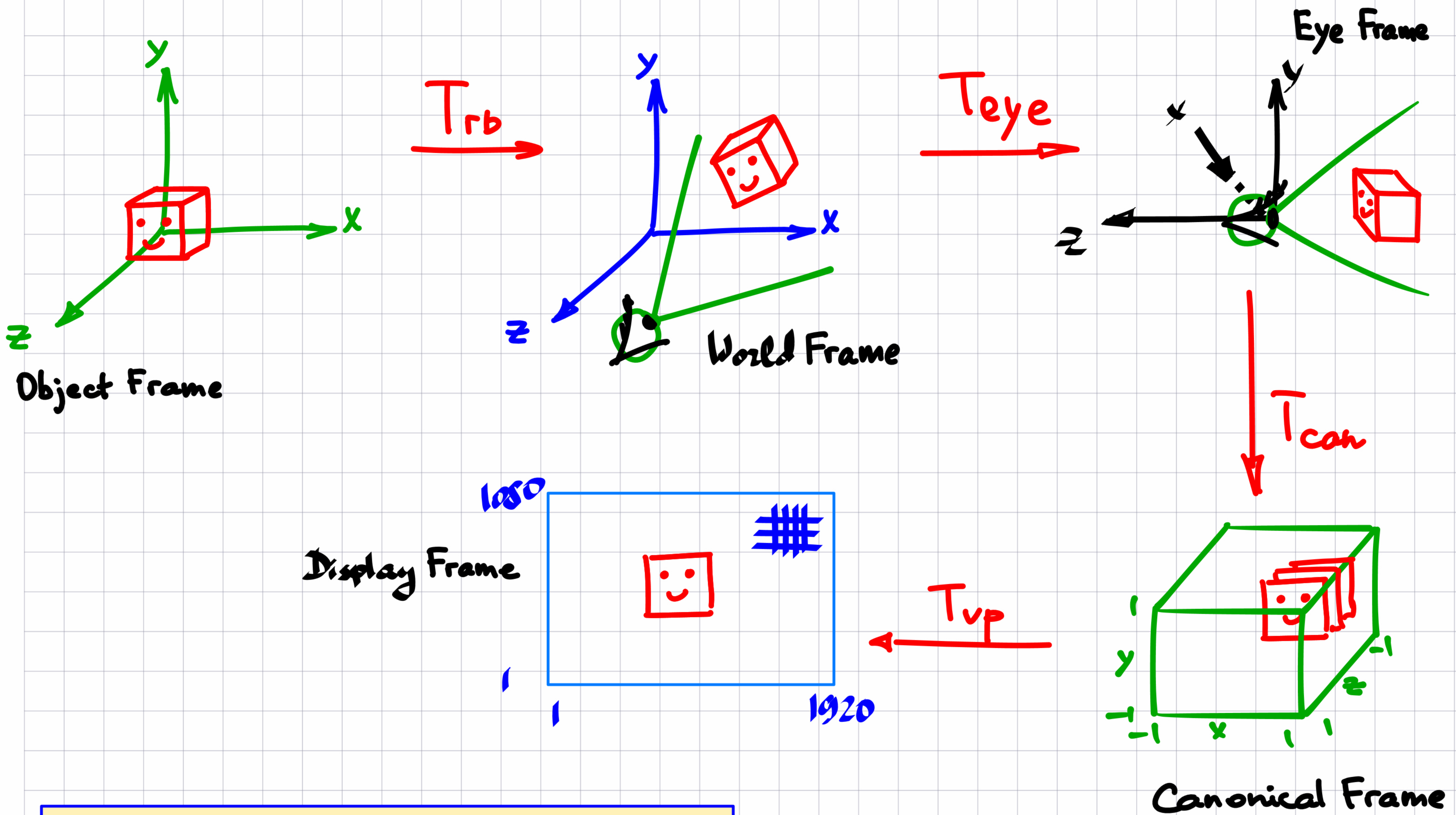


Announcements

- **Dec 16, 7-11pm** in Siebel 4240.
Final project presentations and Open House for press!

Rendering



$$T = T_{vp} \cdot T_{can} \cdot T_{eye} \cdot T_{rb}$$

T_{dist} (points to T_{vp})
 T_L or T_R (points to T_{can})

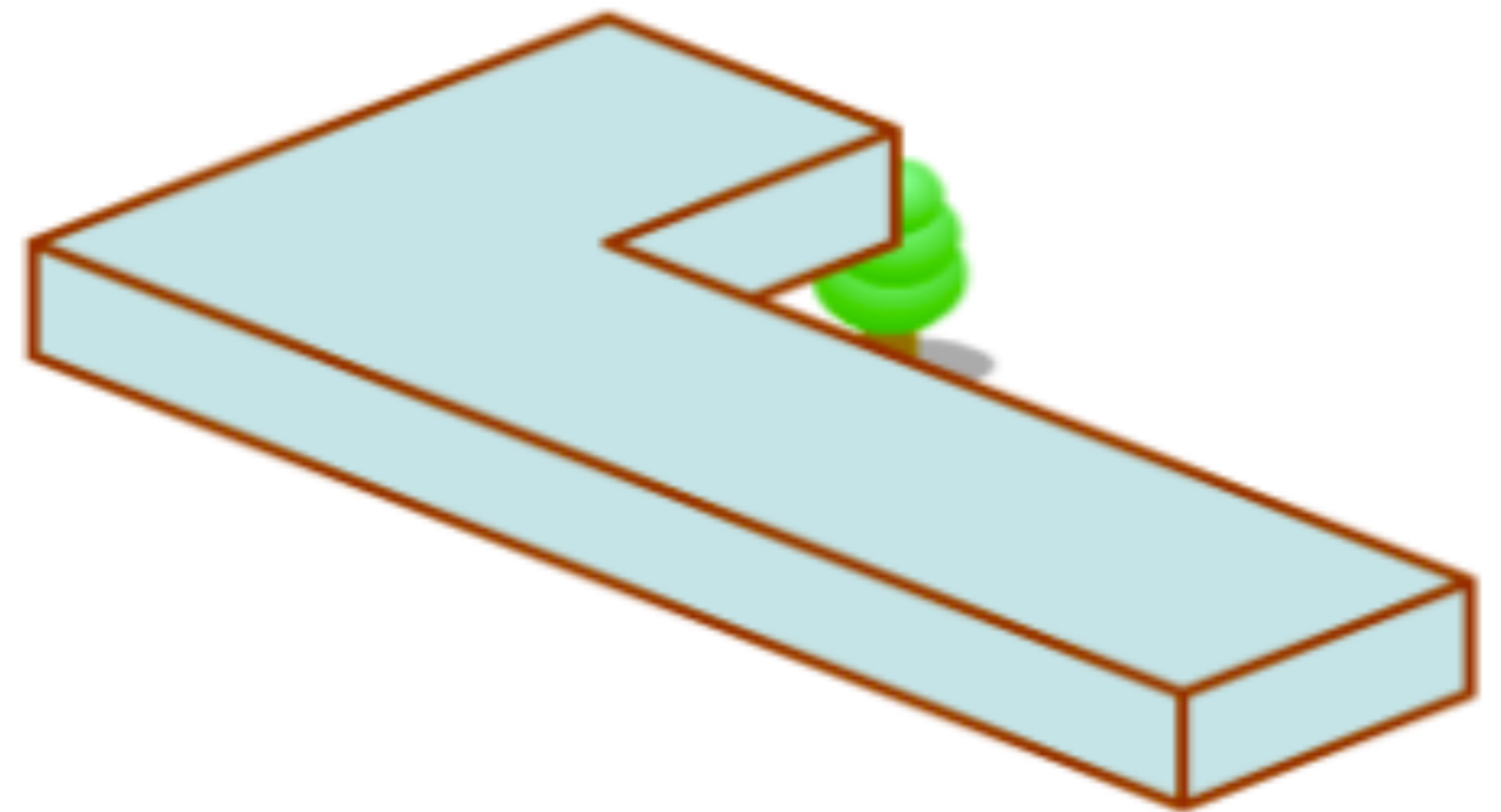
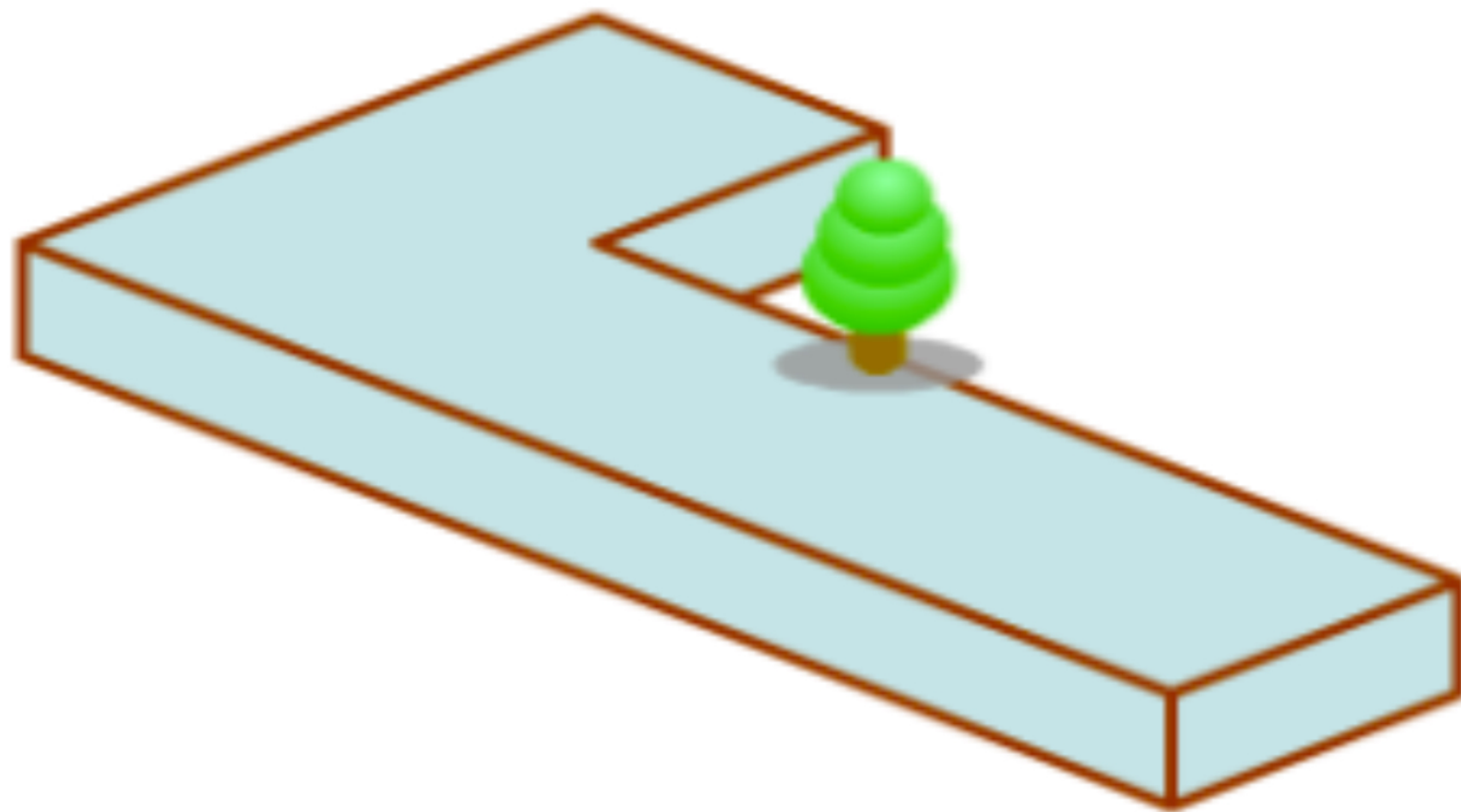
This was _____

Now, read _____

(Visual) Rendering

Next problem:

Start with standard computer graphics techniques.



Two approaches

- Image-order rendering:

- Object-order rendering:

Rendering in VR vs Computer Graphics

$$T = T_{vp} \cdot T_{can} \cdot T_{eye} \cdot T_{RB}$$

T_{dist} (green arrow pointing to T_{vp})
T_{L or R} (green arrow pointing to T_{can})

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Visual vs audio
rendering

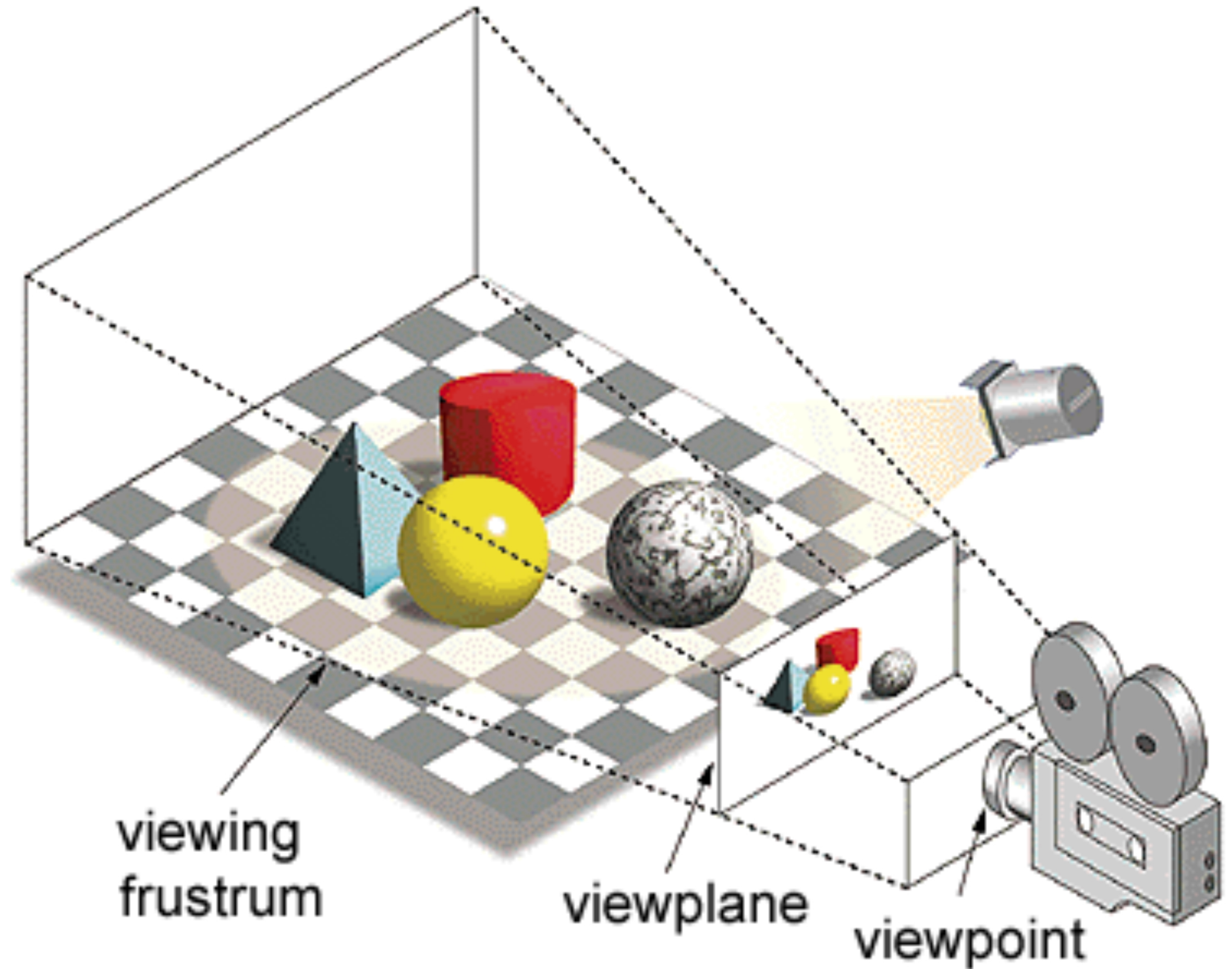


Image-Order Rendering

Ray tracing stages:

1. Ray generation

2. Ray intersection

3. Shading

Image-Order Rendering: Shading

Ray tracing stages:

1. Ray generation
2. Ray intersection
3. Shading: Simplest:
Lambertian model

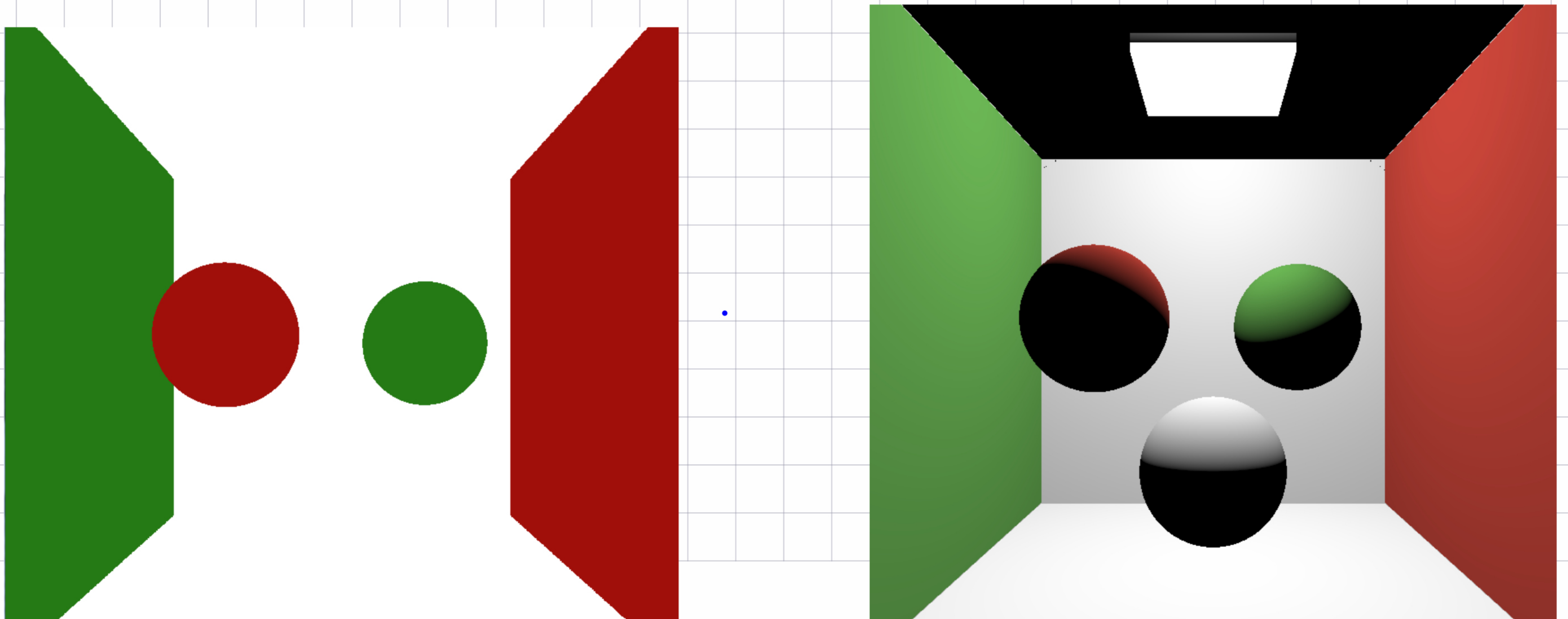


Image-Order Rendering: Shading

Handling highlights/shininess



Image-Order Rendering: Shading

Handling highlights/shininess:
specular component.

$$L = k_d \cdot I \cdot \max(0, n \cdot l) + \text{diffuse}$$

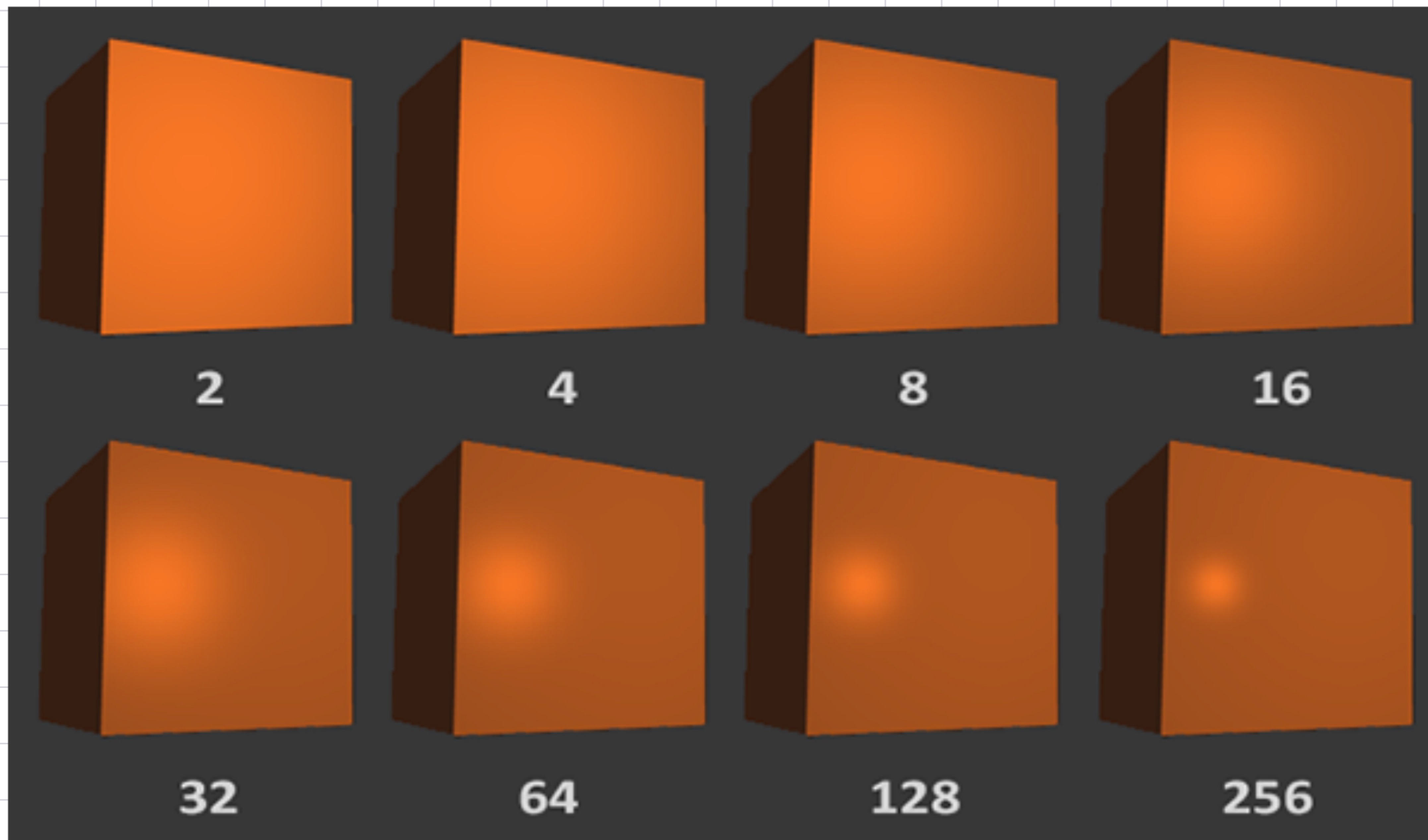


Image-Order Rendering: Shading

Problem: What happens to the sides of objects turned away from the light source?

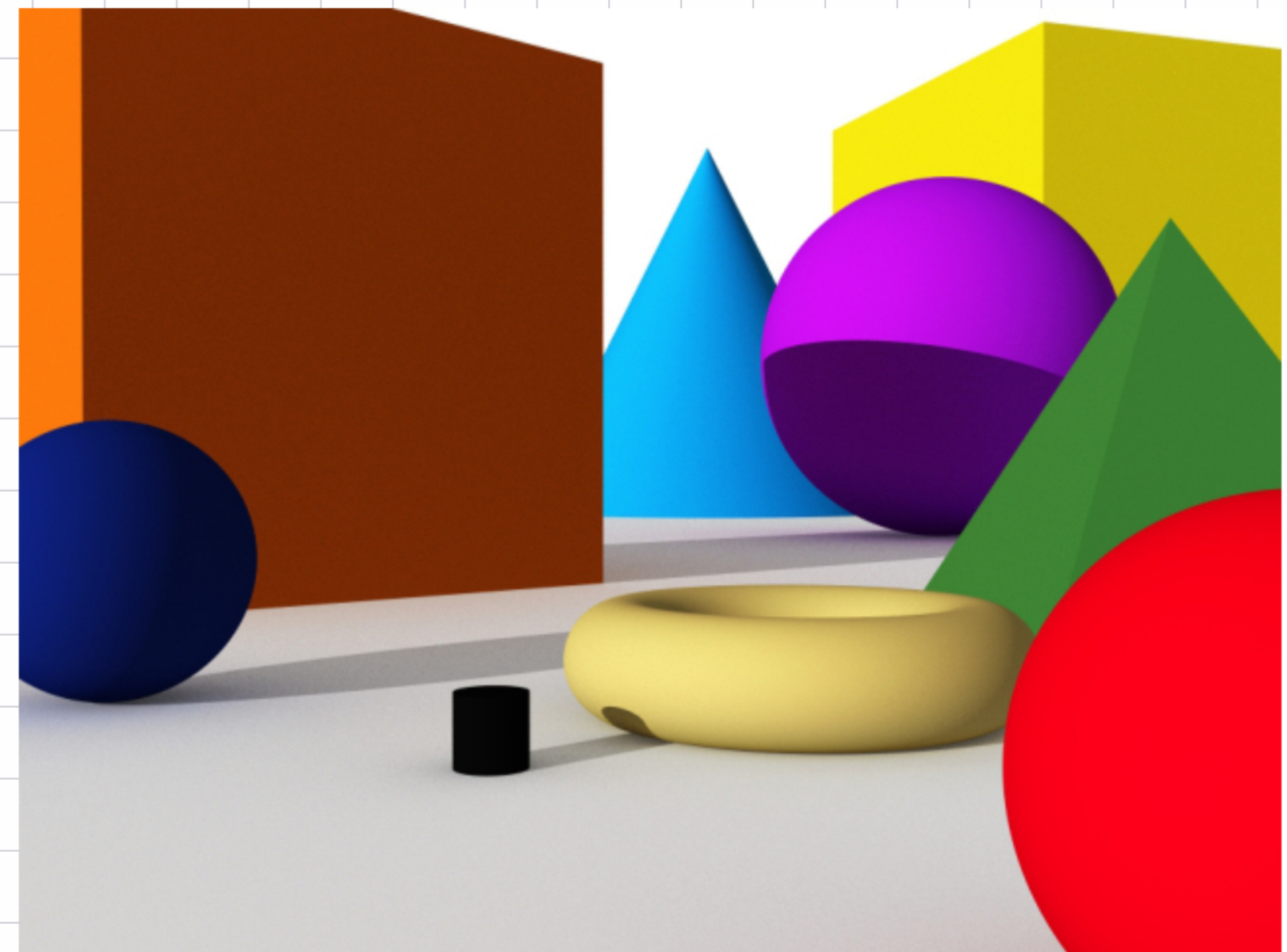
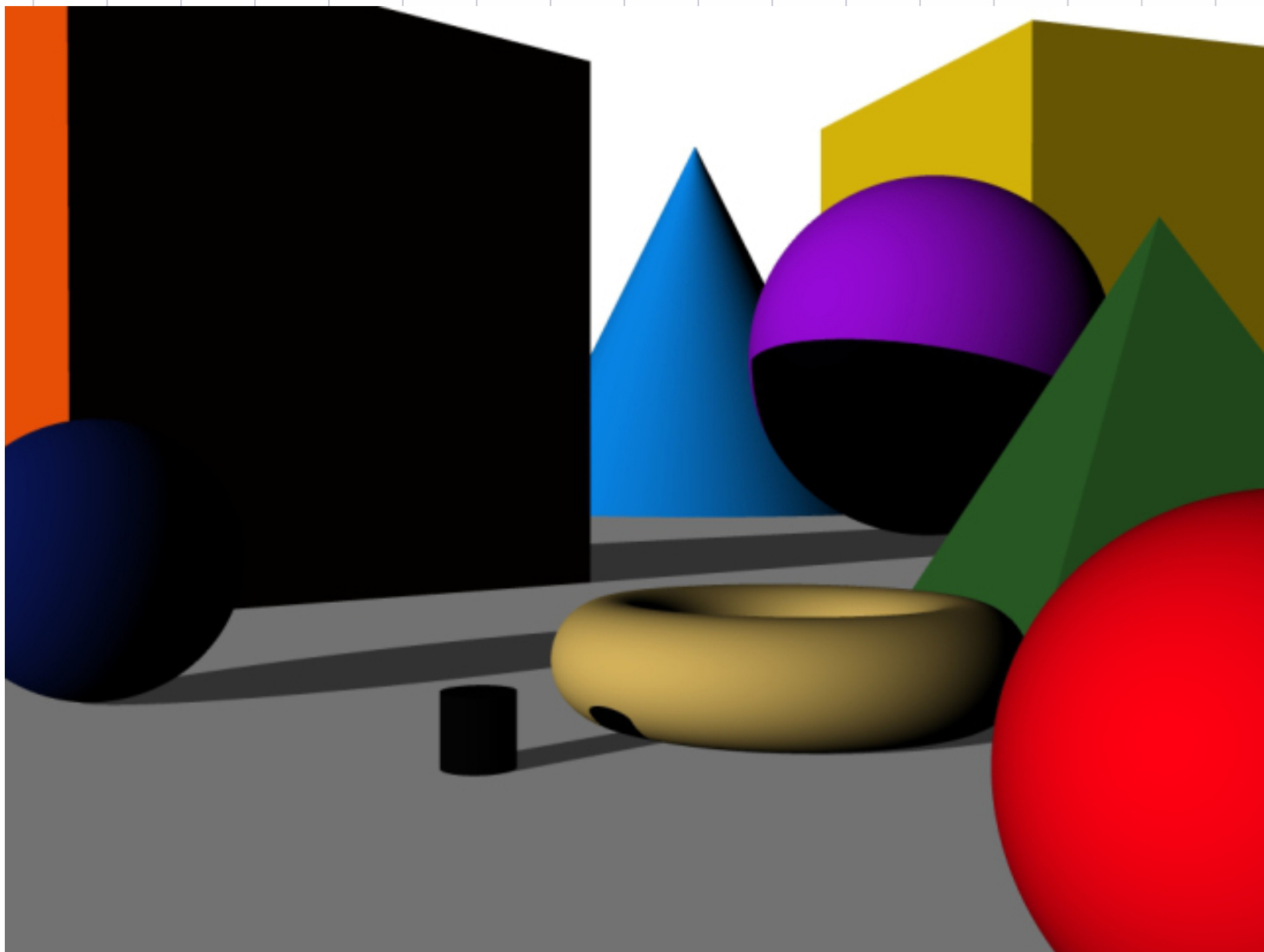


Image-Order Rendering: Shading

Alternative approach: global illumination

- Handling multiple reflections
- Very expensive



<http://graphics.stanford.edu/~henrik/images/global.html>

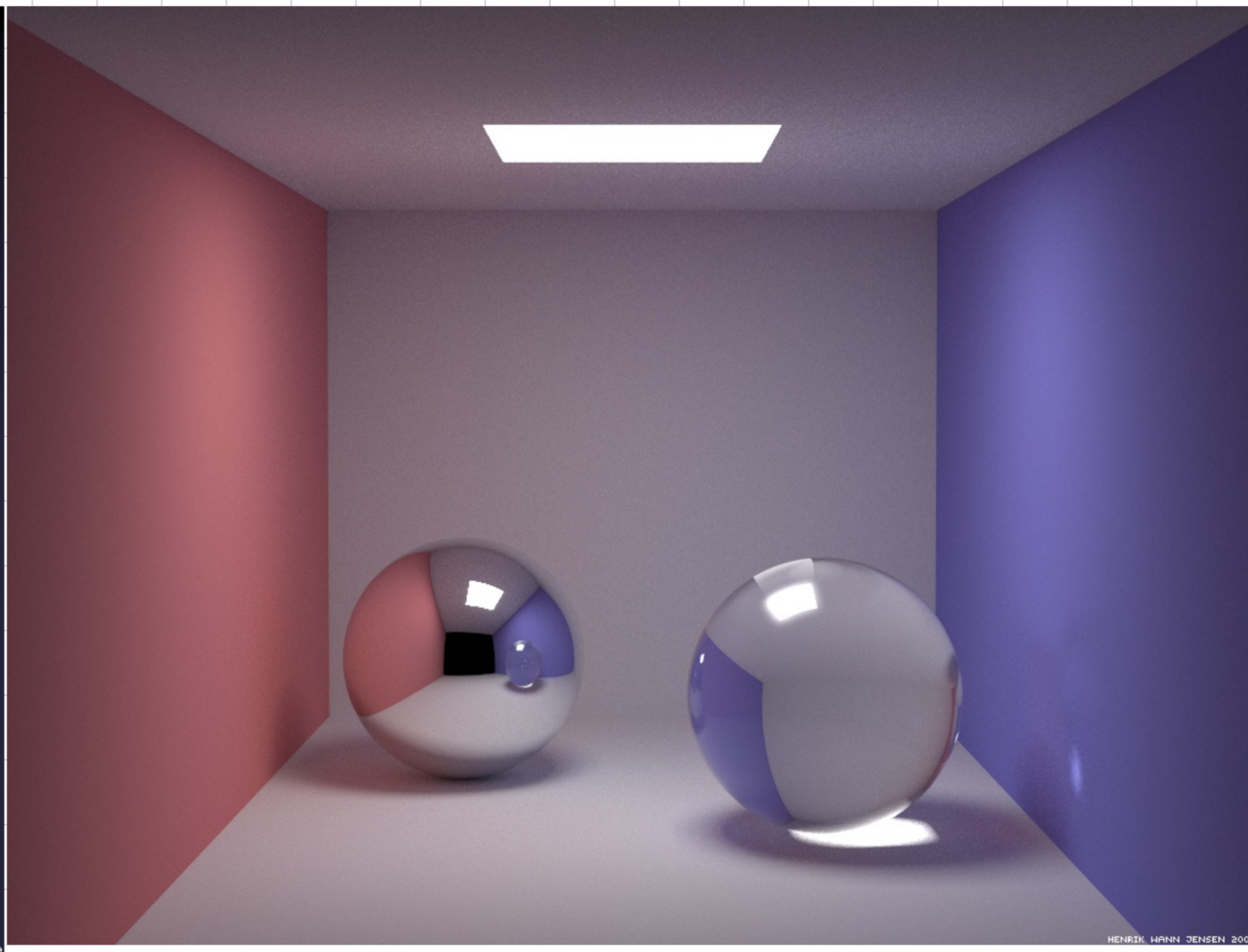
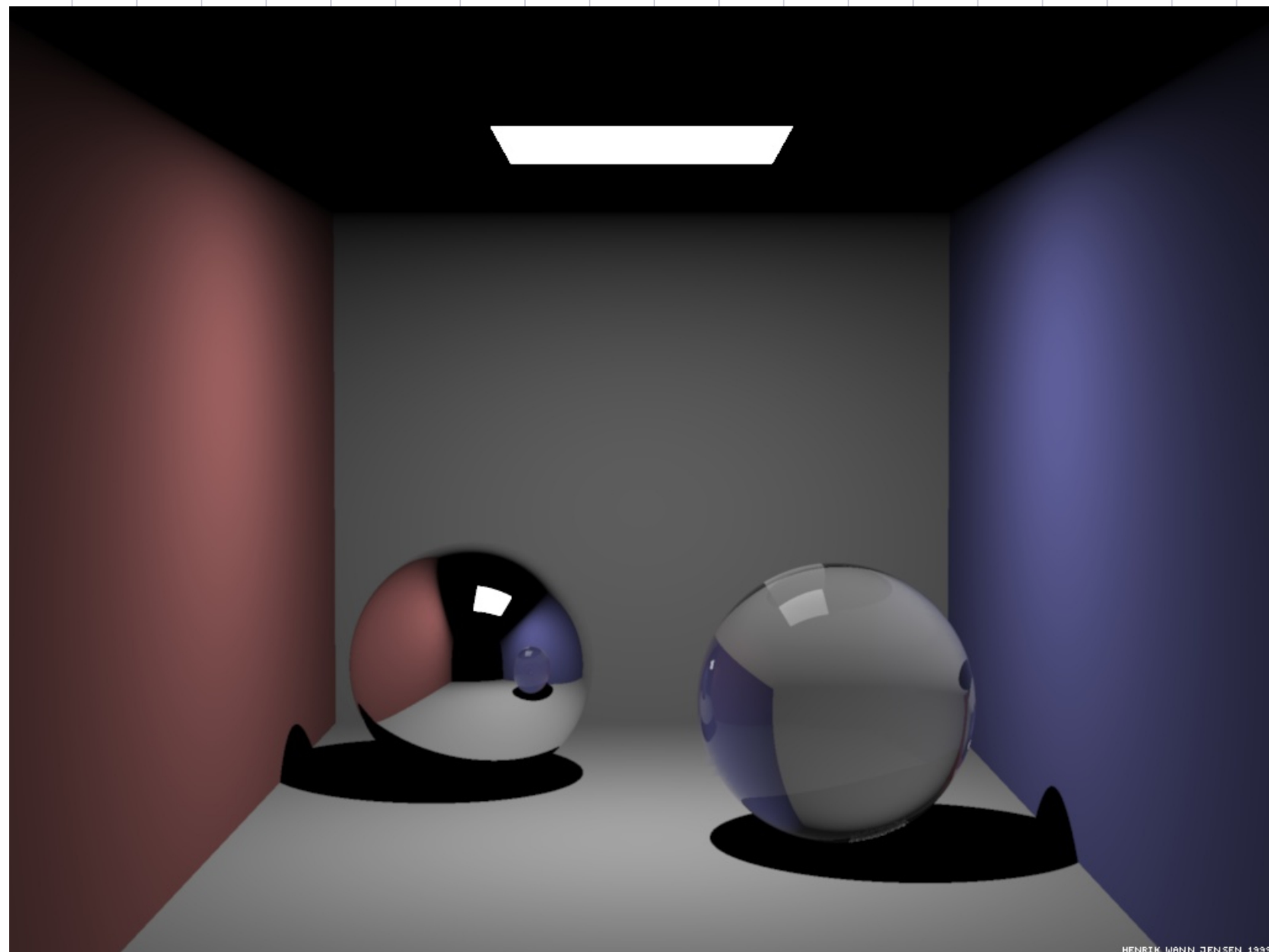
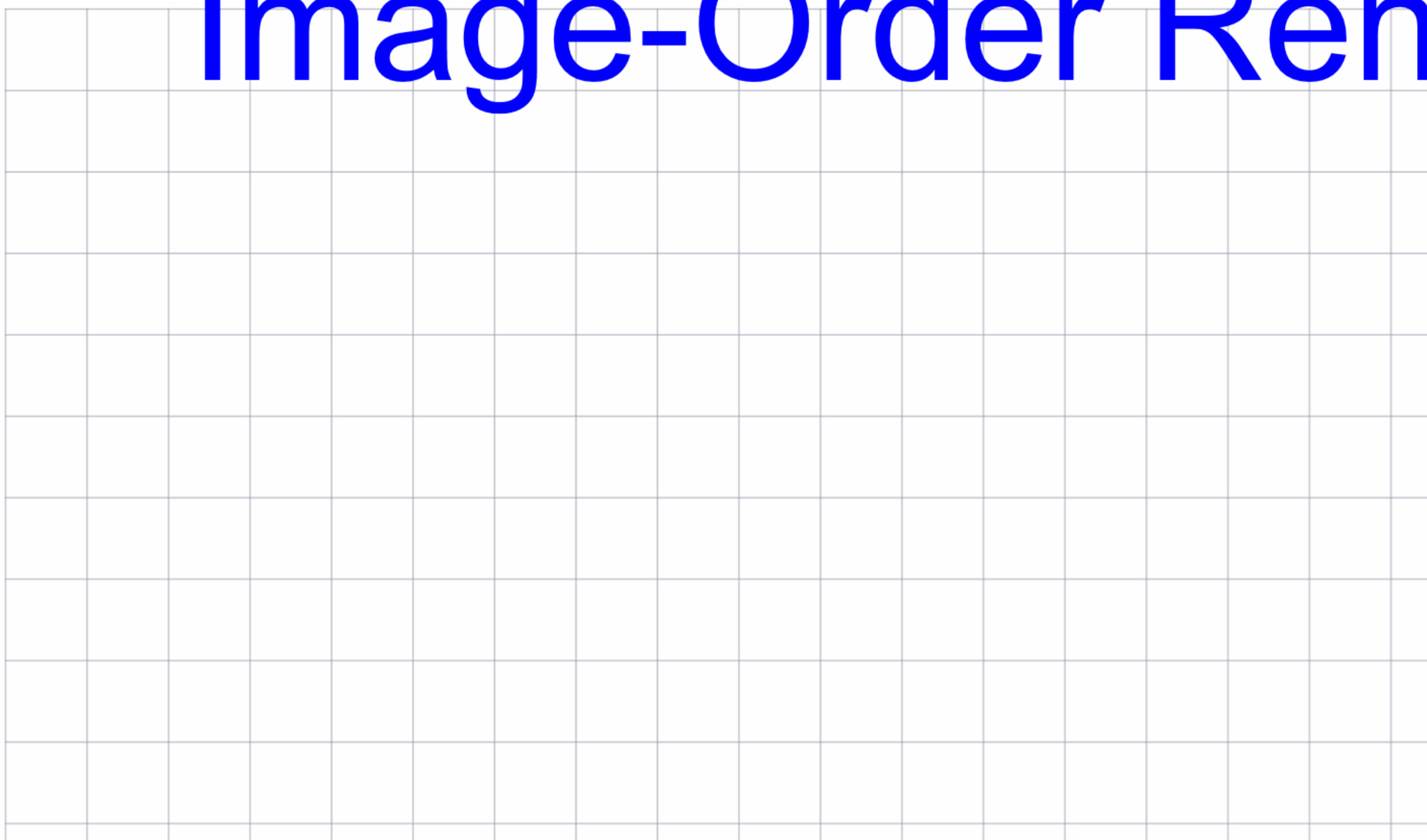


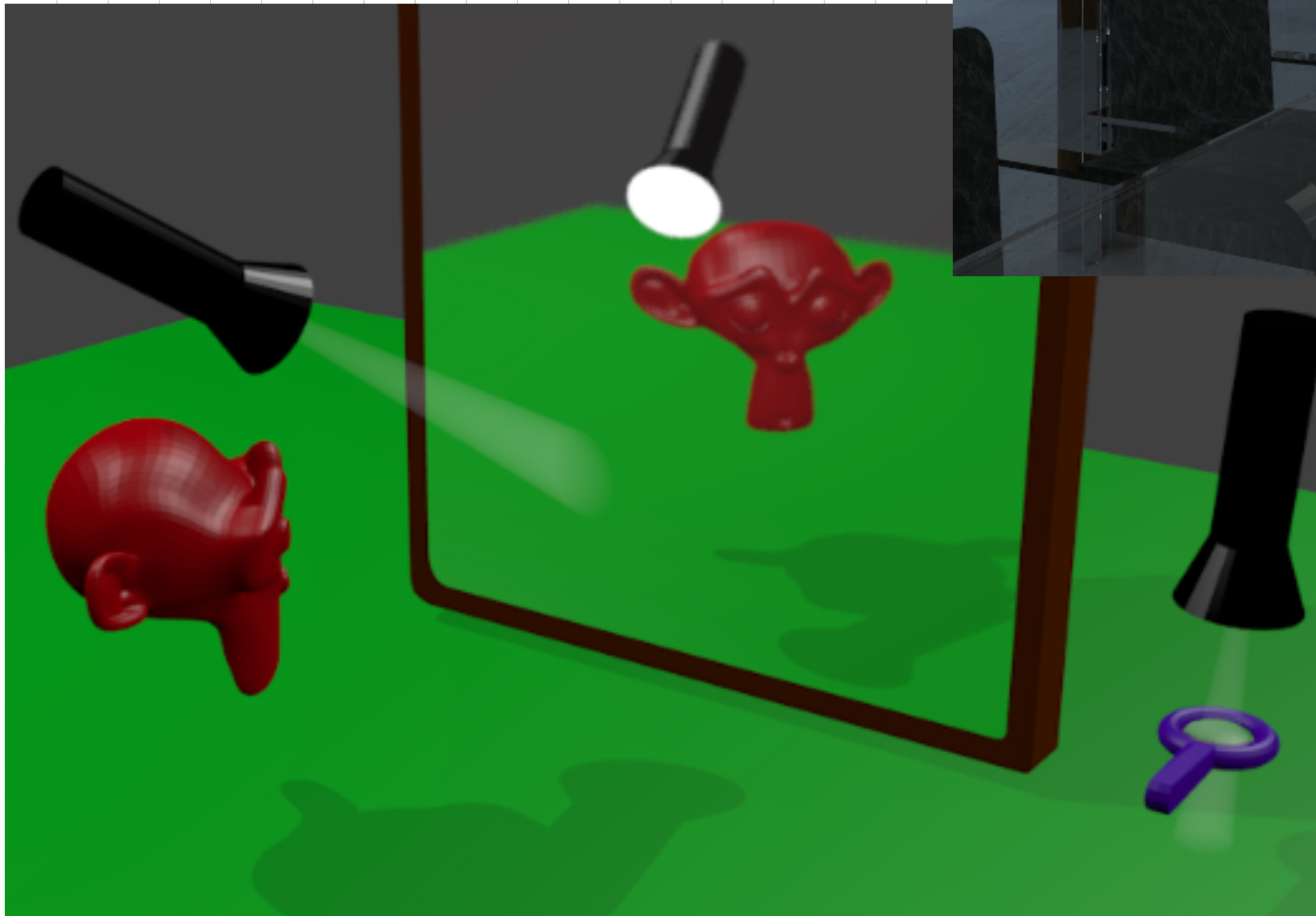
Image-Order Rendering: Shading

BRDF: Bidirectional Reflectance Distribution Function

Image-Order Rendering: Shading in VR



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Object-Order Rendering

