

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

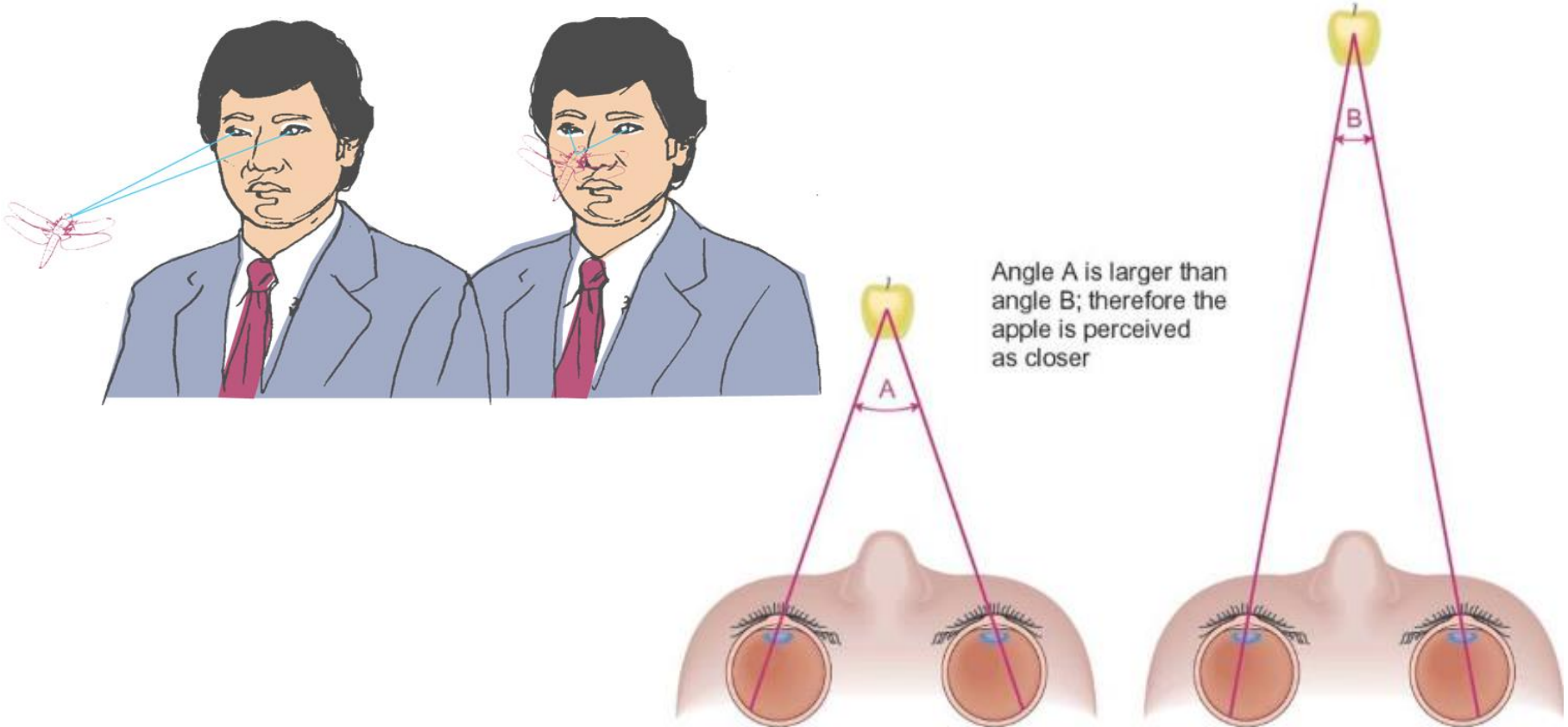
Retinal disparity: Images from the two eyes differ.



1. Hold your two index fingers about 5 inches in front of your eyes with the tips $\frac{1}{2}$ 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.

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

- *Cues of depth that can be detected by one eye instead of two.*
- 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:

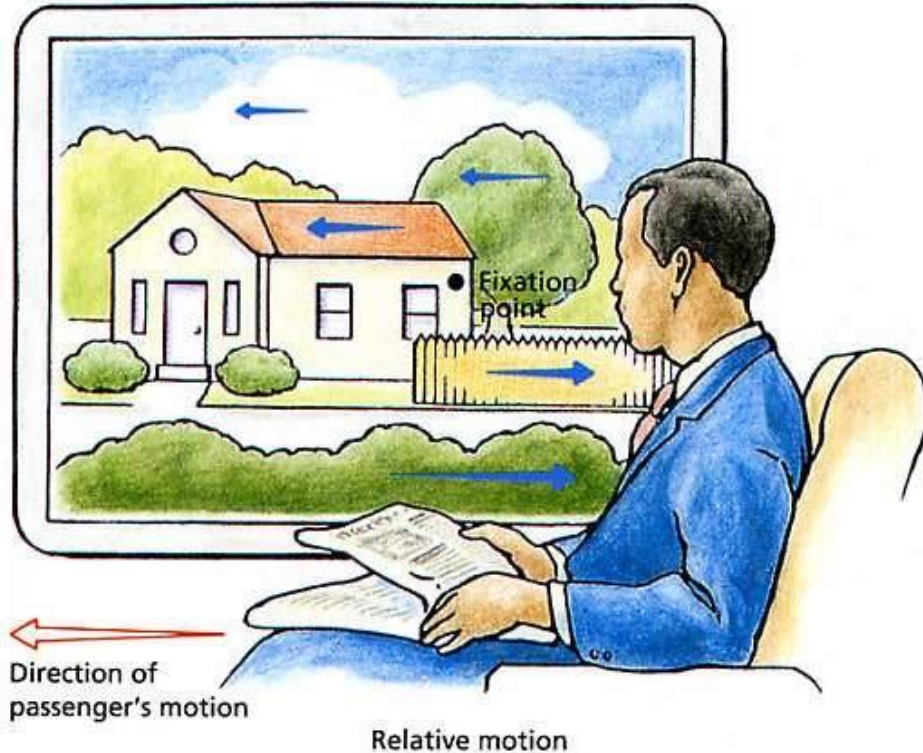
Closer is clearer

Farther is fuzzier

Monocular Cues

Motion Parallax (Relative motion):

- Objects closer to a fixation point appear to move backwards
- Objects beyond the fixation point appear to move with you at a decreasing speed as the object gets farther away.



[Demo](#)

The closer an object is, the faster it appears to move.

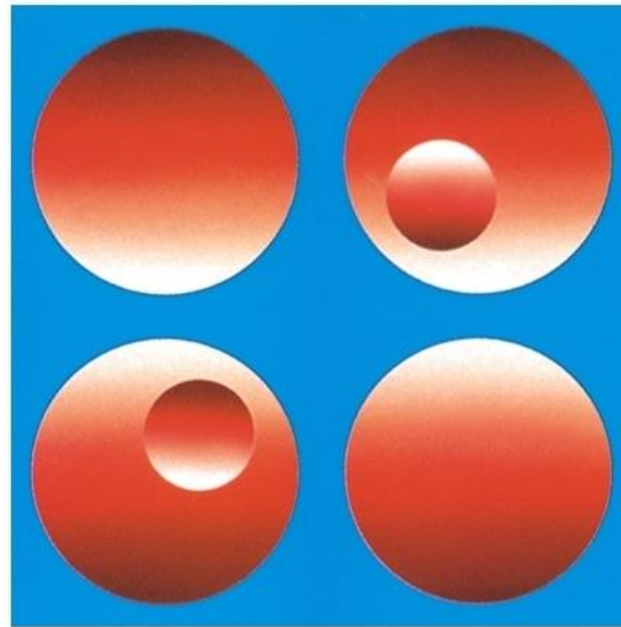
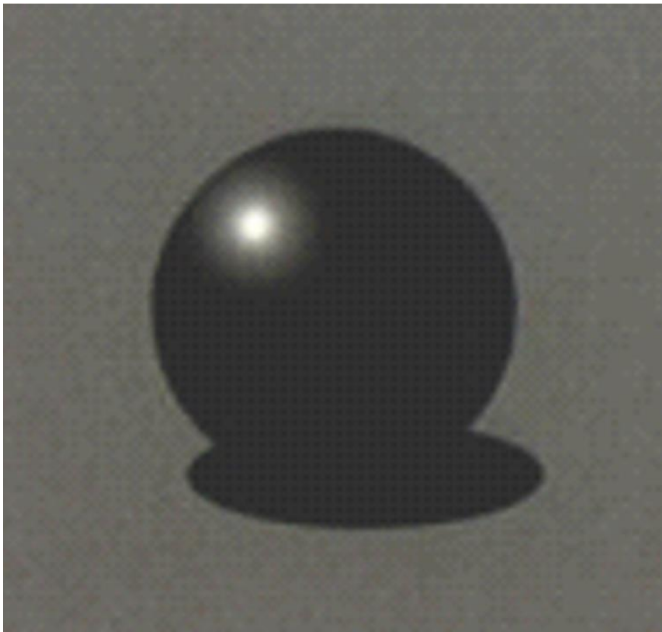


- Without the monocular cues, pictures seem “flat”.

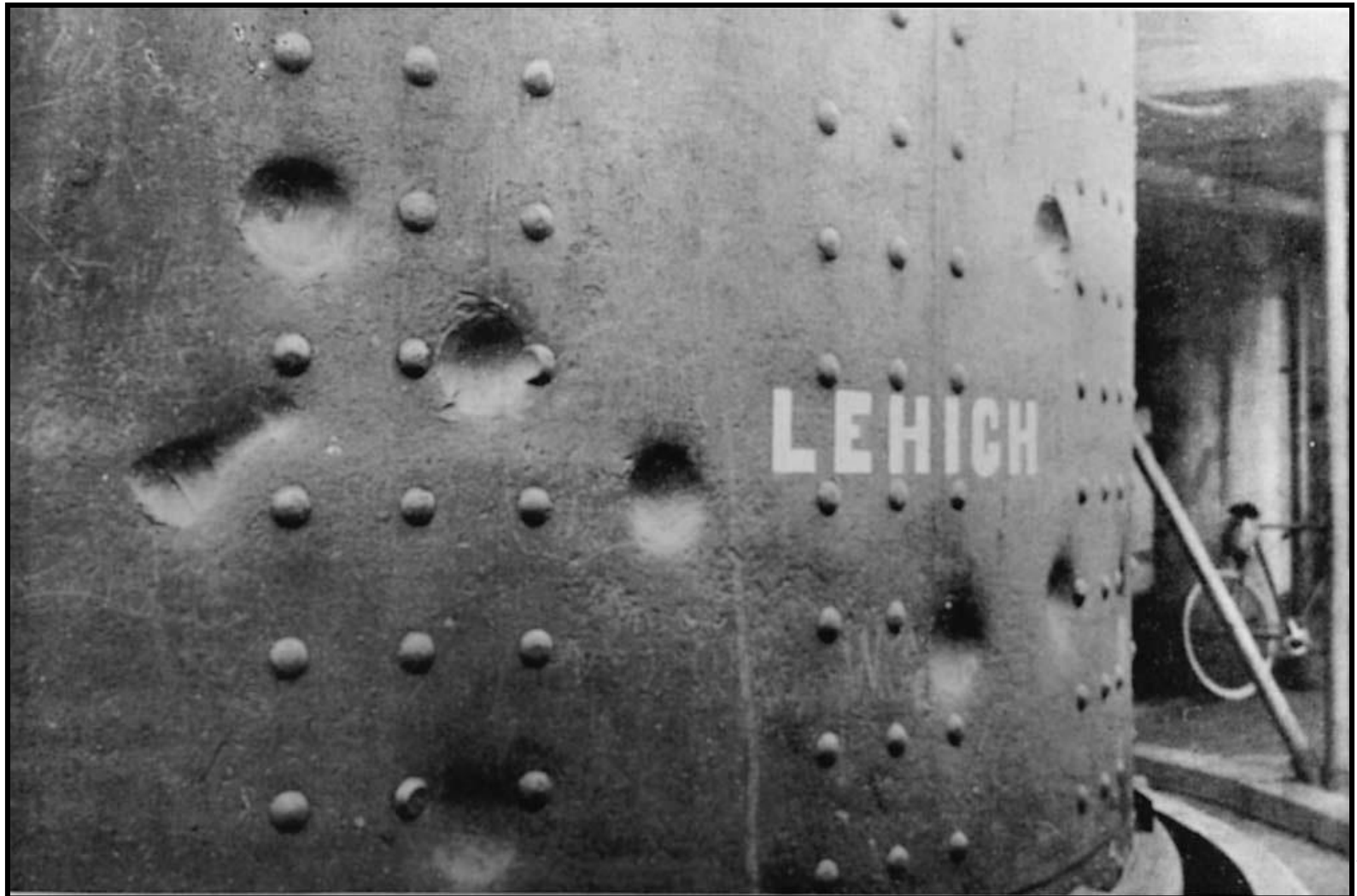


Monocular Cues

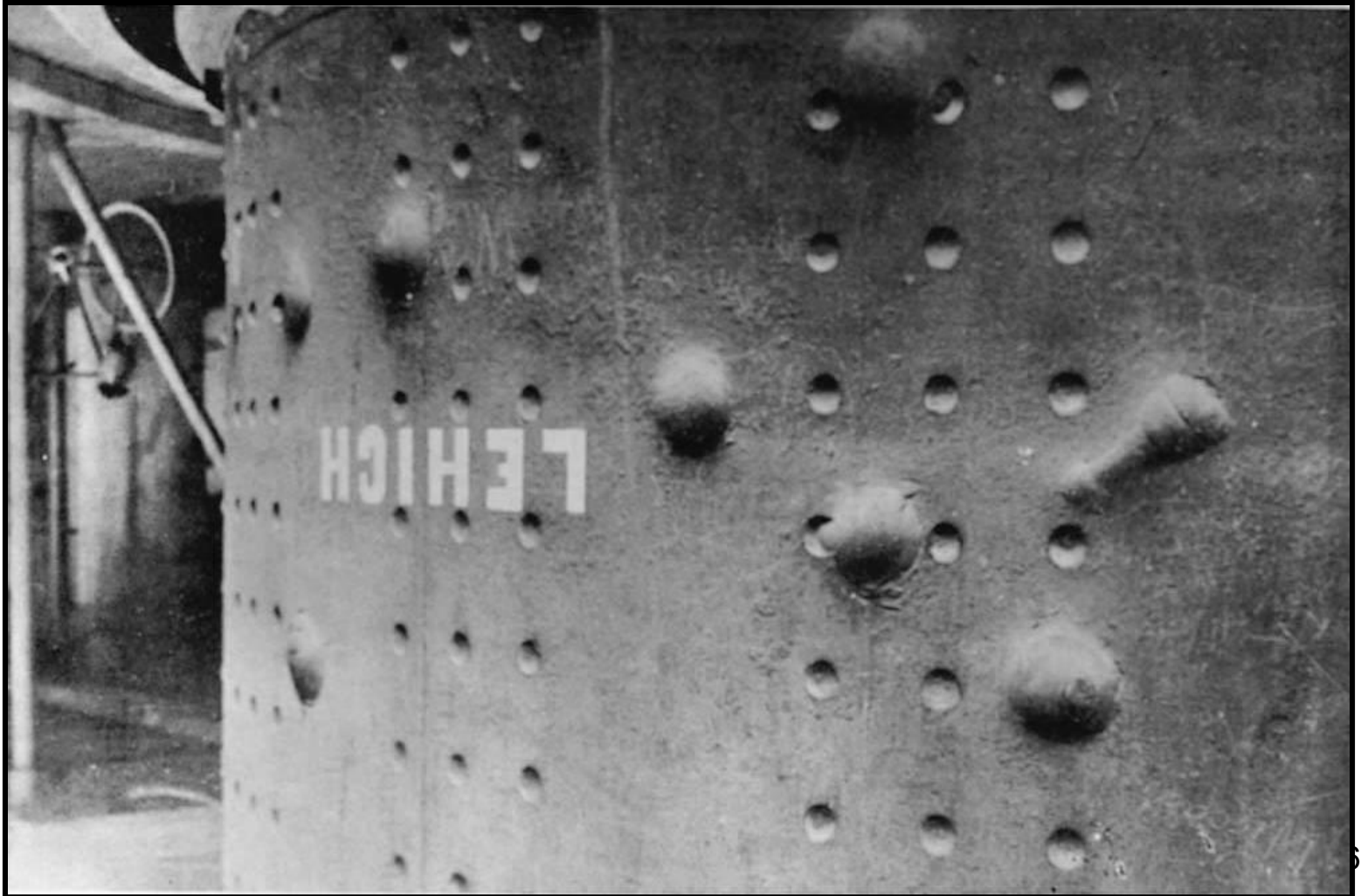
Light and Shadow: Nearby objects reflect more light into our eyes than more distant objects. Given two identical objects, the dimmer one appears to be farther away.



What do the inconsistencies look like on this steel drum?

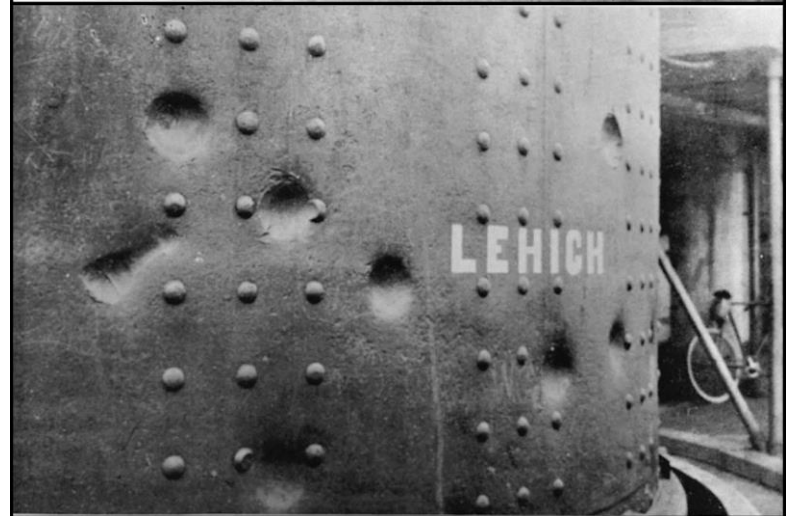
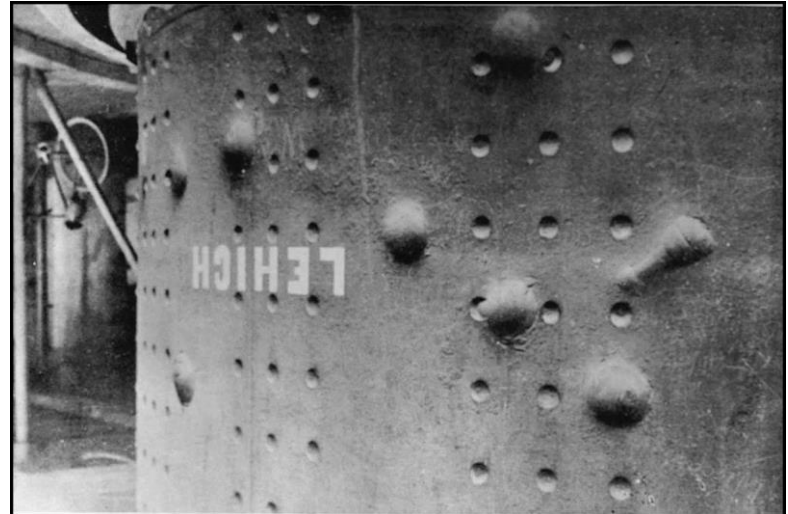
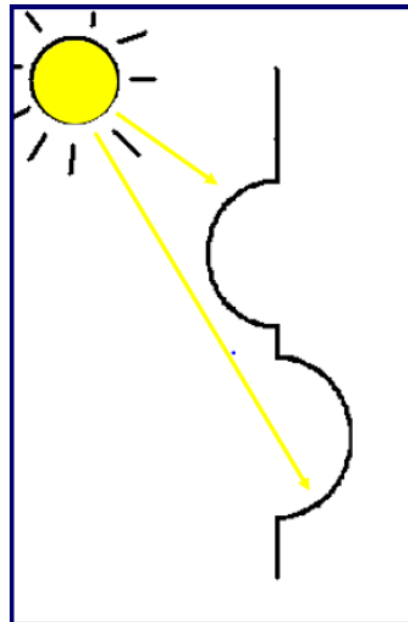


you can see them as
bulges now

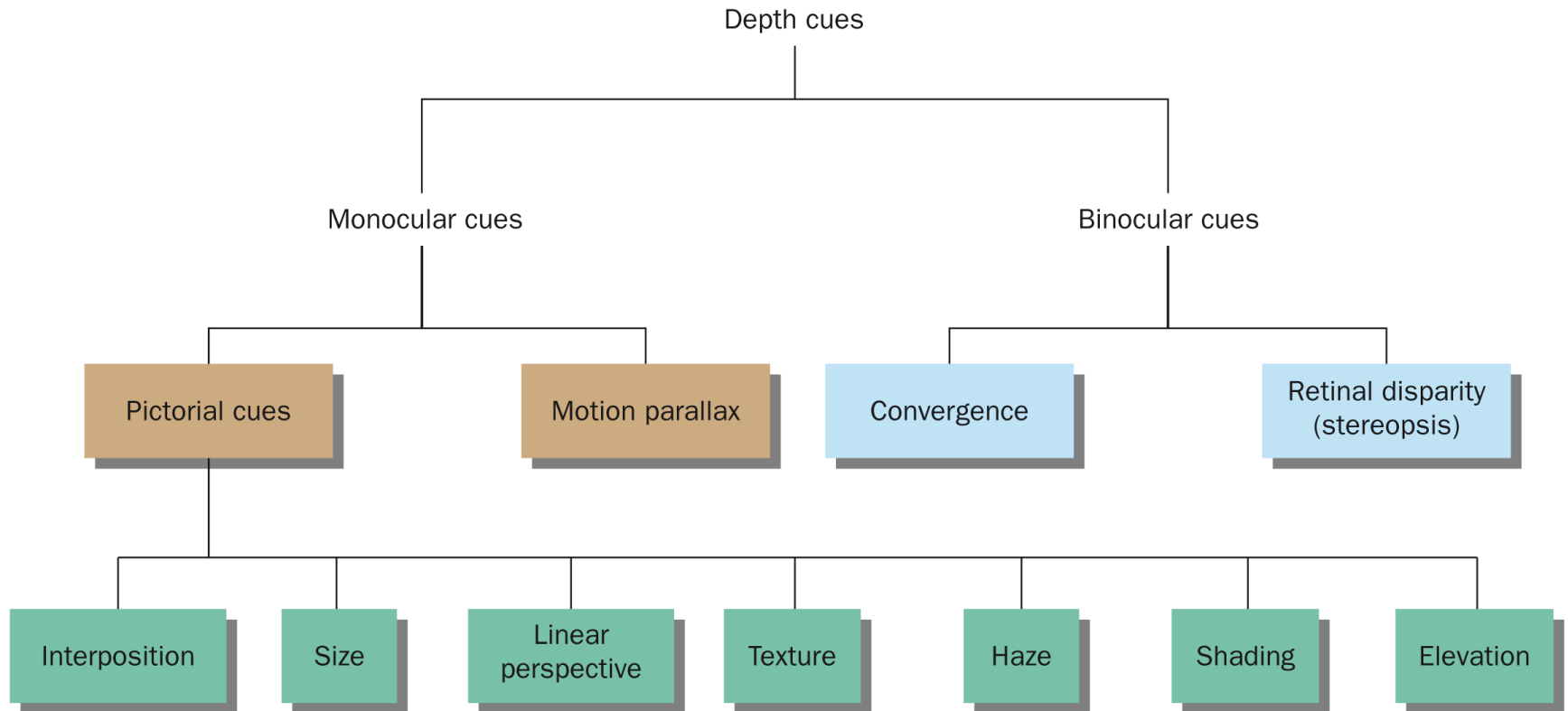


Shading

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.

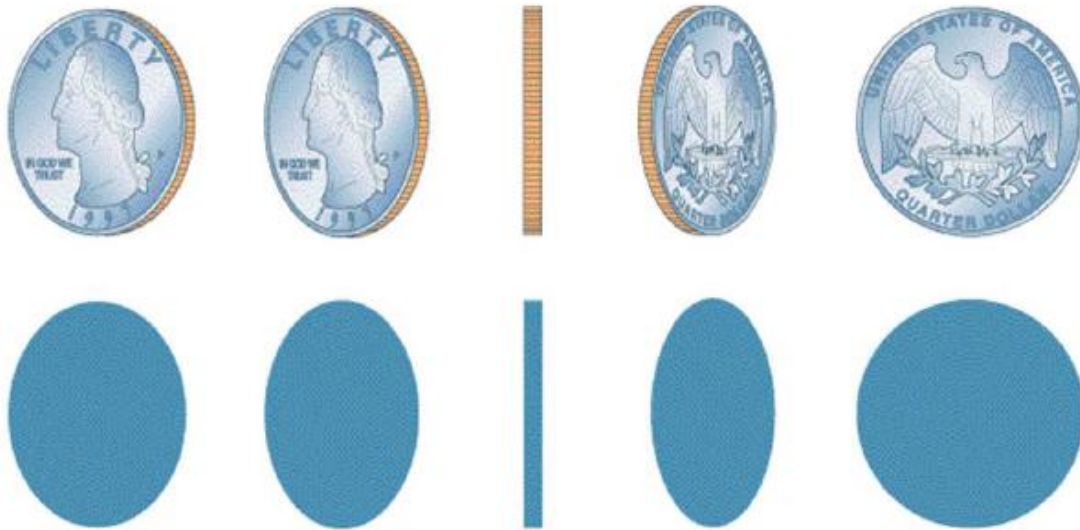
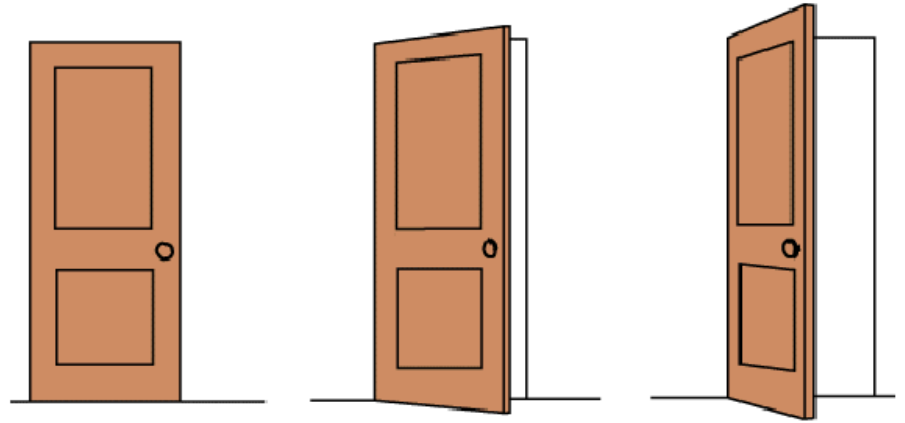
Perceptual Constancy

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