3D Arts

Month 2, Lecture 5

PHOTOMETRIC LIGHTING

What You Will Learn Today:

- Photometric vs. Standard Light
- Physics-Based Light Terminology
- Photometric Light Applications
- Daylight system
- Mental Ray Overview
- Indirect Illumination Overview
- Exposure Control Overview

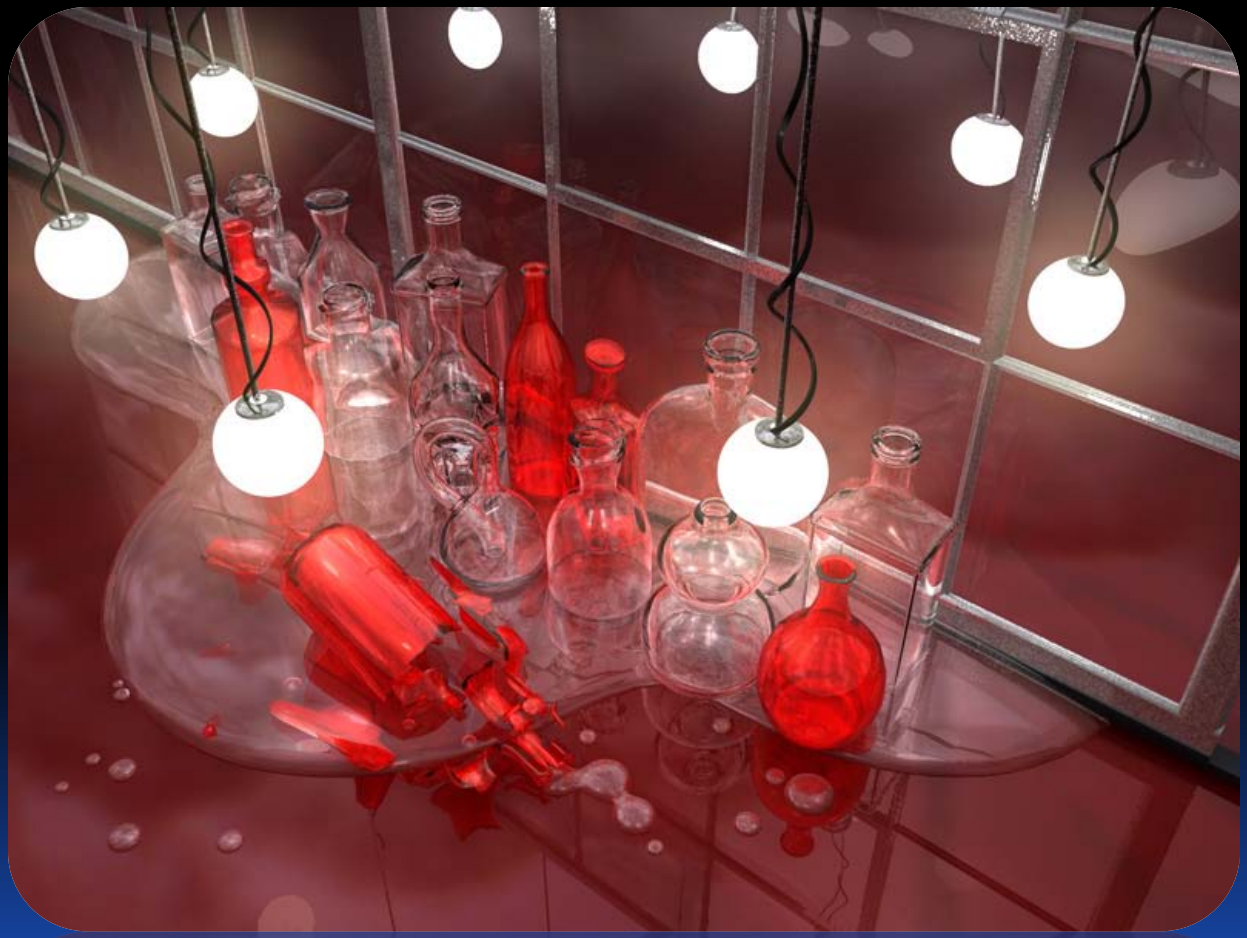
Standard Lights

- Review

Qualities of light: Intensity

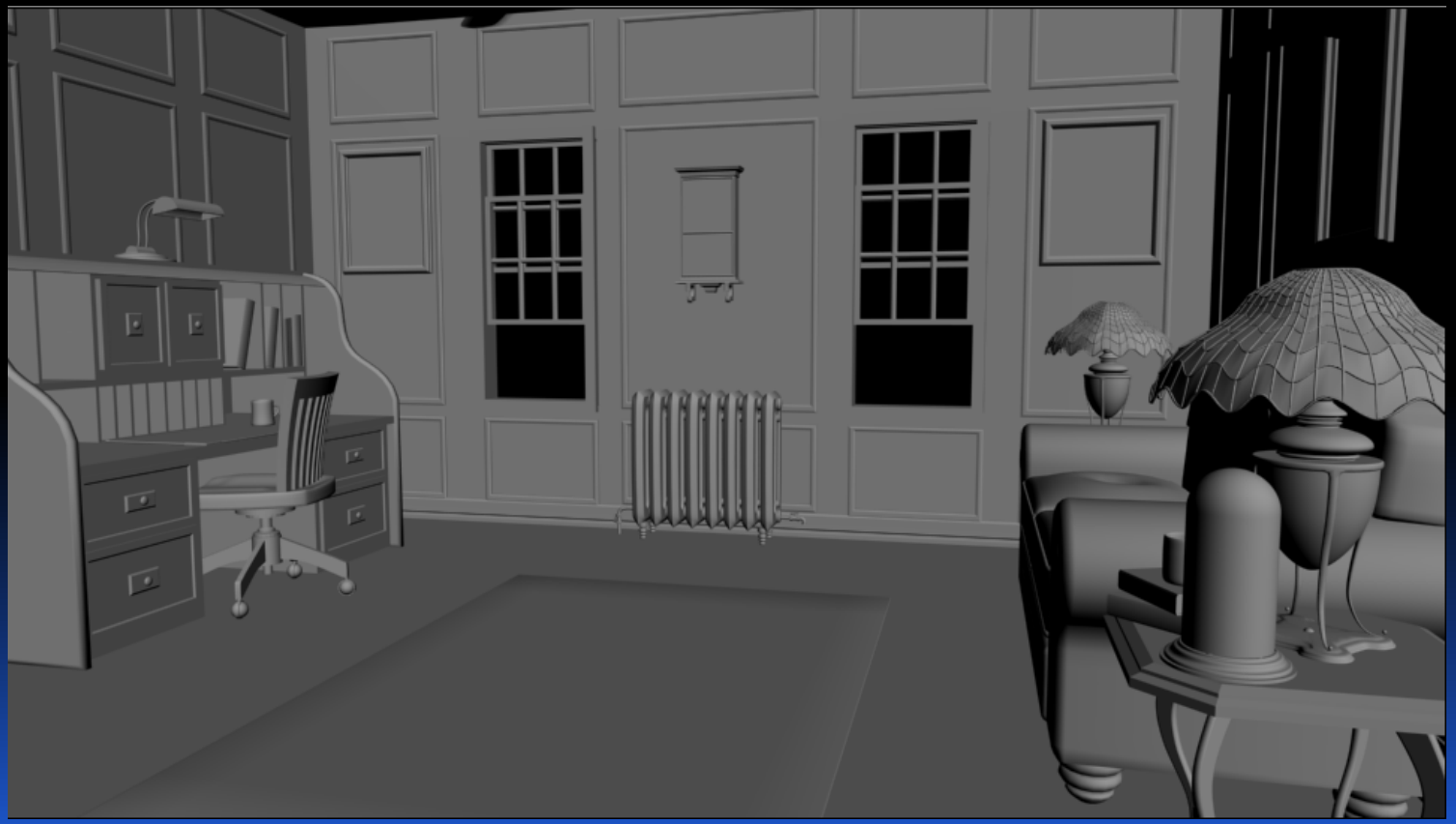
Qualities of light: Throw

Qualities of light: Motivation

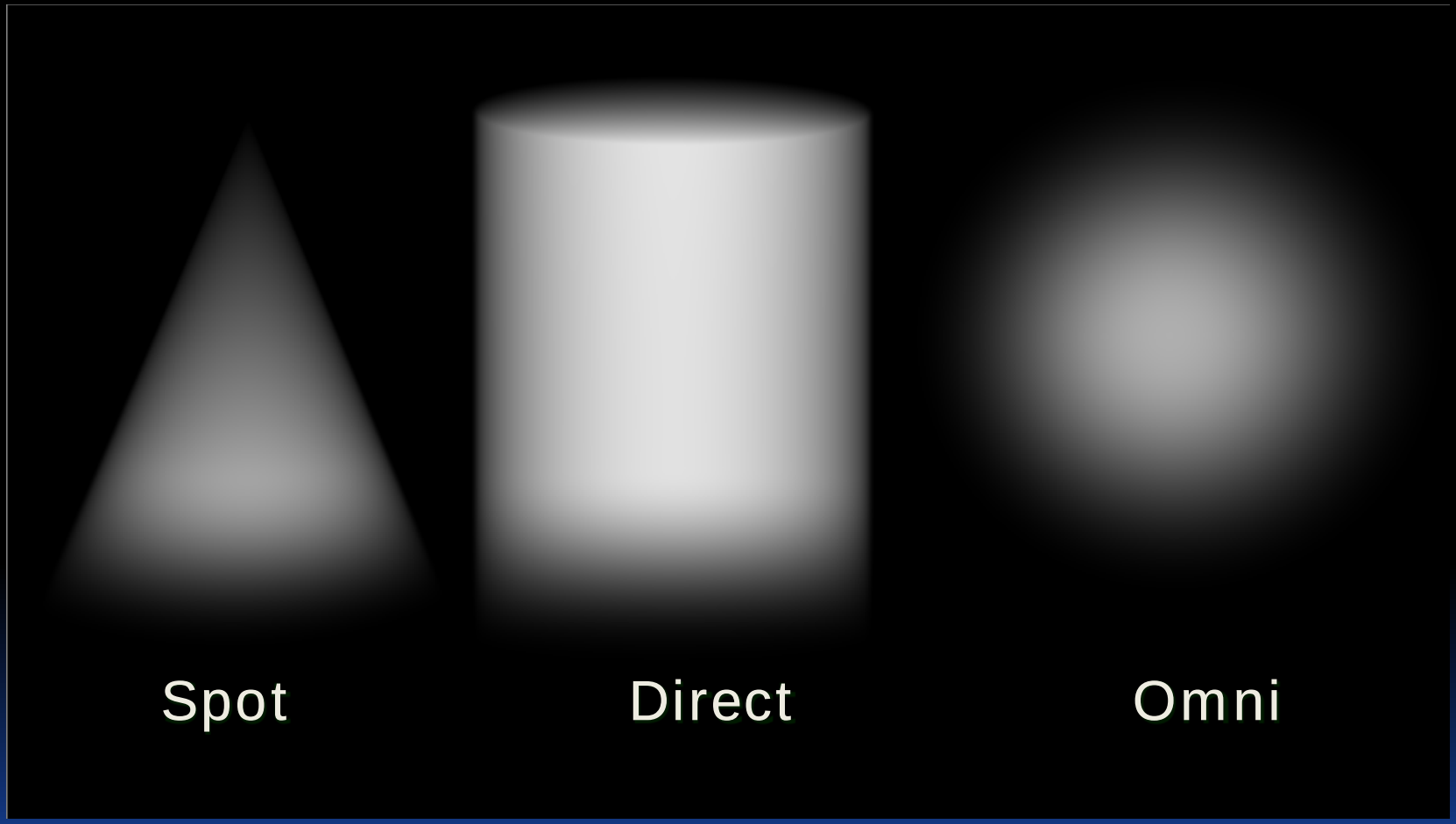


Environment Lighting

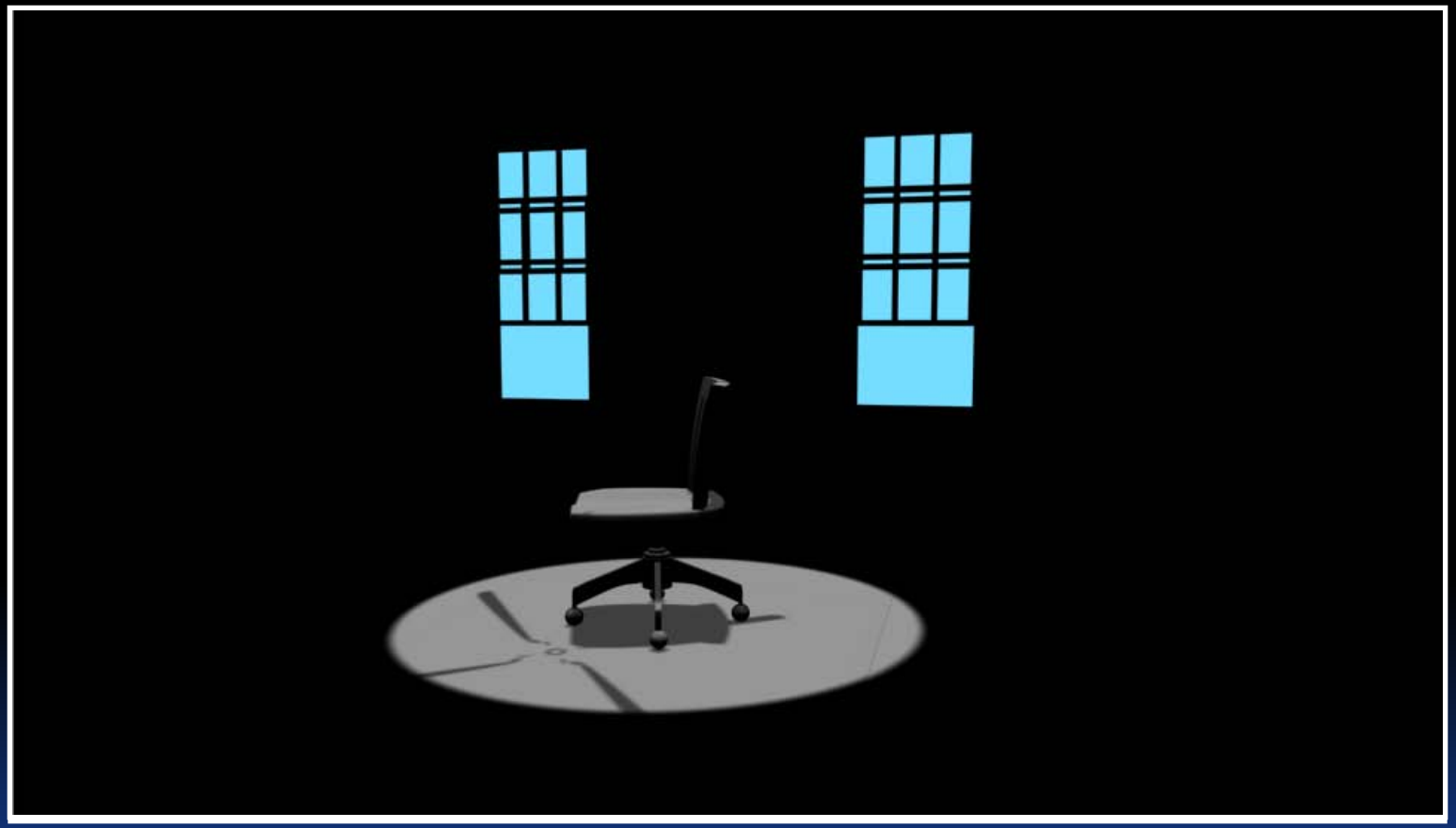
- 1 or 2 default lights



Standard Light Types



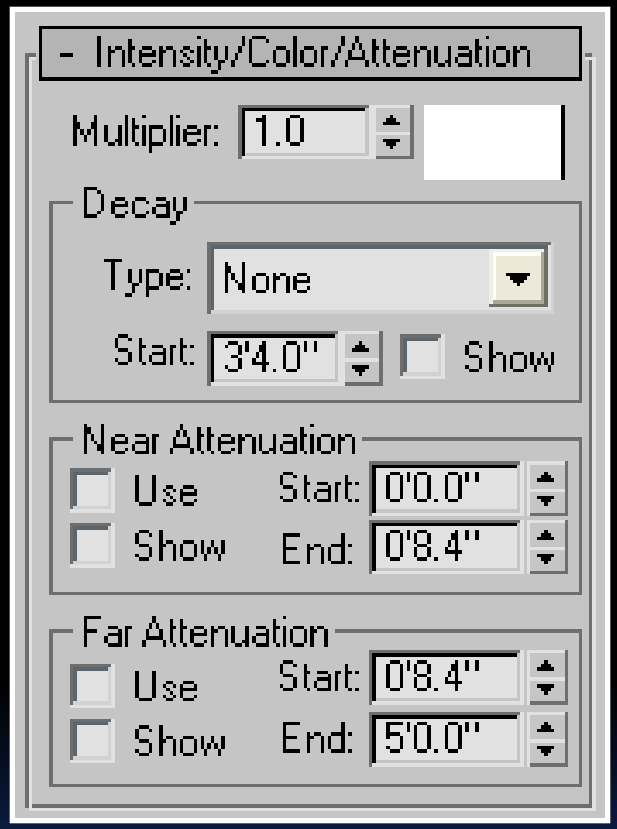
Directional Lights



Omni Lights

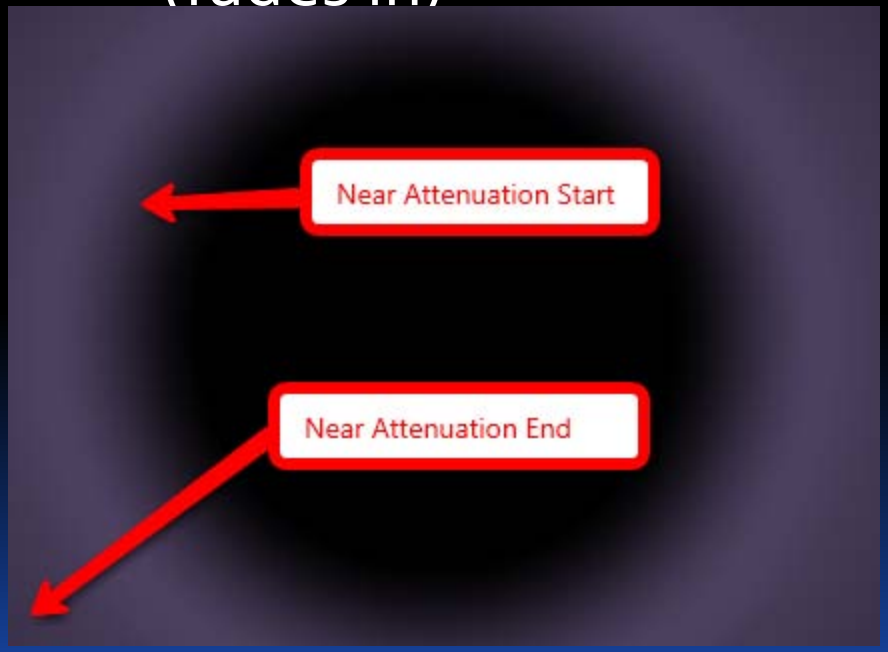
Intensity/Color/Attenuation

- Intensity
  - Multiplier
  - Brightness of light
  - Multiplied against Global Light Level in Environment Dialog
- Color
- Attenuation (Falloff)

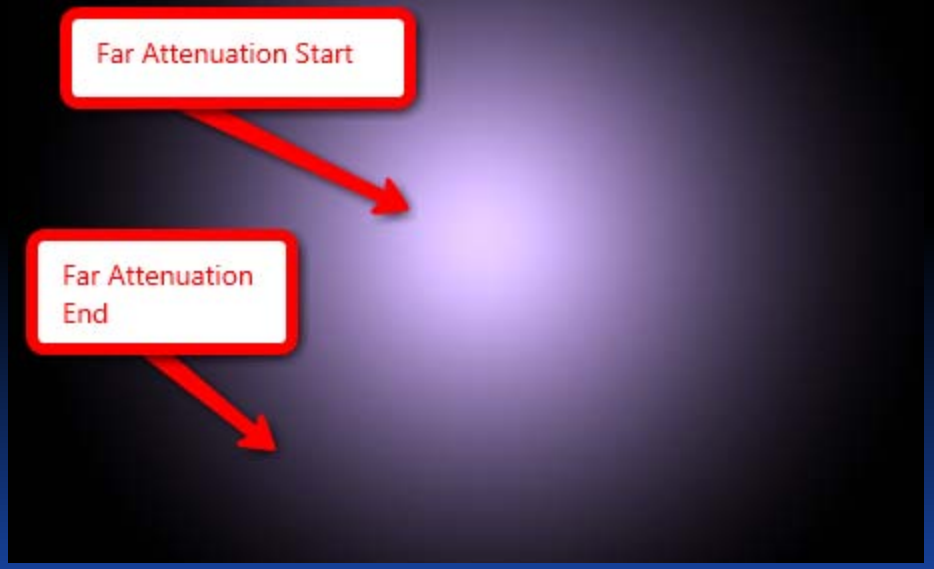


Near / Far Attenuation

- Near
- sets the distance at which the light begins (fades in)



- Far
- sets the distance at which the light drops off to zero (fade out)



Attenuation

Volumetric Light

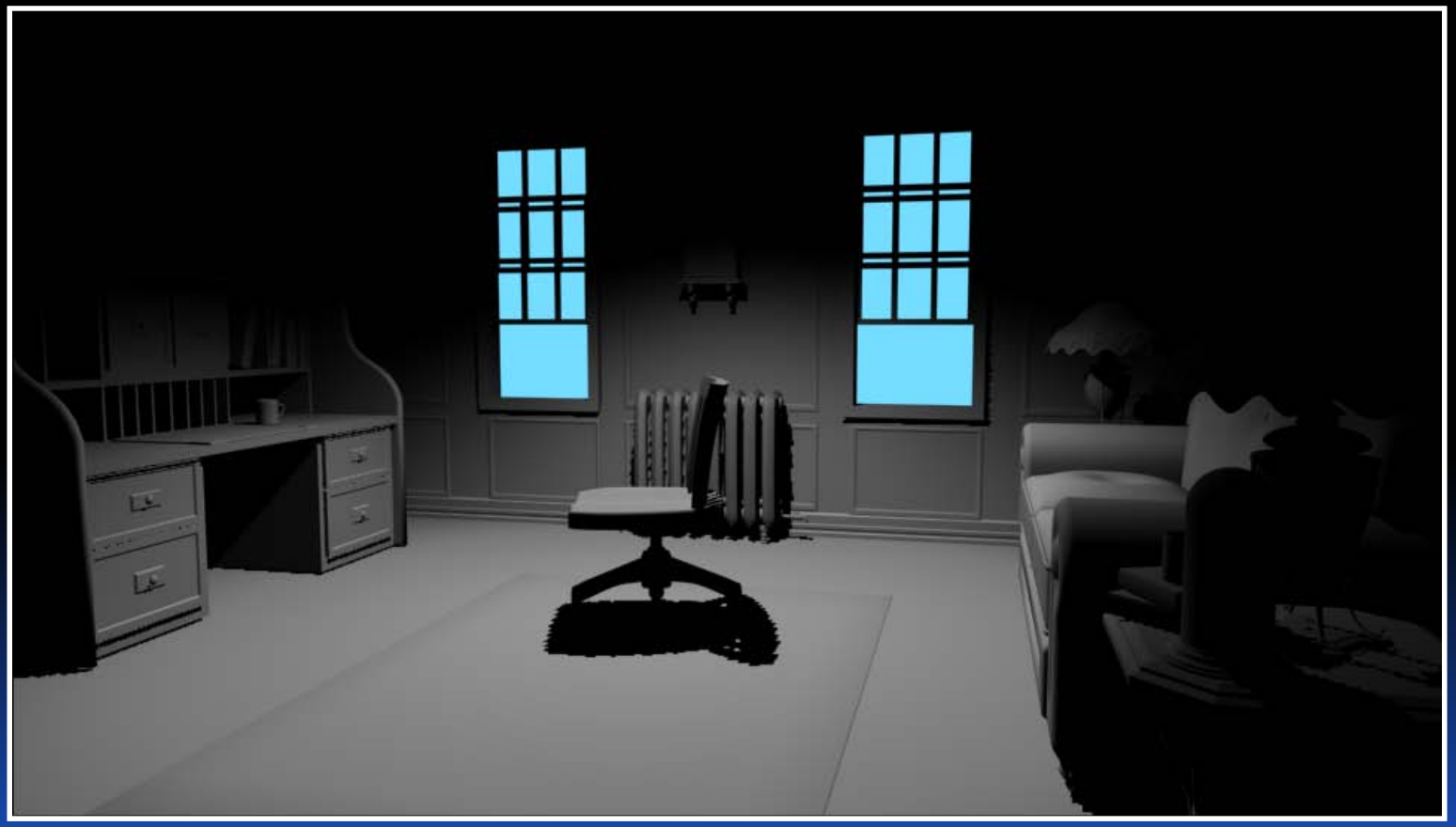
- Light effects based on interaction between light and atmosphere

Shadows

- Check the Box
- Select Shadow type
  - Shadow Mapped
  - Ray Traced Shadows

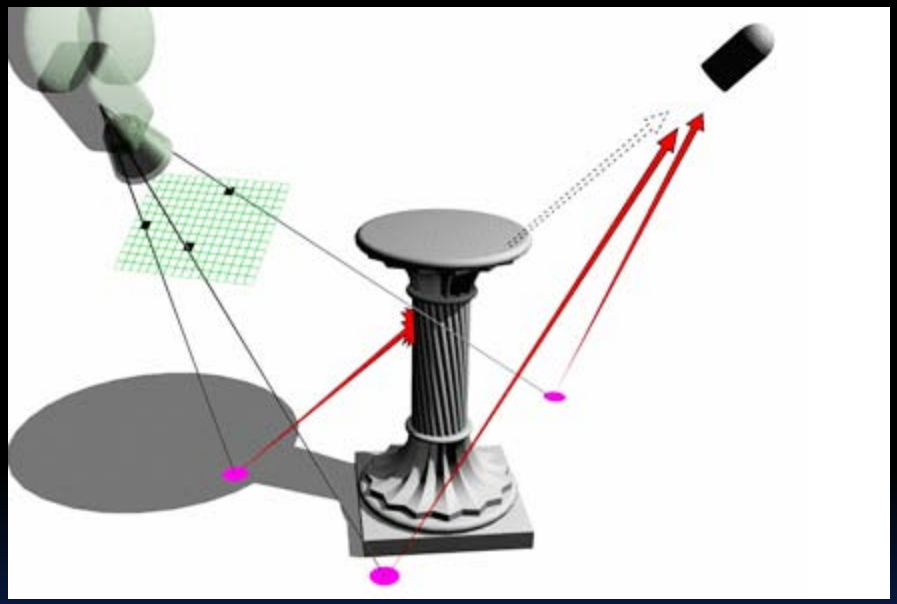
Shadow Maps

- Check the Box



Ray-Traced Shadows

- Sharp, defined shadows created by bouncing light rays around a scene



Photometric vs. Standard Lights

- Daylight System – Mental Ray
- Sky Light – Scanline Renderer

Light Strategies

What to look for

Terminology

Since Photometric lights are considered "real world" lights, real world terminology applies

The terminology is culled from the photography and scientific fields

- Kelvin
- Lumens
- Lux
- Candelas
- f/stops

Photometric Properties

- Photometric values that enable you to define lights as they would be in the real world.
- Color (Kelvin)
- Luminous Flux (lumens)
- Illuminance (lux)
- Luminance (candelas)
- Luminous Intensity

Color – Kelvin

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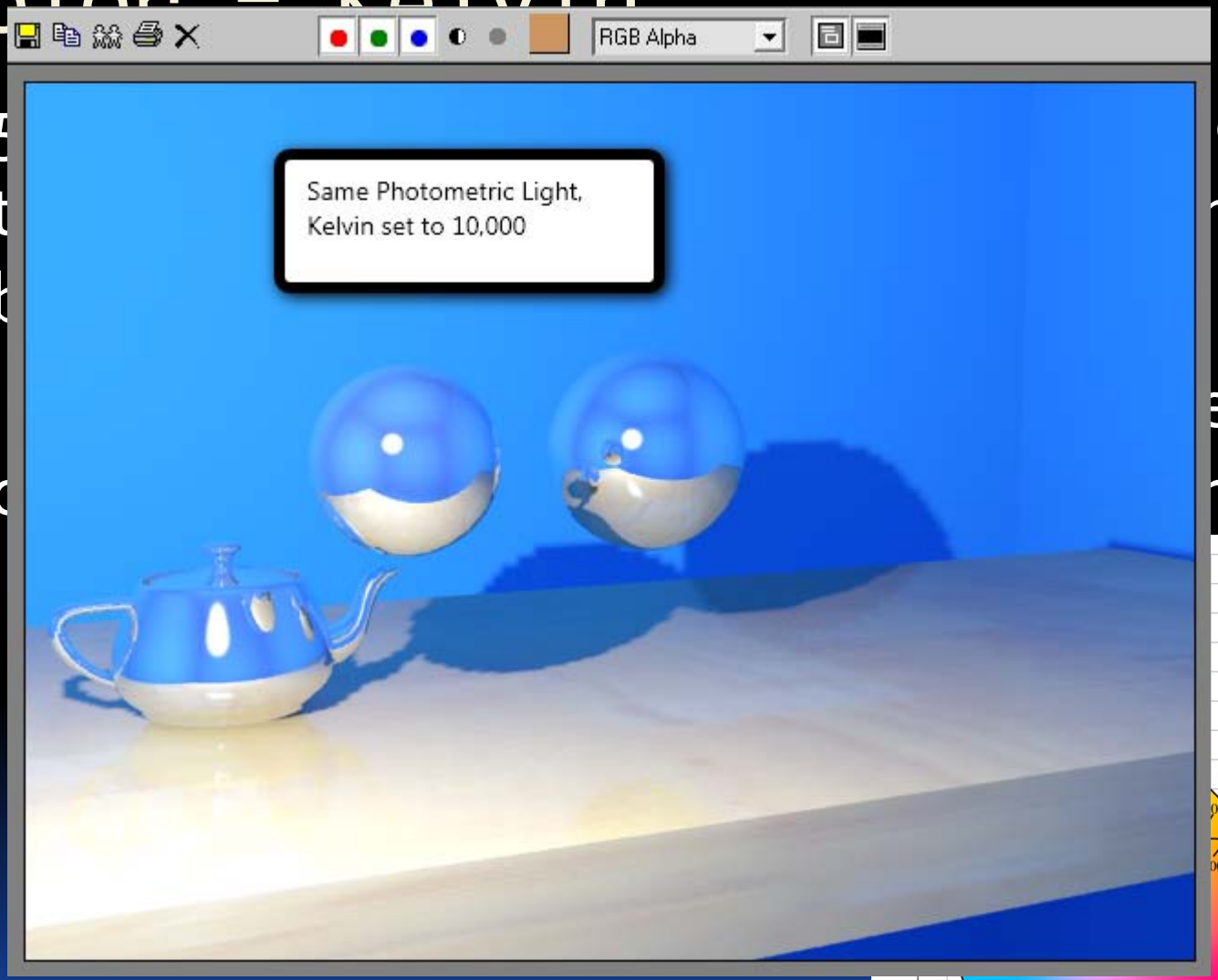
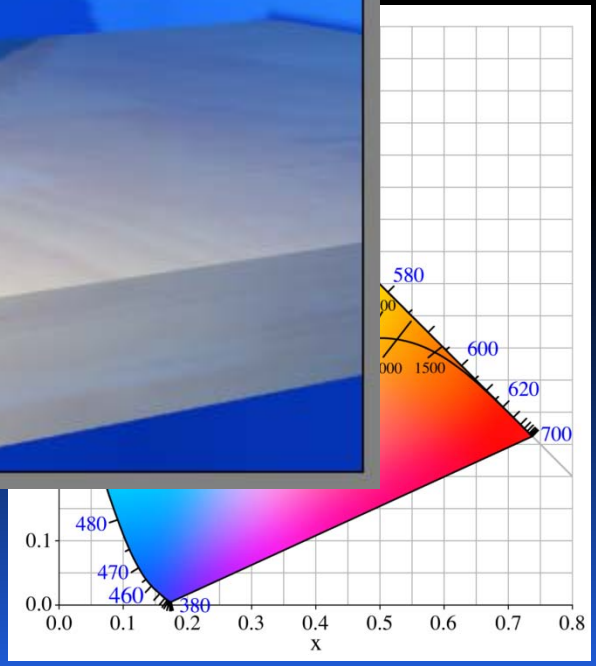
- …e c…rs.





Luminous Flux (lm)

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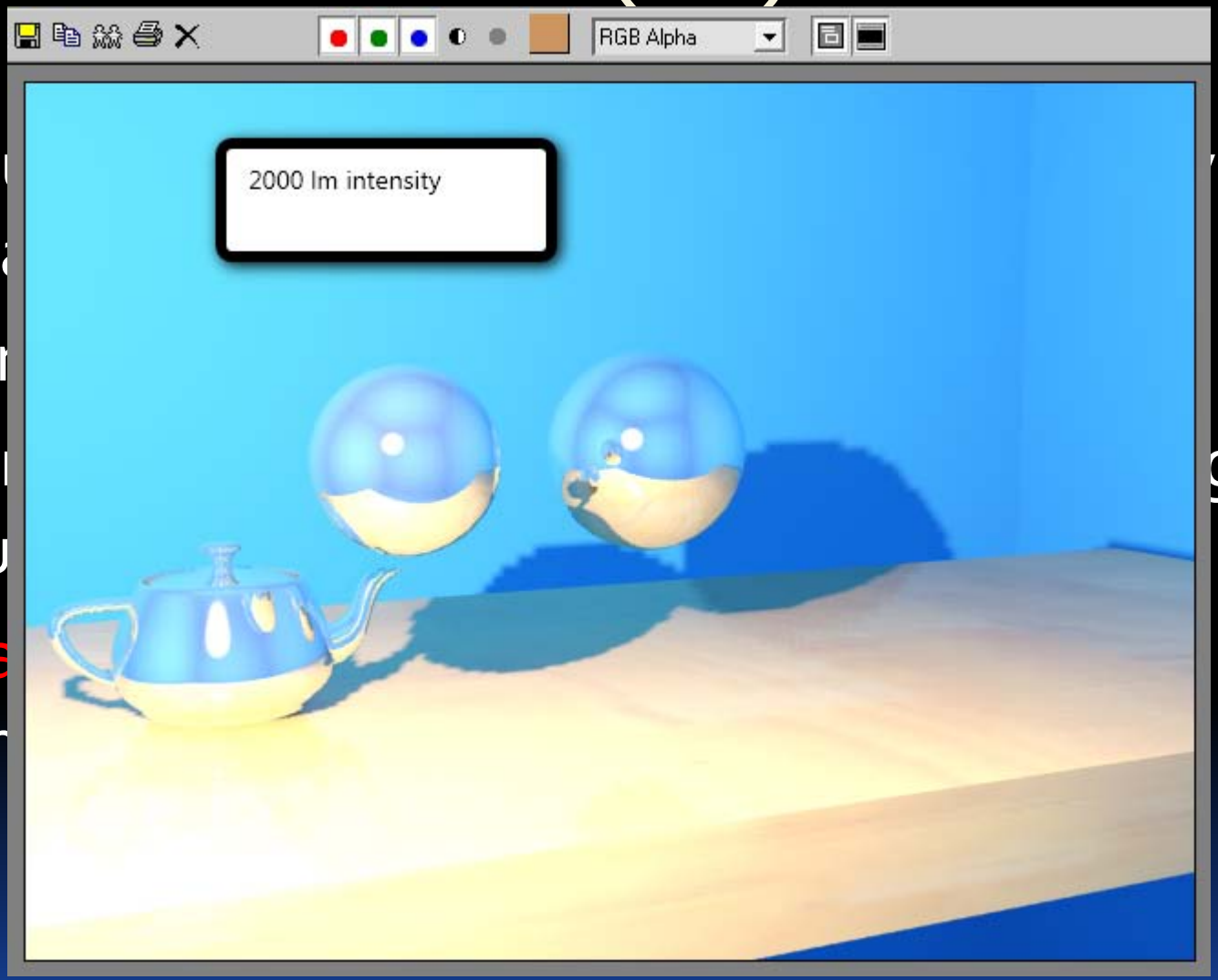


Illuminance

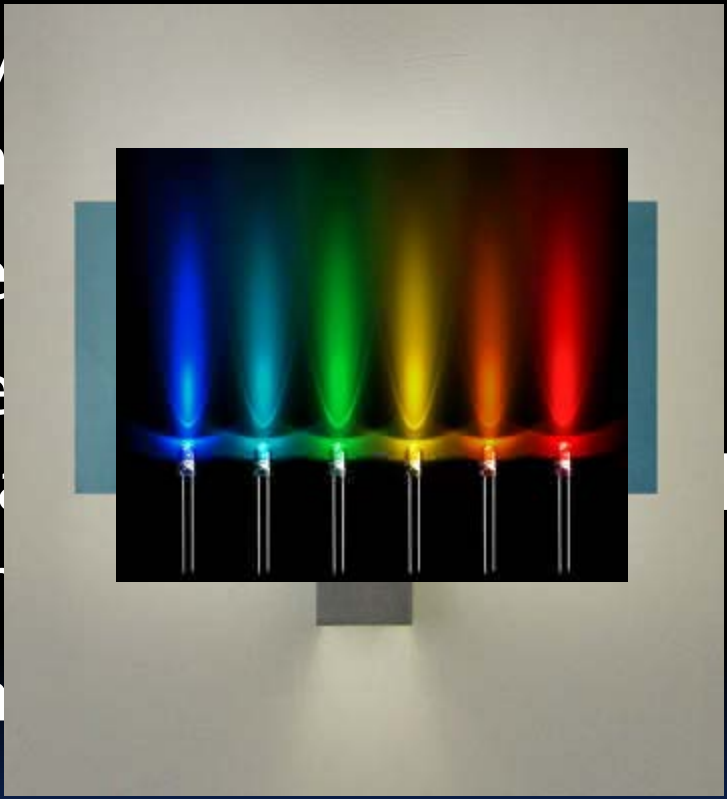
- Luminous Flux the total incident on a surface per unit area
- Describes "Effect" of Luminous Flux
- International System (SI) measure is Lux (lx)
- Lux = 1 Lumen per square meter
- Layman's term: how bright the luminous flux appears per square unit (meter, inch etc…)

Luminance

- Part of light "Effect" that reflected back into the environment
- Measured in candelas per square meter or inch.
- Candela was originally defined as the luminous intensity emitted by a single wax candle.
- Layman's terms: value of light reflected off a surface. a measure of how bright or dark we perceive the surface

Luminous Intensity

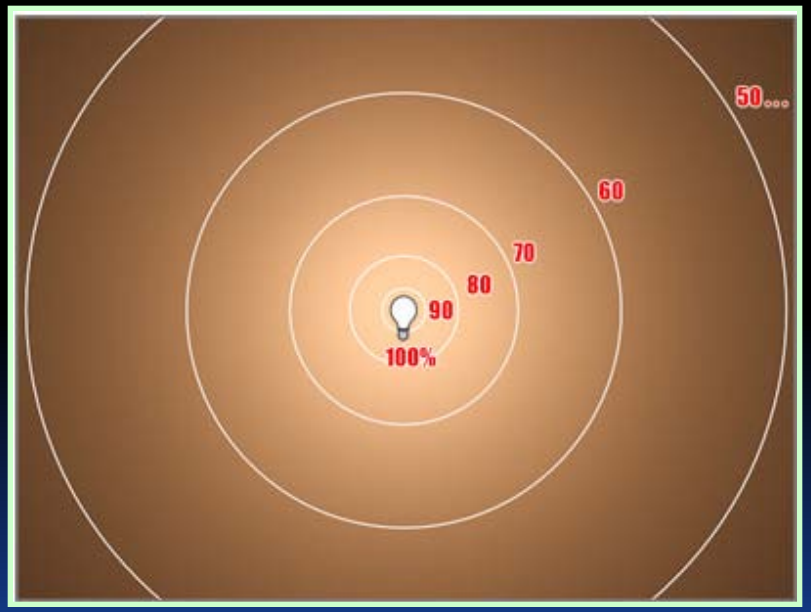
- Intensity a point source in a certain
- Measure
- Describe tensity of a light source v he outgoing direction
- "Uneven



Photometric Distribution

(Drives Luminous Intensity)

- Uniform Spherical
- Completely even distribution



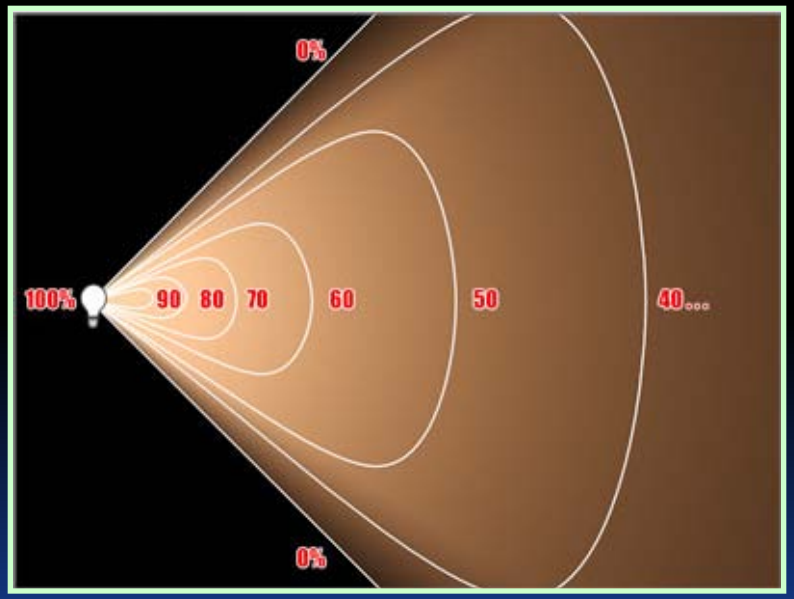
Photometric Distribution
(Drives Luminous Intensity)

- Uniform Diffuse
- Emits from only one hemisphere

Photometric Distribution

(Drives Luminous Intensity)

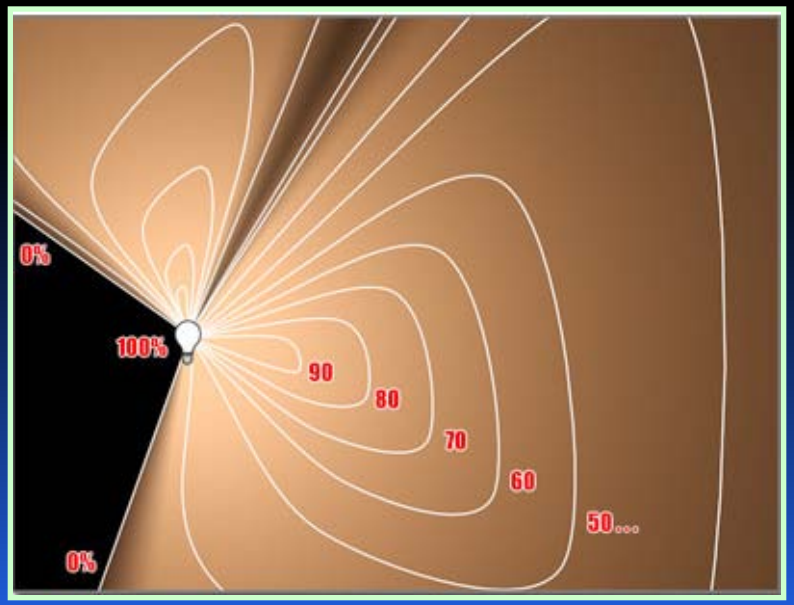
- Spotlight Distribution
- Like a flashlight or headlights



Photometric Distribution

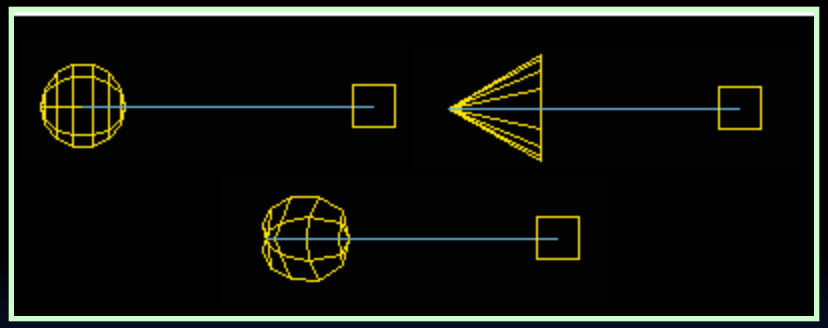
(Drives Luminous Intensity)

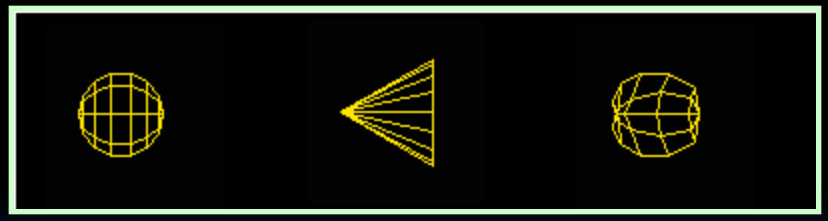
- Photometric Web Distribution
- Available from light manufacturers (.ies files)
- http://genet.gelighting.com/LightProducts/Dispatcher?REQUEST=IESCATEGORYPAGE (or just Google .ies files)



Photometric Light Types

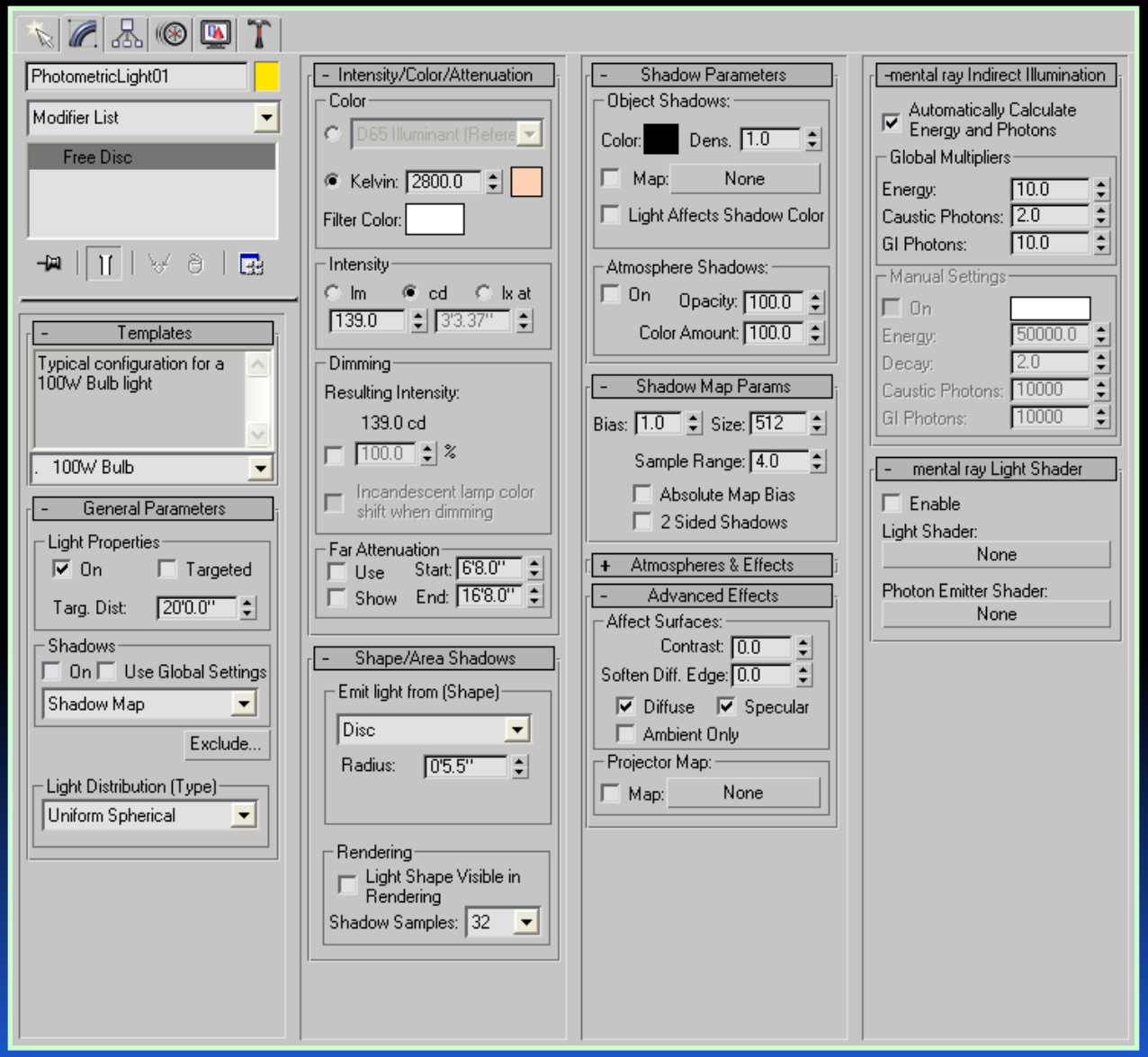
- Target Light
- Free Light
- Mr Sky Portal



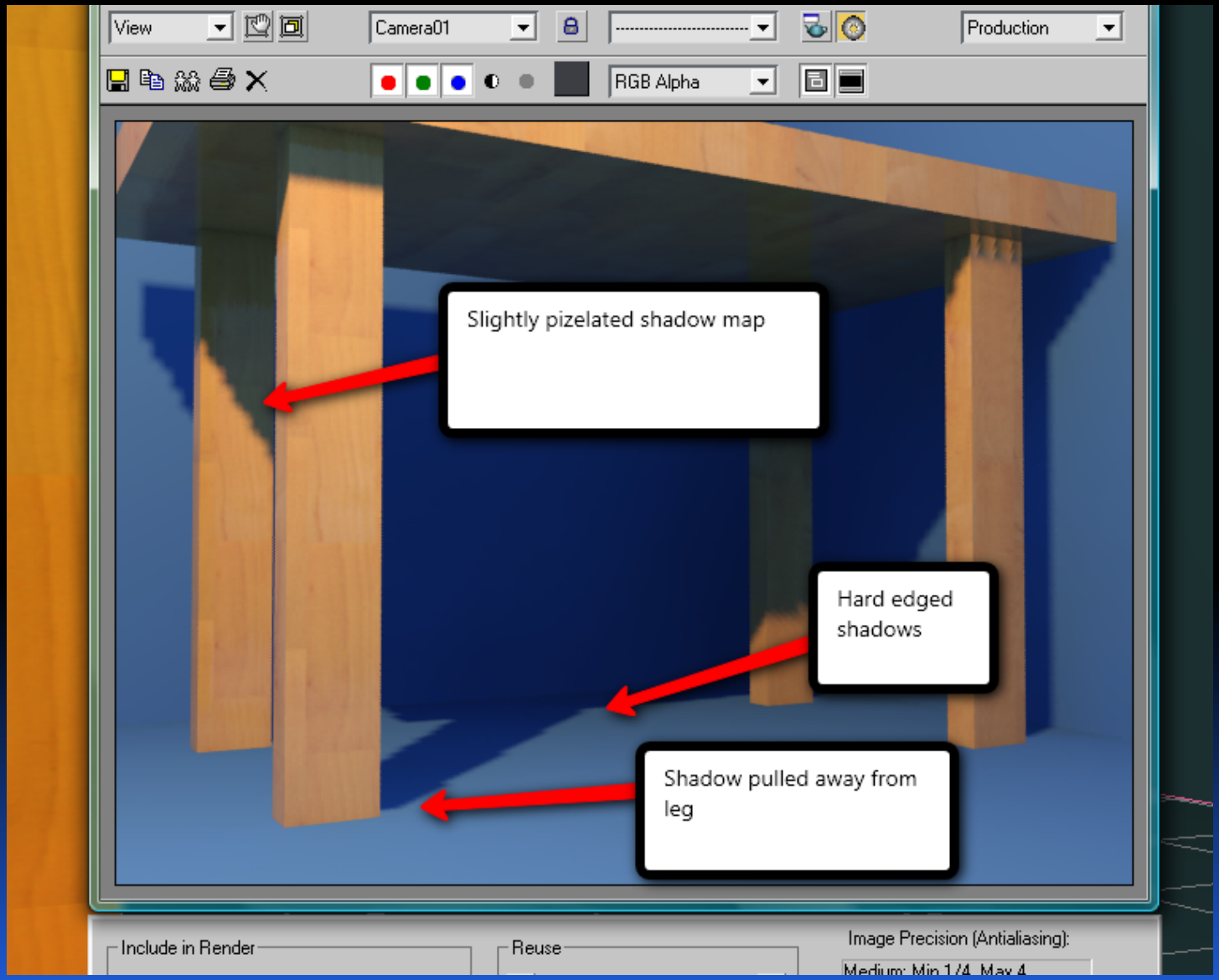


Core Tools

- Presets
- Shadow Type
- Distribution Type
- Color
- Intensity
- Shape
- Shadow Parameters



Shadows: A Critical Eye



Affecting Shadows

- Shadow type
- Light shapes
- Samples
- Density

Shadow Type

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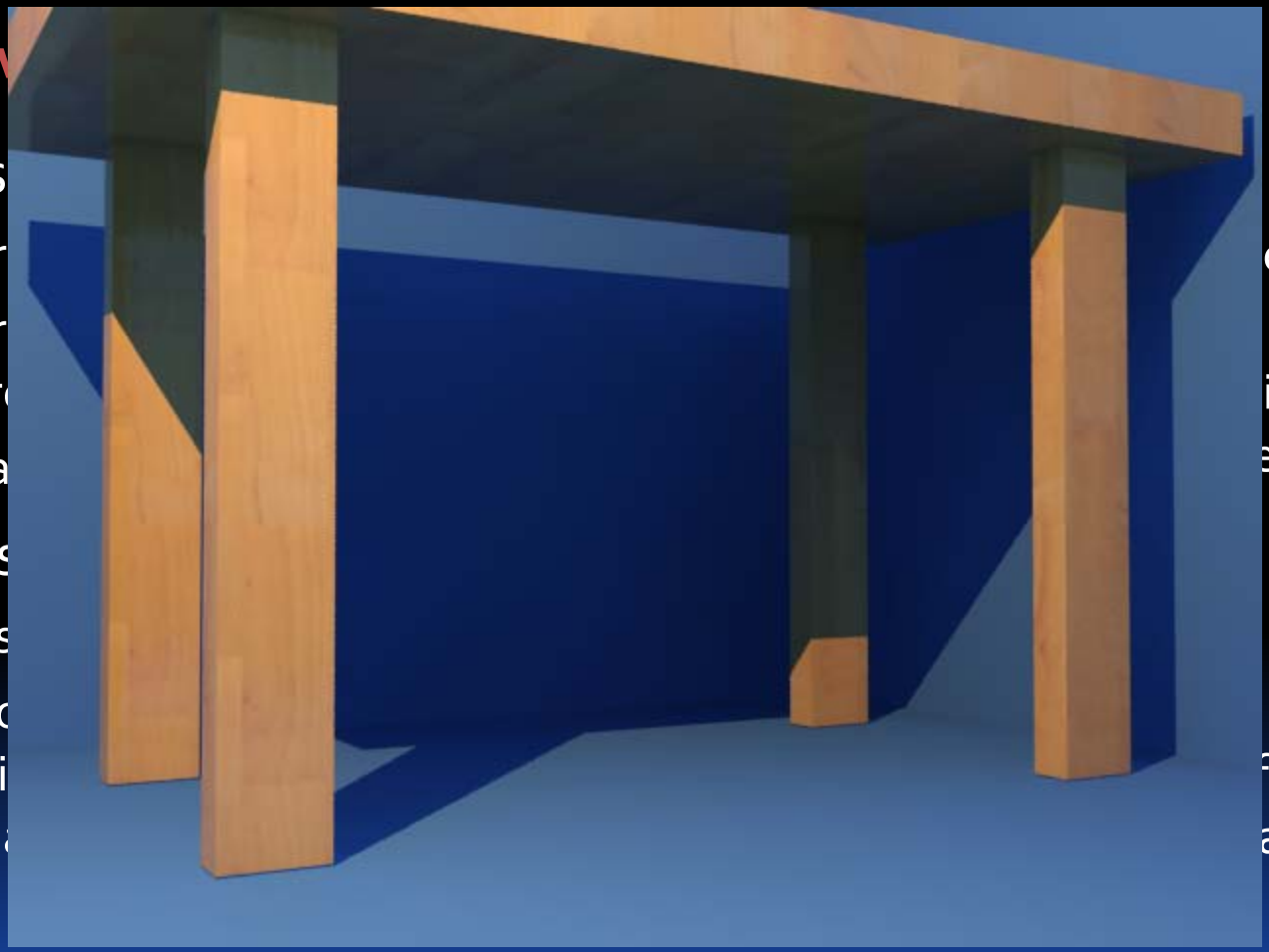

Light Shapes

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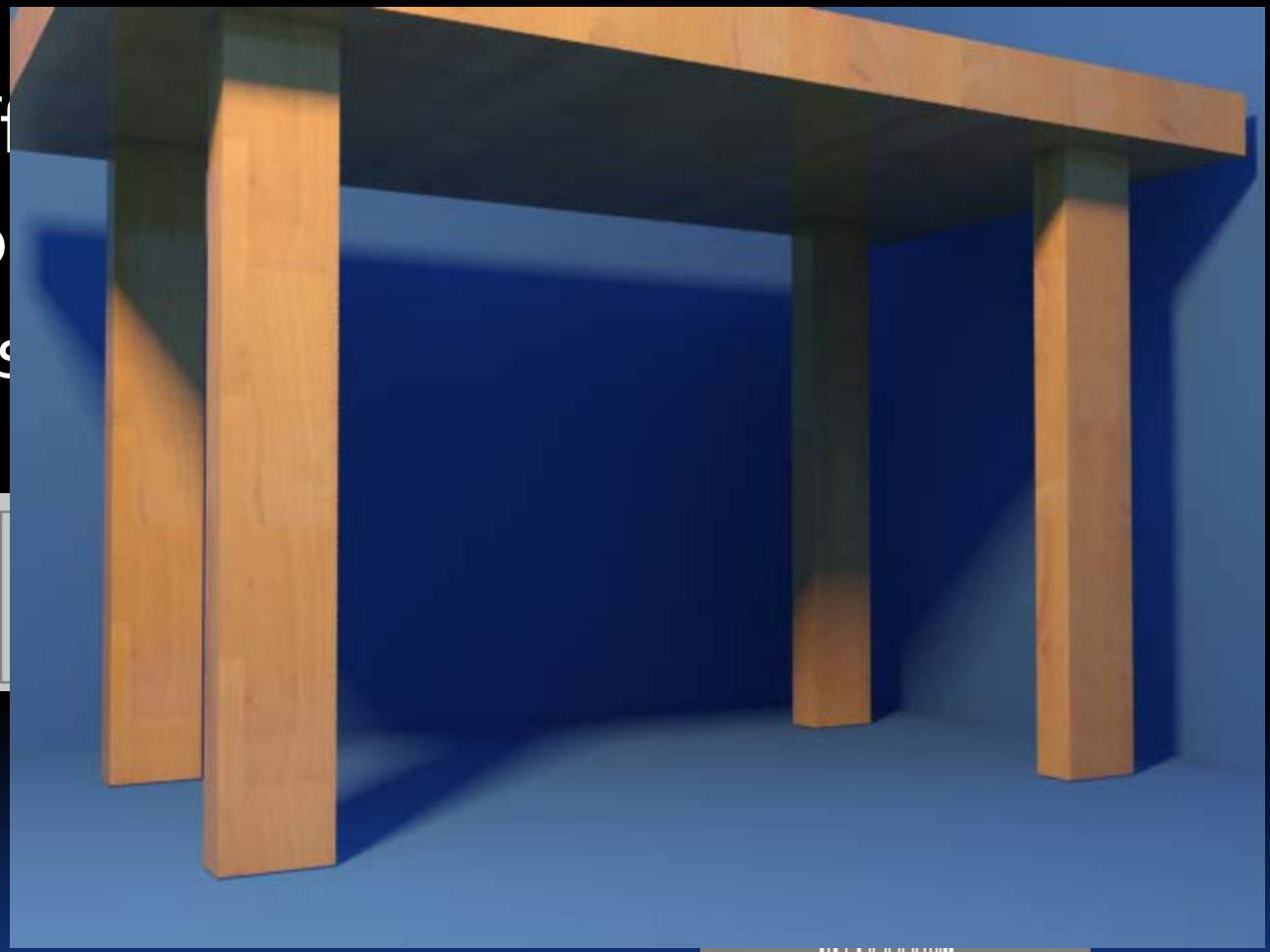

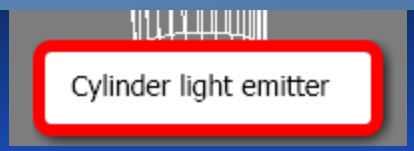

Size (Shadow Map Only)

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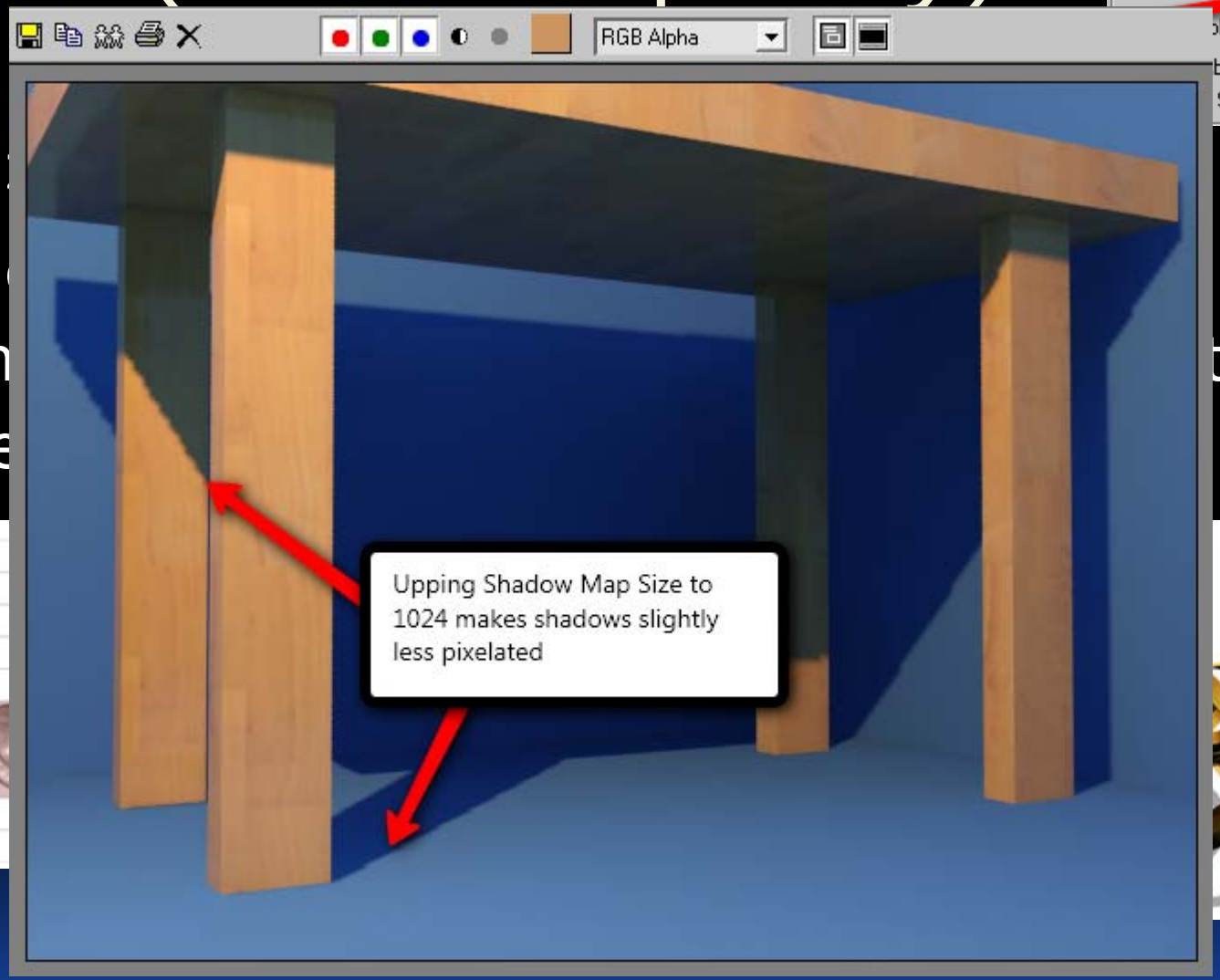

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Samples (Shadow Map Only)

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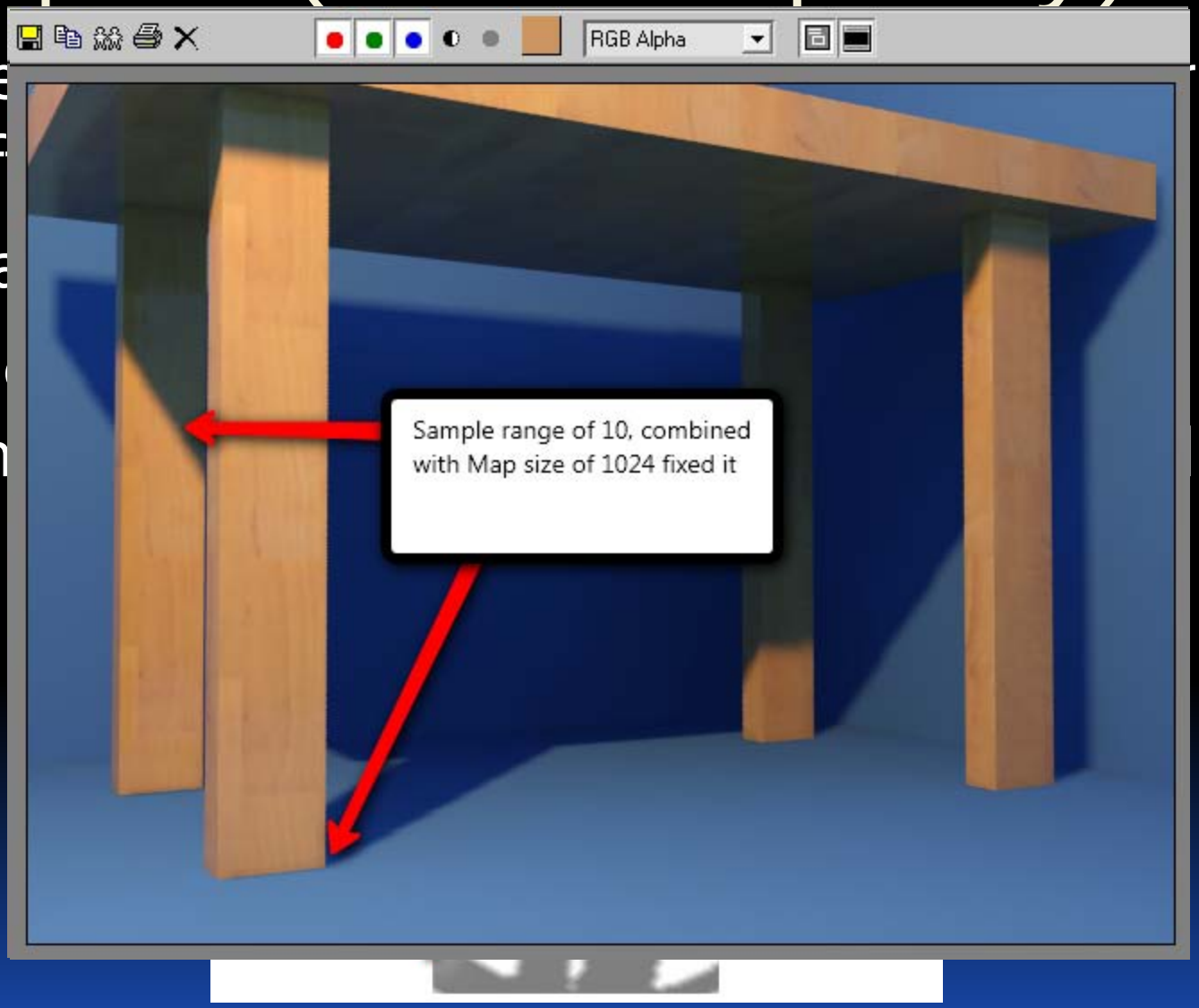
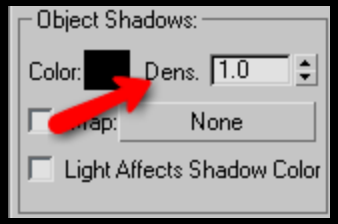


Density



- How dark / solid the shadow is.
- If set to 1, the shadow will appear pure black, which is usually too dark

Bias

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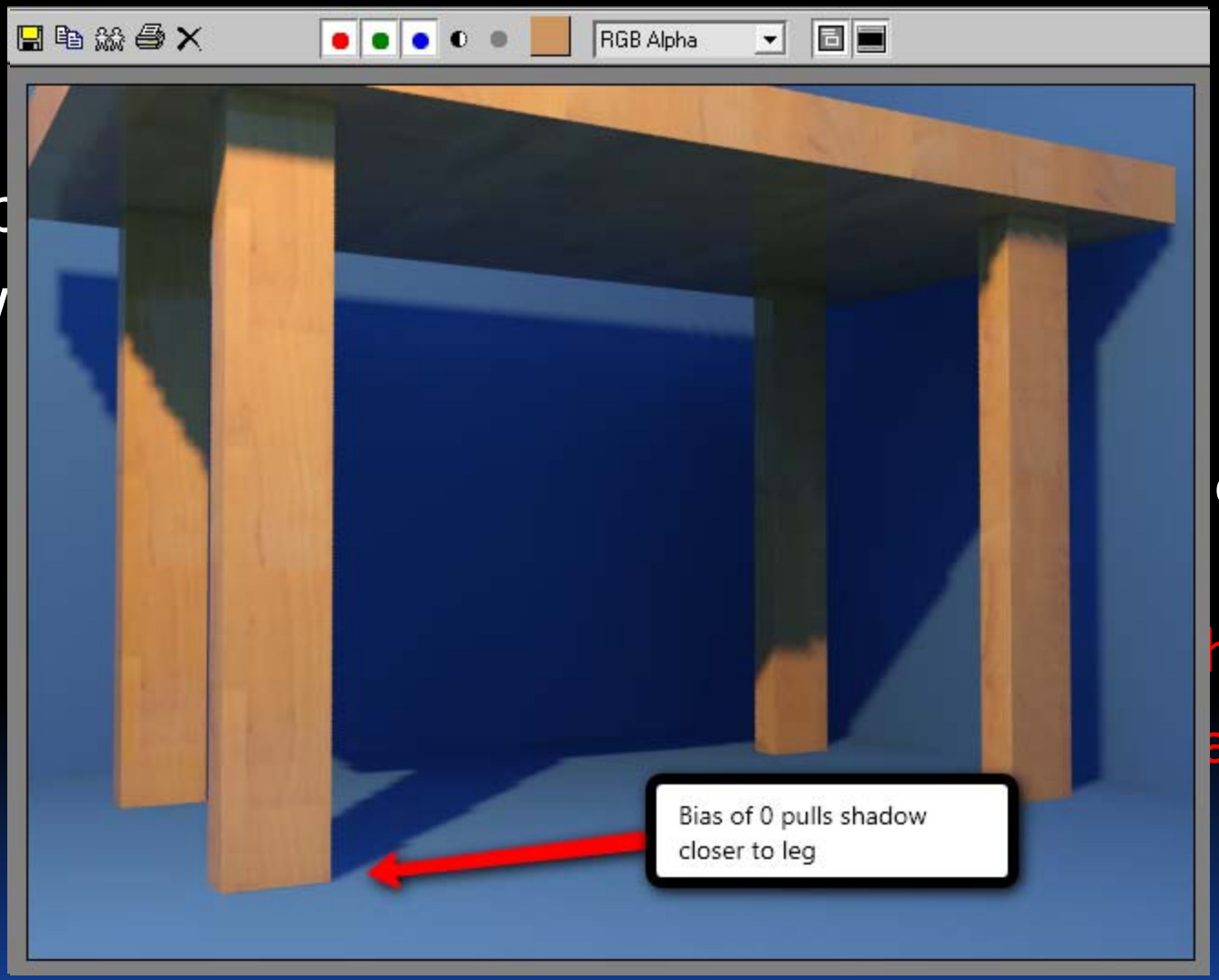
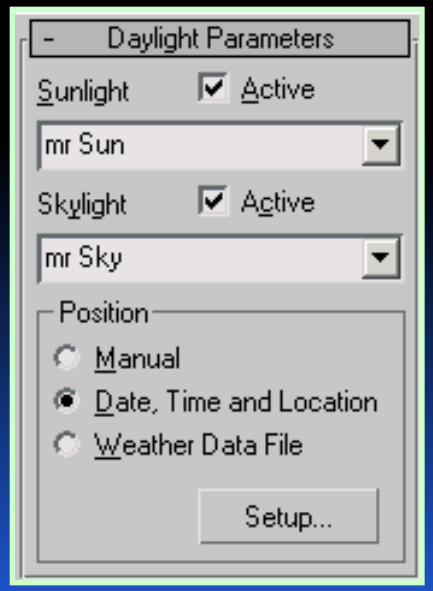


Lighting Systems

Daylight System

Daylight System

- Uses light that follows the geographically correct angle and movement of the sun over the earth at a given location.



Daylight System + mr Physical Sky

- mr Physical Sky
  - Material type that mimics sky conditions including
    - Haze
    - Color
    - Horizon
    - Sunlight

Rendering and Lights

What is a rendering engine?

- Scanline Renderer
  - No advanced lighting calculation
  - All lighting quality is determined by you and your ability to control the lights
  - Pros: Quick results, easy to use, all controls on the lights
  - Cons: realism harder to achieve, requires experience to master
- Mental Ray
  - Advanced lighting calculations and effects (HDR)
  - Quality is a balance of light control and rendering controls
  - MR is a DEEP "sub program"
  - Pros: Great looking lighting with some ease.
  - Cons: Time, complex, requires deeper understanding of physics of light

Mental Ray vs. Scanline

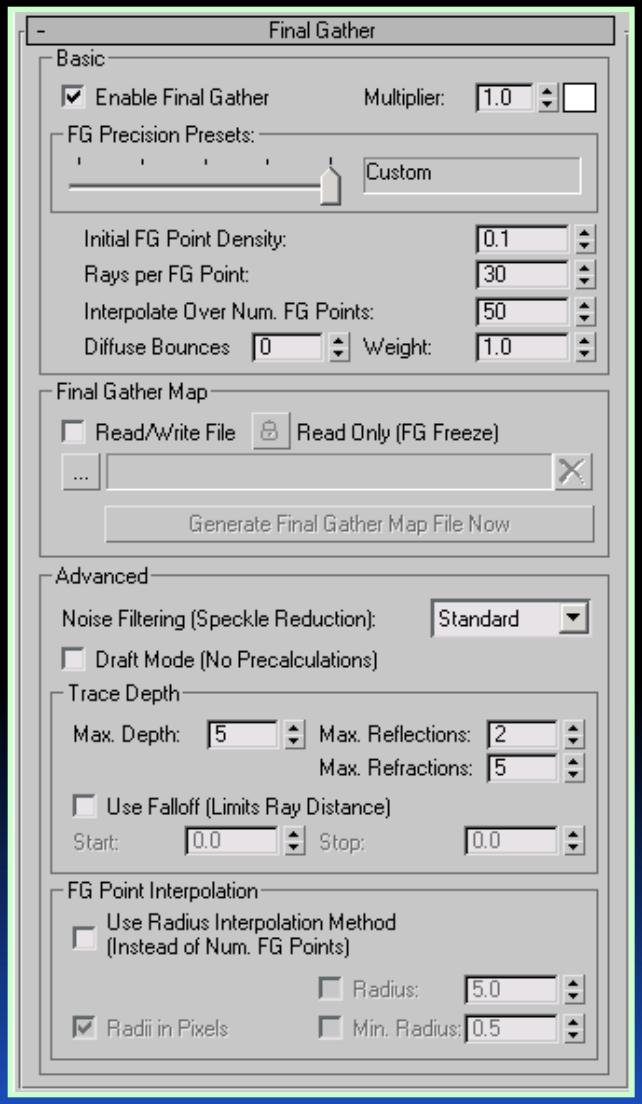
- Don’t need to simulate lighting effects “by hand”
- Replaced by googolplex (buttload?) of parameters
- Renders rectangle blocks (buckets)

Mental Ray Core Areas

- Indirect Illumination (Final Gather)
- Exposure Control

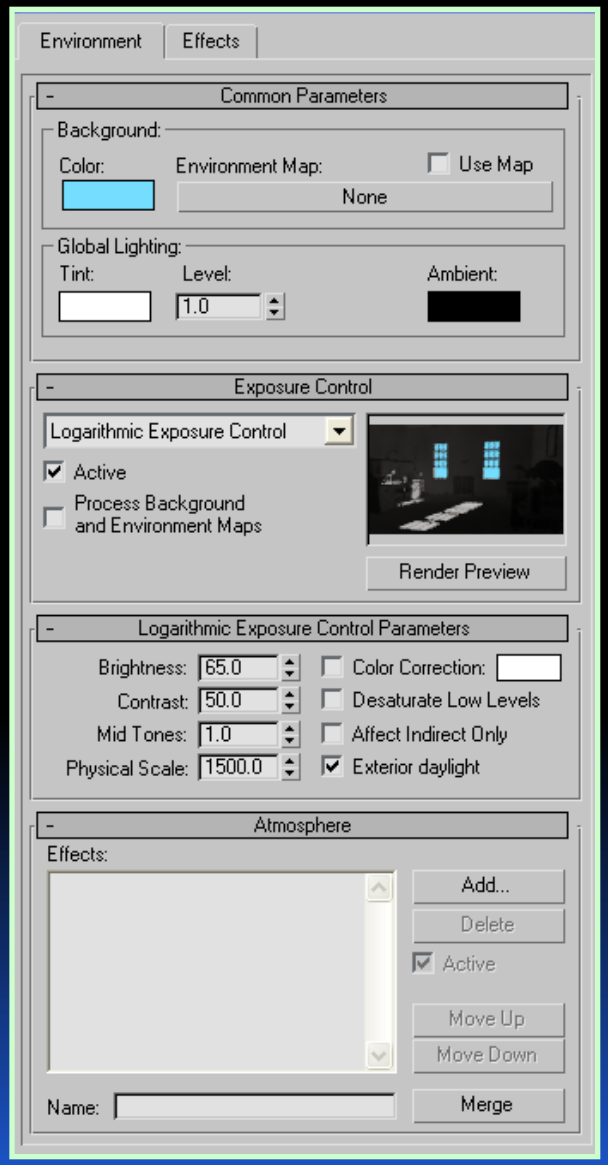
Indirect Illumination

- controls for rendering bounced light within an environment, including final gathering, caustics, and photons



Exposure Control

- Adjust the output levels of rendering, as if you were adjusting film exposure.
- compensates for the limited dynamic range of computer displays

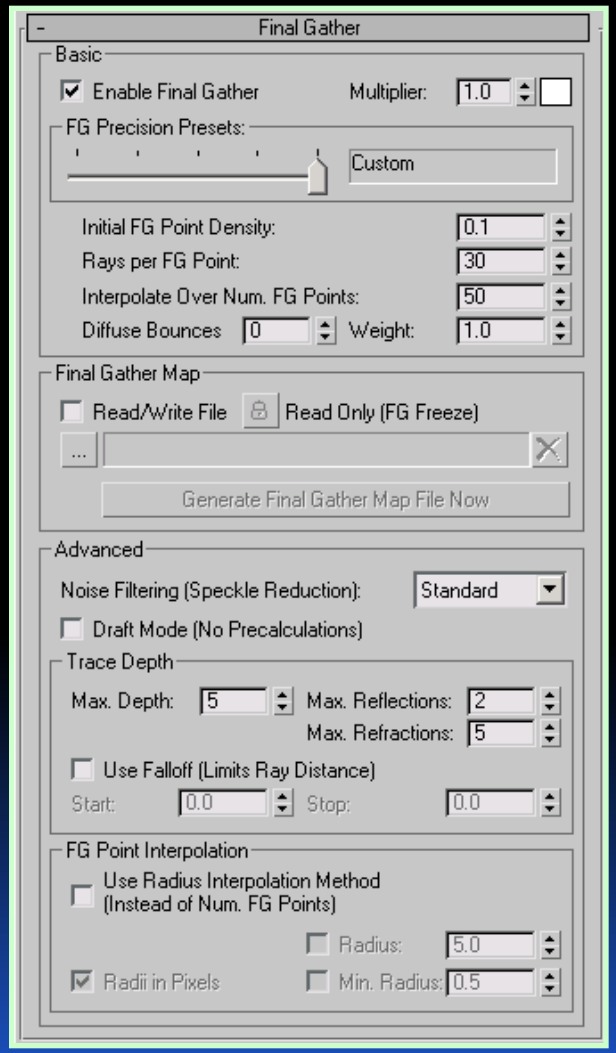


Final Gather

- Why?
  - More physically accurate than any other technique
  - Calculates indirect diffuse, glossy and specular inter-reflection
- Diffuse reflections- effects of the reflected light bouncing off diffuse surfaces.
- Mental Ray offers a method that allows to make more accurate renderings: Final Gather.

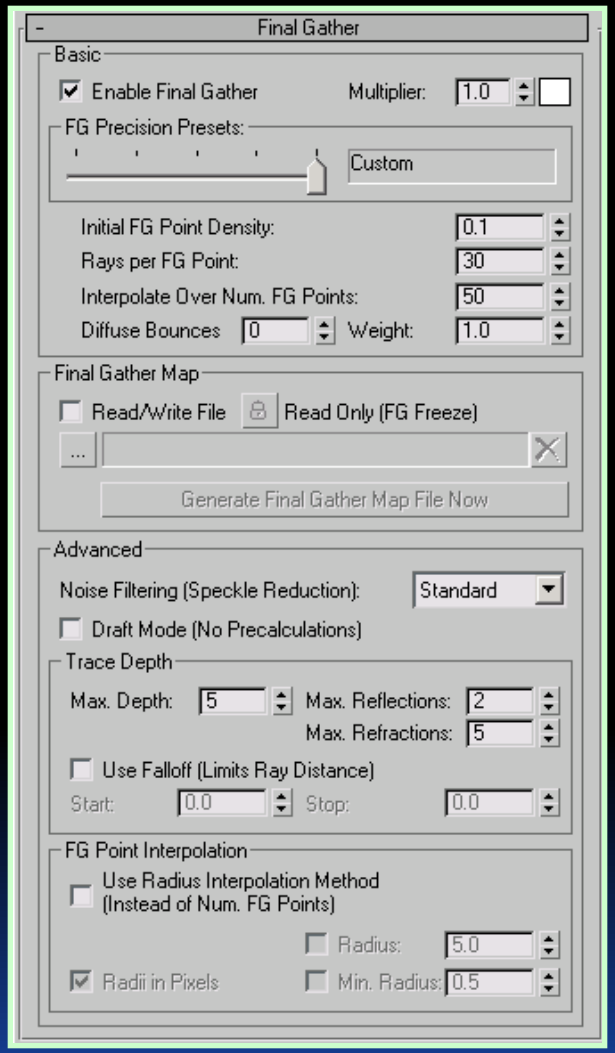
Indirect Illumination Tab

- Final Gather
- controls for rendering bounced light within an environment



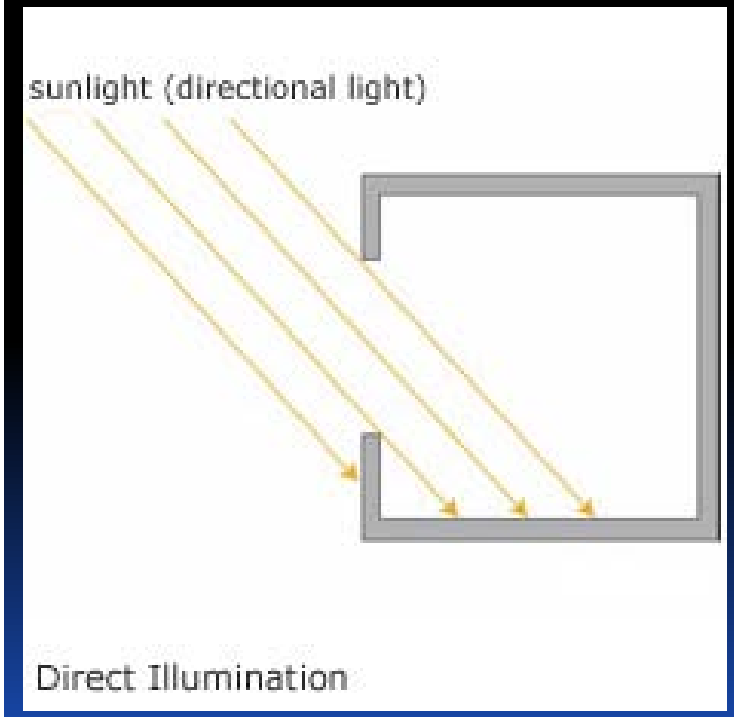
Indirect Illumination Tab

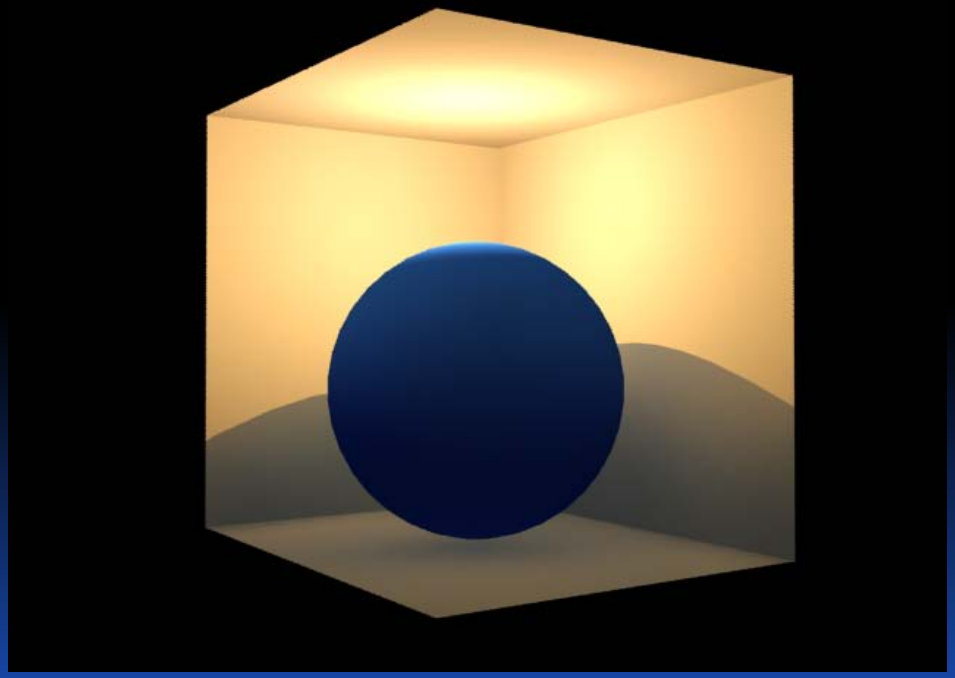
- Final Gather
- controls for rendering bounced light within an environment



Understanding Final Gather

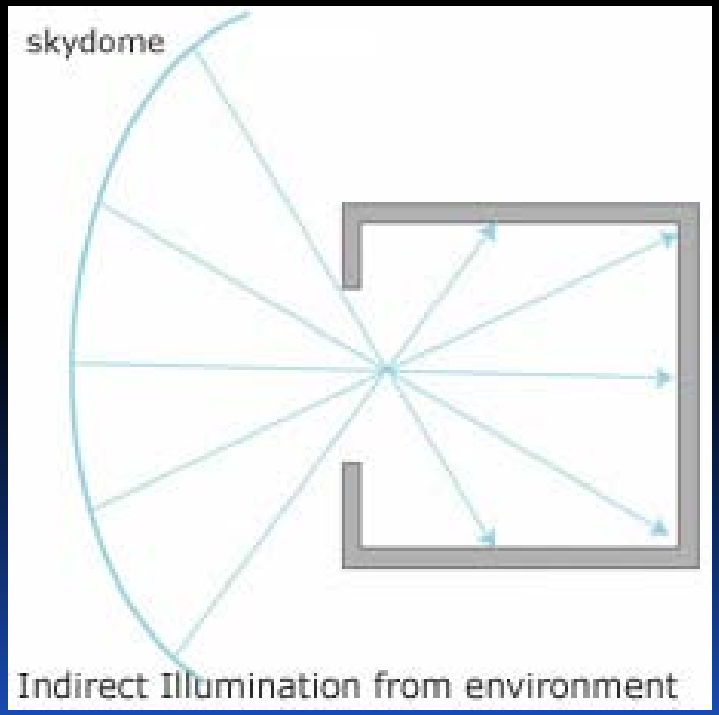
- Direct Illumination- light directly from the source to the object

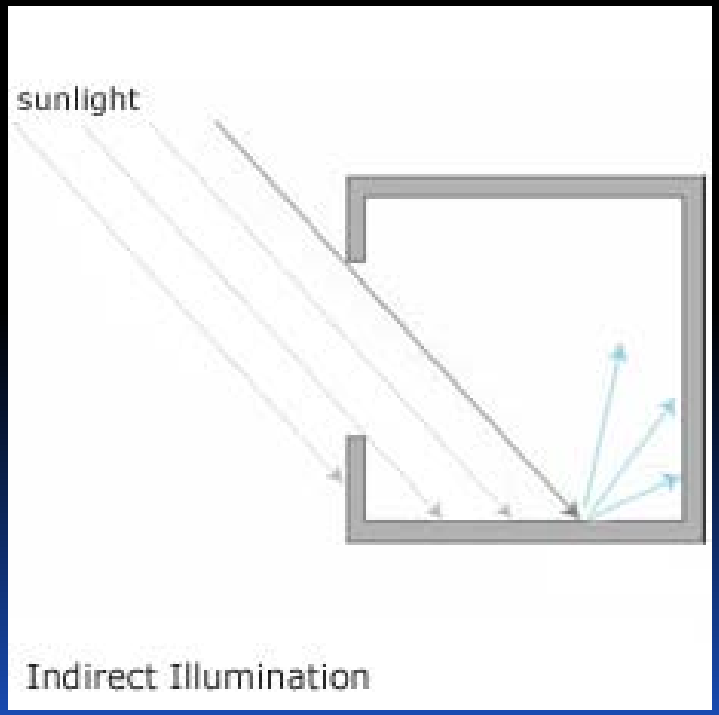


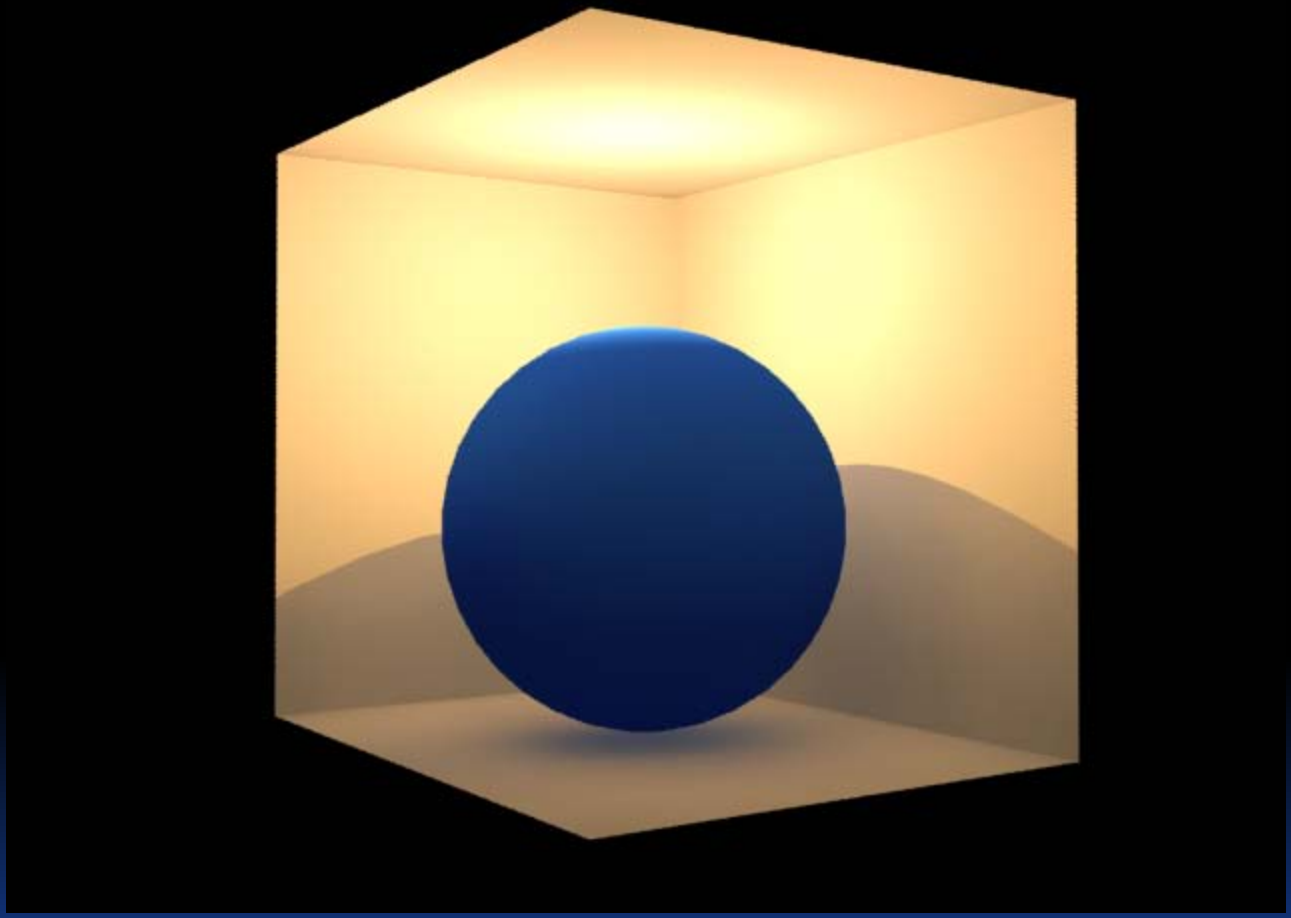


Understanding Final Gather

- Indirect Illumination- illumination created by bouncing light rays





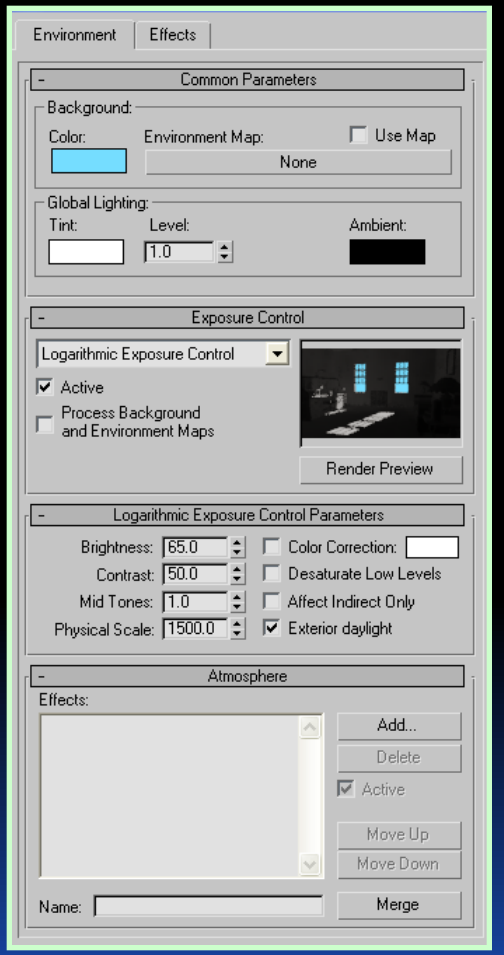


Final Gather

- With Final Gather the calculations of light are divided in two components:
- Direct Illumination
- Indirect Illumination
  - Indirect Illumination from other surfaces (light bounces of direct light)
  - Indirect Illumination from the environment (eg: skydome)

Exposure Control

- Adjust the output levels of rendering, as if you were adjusting film exposure.
- Use to adjust light balance
- Use mrPhotographic



Exposure Value (EV)

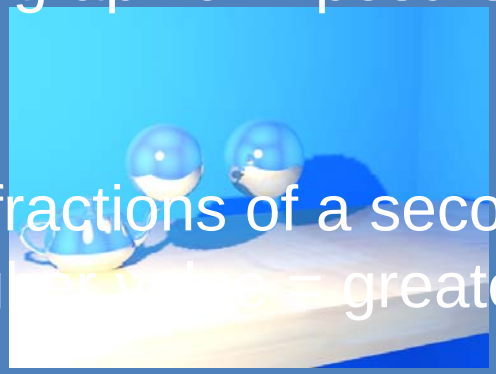
A combination of the three Photographic Exposure values

•Exposure Values are:

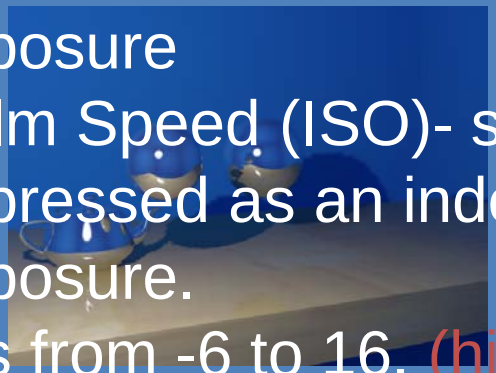
- •Shutter Speed- duration, in fractions of a second, that [illegible] open. Higher value = greater exposure.
- •Aperture- size of the opening of the "camera iris," expressed as a ratio (f/stop). Higher value = lower exposure
- •Film Speed (ISO)- sensitivity of the film, expressed as an index. Higher value = greater exposure.

• Goes from -6 to 16. (higher values are Darker)

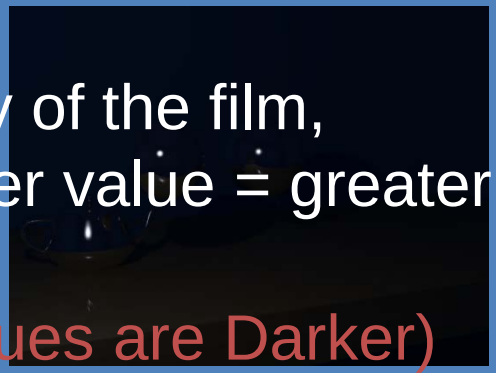
Exposure Value: 1.0



Exposure Value: 2.0



Exposure Value: 5.0



Exposure Value: 10.0

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