Rendering

Introduction to Rendering

CS 415: Game Development

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Rendering

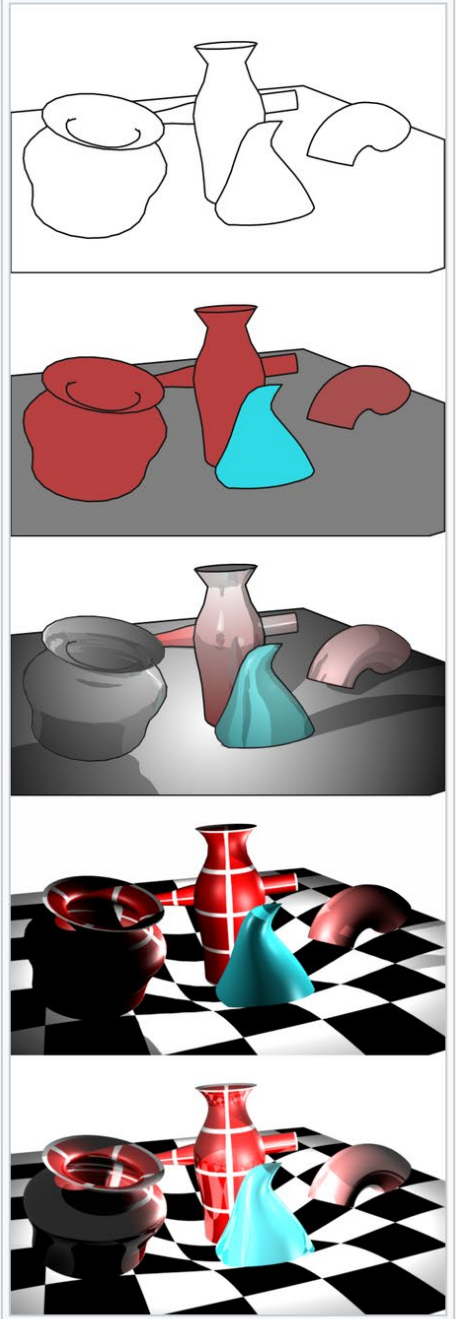
Rendering or **image synthesis** is the automatic process of generating a photorealistic or non-photorealistic image from a 2D or 3D model (or models in what collectively could be called a scene file) by means of computer programs.

Wikipedia

What is the same about each image at the right?

What is different?

What technology enables this change in modern real-time graphics?



A variety of rendering techniques applied to a single 3D scene

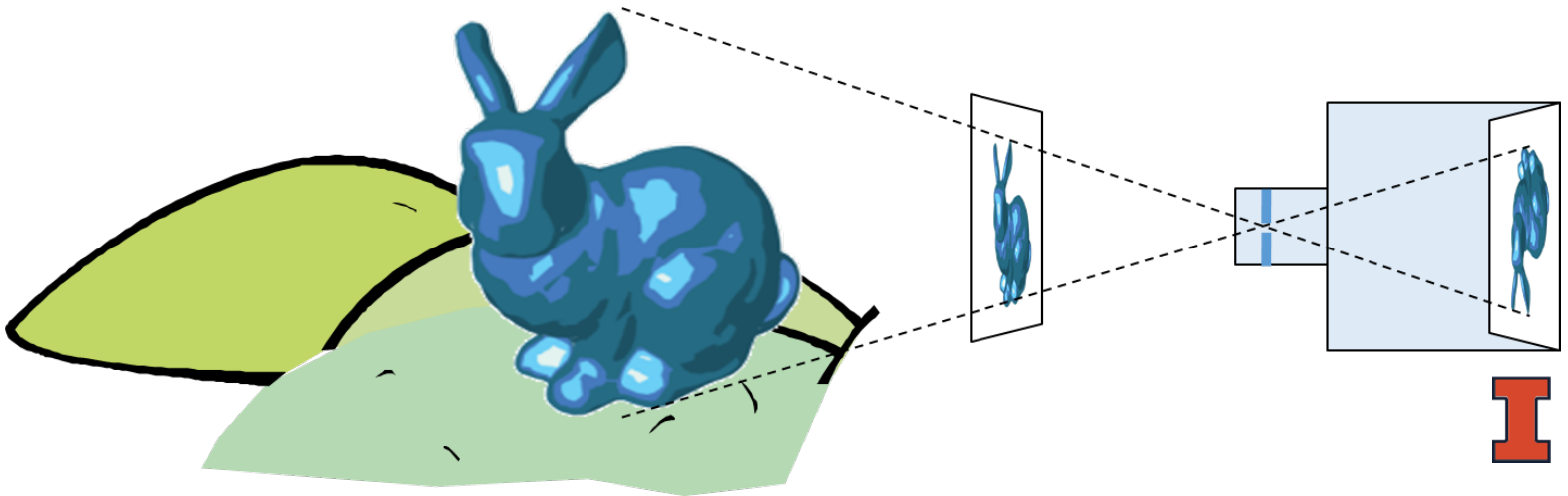
3D Graphics: Image Formation

Goal in CG (usually)is to generate a 2D image of a 3D scene…

The input data is a scene description
Output is an image

To achieve this we computationally mimic a camera or human eye

In the scene…there are objects…lights…and a viewer



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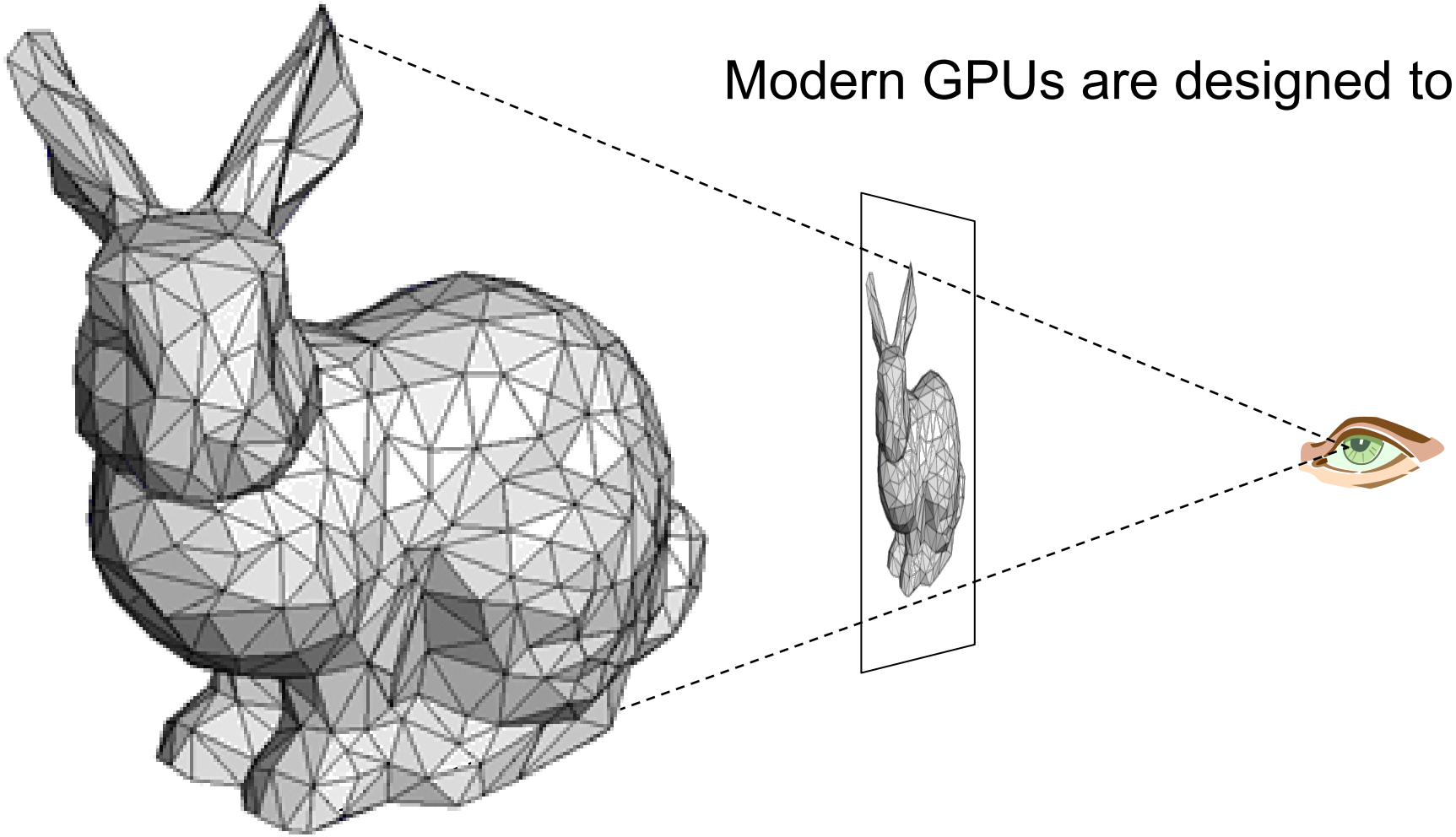
Polygonal Models

Surfaces are most often modeled using triangles

Modern GPUs are designed to render triangles



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By Gilles Tran - http://www.oyonale.com/modeles.php?lan

Rendering generally uses one of two approaches

- Rasterization
- Ray tracing
- Sometimes both….

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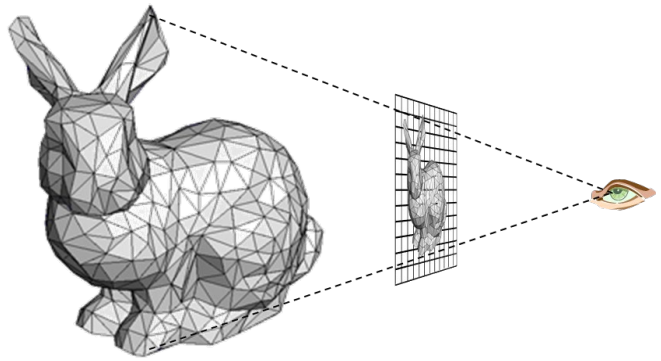
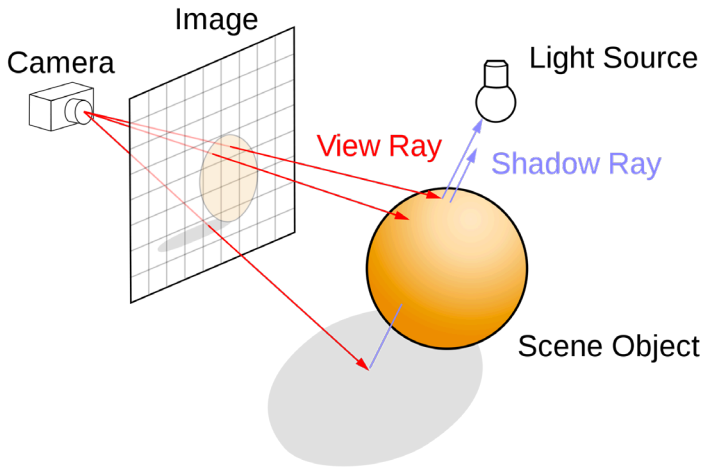
Rasterization versus Ray Tracing

To oversimplify….
In rasterization, geometric primitives are projected onto an image plane and the rasterizer figures out which pixels get filled.



In ray-tracing, we model the physical transport of light by shooting a sampling ray though each pixel in an image plane and seeing what the ray hits in the scene



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Rasterization versus Ray Tracing

Rasterization loop:

For each object

For each pixel—closer?

Ray tracing loop:

For each pixel

For each object—closest?

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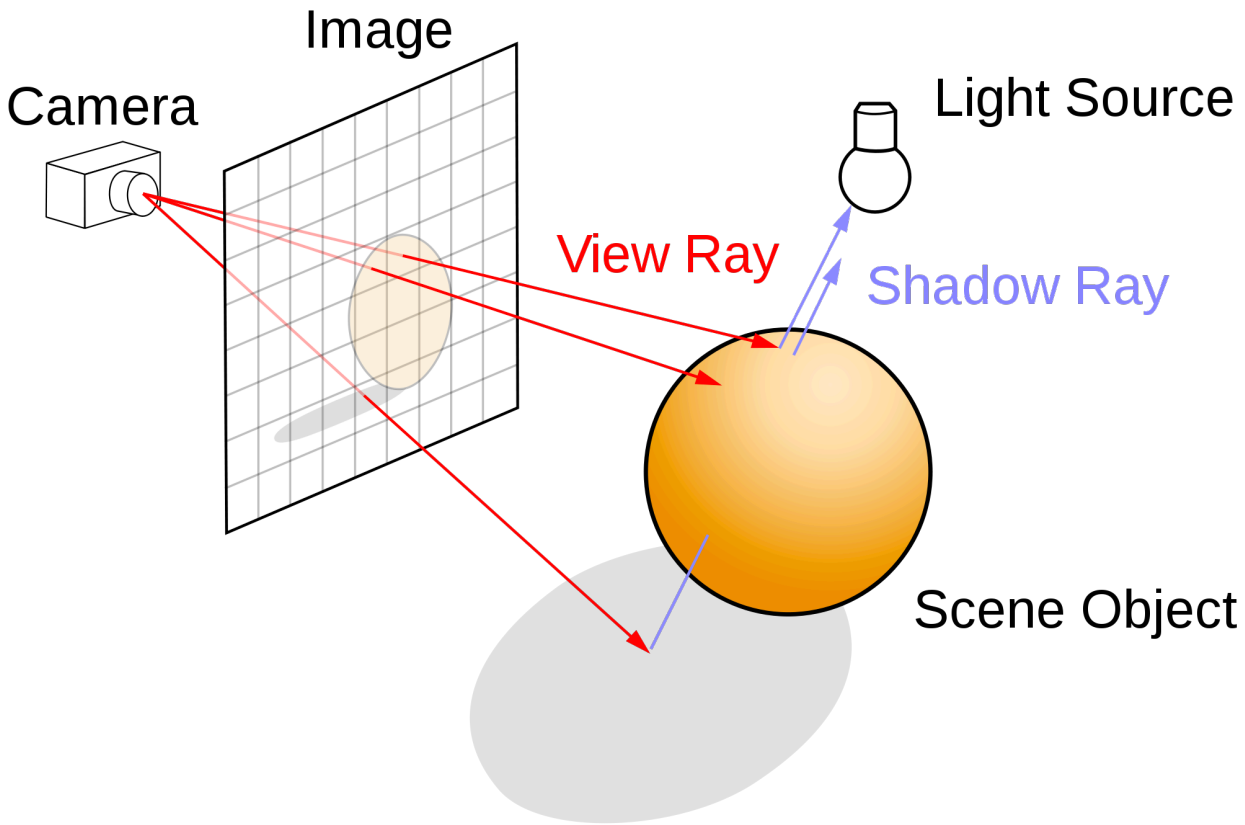
Ray Tracing

Follow ray of light….

Can trace from an eyepoint through a pixel

See what object the ray hits…

How would you check to see if the object is lit or in shadow?



Global versus Local Illumination

For true photo-realism:

We cannot compute color or shade of each object independently
Why?

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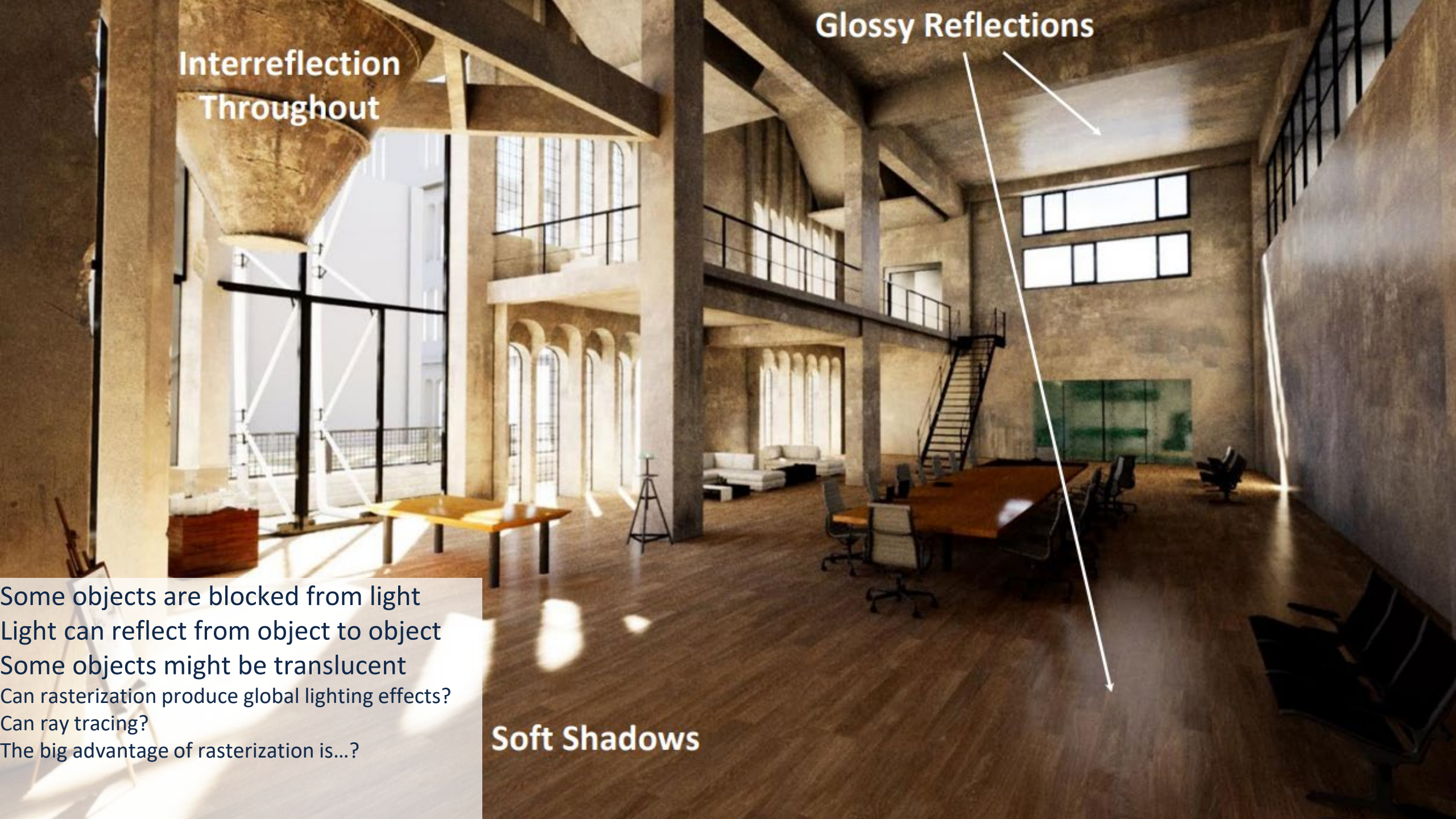

Some objects are blocked from light

Light can reflect from object to object

Some objects might be translucent

Can rasterization produce global lighting effects?

Can ray tracing?

The big advantage of rasterization is…?