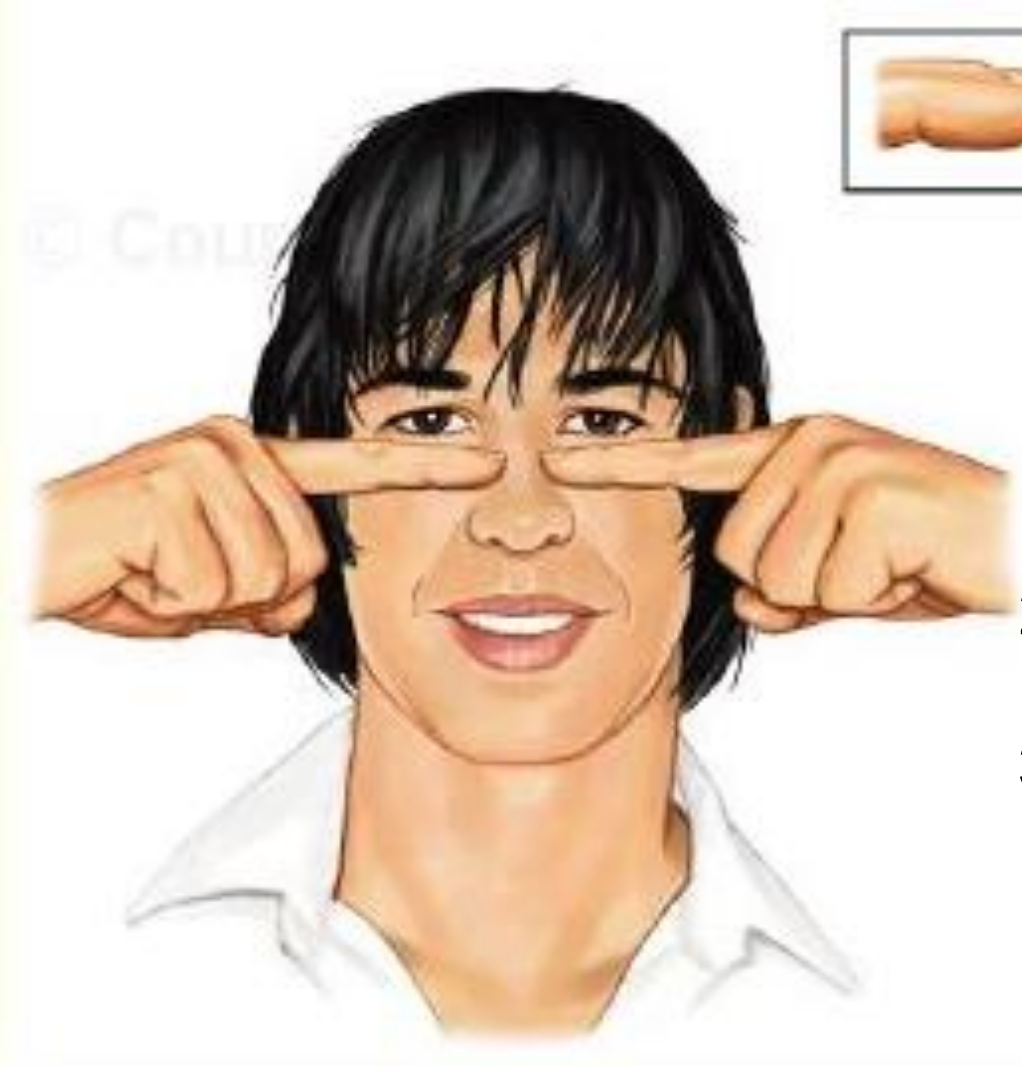
Binocular Cues

- Humans are able to see things that are both far and near, and can actually identify where those objects are in space (meaning, they can determine if those objects are close or far away).
- This sort of depth perception requires both of our eyes, which is referred to as binocular cues ***(depth cues that require both of our eyes).***

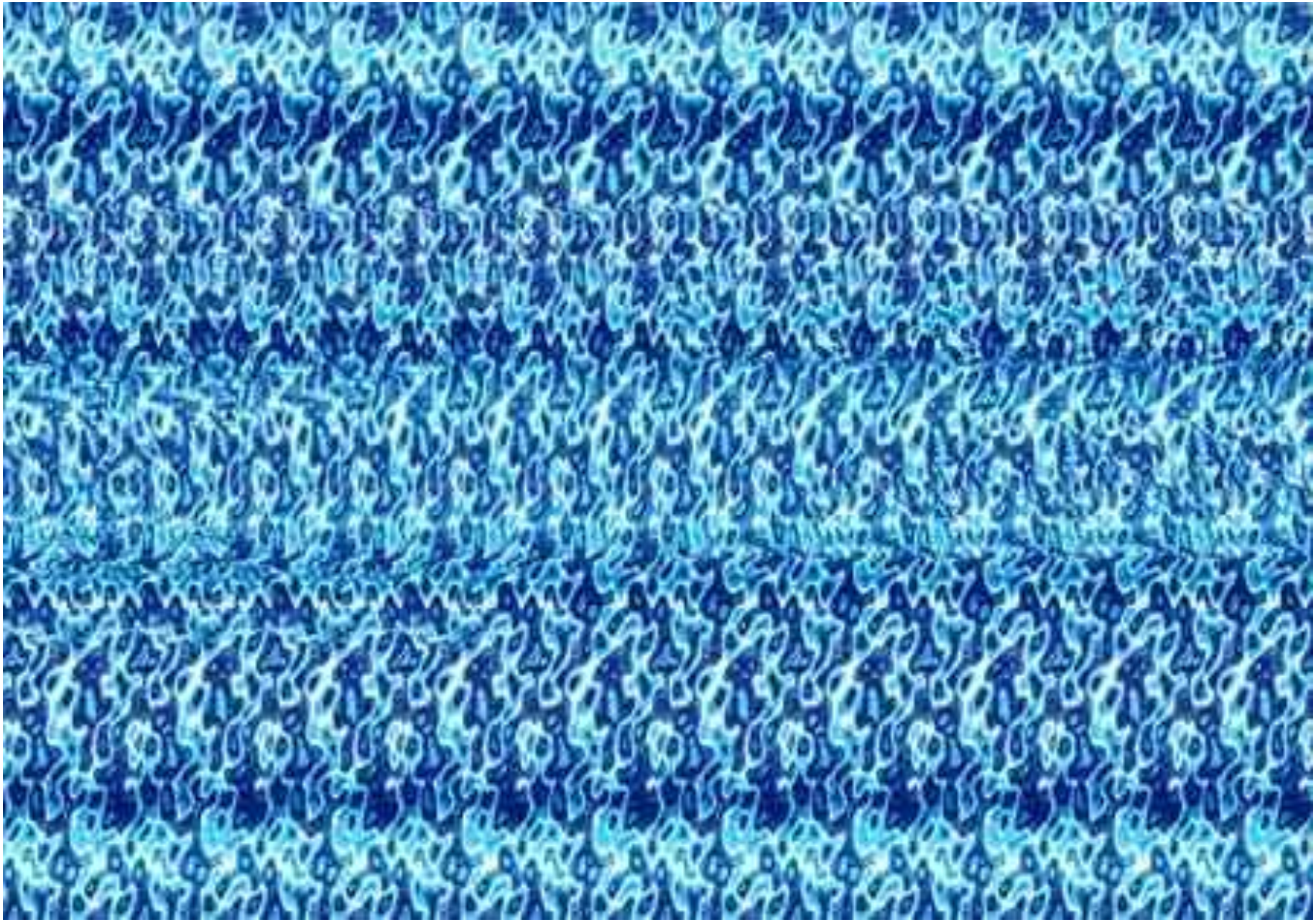
Binocular Cues

Retinal disparity: Images from the two eyes differ.



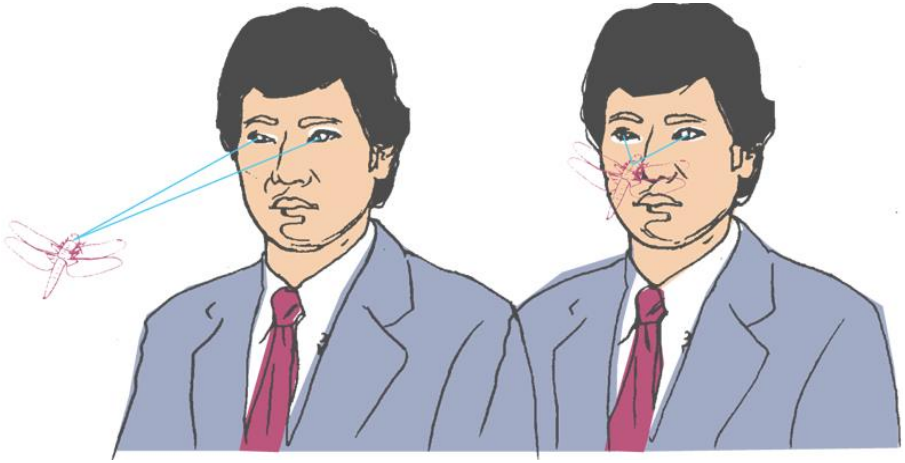
1. Hold your two index fingers about 5 inches in front of your eyes with the tips ½ inch apart.
2. Now look beyond them. What do you see?
3. Move your fingers out farther and the retinal disparity—and the floating finger—will shrink.

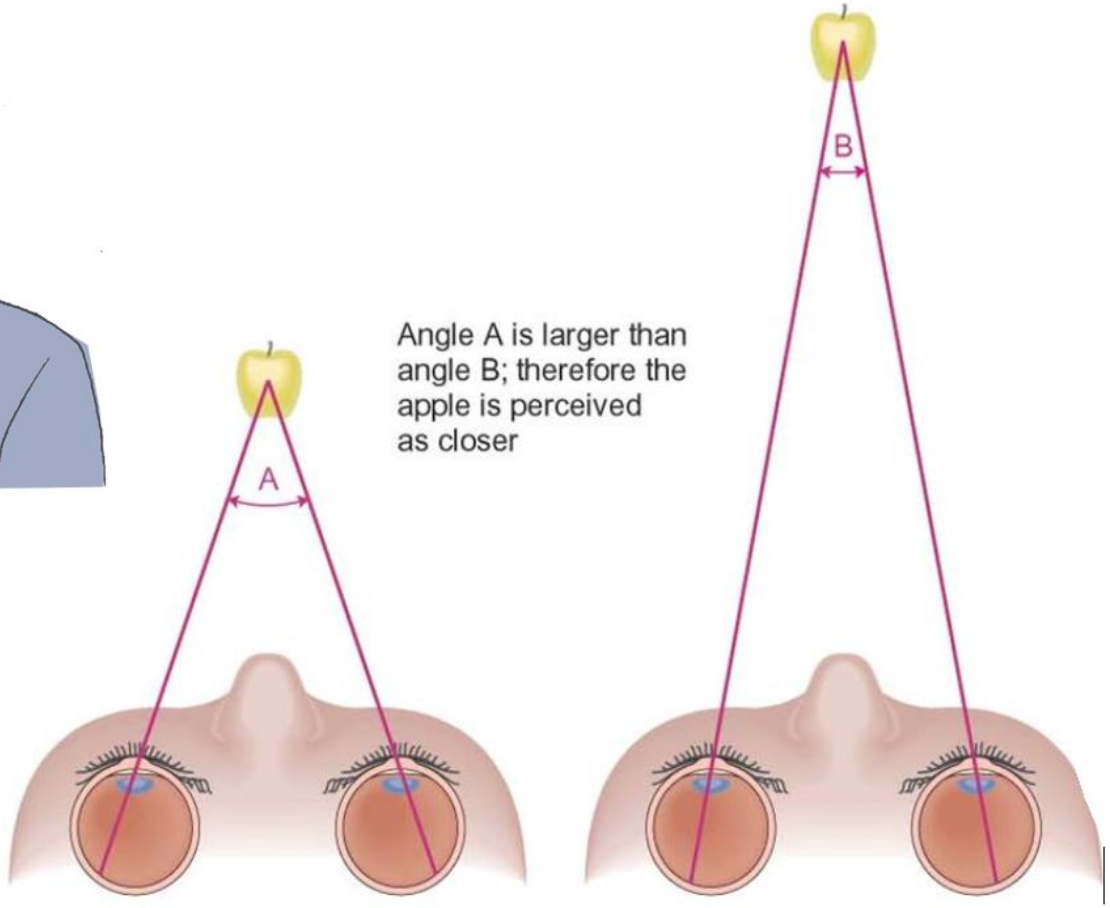
Retinal Disparity – Magic Eye



Binocular Cues

Convergence: Neuromuscular cues. When two eyes move inward (towards the nose) to see near objects and outward (away from the nose) to see faraway objects.





Monocular Cues

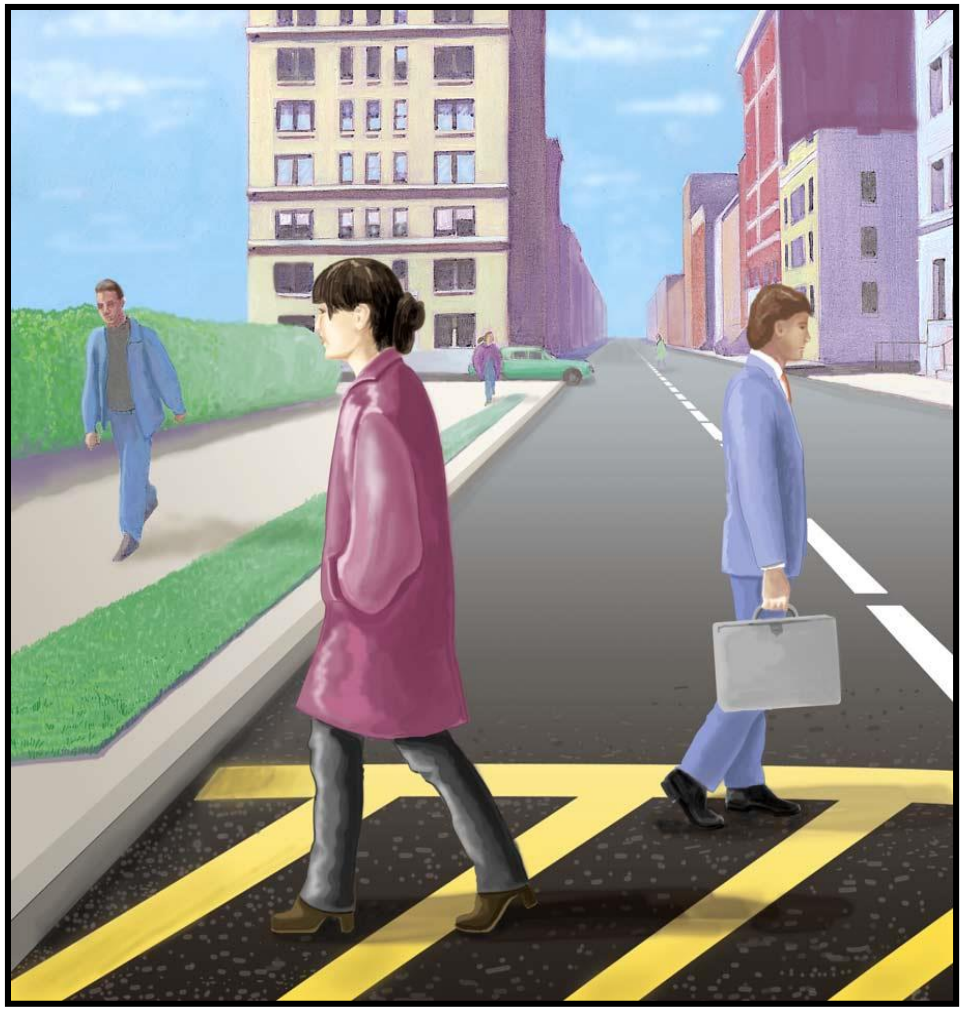
- ***<u>Cues of depth that can be detected by one eye instead of two.</u>***
- Mon (one) ocular (eye)
- For example, size is a monocular cue. One doesn't need two eyes to tell how large an object is, and because of its size, how close it is perceived to be.

Monocular Cues for Depth Perception

- Relative Size:

We know smaller is farther, we know how big things ought to be compared to each other

Monocular Cues for Depth Perception



- Interposition:

If one thing blocks another from view, that thing must be closer.

Monocular Cues

Interposition:

Monocular Cues for Depth Perception

- Relative Height:

Generally,
higher is farther away

Monocular Cues for Depth Perception

- Linear Perspective:

Parallel lines converge on horizon

Monocular Cues for Depth Perception

- Texture Gradient:

Closer is coarse

Farther is finer

Monocular Cues for Depth Perception

- Relative Clarity:

Closer is clearer

Farther is fuzzier

Motion Parallax (Relative motion)

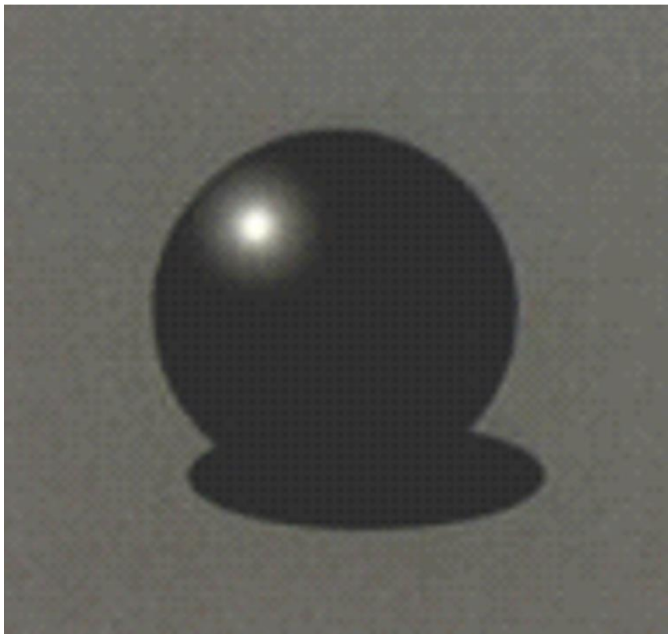
- Objects closer than fixation point appear to move backwards.
- Objects beyond fixation point appear to move with you at a decreasing speed as the object gets farther away.
- The closer an object is, the faster it appears to move.

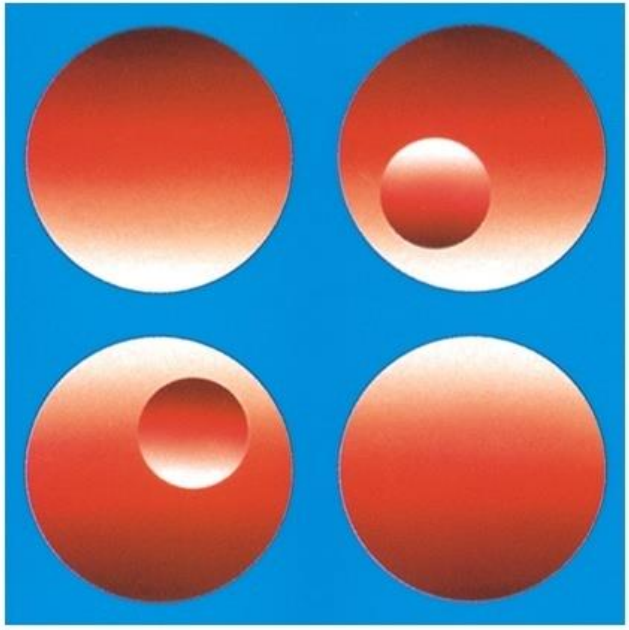
Relative motion

Direction of passenger's motion

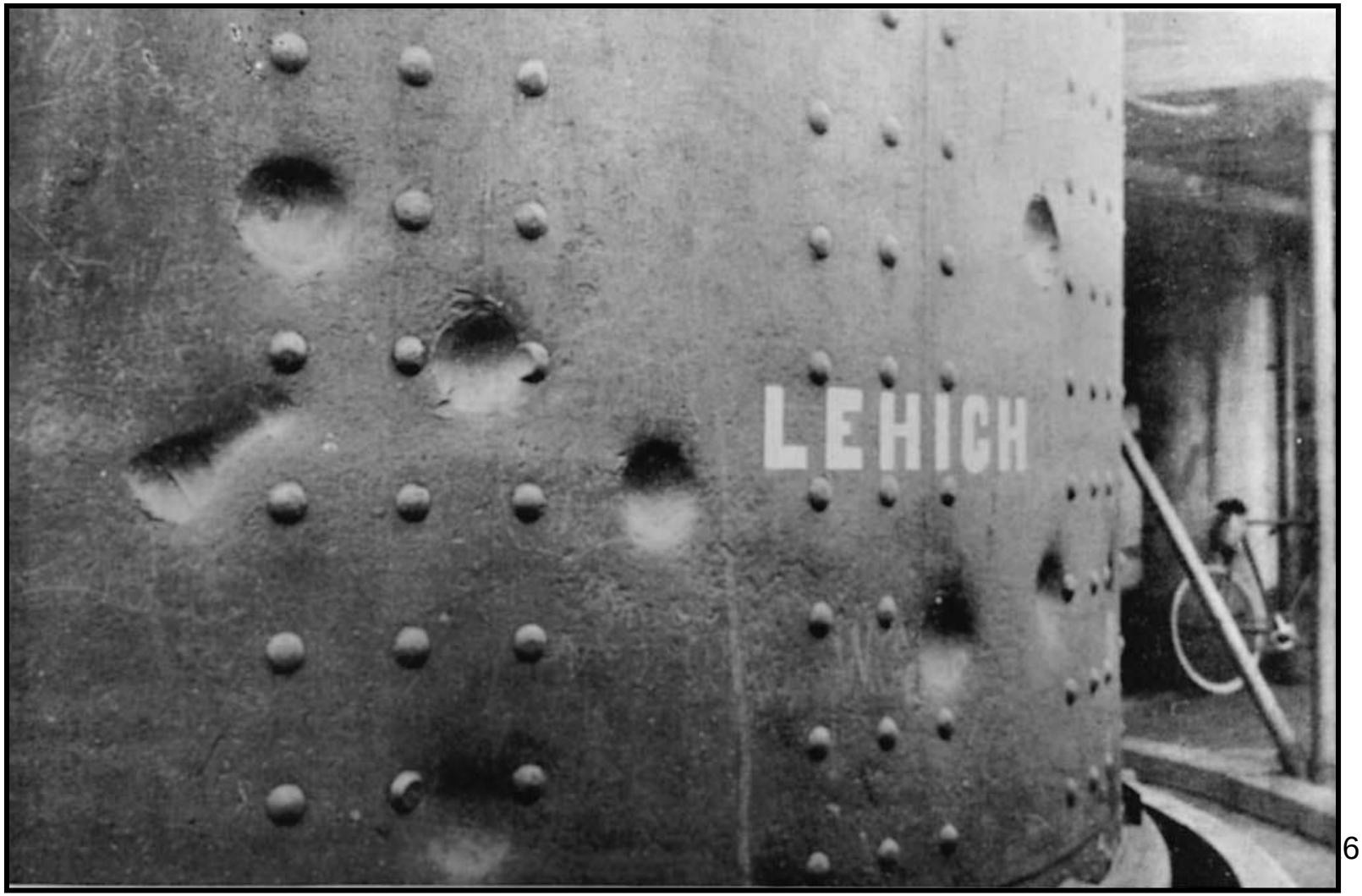
Without the monocular cues, pictures seem “flat.”

Light and Shadow: Nearby objects reflect more light into our eyes than more distant objects. Given two identical objects, the dimmer one appears to be farther away.

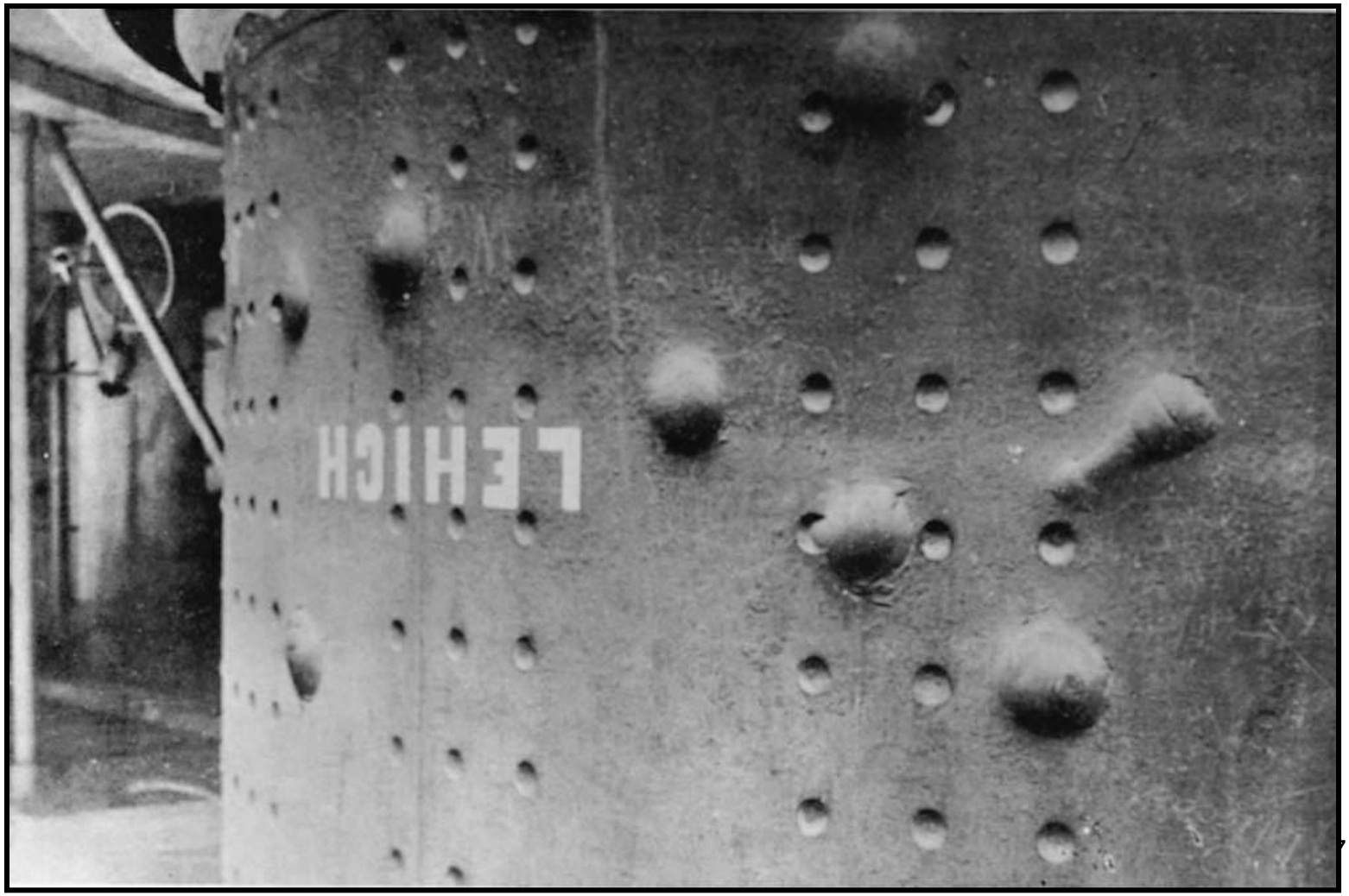




What do the inconsistencies look like on this steel drum?

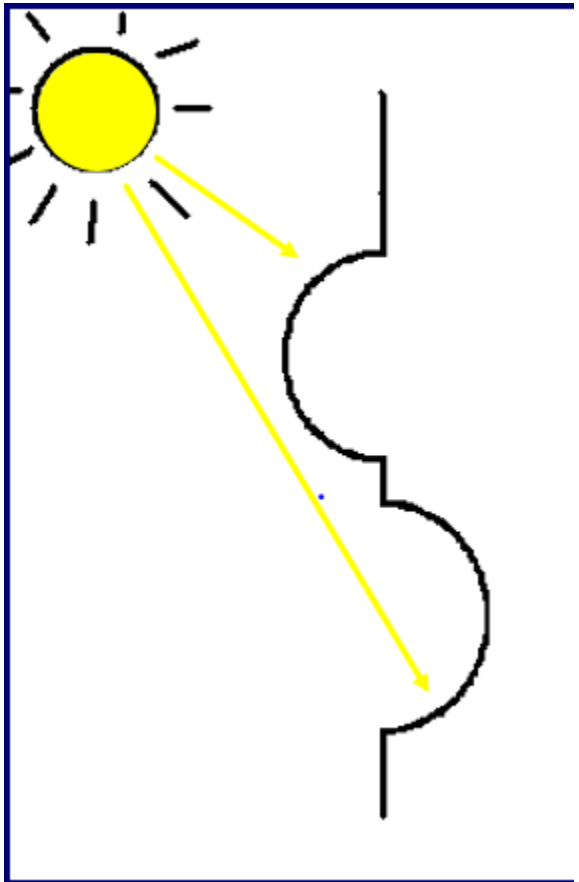


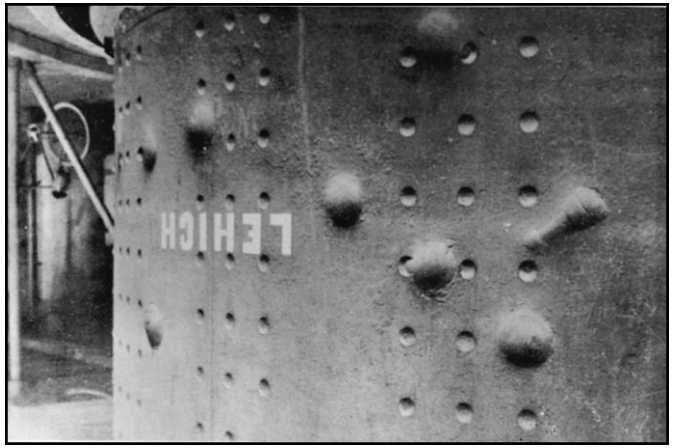
you can see them as bulges now

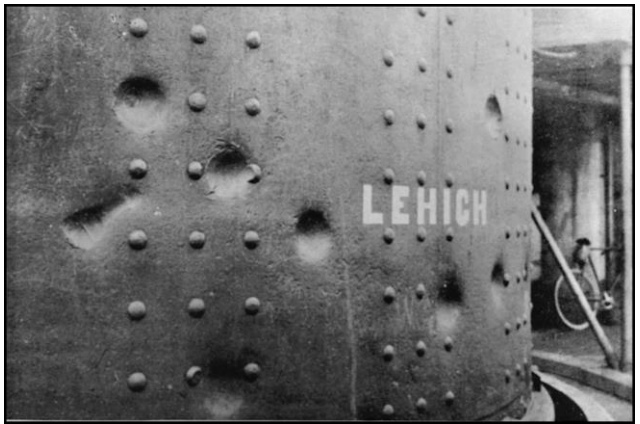


Shading

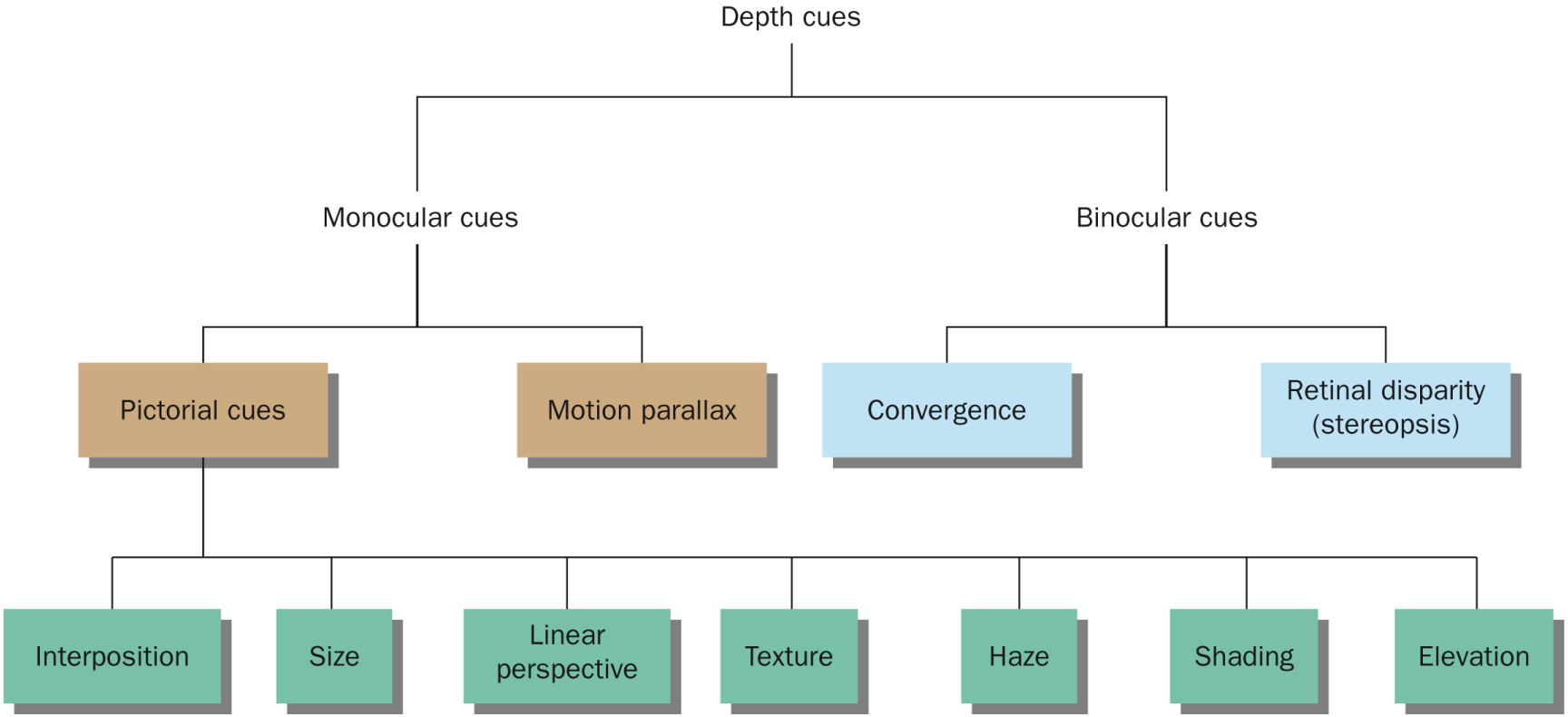
Shadows often appear on bottoms of objects that protrude and the tops of objects that recede.







The principal monocular and binocular depth cues



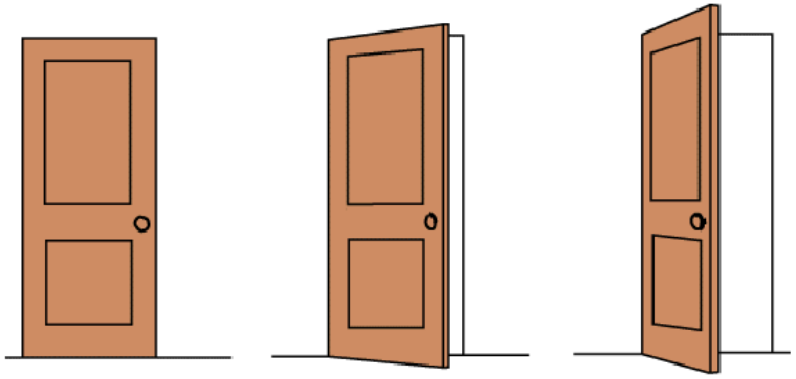
Source: Adapted from Matlin, M.W. and Foley, H.J., *Sensation and Perception* (3rd edition). Boston: Allyn & Bacon, 1992.

Perceptual Constancy

Ability to recognize the same object under different conditions, such as changes in ***illumination***, ***distance***, or ***location.***

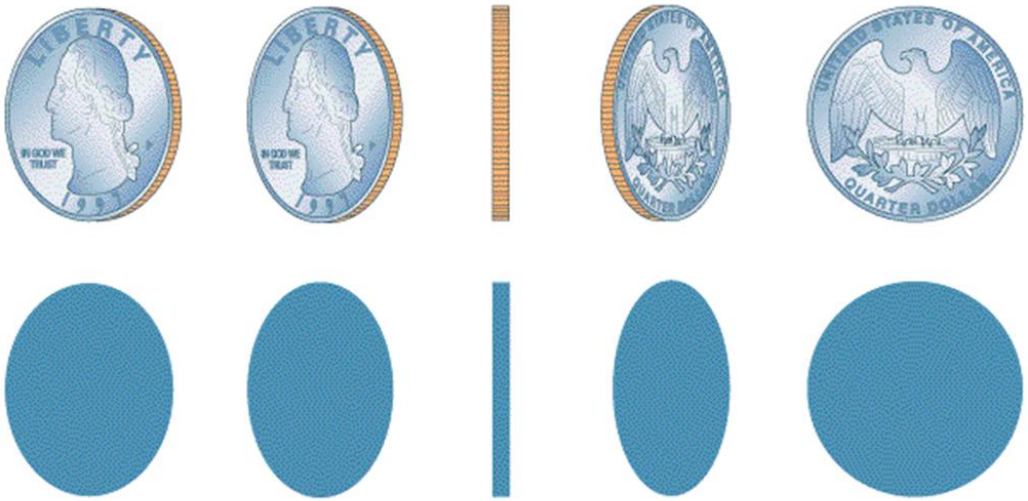
Once we have formed a stable perception of something, we see it as essentially the same regardless of differences in viewing angle, distance, lighting, and so forth.

Shape Constancy



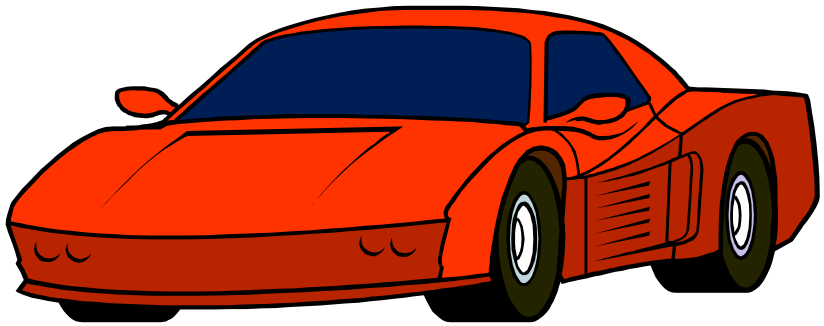
The tendency to perceive the **shape** of a rigid object as constant despite differences in the viewing angle

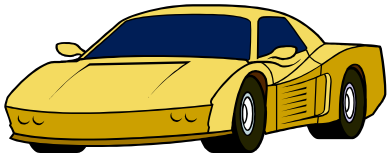
- Even though these images cast shadows of different shapes, we still see the quarter as round



Size Constancy

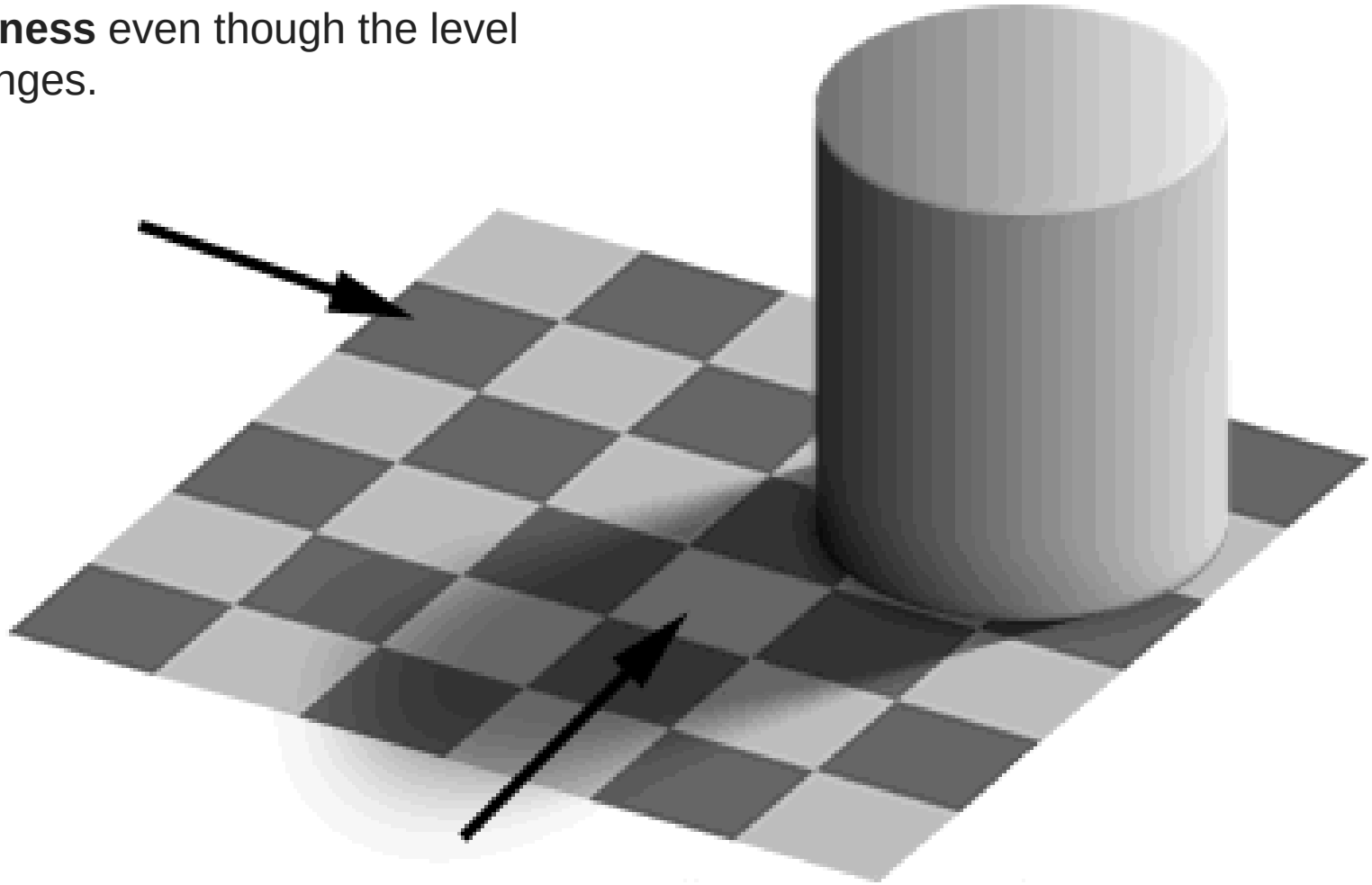
The perception of an object as the same size regardless of the distance from which it is viewed.



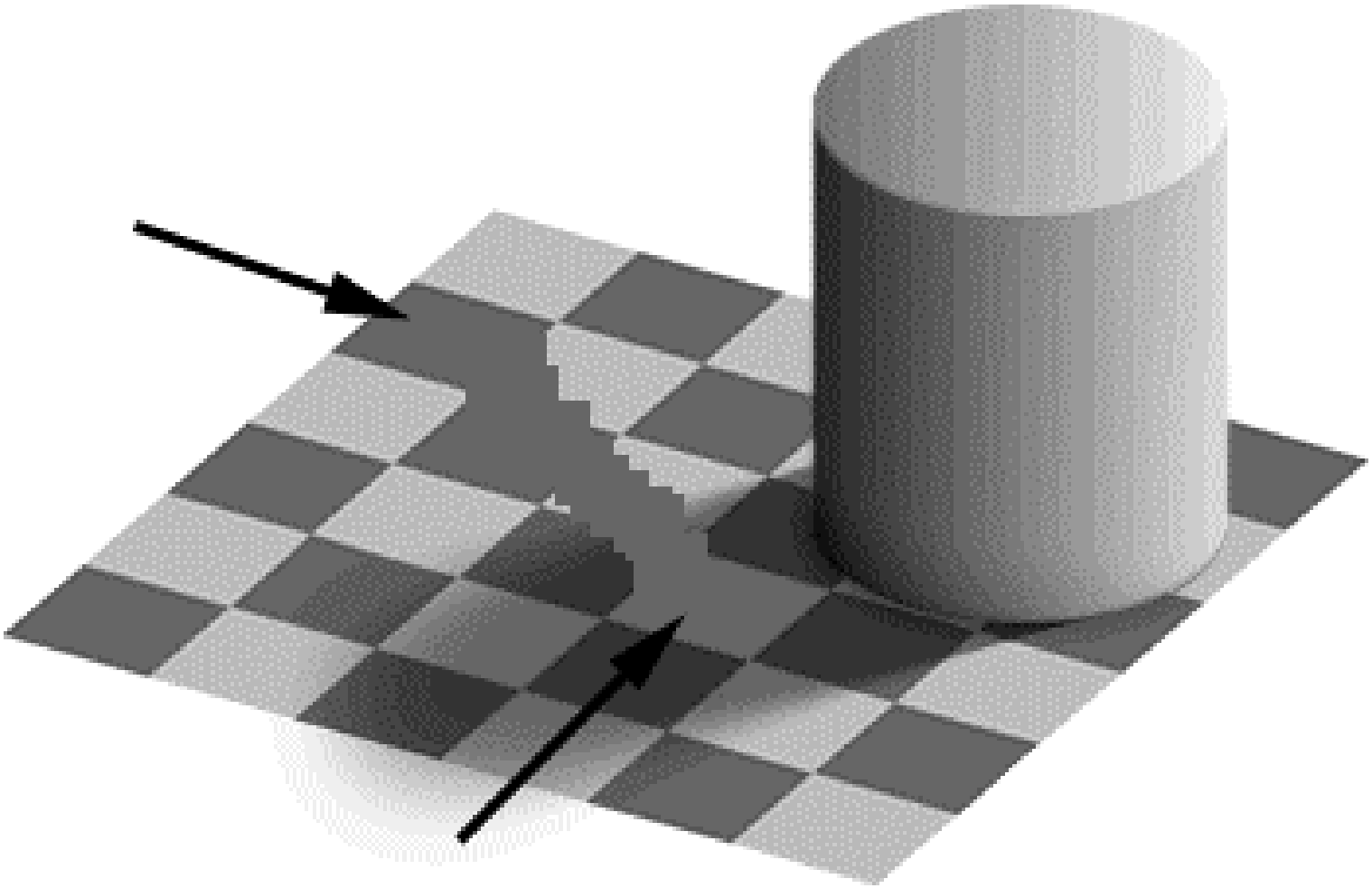


Brightness Constancy

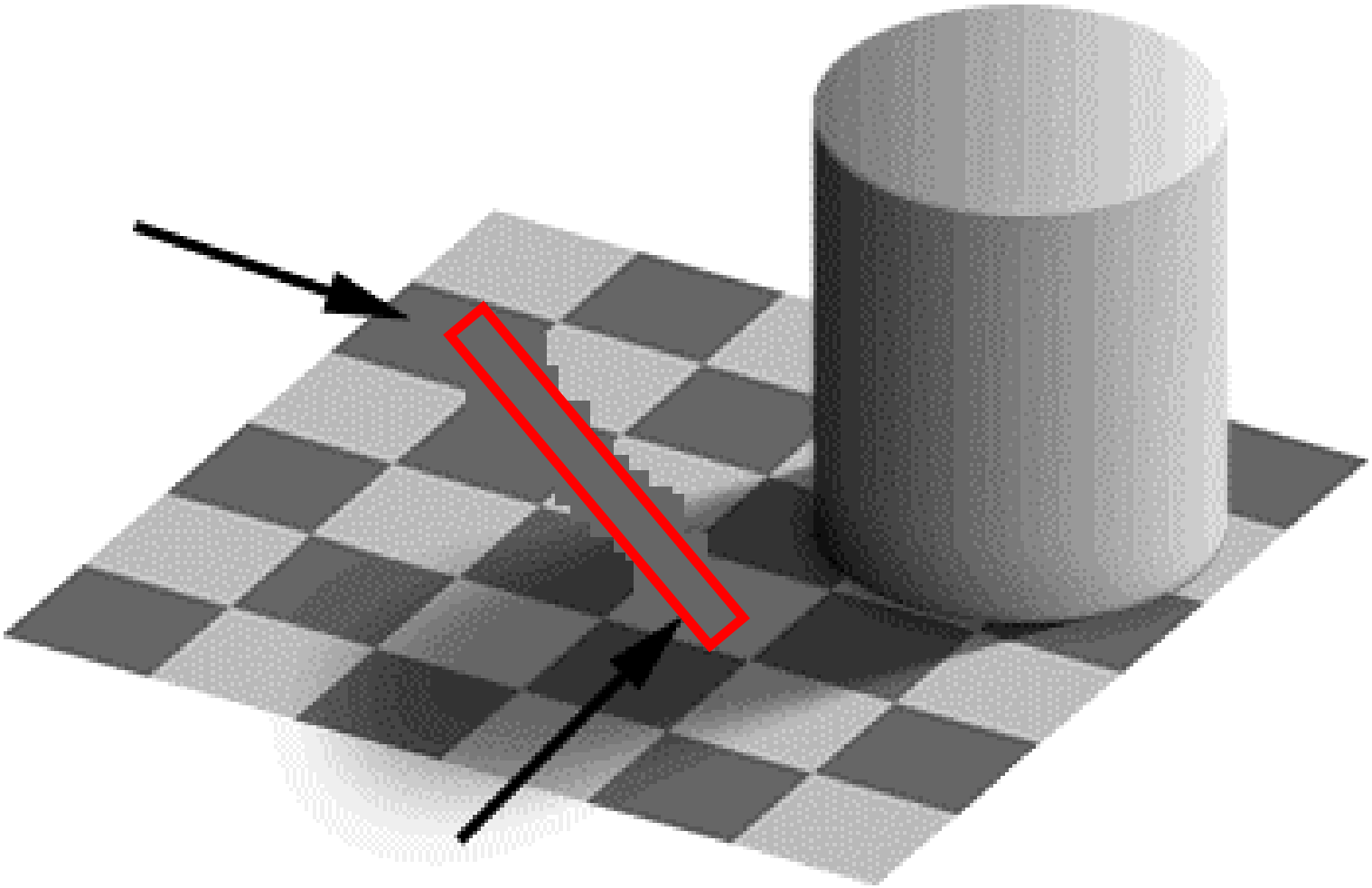
Brightness constancy is our visual ability to perceive objects as having the same level of **brightness** even though the level of lighting changes.



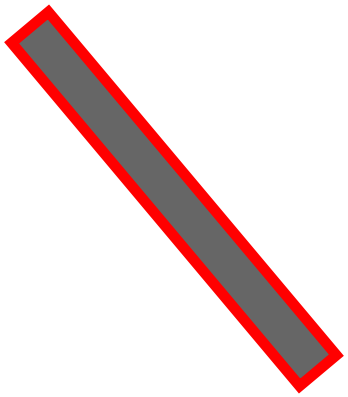
Brightness Constancy



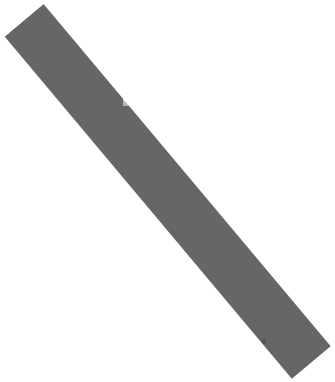
Brightness Constancy



Brightness Constancy

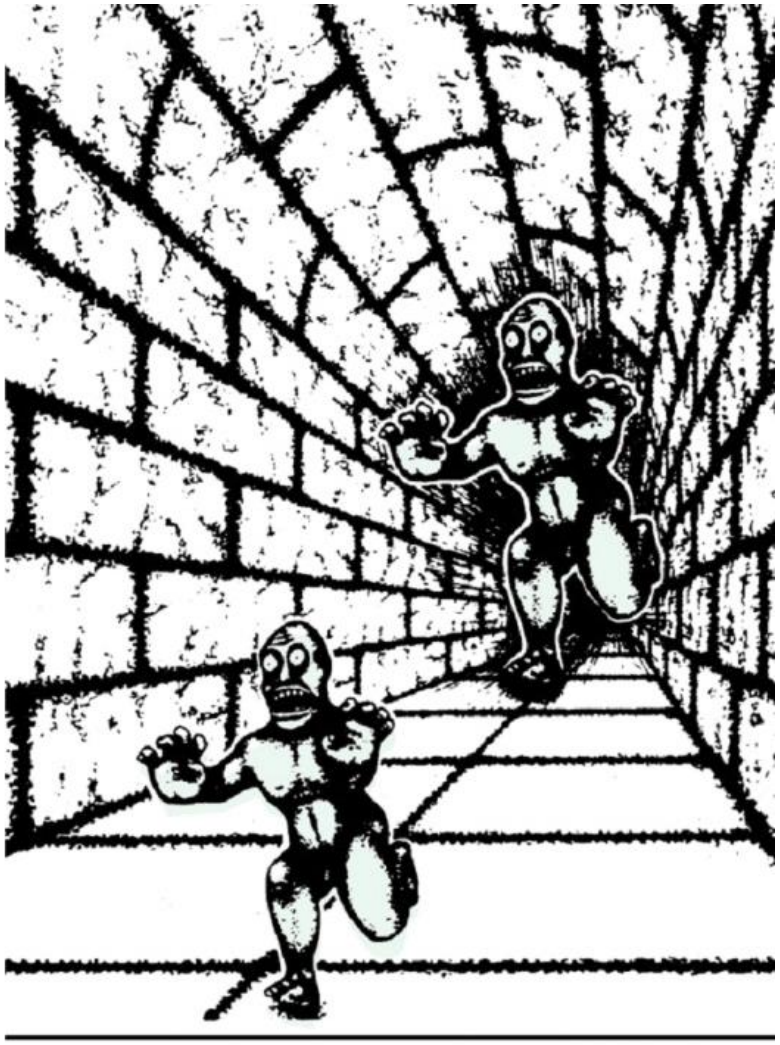


Brightness Constancy



Size-Distance Relationship

The Monster Illusion



(a)

The images are actually the same distance from the observer (as the screen is flat), but because of relative height and linear perspective, the monster on the top appears to be farther away.

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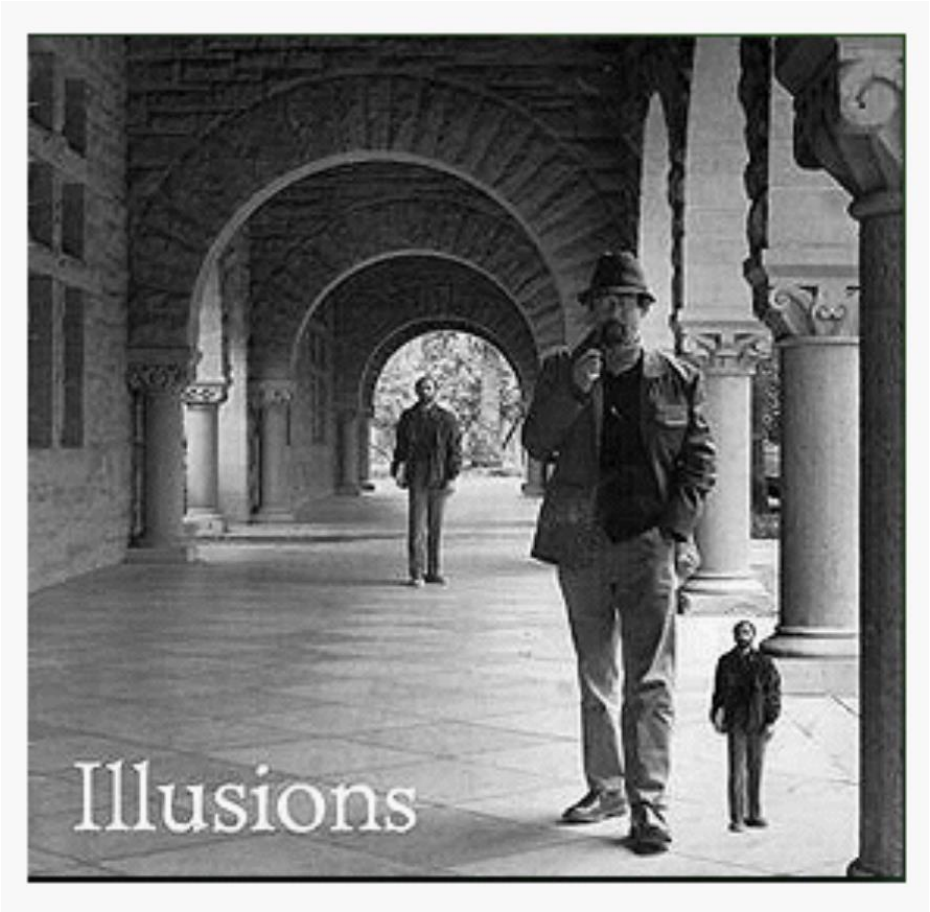
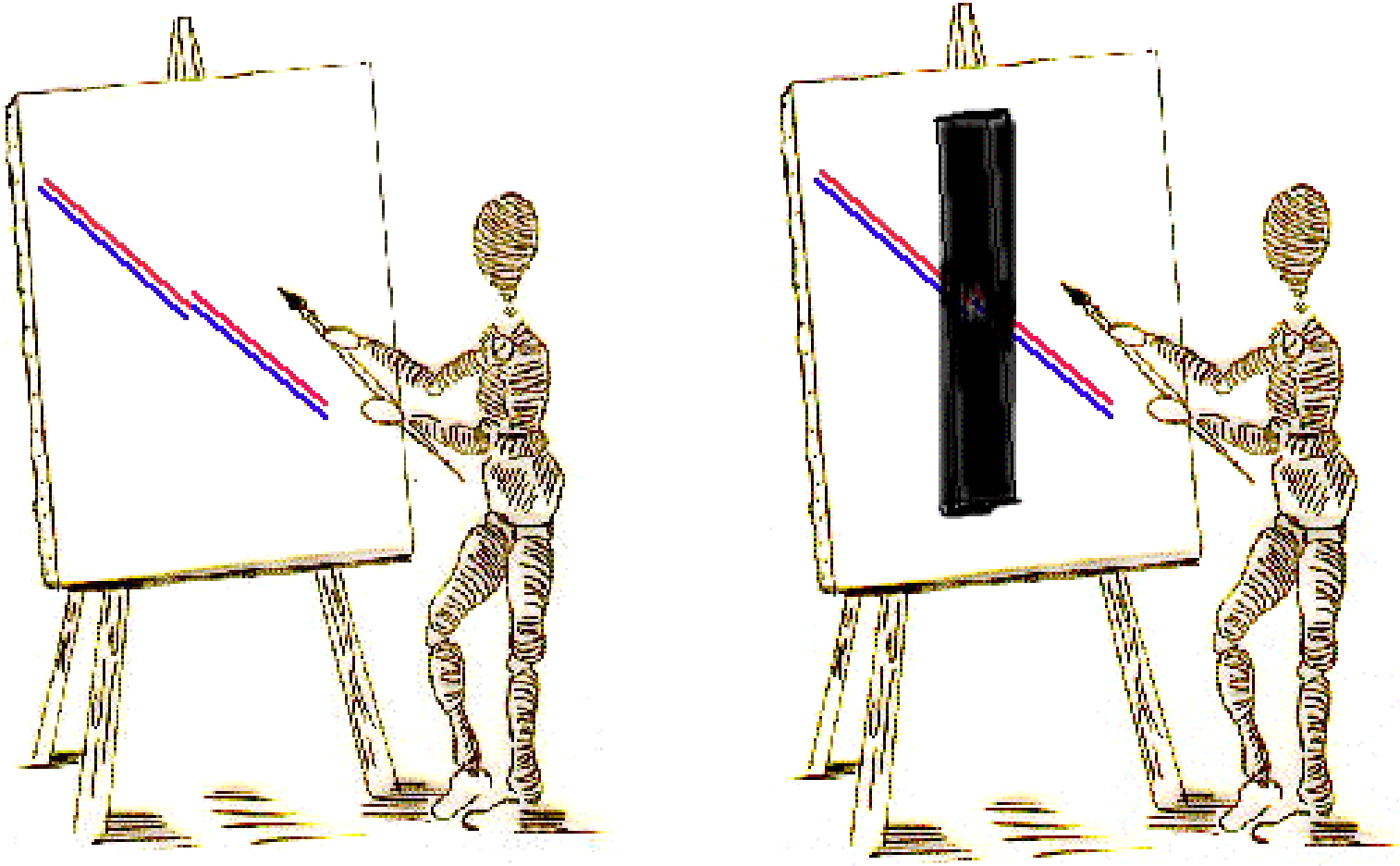
Perceived size is a function of <u>*perceived*</u> distance

Size-Distance Relationship



Perceived size is a function of *perceived* distance



The images are exactly the same except for the thick black area in the right image (an example of the Poggendorff illusion (1860)). In the figure on the right, there appear to be two continuous diagonal lines: a red and a blue line. What occurs in your visual system that could account for the appearance of the continuous diagonal lines?