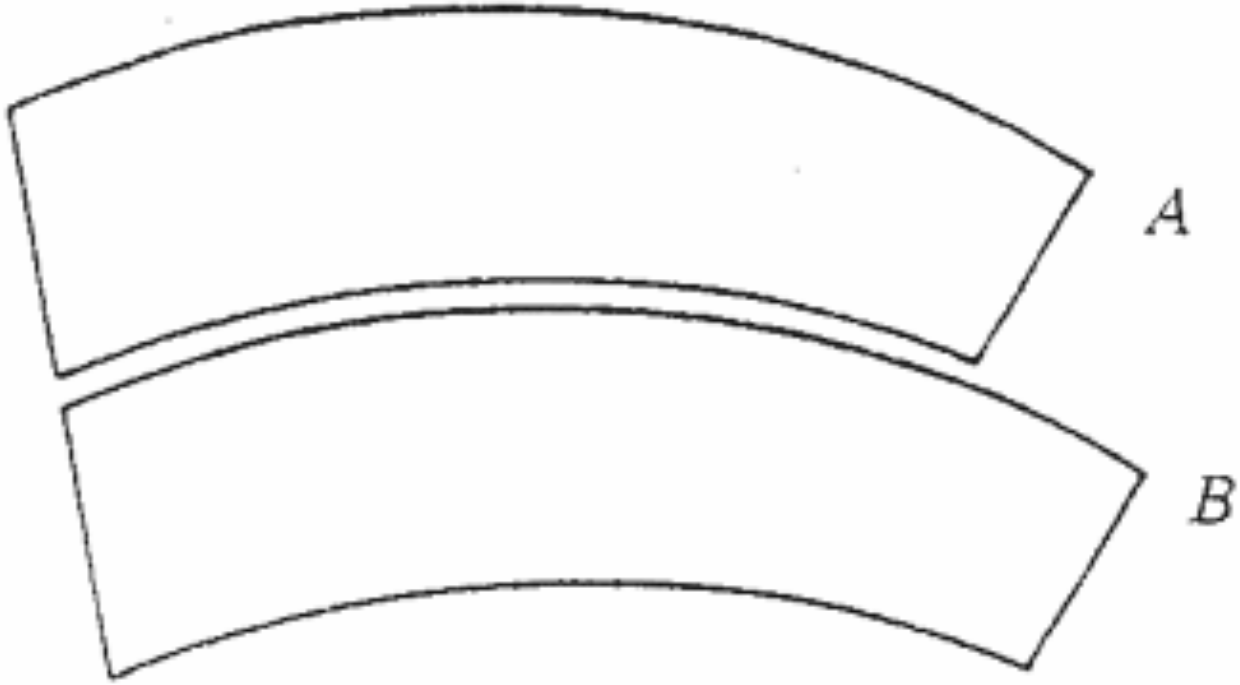


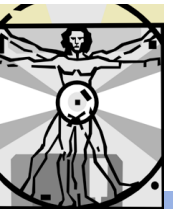




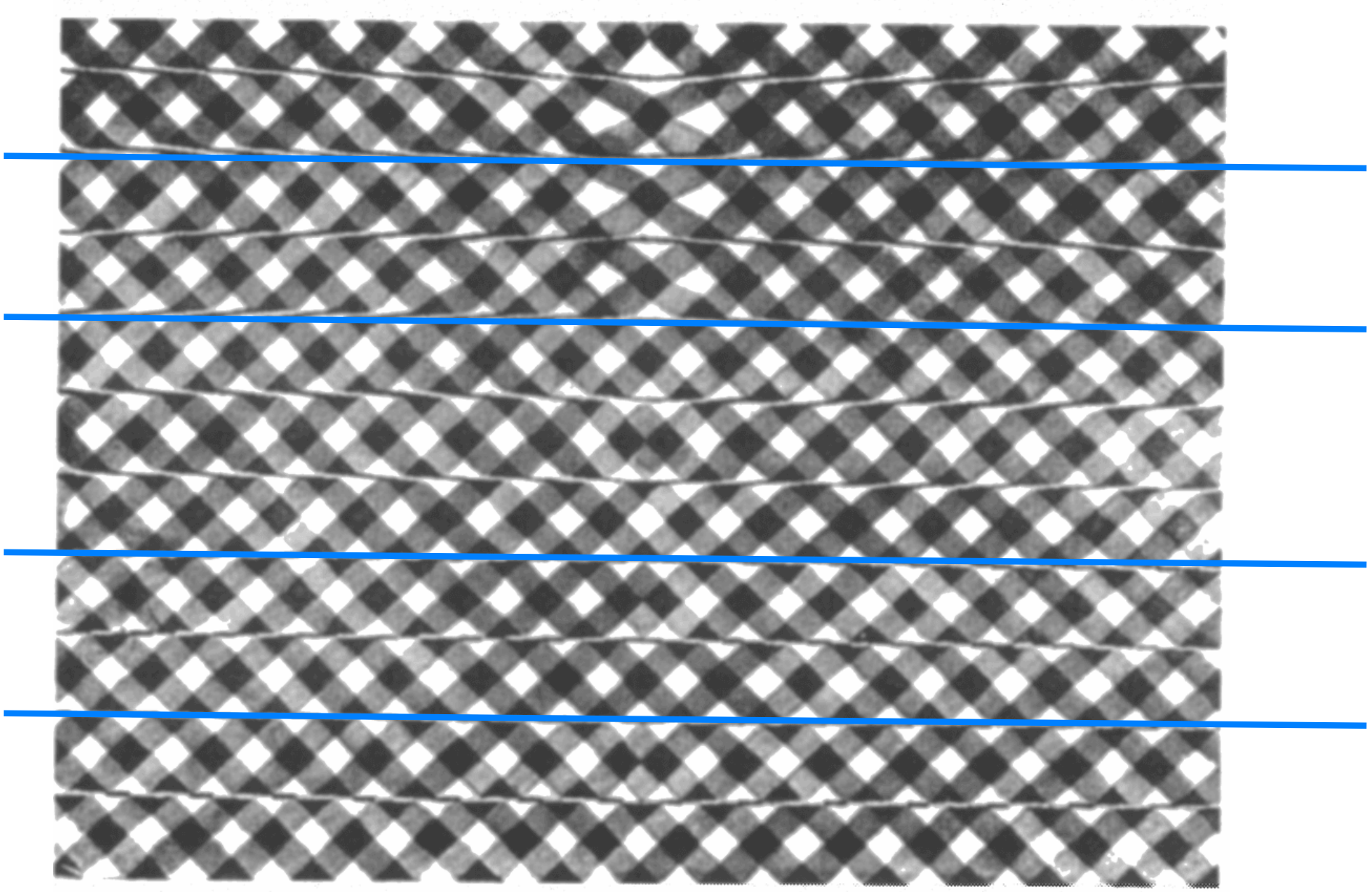
Contrast Illusions

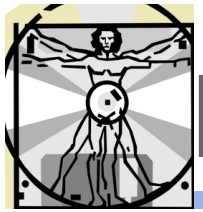
- A variety of examples





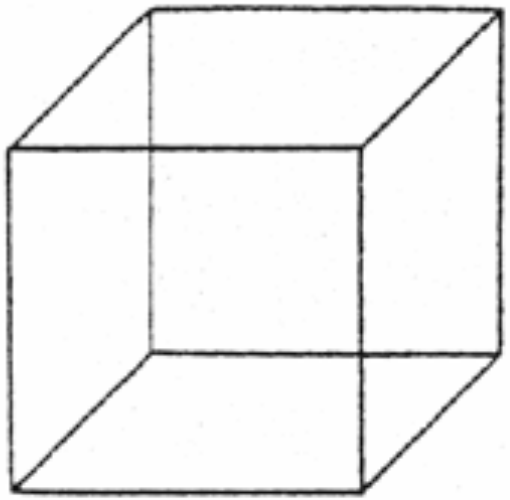
Contrast Illusions

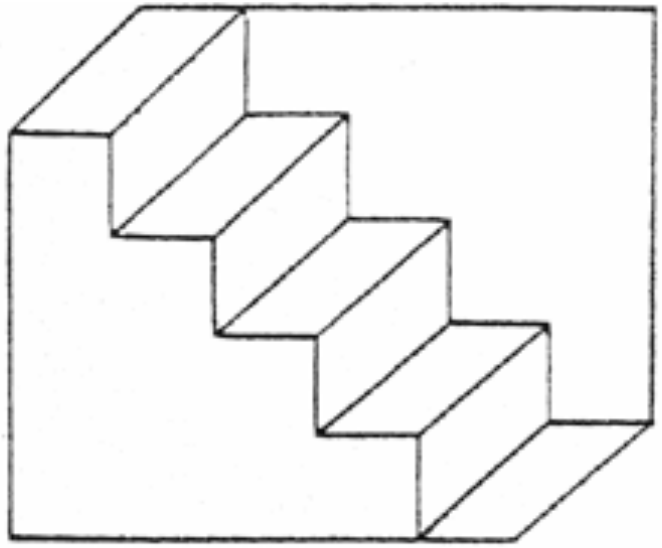




Reversible & Multistable Images

- Some shapes can be seen in multiple orientations
  - Flips may be result of fatigue



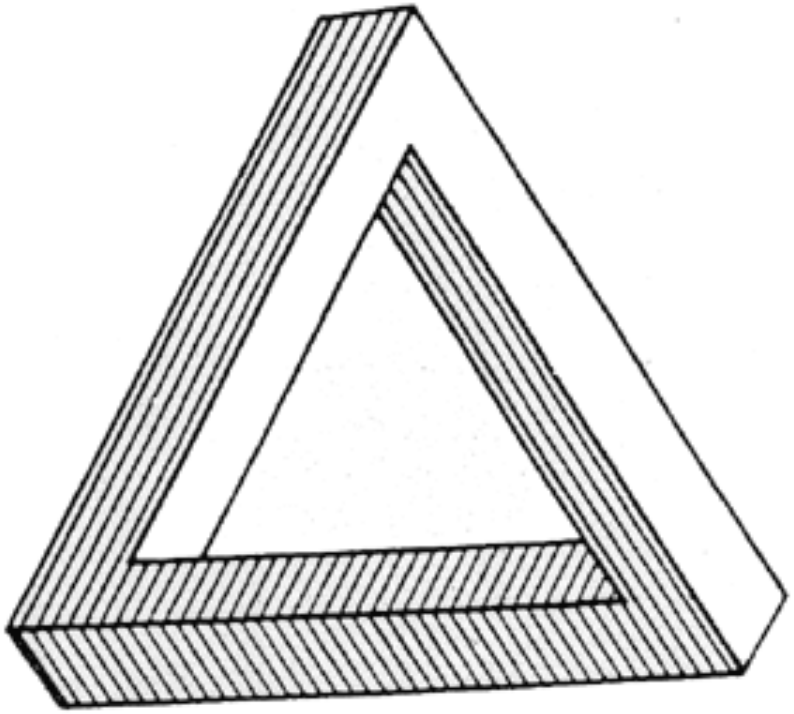


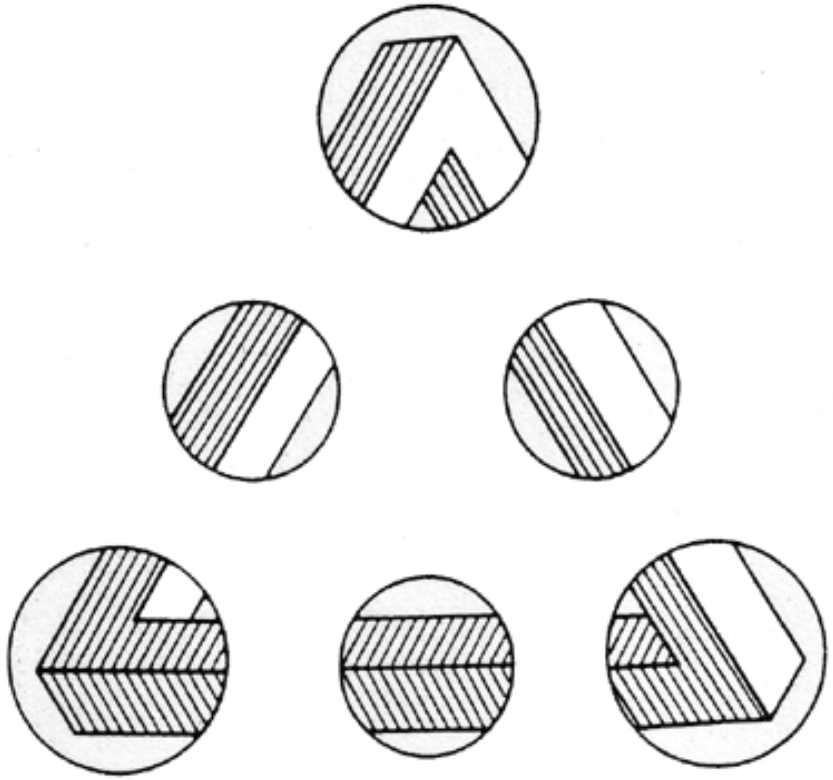
Factors in Illusory Perception

- Optical and retinal factors
  - e.g. subjective curvature
- Cognitive components
  - e.g. learning, experience, expectation

Impossible Figures

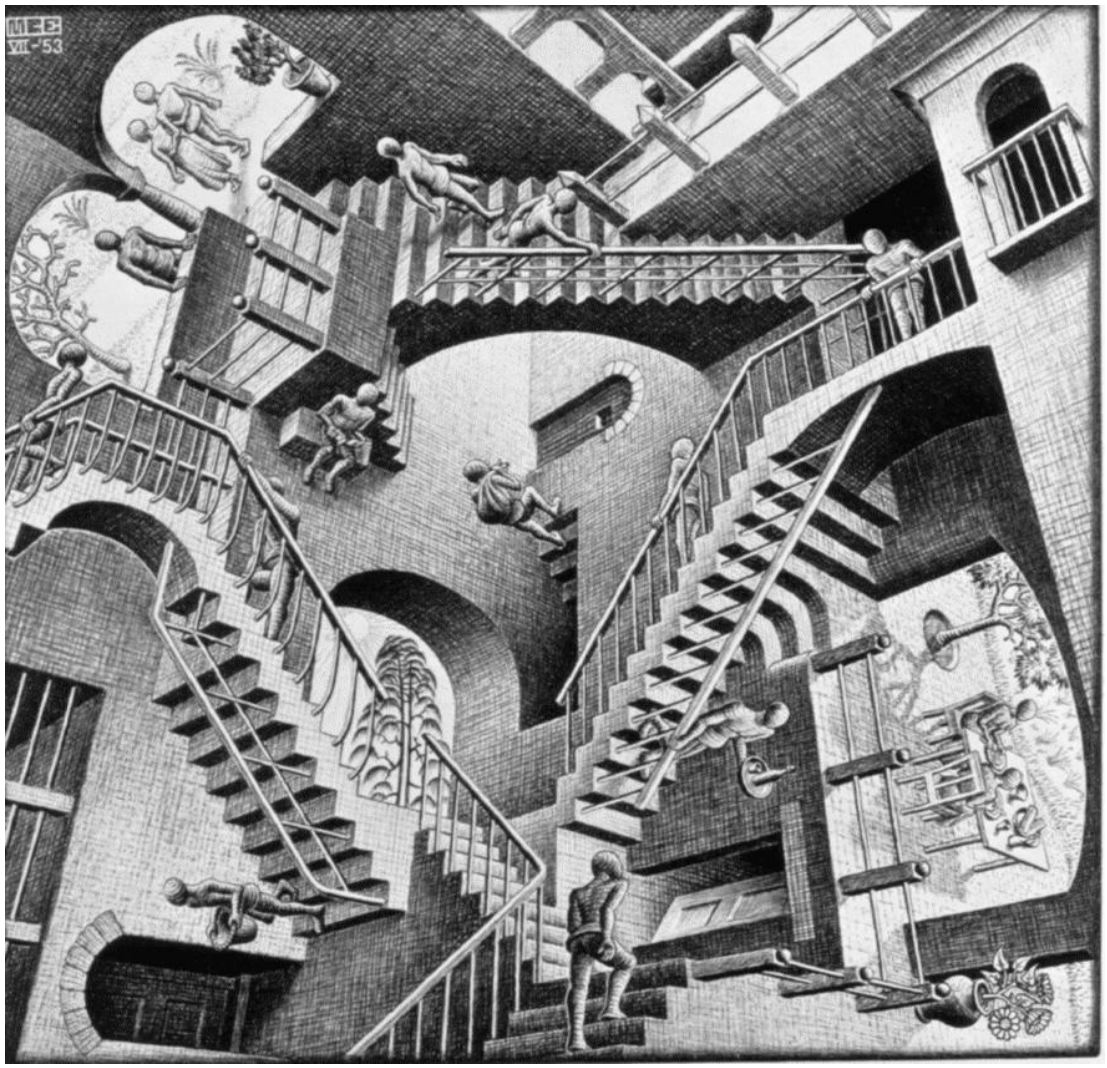
- Curious…but not really illusory
  - We accept them when examined locally, but global inconsistencies are confusing





Impossible Figures

- Escher is master of impossible figures
  - www.mcescher.com



Escher Demo Videos

- YouTube:

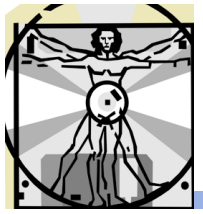
https://www.youtube.com/watch?v=7dMjhhpCQFo

https://www.youtube.com/watch?v=f555rLJnDCI

https://www.youtube.com/watch?v=JdgPvripL9A

Summary of Illusions

- No satisfactory single explanation, in general
- Constancy (of various types) and learning, expectation, and experience are all major contributors to illusory perceptions at times



Upcoming

- Camouflage