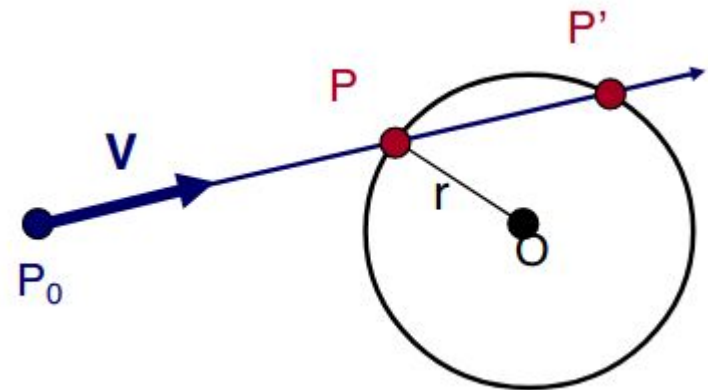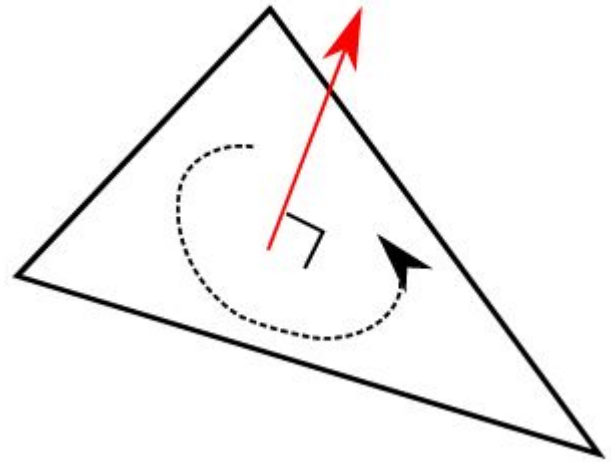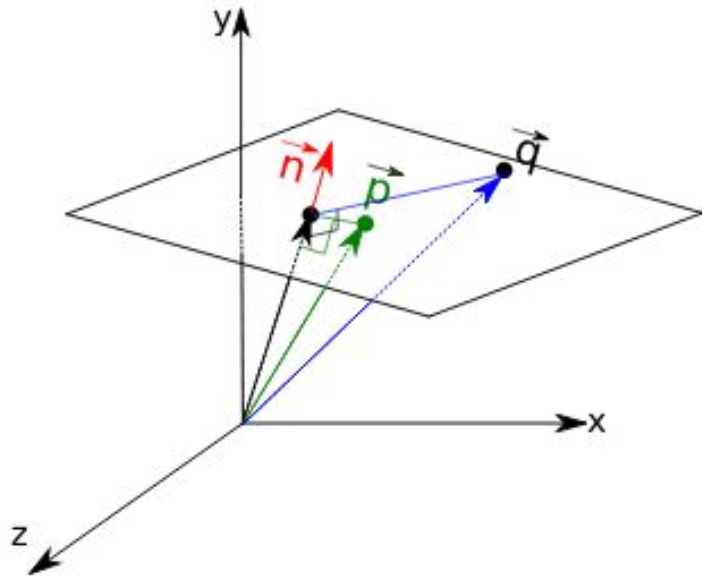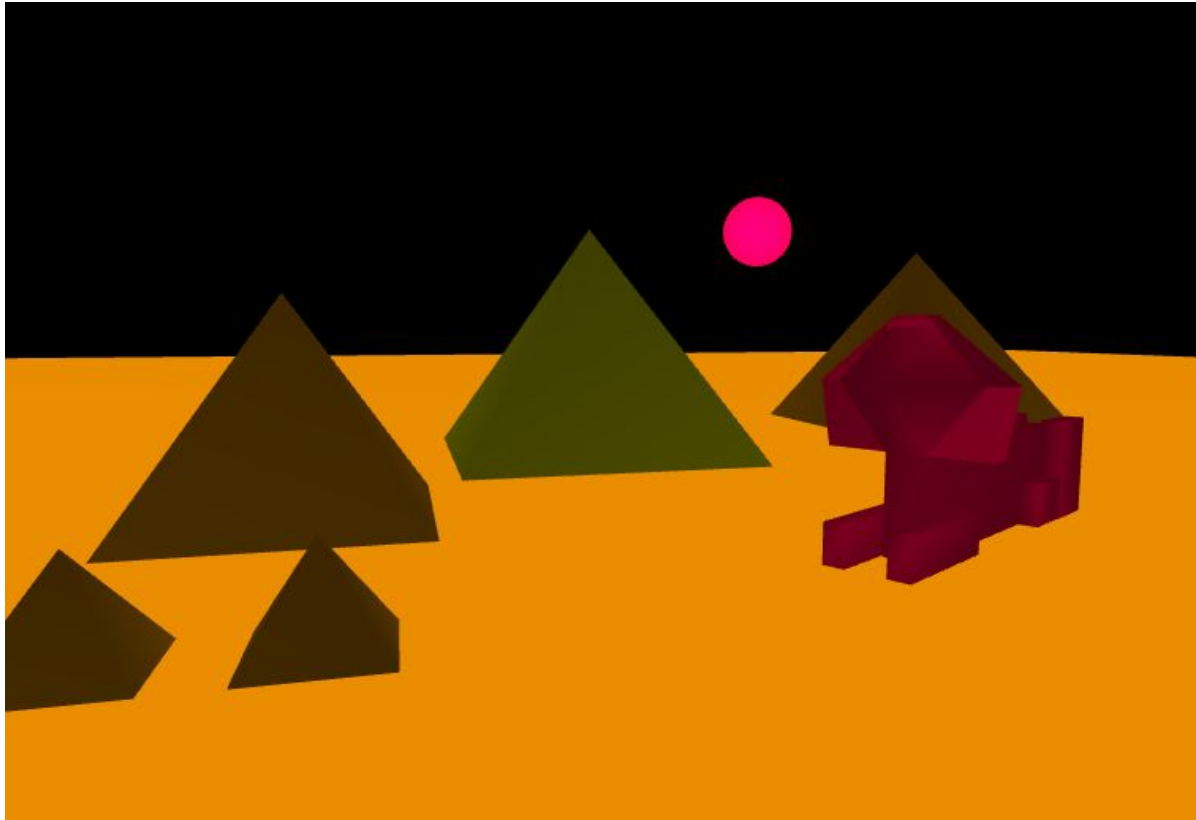# CS 476: Computer Graphics

Lecture 1: Overview

Geometric Primitives

$$Ax + By + Cz + D = 0$$

3D Scene Generation

Clem Lapeyre, Samni Oyenuga, Gray Williams

Digital 3D Geometry, Duke University, 2019

```
{
"name":"PyramidsOfEgypt",

"receiver":[-2, 0.8, 0],

"source":[20.5, 1.63, 11.27],

"children":[

{

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                         0, 0, 1, -1.2,
                         0, 0, 0, 0.2]
},
{

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                         0, 0, 1, 0.5,
                         0, 0, 0, 0.2]
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                         0, 0, 1, 2.4,
                         0, 0, 0, 0.3]
},
{
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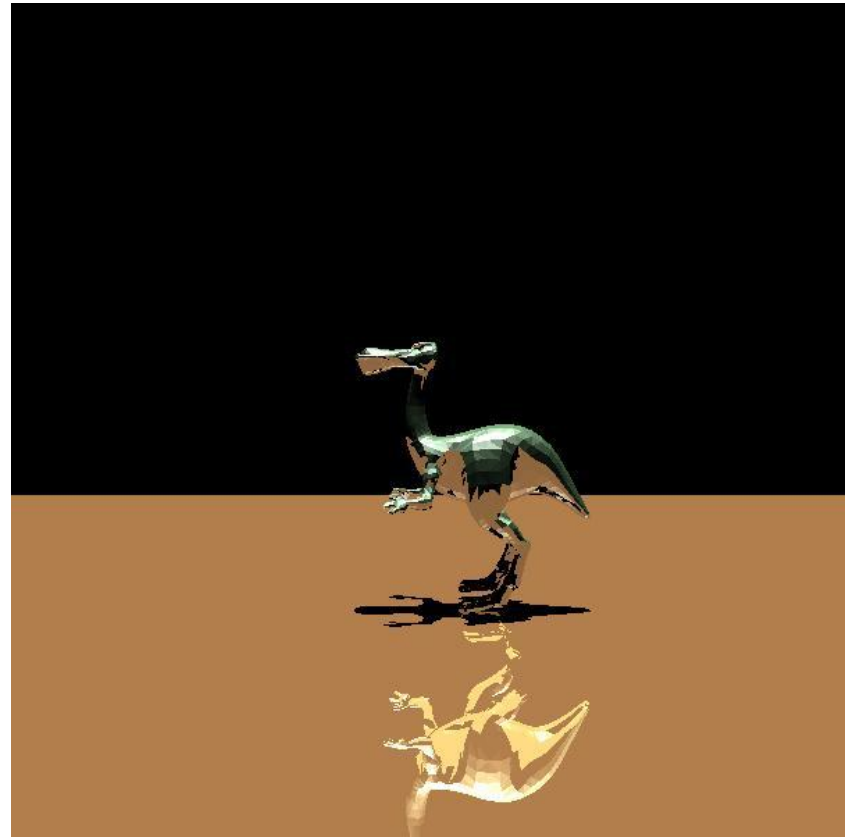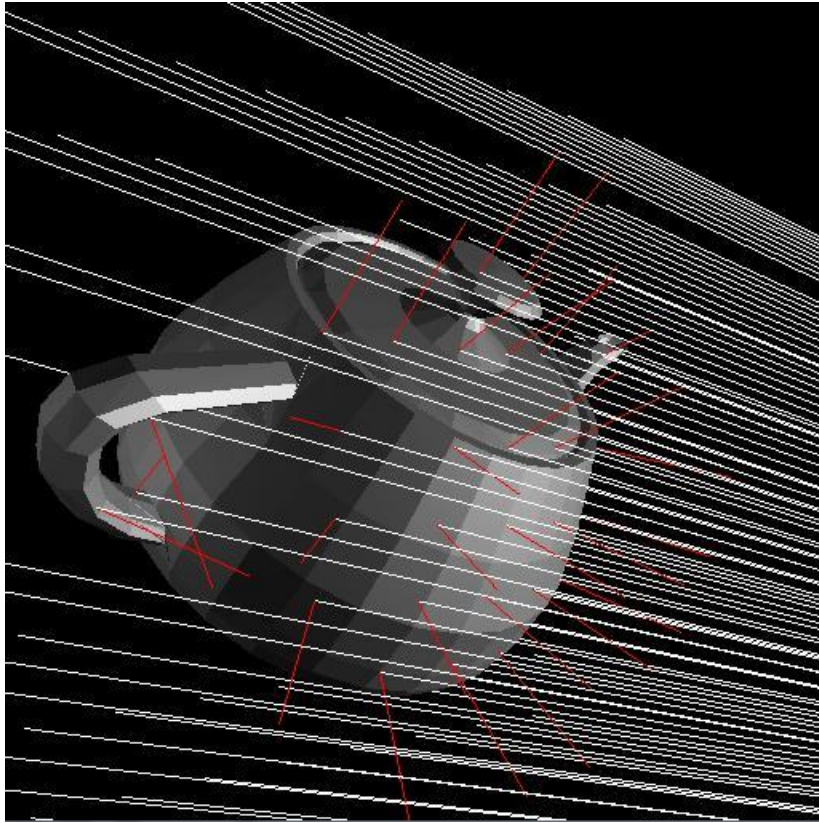
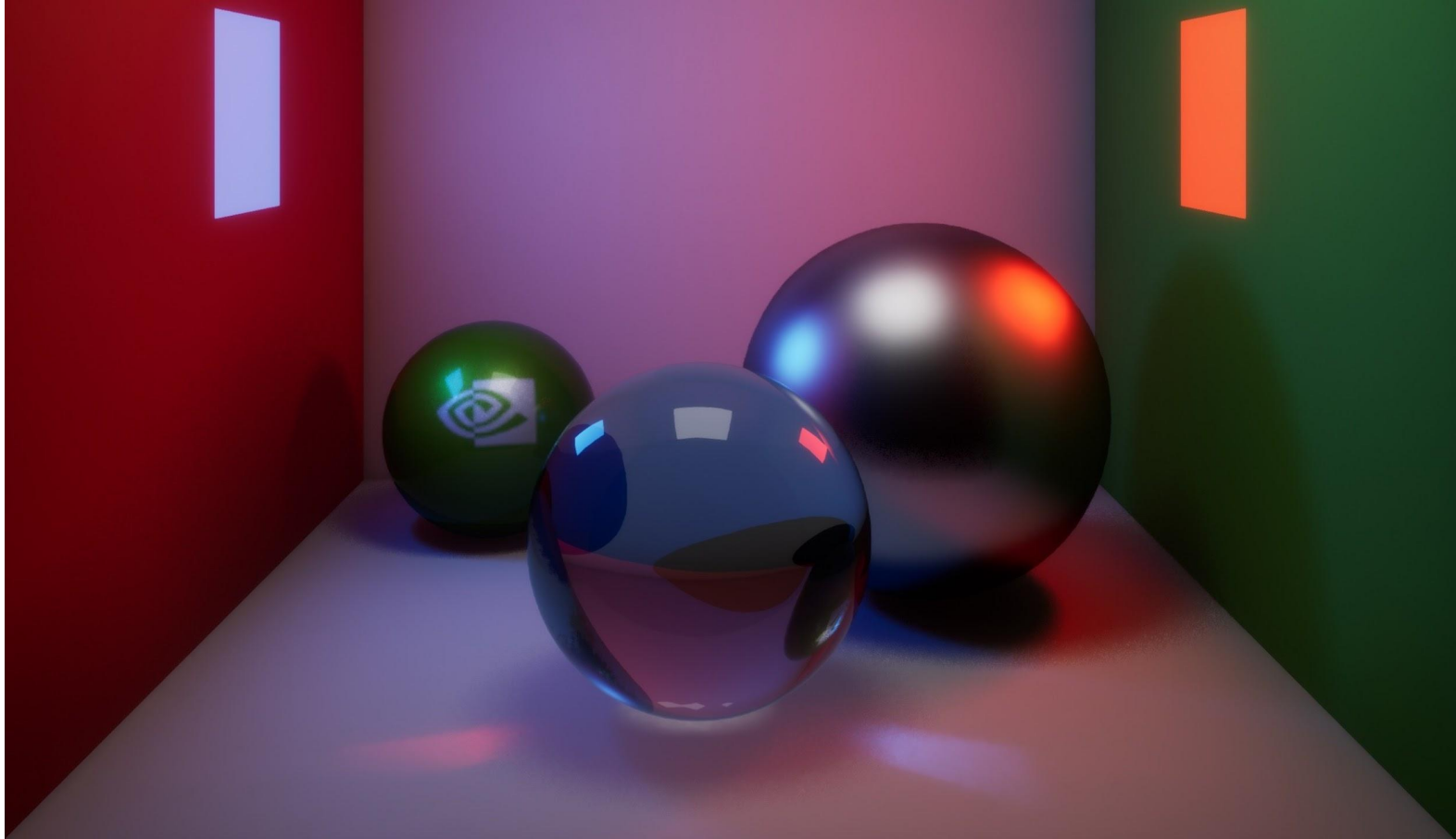# Rendering

How do we see light? Let's reverse engineer it!
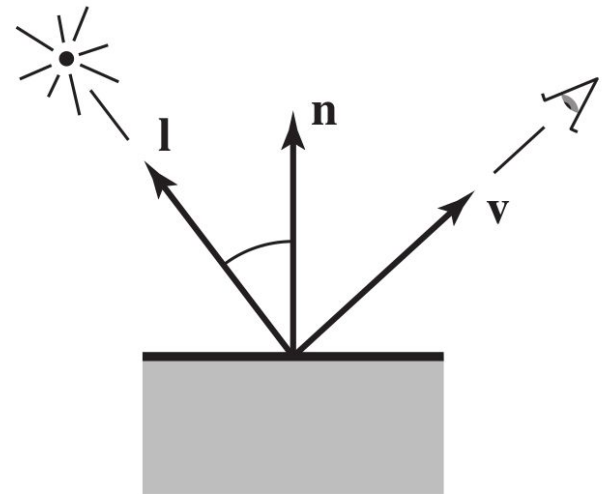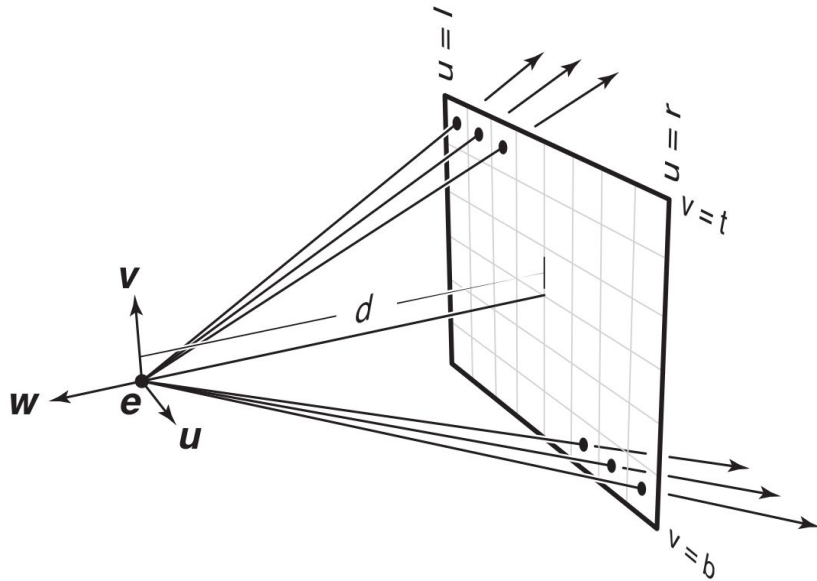
Figure 4.12. Geometry for Lambertian shading.

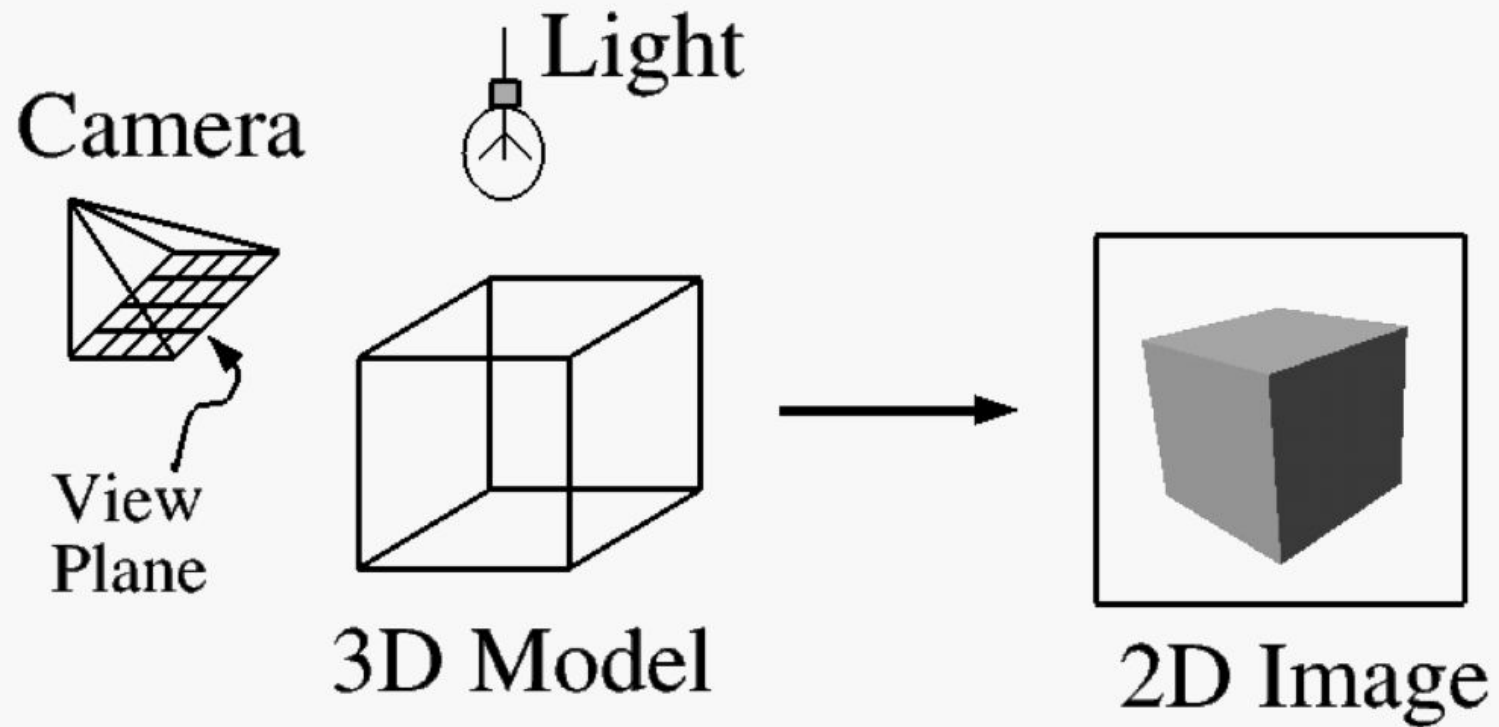Shirley/Marschner Ch. 4

Ray Tracing: Pixel First REndering

Tralie 2009

Ray Tracing: Pixel First REndering

Real-Time Pipeline: Object First Rendering

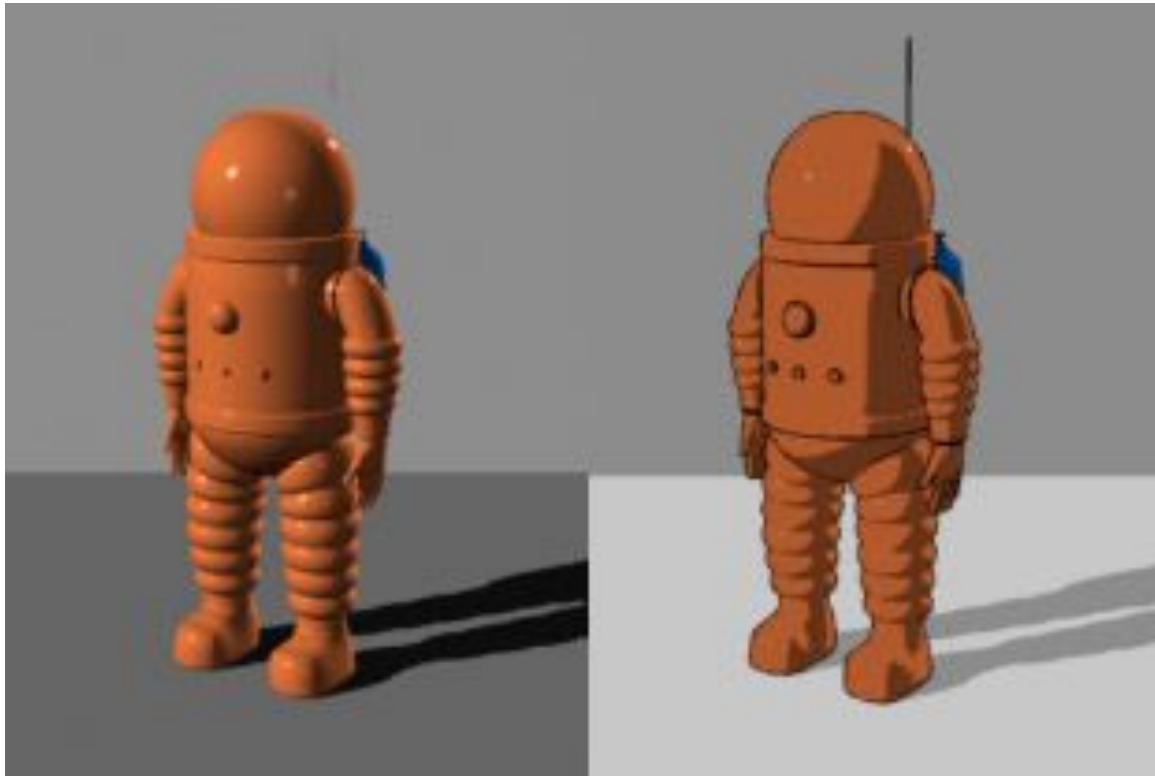# Real-Time REndering TOols: Shaders ANd WebGl

surface normals
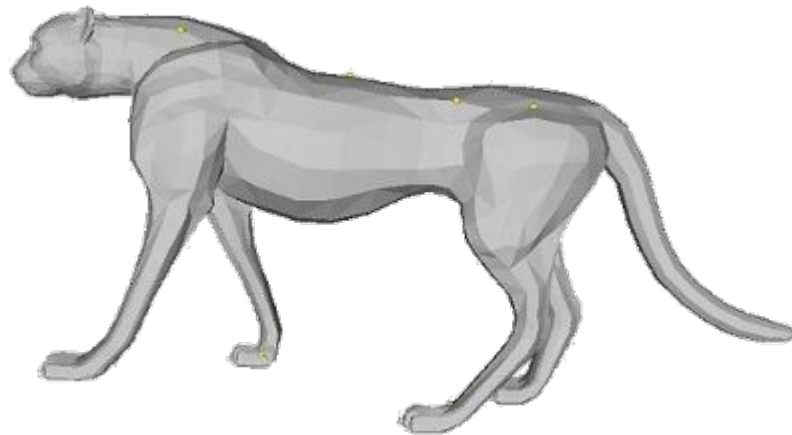
Rendering: Global Illumination

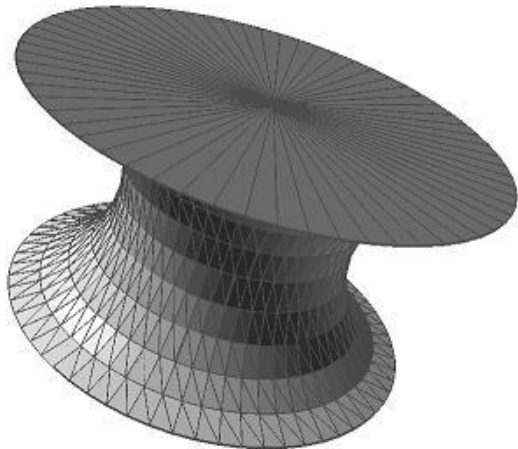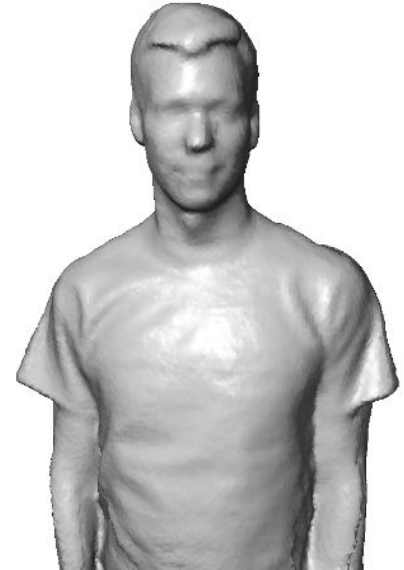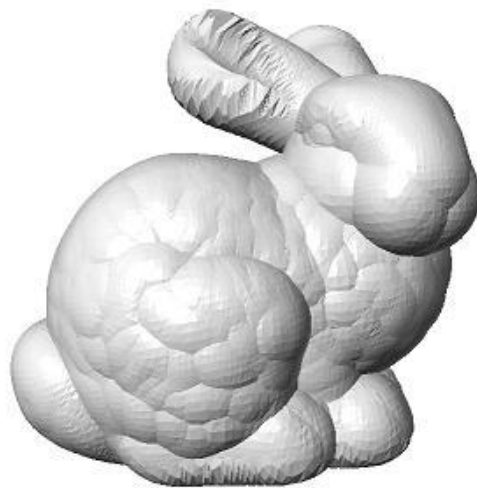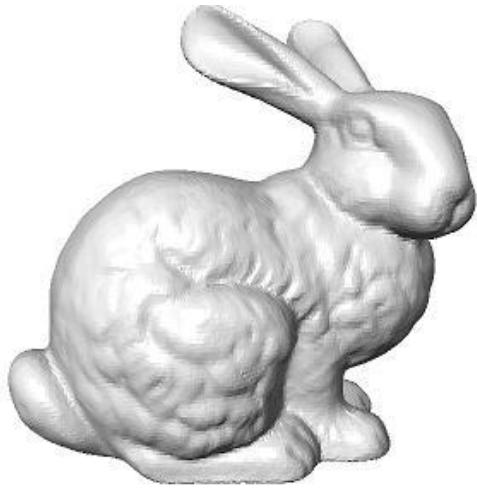**Radiosity**: http://dudka.cz/rrv/files/screenshot/room4-step079-snapshot000.png

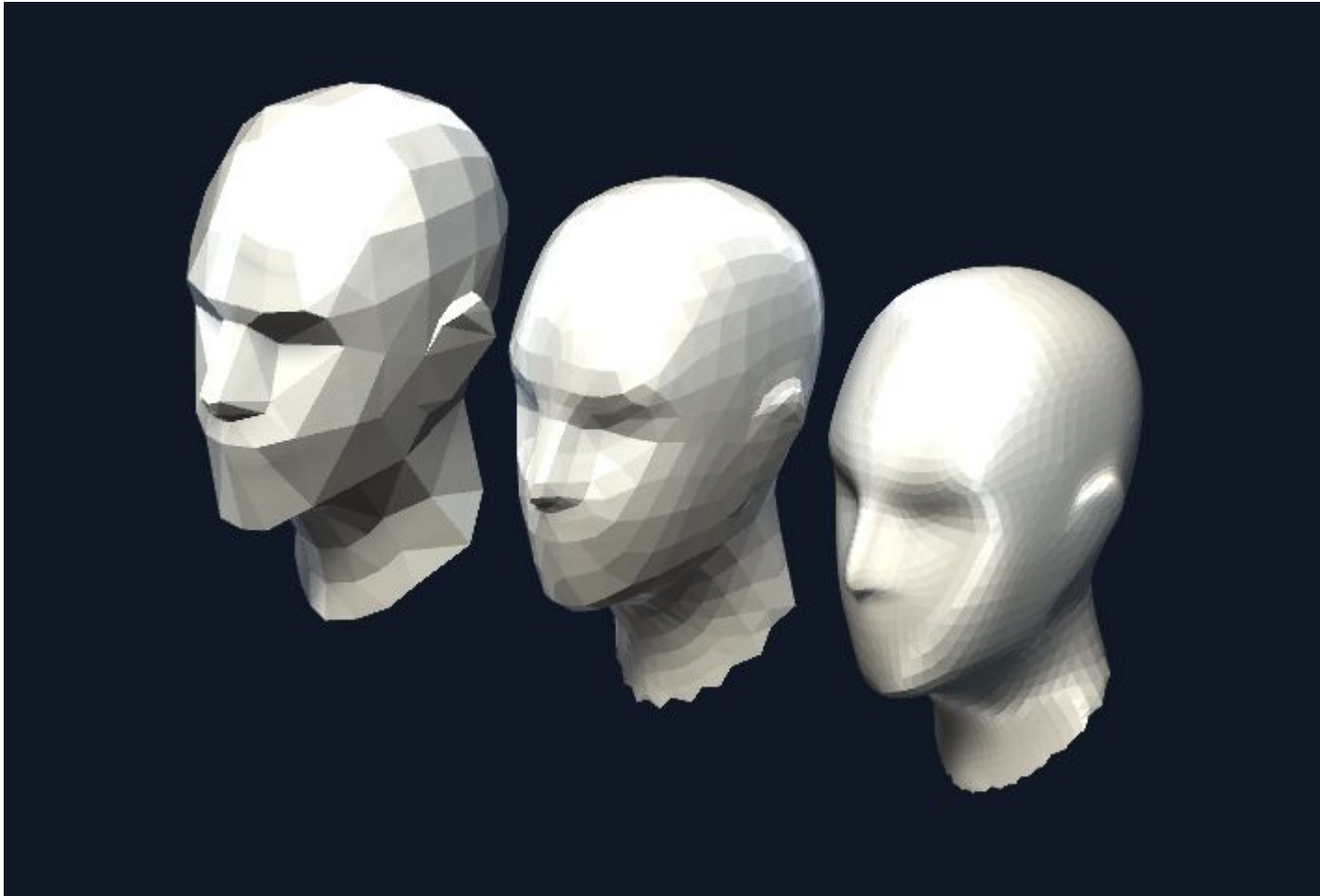# ARtistic Effects

Cel Shading (aka "Toon Shading")

3D Shape Representations

Polygon Meshes

3D Shape Representations

Subdivision Surfaces

https://raw.githubusercontent.com/mattatz/unity-subdivision-surface/master/Captures/Heads.png

3D Shape REpresentations
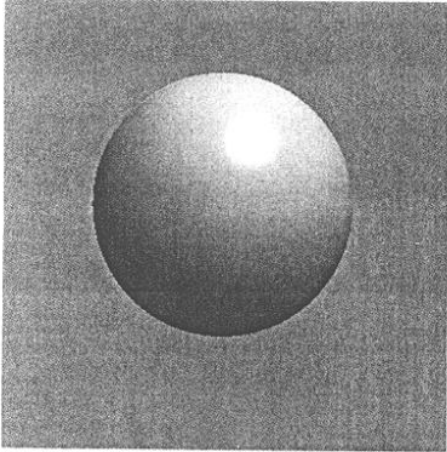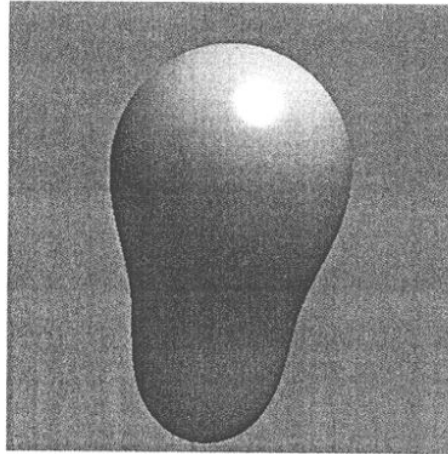
Volumetric Representations

https://renderman.pixar.com/resources/RenderMan_20/appnote.31.html
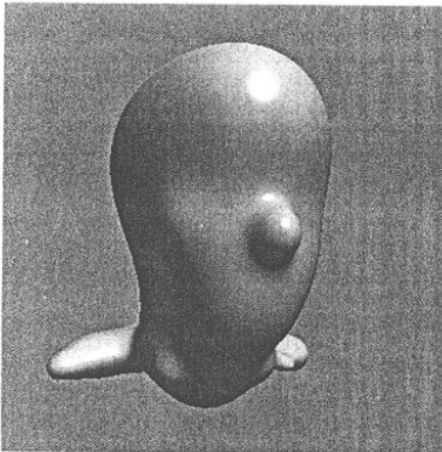
3D Shape REpresentations

Volumetric Representations? Building a head from blobs
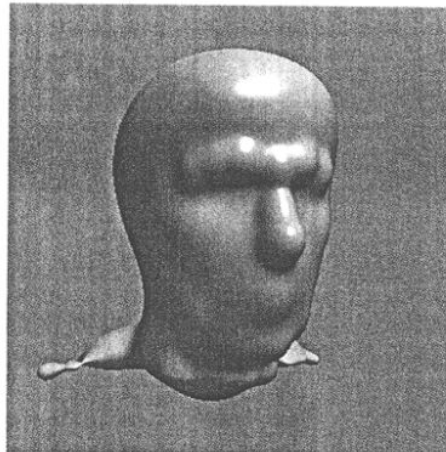

(a) $N = 1$
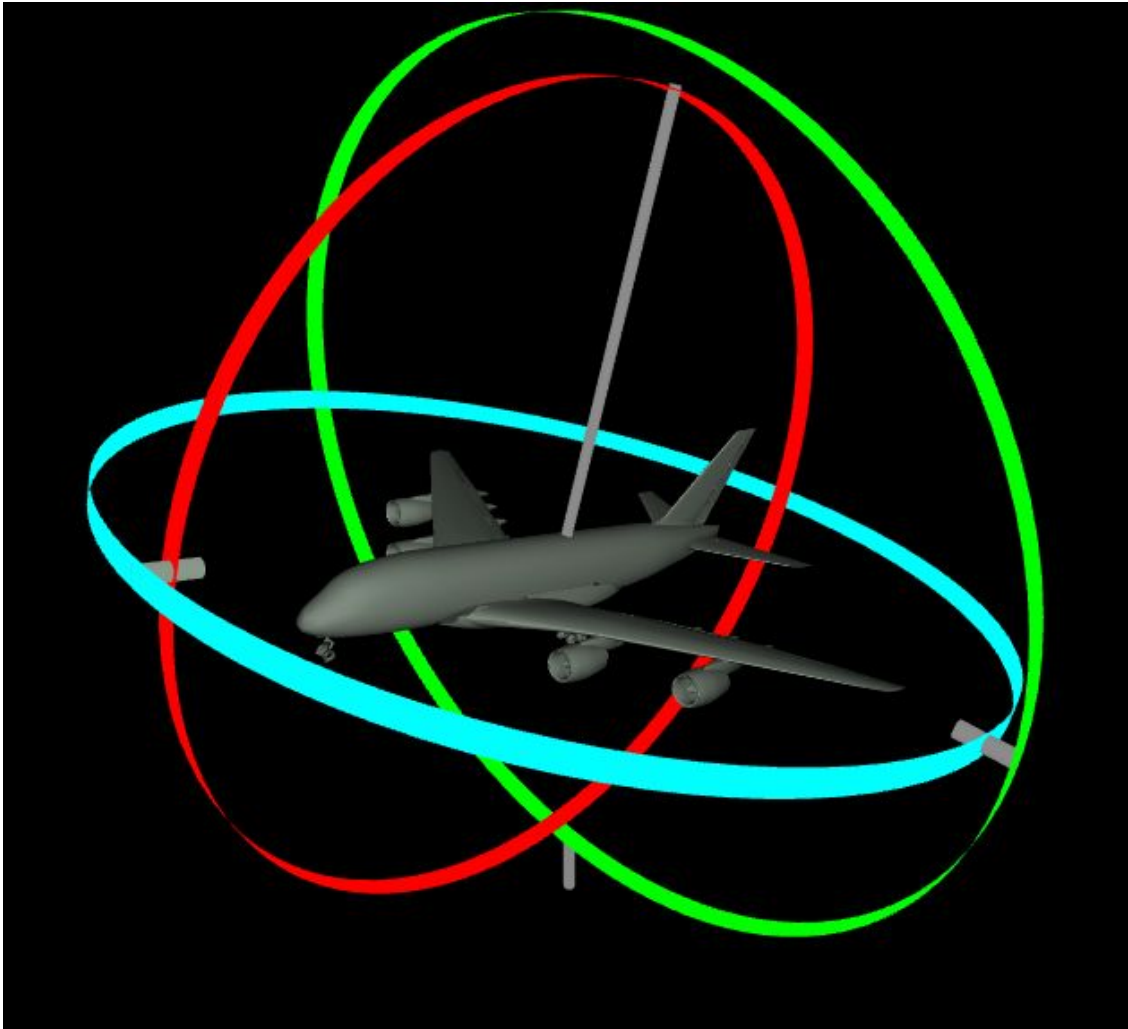
(b) $N = 2$

(c) $N = 20$

(d) $N = 60$

3D Animation

Keyframes

https://animationmethods.wordpress.com/category/3d-animation-2/

3D Animation

Rotation Interpolation

3D Animation

Rigging/Skinning