Photorealism

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What Will We Learn?

- How can I use photorealistic shading methods in 3-D graphics to make visualizations easier to understand?
- How do 3-D depth cues enable the human visual system to perceive a 2-D image as depicting a 3-D scene?

Why Photorealism

- Visual perception relies on depth cues that indicate an otherwise flat image represents a three-dimensional scene

  occlusion, shadowing, perspective, stereopsis, focus, lighting, texturing, attenuation

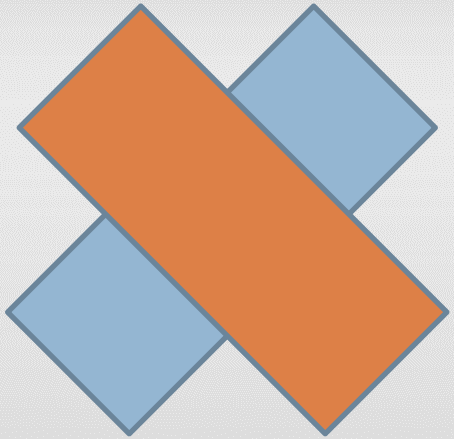
- Photorealistic rendering simulates these cues to aid (fool) the eye in perceiving a flat image as three-dimensional

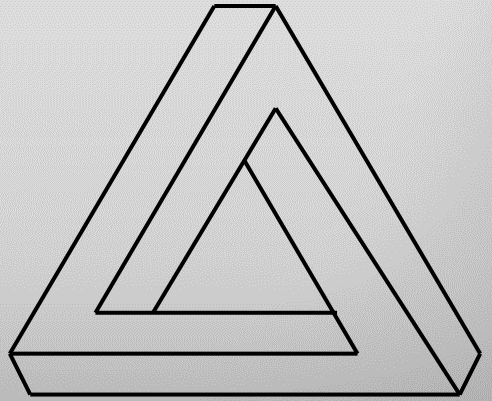
Pere Borrell del Caso, *Escaping Criticism*, 1874

Margritte, Human Condition

Occlusion

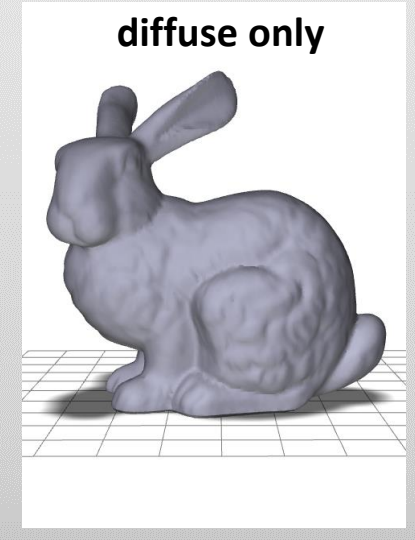
- Most objects are opaque and hide objects behind them
- Occlusion cue implies a visual sort from near to far
- Strongest cue
- Easier to compute for opaque objects than for translucent objects

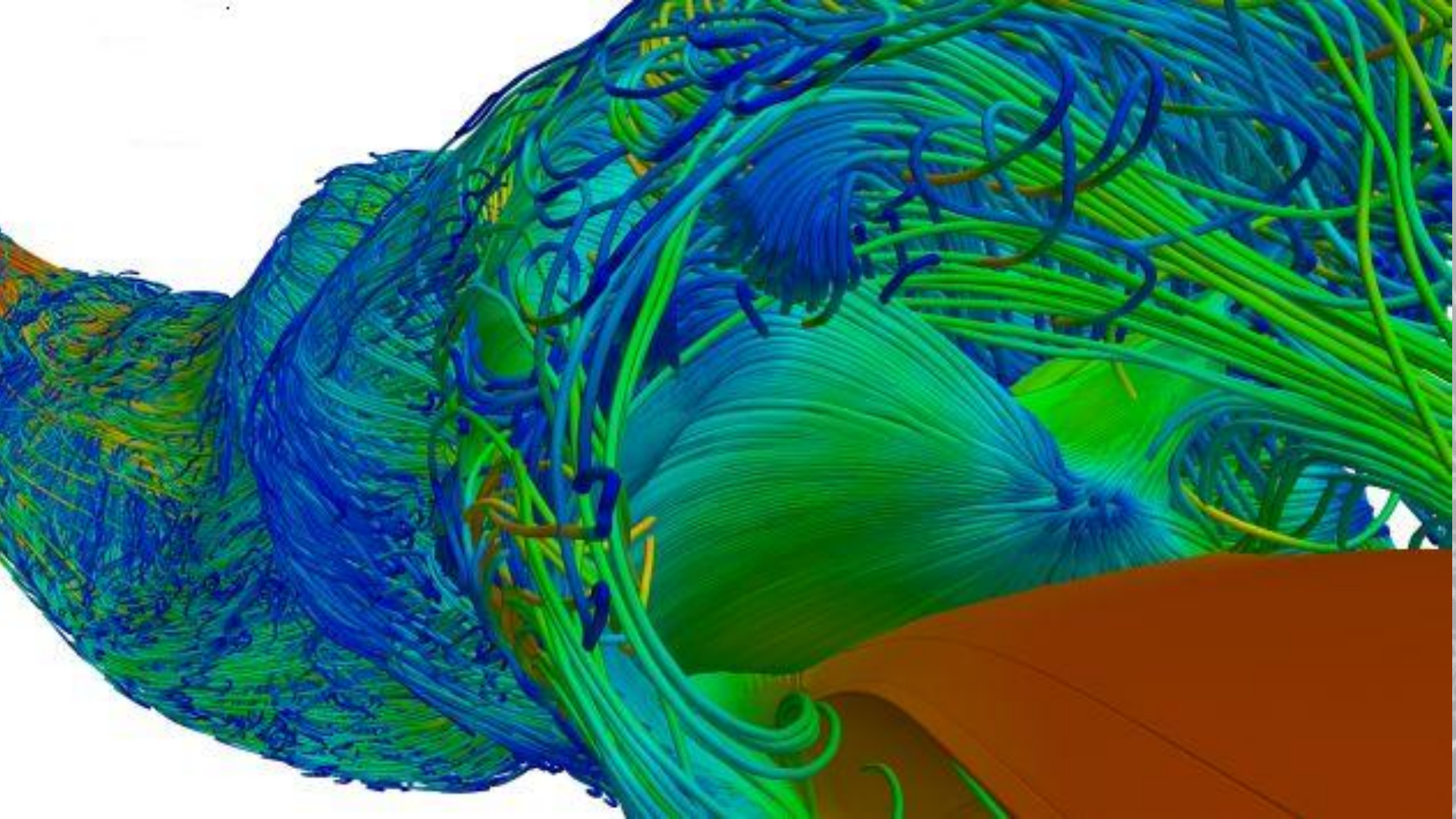




Illumination

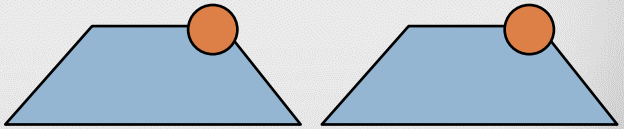
- Cues the human visual system of the orientation of a surface
- Diffuse illumination
  - surface brightest when facing a light source
  - Implies roughness
- Specular illumination
  - surface brightest when reflecting a light source
  - Implies smoothness

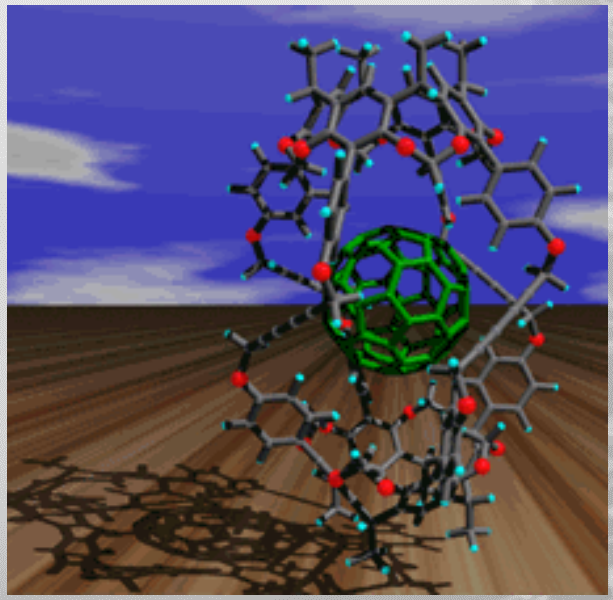




Shadowing

- Shadows indicate light occlusion
- Cues perceptual system to object positions relative to each other





Kendall N. Houk, UCLA

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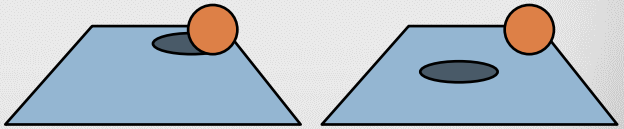

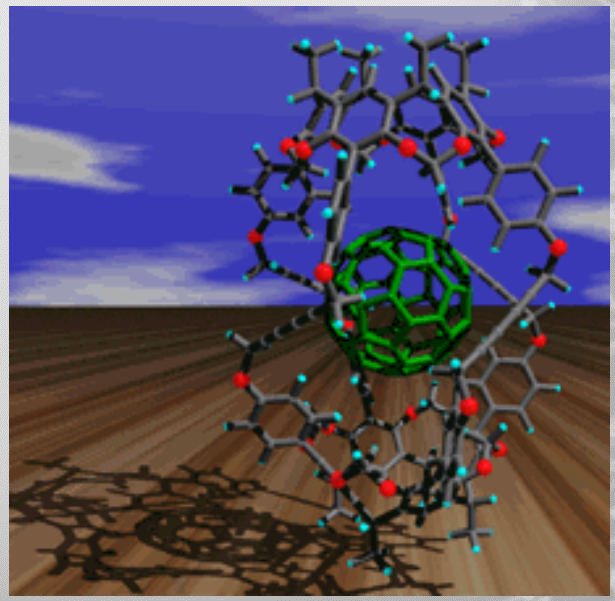

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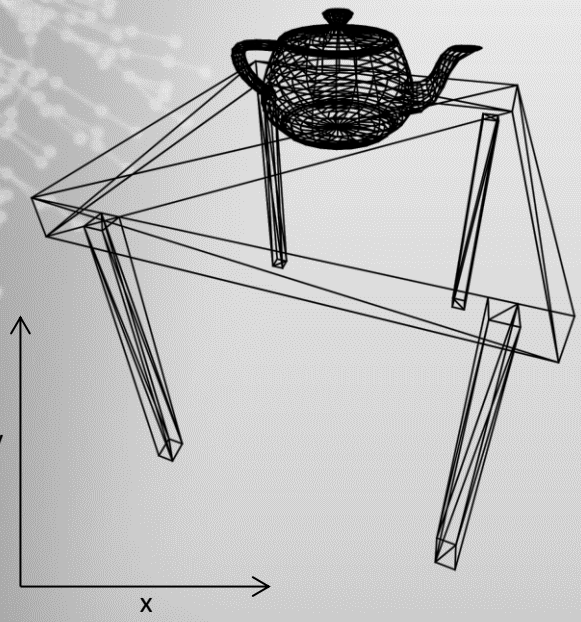
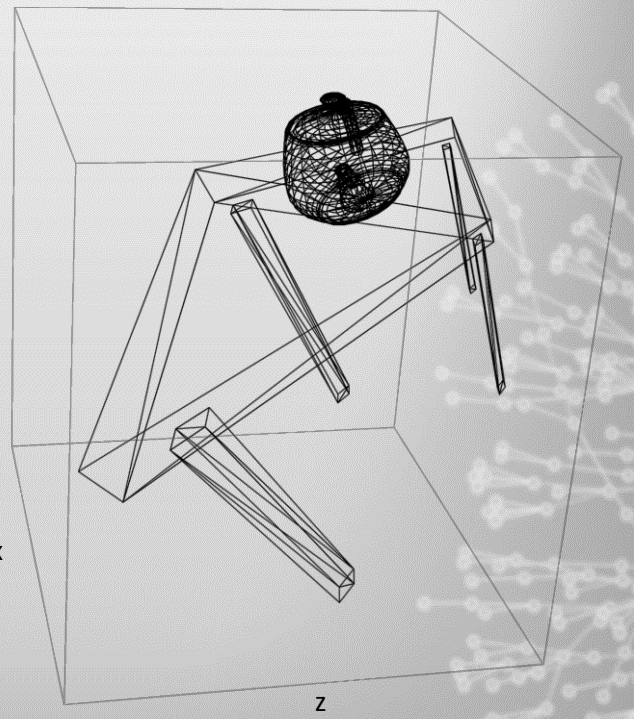
Perspective

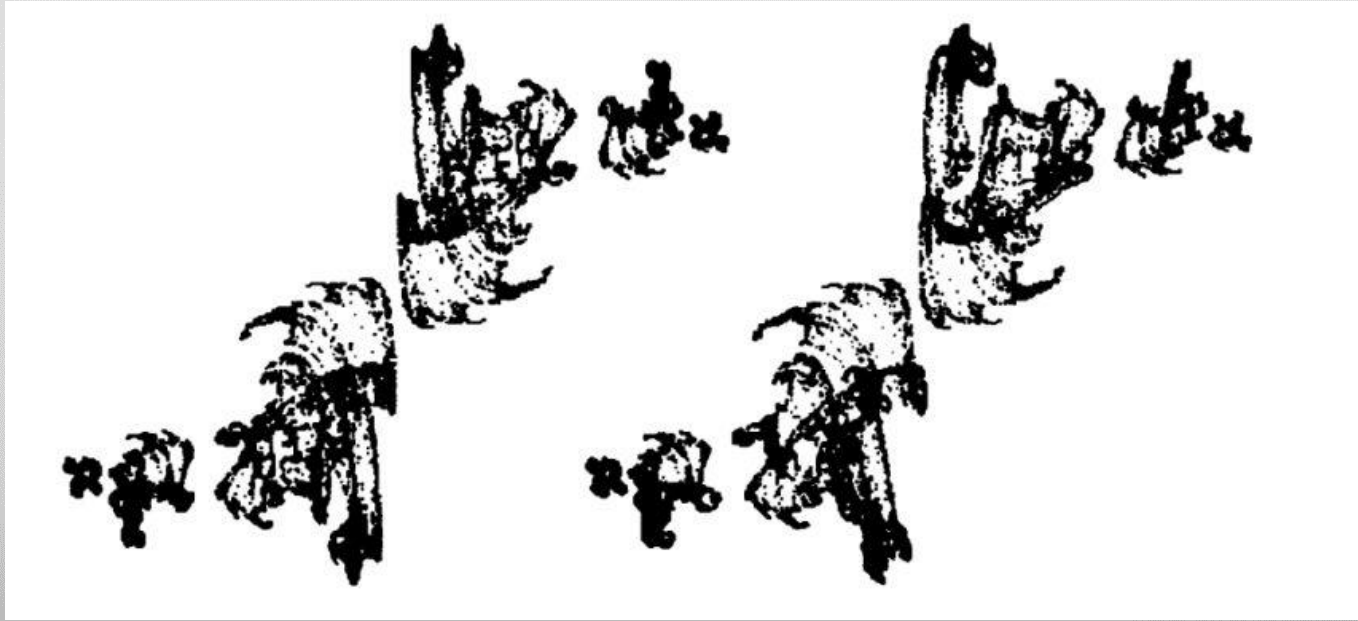


- Size constancy cues depth – objects are same size but farther ones appear smaller
- In 3-D graphics, we make shapes farther away actually smaller



Stereopsis

- Rendering from two different viewpoints (one for each eye)
- View directions should be parallel, not rotated



What Did We Learn?

- Occlusion is the strongest depth cue
- Shadowing is occlusion of a light source
- Illumination reveals surface orientation
- Perspective can reveal different scales of visualization in addition to aiding depth perception
- Stereo is useful when other cues are unavailable