# Seeing Depth

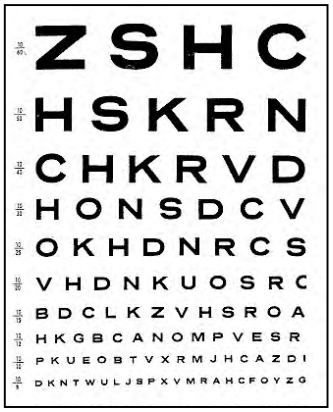
# Visual Cues for Depth

Occlusion

Geometric Perspective

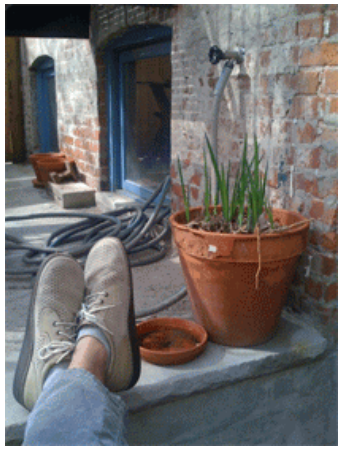
Known sizes and patterns

Lighting and Shadows




Focus and Depth of Field

Atmospheric Perspective



Parallax

Stereopsis

# Occlusion

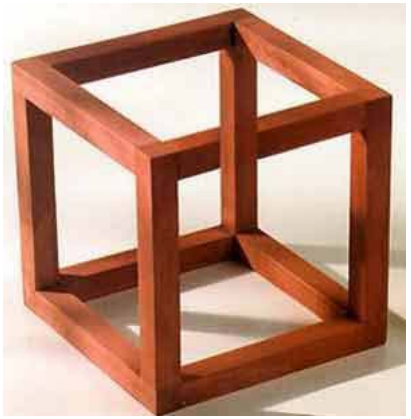
Closer objects occlude (hide) the things behind them.

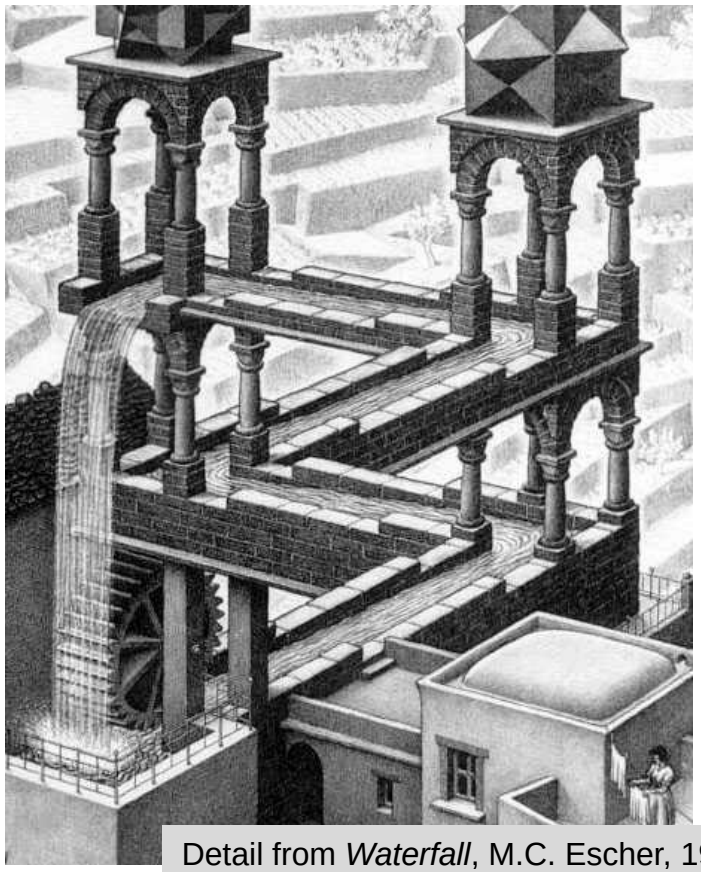
Even in this surreal painting we immediately see the boy as being closer to us than the woman because he partially blocks our view of her.

Detail from *The Madonna of Port Lligat,* Salvador Dali, 1950

# Distorted Occlusion

Distorted occlusion can be used to create surreal images.



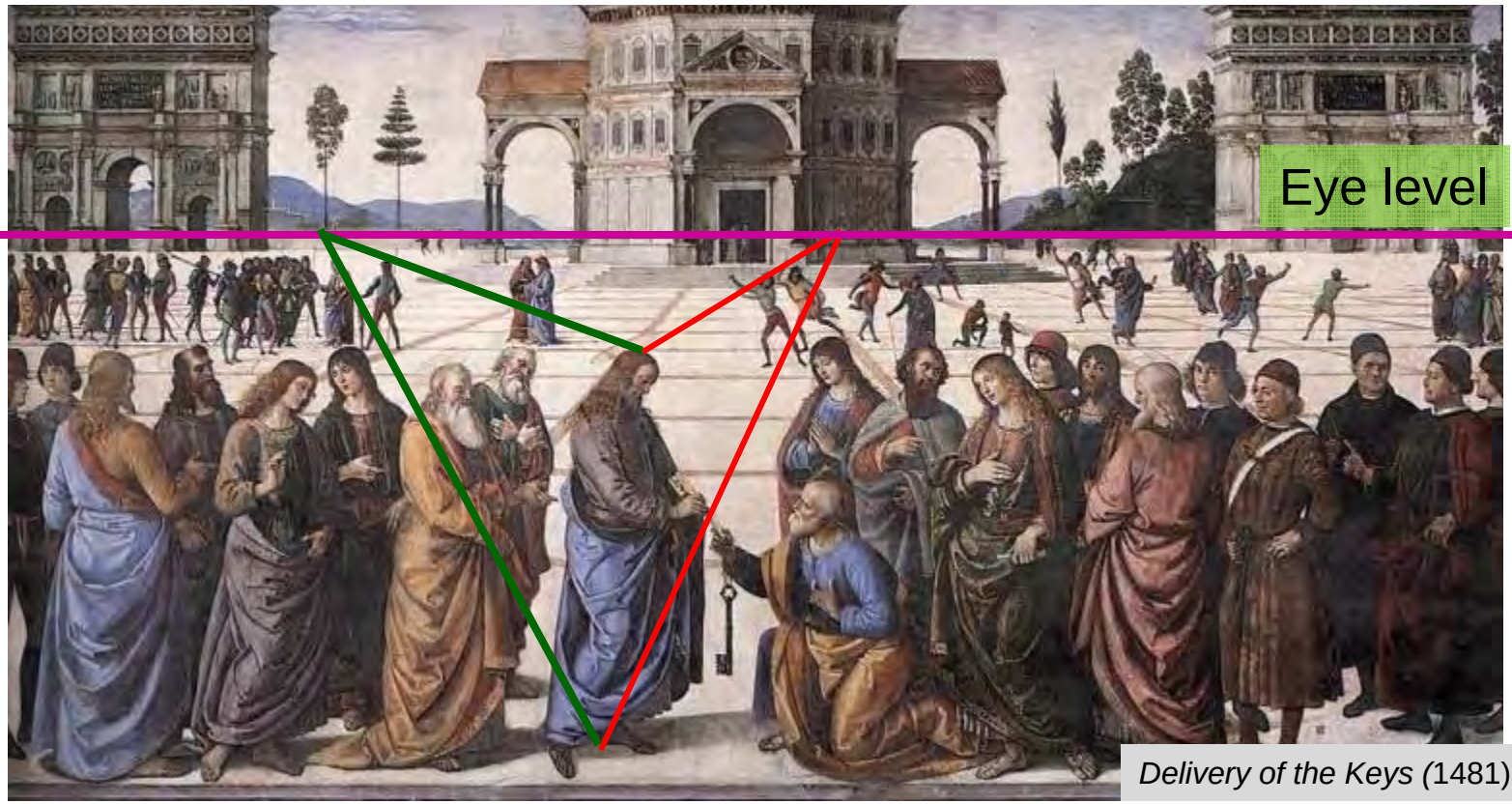


Detail from *Waterfall*, M.C. Escher, 1961

*Carte Blanche,* René Magritte (1965)

# Geometric Perspective

Size and position of elements in a scene vary with the distance from the viewer, as set by the rules of geometric perspective.

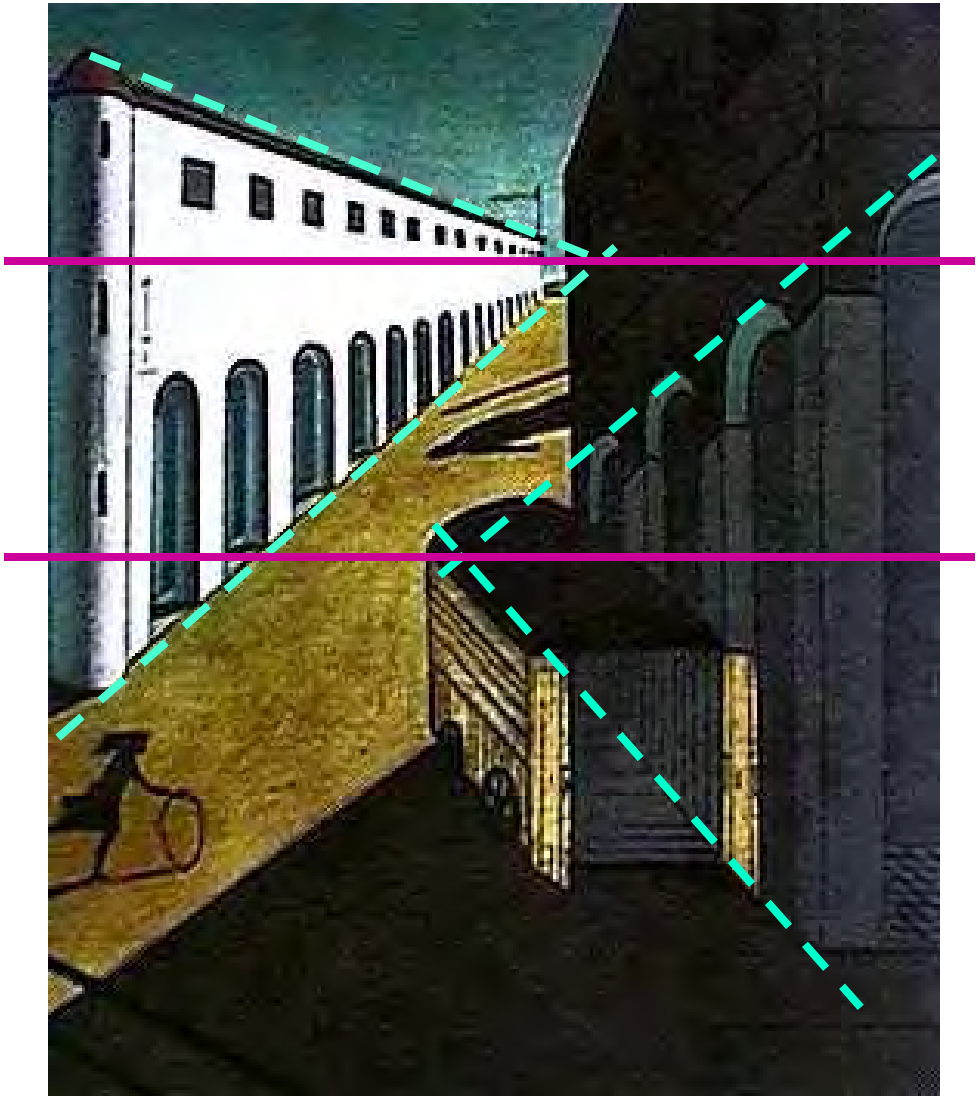



*Delivery of the Keys* (1481)

# Distorted Perspective

Distorted perspective also creates surreal, dream-like images.

The two buildings converge to different eye levels.



*Mystery and Melancholy of a Street*, de Chirico, 1914

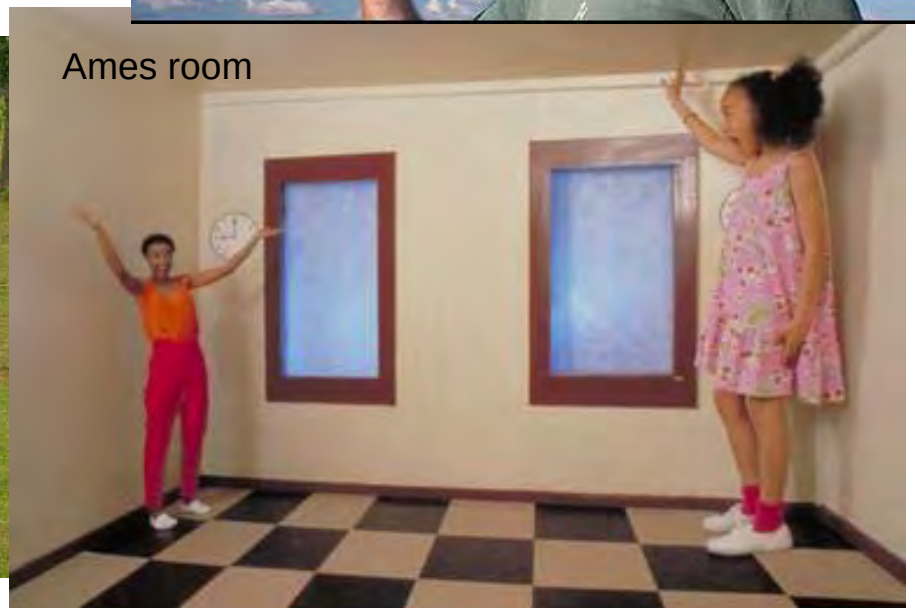
# Known Sizes & Patterns

Knowing the size of lighthouses we see the lizard as a giant in the distance.


Knowing tile patterns we see the depth increasing towards the top of this photo.

# Forced Perspective

Known size is a weak visual cue for depth, easily overridden by other visual cues.



Ames room

# Compositing

Compositing (combining two images into one) makes scale models appear larger and farther away by using forced perspective

*Jason and the Argonauts* (1963)

Ray Harryhausen

# Lighting and Shadows

A Trompe-l'œil (trick the eye) fools us into seeing a 2D painting as being 3D by using lighting and shadows.

# Atmospheric Perspective

Objects in the distance have a bluish, unsaturated color due to atmospheric scattering of blue light.

More effective for indicating great distances.

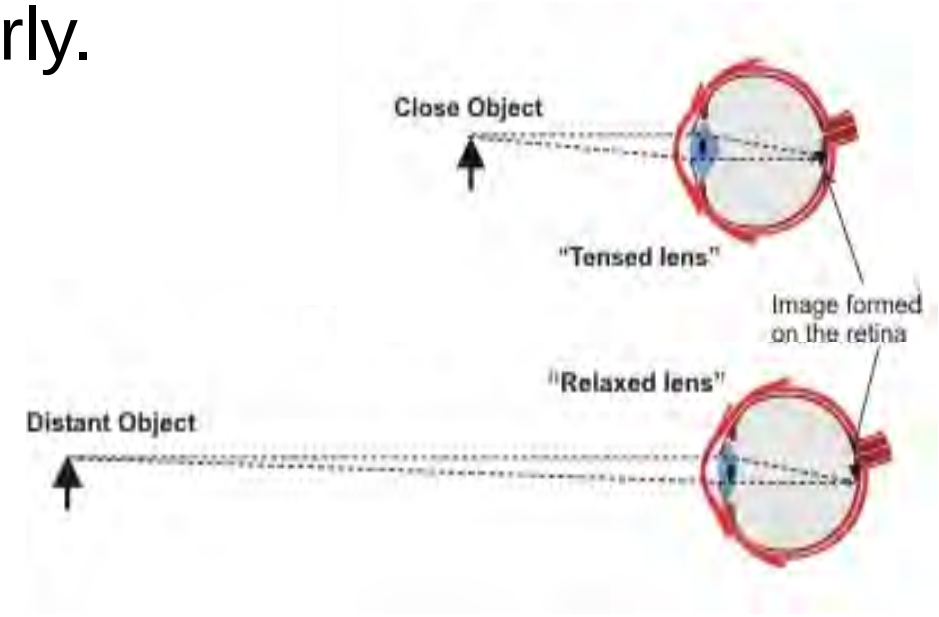
# Focus


Our eyes adjust focus, tensing or relaxing the lens, depending on the distance to the object.

Objects that are very far or very close are difficult to focus clearly.

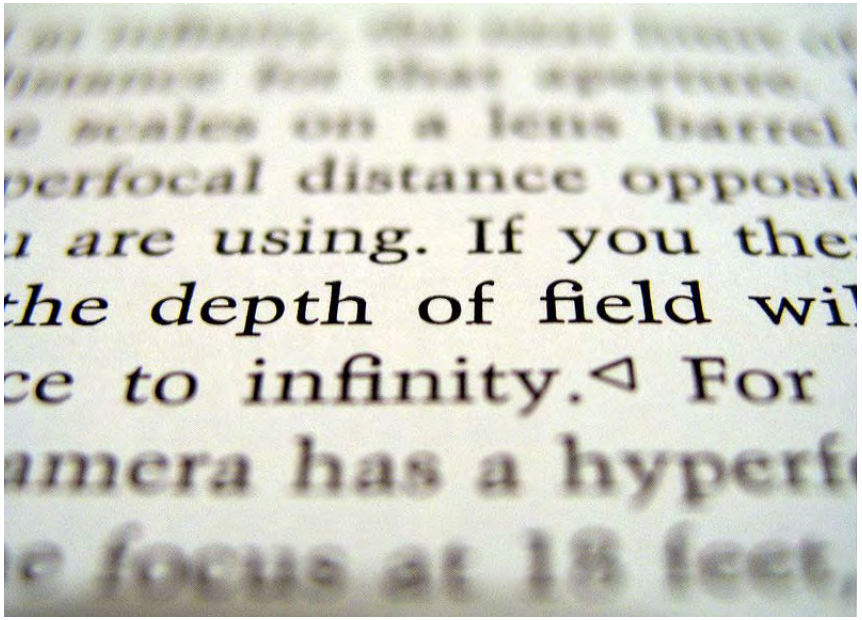
*Perspective, with respect to painting, is divided into three parts…*
*the first is the diminution in the size… the second is that which deals with the diminishing in color…*
*the third is the diminution of the distinctness of the shapes and boundaries…*

Leonardo Da Vinci



# Depth of Field

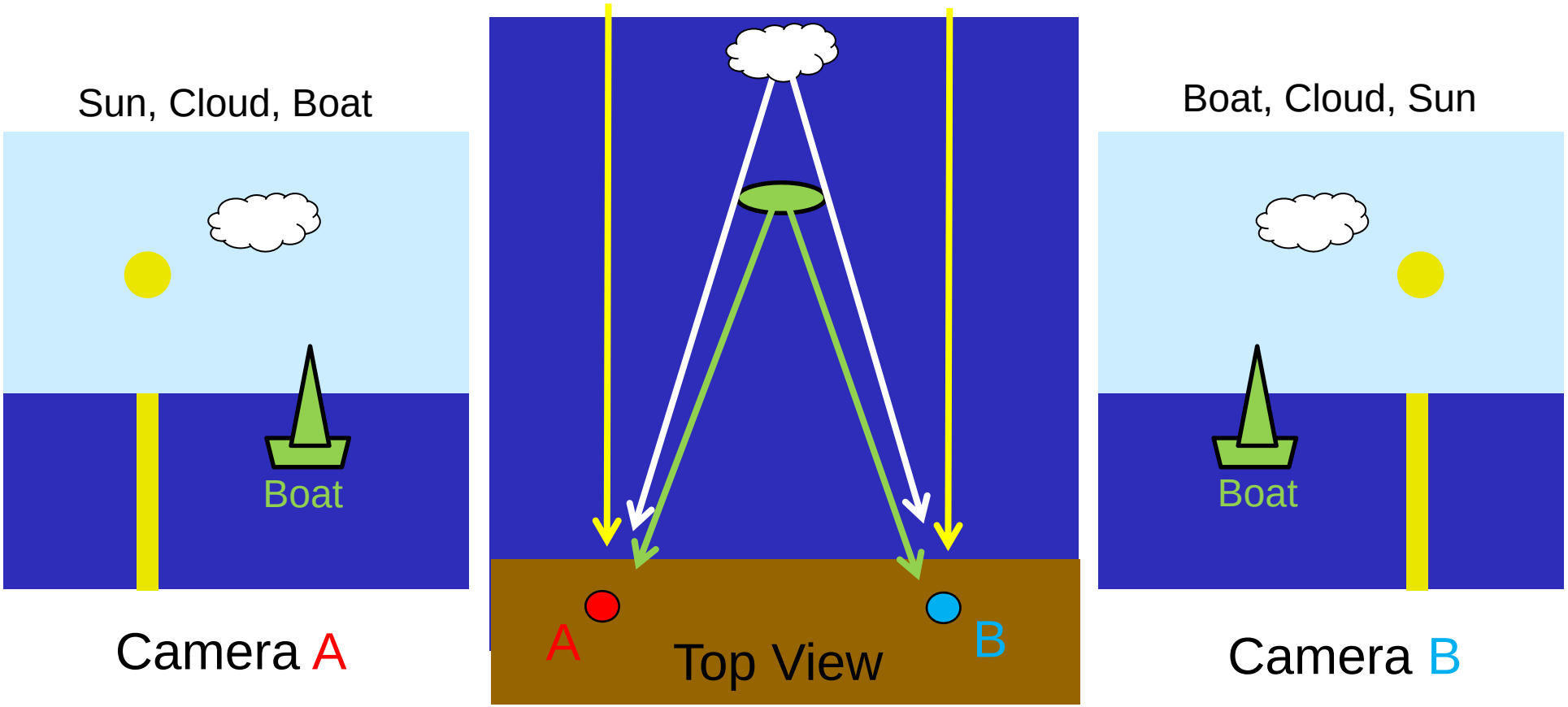
Depth of field (DOF) is the distance between the nearest and farthest objects in a scene that appear simultaneously in focus.



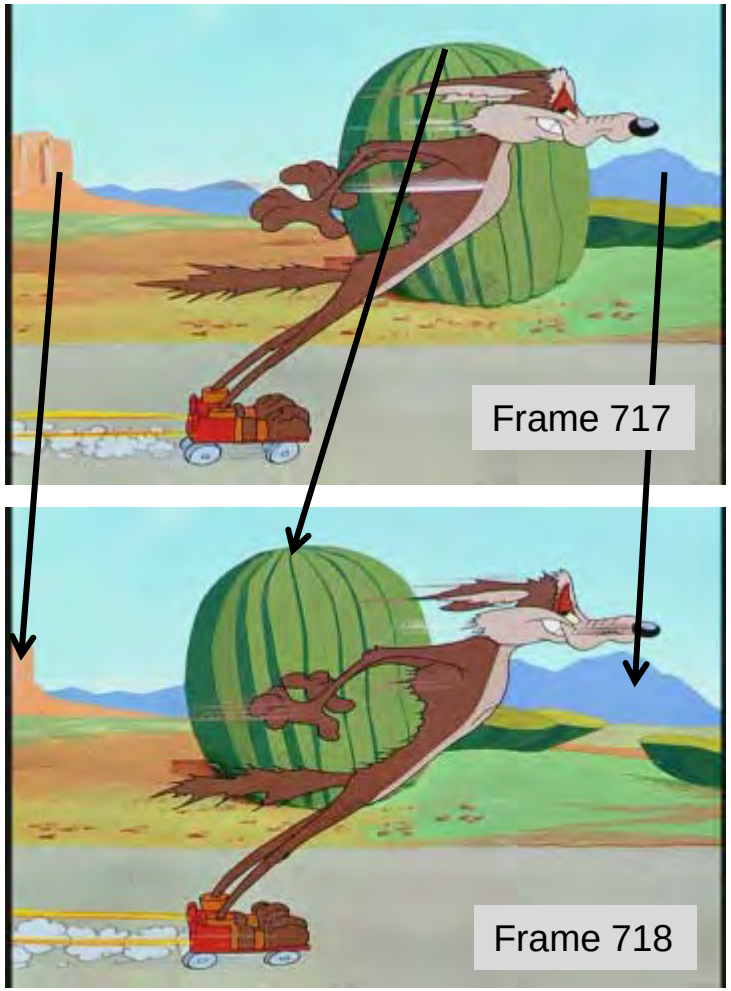

Miniature faking takes a photo of a life-size location and makes it look like a scale model by blurring parts of the photo to simulate a shallow depth of field

# Parallax & Position

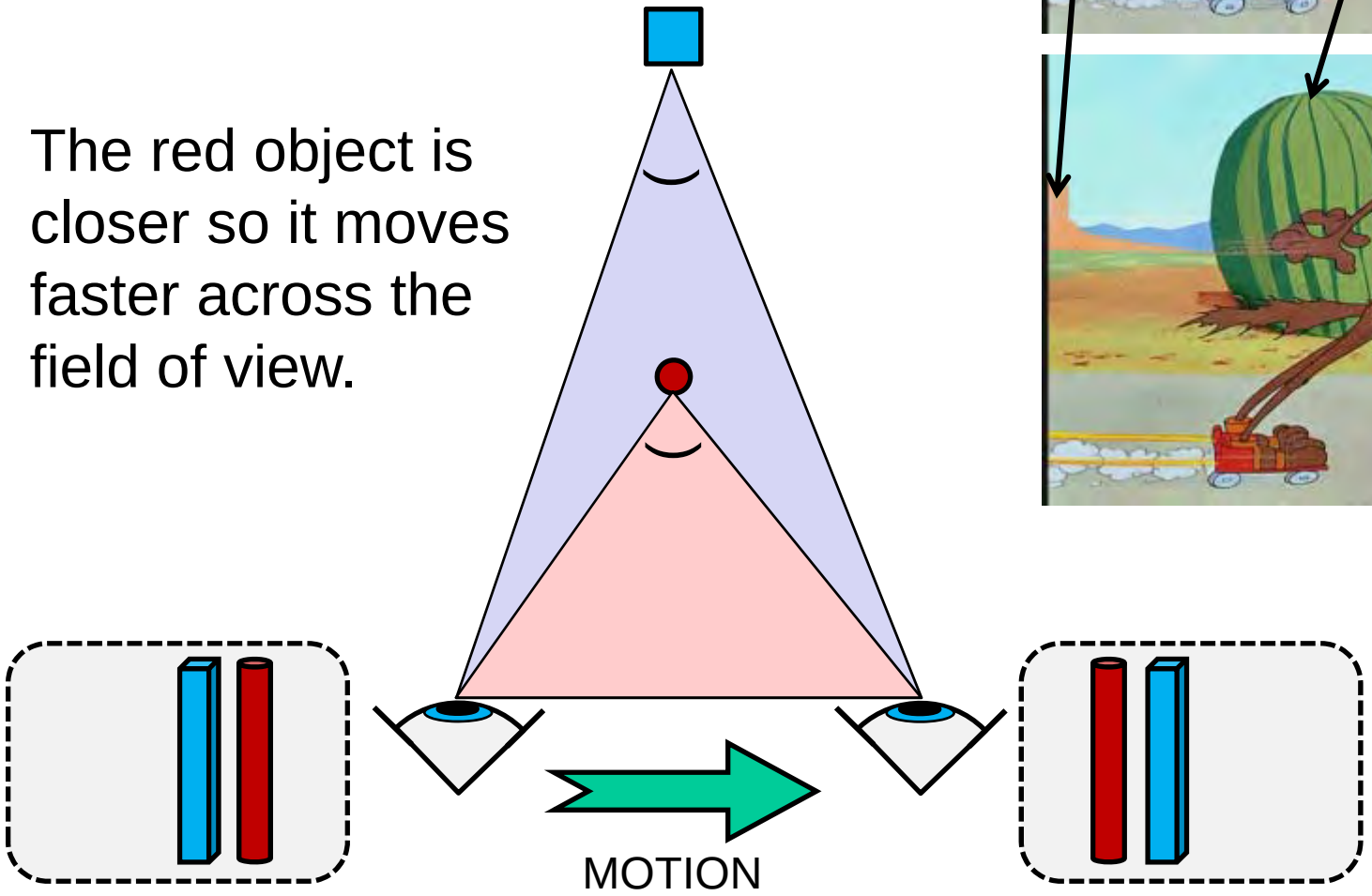
Due to parallax the positioning of objects in a scene depends on their distance from camera.



# Parallax & Motion




The red object is closer so it moves faster across the field of view.

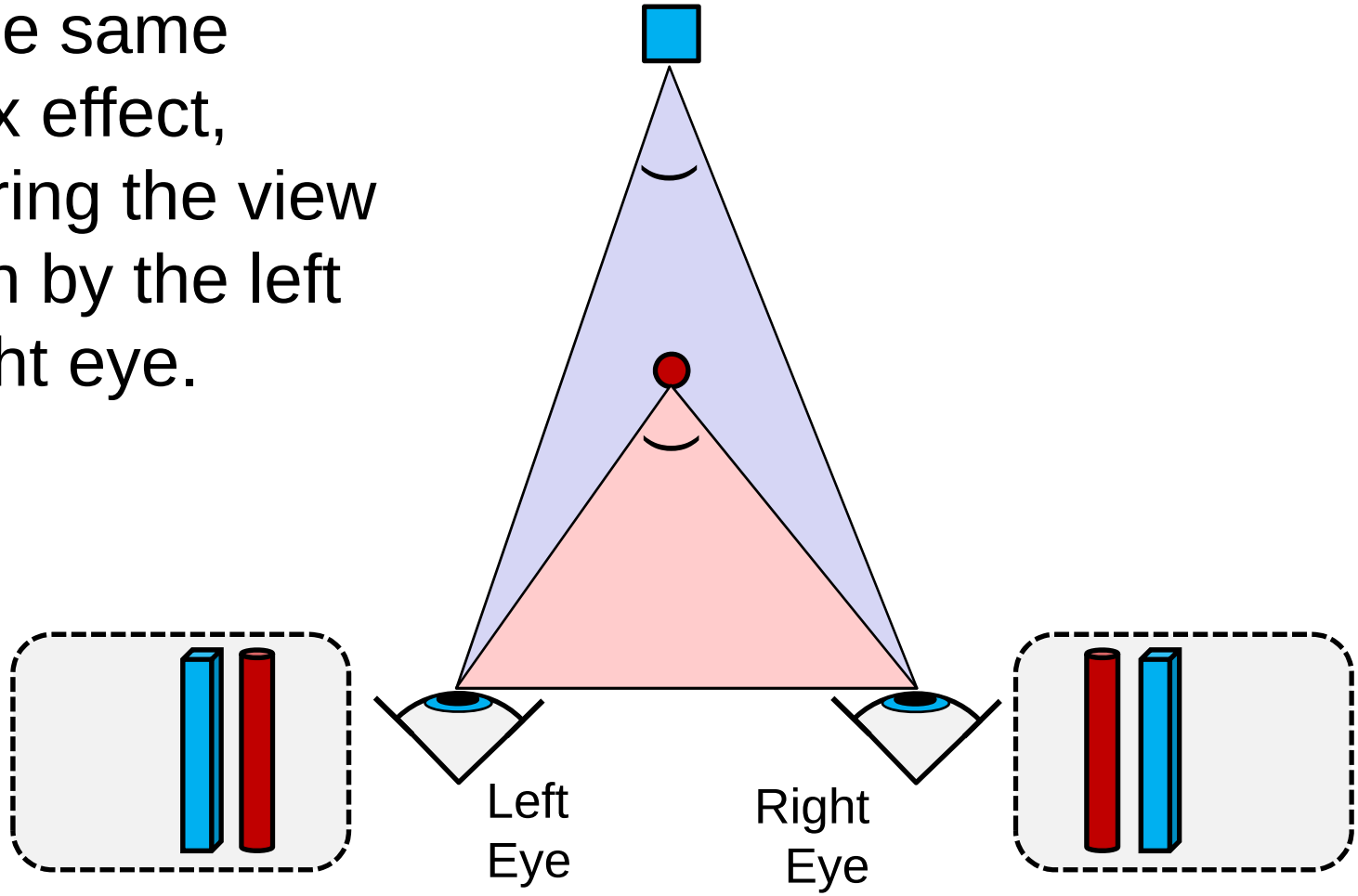


# Multi-plane Camera

Multi-plane cameras create depth by parallax

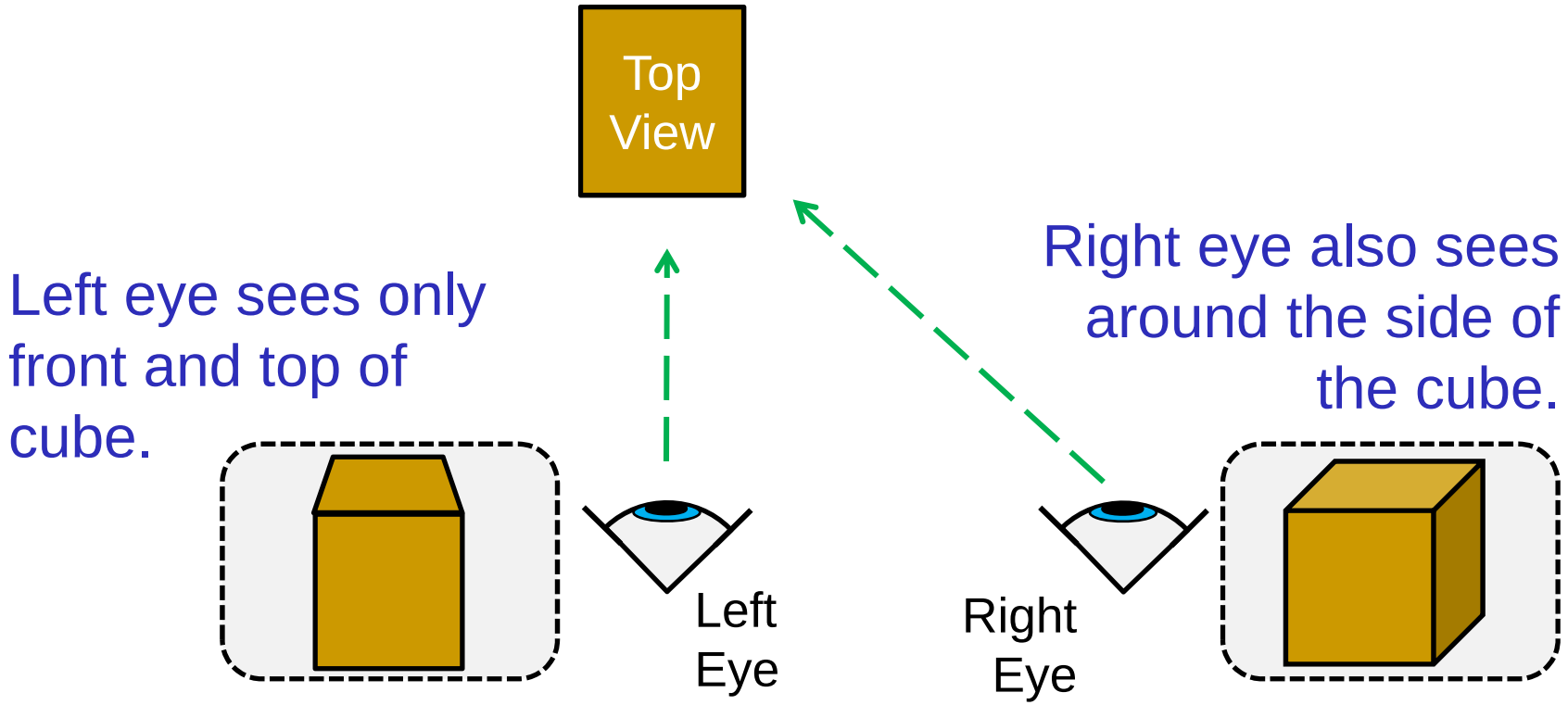
# Parallax & Stereopsis

Stereoscopic vision uses the same parallax effect, comparing the view as seen by the left and right eye.



# Occlusion Revelation

Occlusion revelation is a stereoscopic effect.
When one eye sees part of an object that the other eye cannot then that's a visual cue for depth.



# Summary

- A flat image may appear to have depth from a variety of visual cues for distance.
- Visual cues for depth and distance include: occlusion, perspective, known sizes, lighting, focus, atmospheric perspective, parallax, and occlusion revelation.
- Some visual cues are stronger and can override others, as in forced perspective.
- Stereoscopic vision (stereopsis) uses the different view in the left and right eye to see depth by parallax and occlusion revelation.