

CG COMPOSITING SERIES

2.3 - Material AOVs
Direct & Indirect, SSS



CG COMPOSITING SERIES

Material AOVs

Simple	Intermediate	Complex
Diffuse	Direct Diffuse + Indirect Diffuse SubSurface Scattering (SSS)	RAW Diffuse Lighting Texture / Color map
Specular	Direct Specular + Indirect Specular Reflection, Coat, Sheen	RAW Specular RAW Reflection Specular filter / Texture map
Emission		
* Reflections + Refractions		

CG COMPOSITING SERIES

Material AOVs

Simple

Diffuse

Intermediate

- **Direct Diffuse**
- **Indirect Diffuse**
- **SubSurface Scattering (SSS)**

Simple

Specular

Intermediate

- **Direct Specular**
- **Indirect Specular**
- **Coat** *Additional Arnold Passes
- **Sheen**

Simple

Emission

Simple

Other / Exceptions

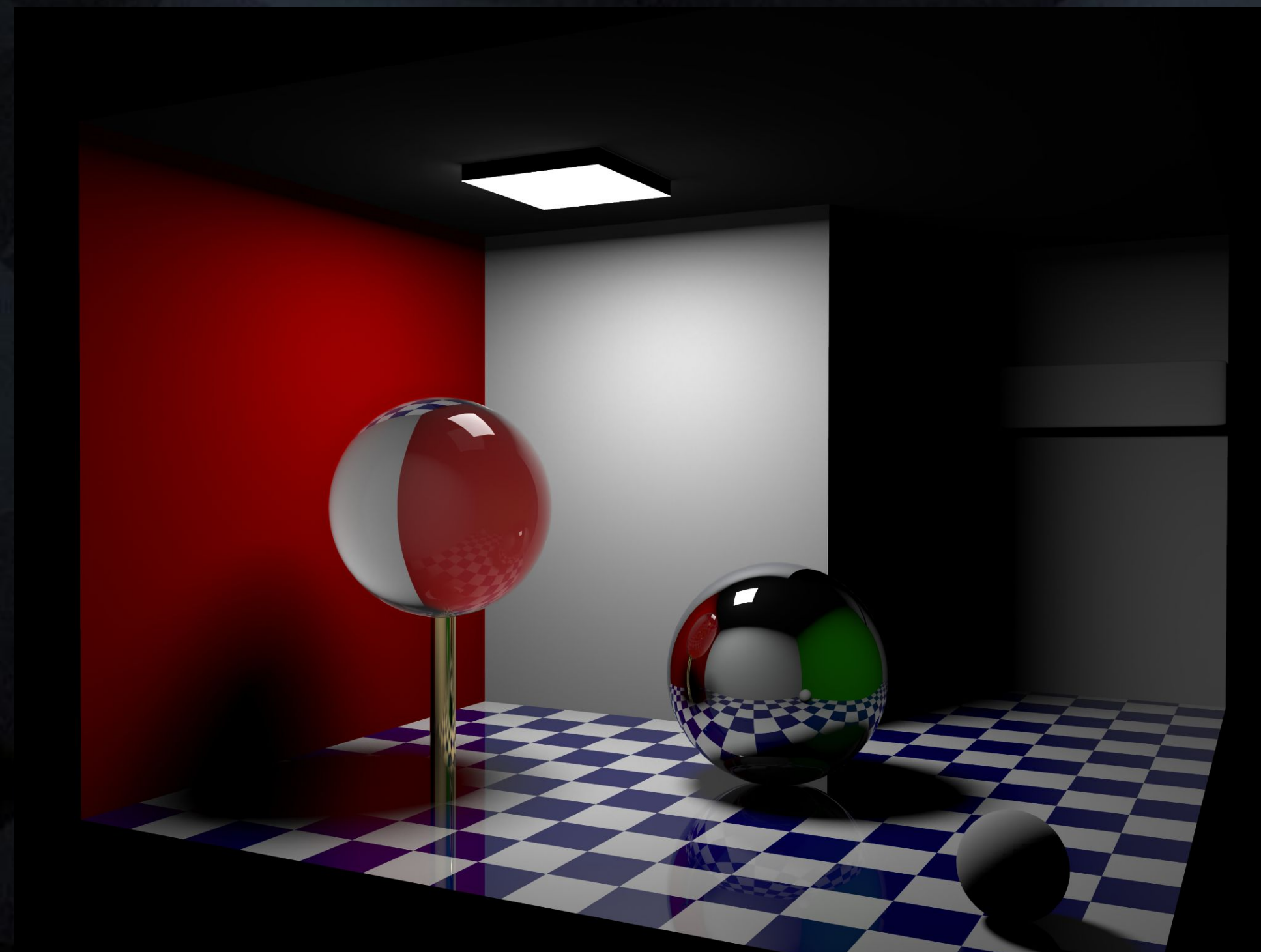
- **True Reflection**
- **Refraction**

CG COMPOSITING SERIES

Direct & Indirect

What is Direct Lighting?

- Direct Lighting is when the Light Source directly illuminates a surface. This could be considered the “first bounce” or the first time the light ray is hitting a surface.



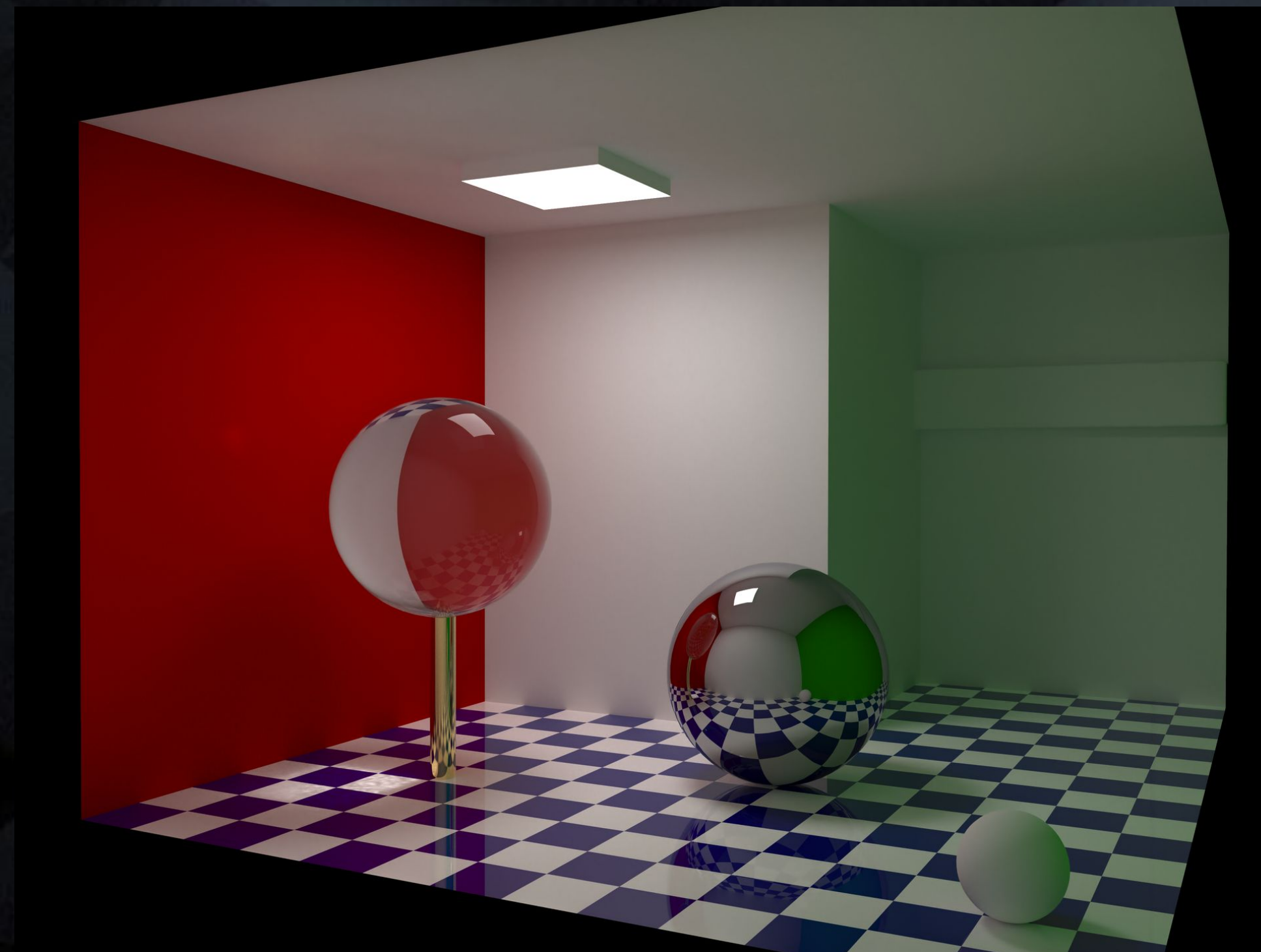
https://en.wikipedia.org/wiki/Global_illumination

CG COMPOSITING SERIES

Direct & Indirect

What is Indirect Lighting?

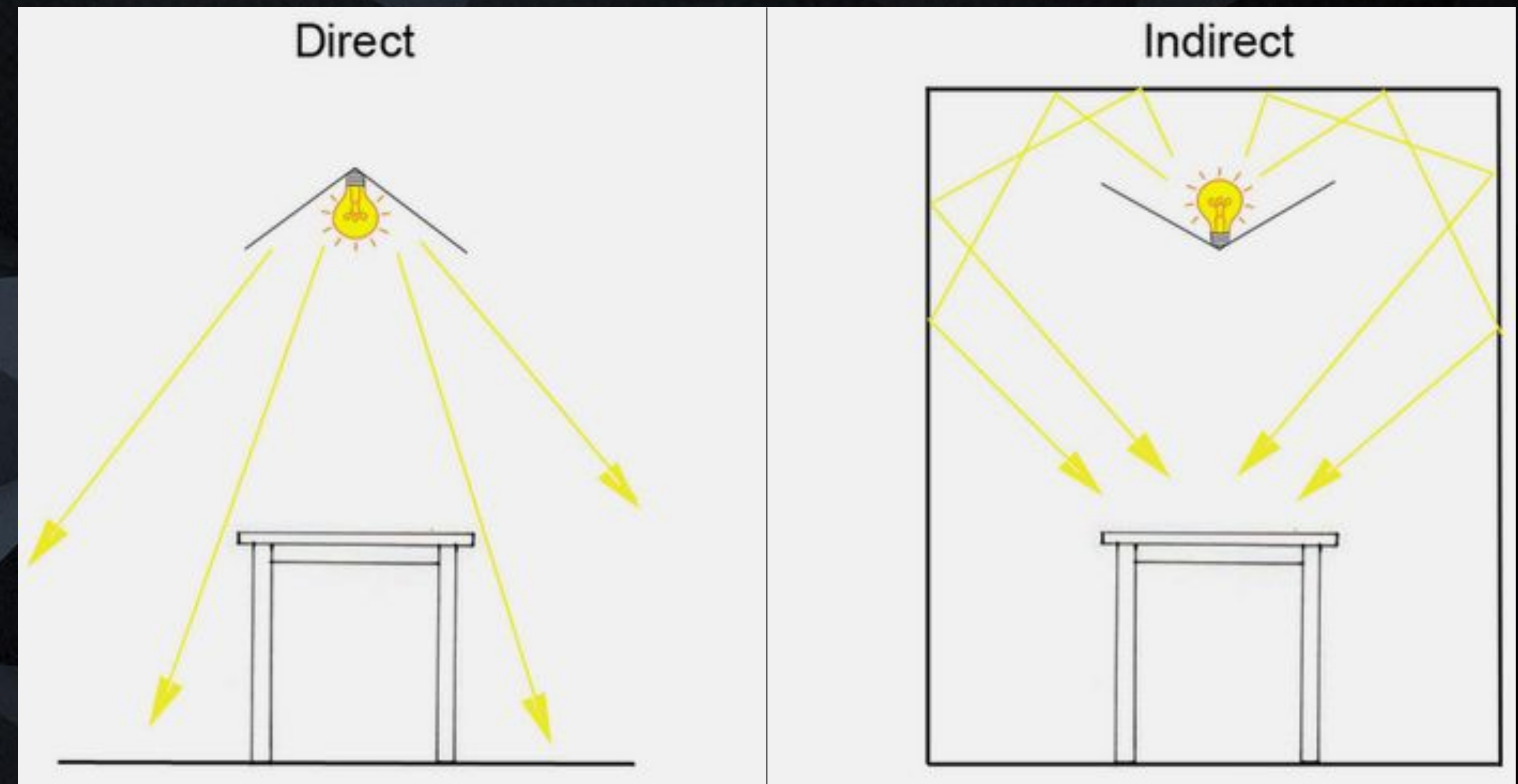
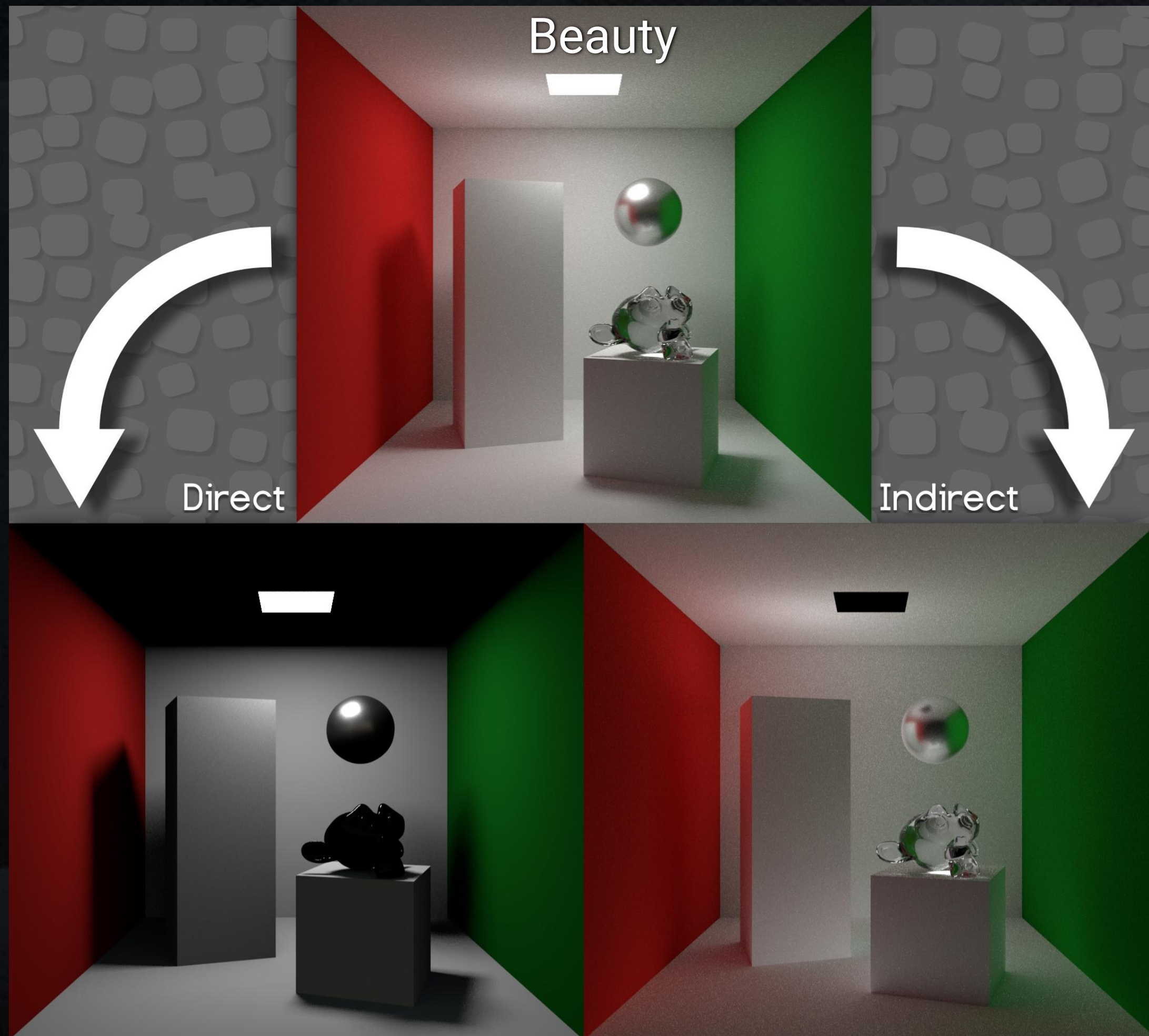
- Indirect Lighting is all subsequent bounces of the Light. This can be known as “Bounce Lighting”. Light is often diffused throughout the scene, and also will pick up some of the surface colors.



https://en.wikipedia.org/wiki/Global_illumination

CG COMPOSITING SERIES

Direct & Indirect



<https://www.olamled.com/direct-lighting-vs-indirect-lighting-which-is-better/>

<https://sinmantyx.wordpress.com/2015/03/18/perfect-clamp-1/>

CG COMPOSITING SERIES

Direct & Indirect



<https://www.unitopledstrip.com/ru/direct-vs-indirect-lighting/>



<https://vcut.co.uk/the-advantages-of-contemporary-indirect-lighting-coving-for-residential-and-commercial-environments/>

CG COMPOSITING SERIES

Ways to Group

Diffuse

Direct Diffuse +

Indirect Diffuse

+

Specular

Direct Specular +

Indirect Specular

CG COMPOSITING SERIES

Ways to Group

Direct

Direct Diffuse +

Direct Specular

+

Indirect

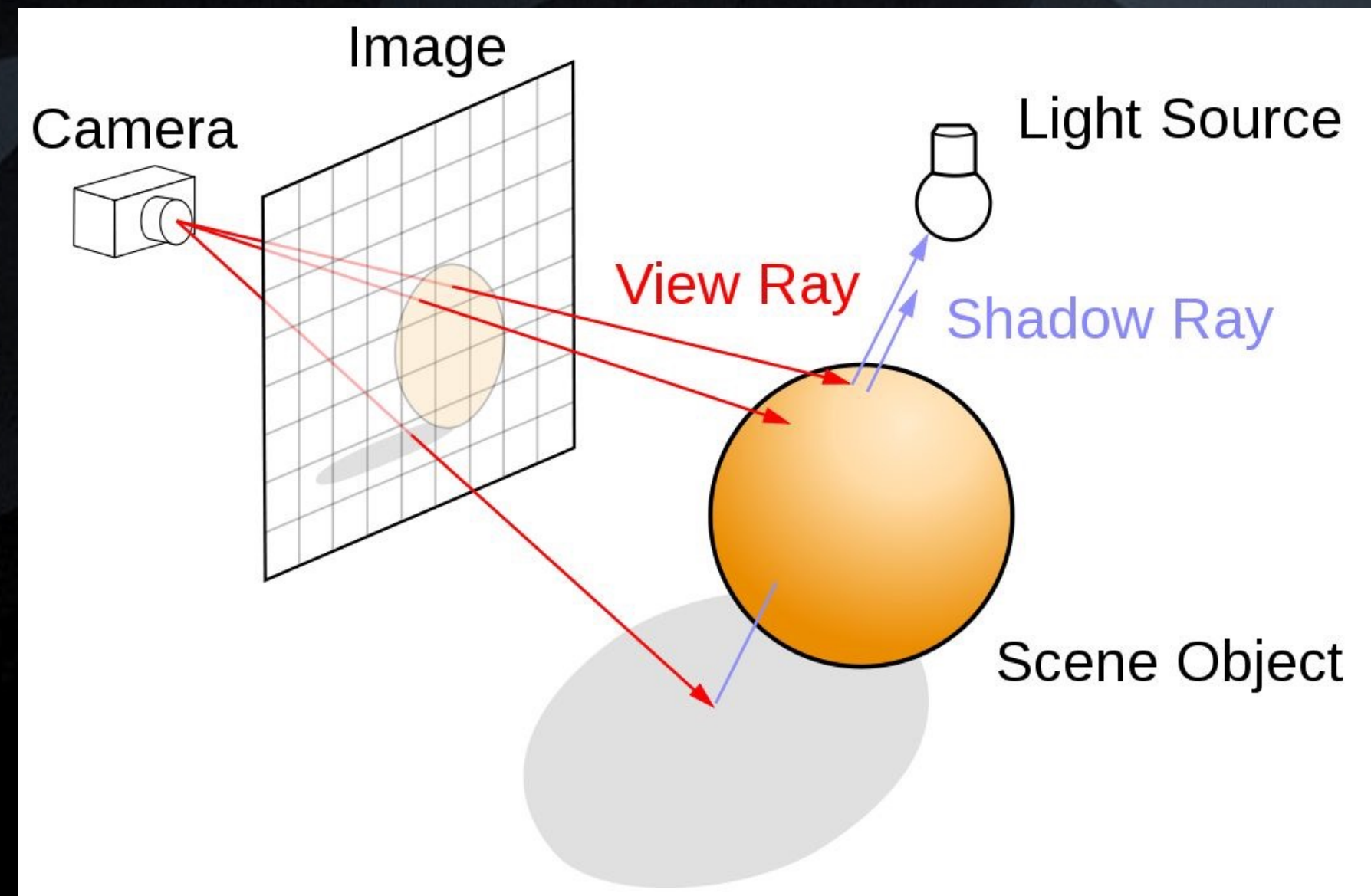
Indirect Diffuse +

Indirect Specular

CG COMPOSITING SERIES

Ray tracing - Direct Lighting

- Ray tracing is a render calculation used to find **Direct Lighting**, shadows, and specular highlights.
- Instead of calculating from the **Light Source** **outwards** and every direction in the scene, it saves time by going from the **Render Camera** **backwards**, only needing to calculate light rays hitting the camera, and necessary for the creating the final image.
- It starts from a pixel on the final render and follows the light path until it reflects off or through a surface/material. It then asks **“Am I directly illuminated by a light source?”** and if so follows the path back to the light source, and determines the distance, intensity, and color of light hitting the surface.
- If the area is not hit by direct light, it renders as black. This calculation ends after the **“first bounce”**.



<https://developer.nvidia.com/discover/ray-tracing>

“Am I directly illuminated by a light source, or not?”



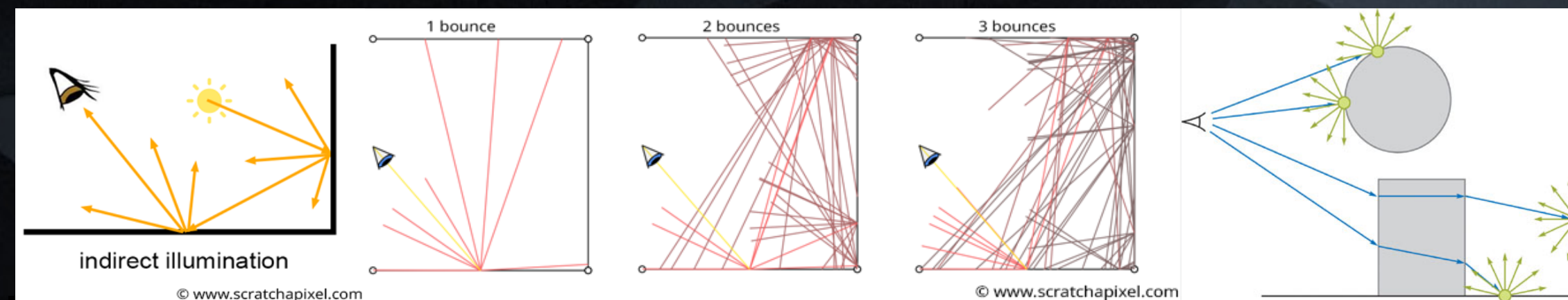
Direct Only

<https://www.dualshockers.com/xbox-one-exclusive-quantum-breaks-wip-screenshots-show-advanced-effects-and-comparisons/>

CG COMPOSITING SERIES

Global Illumination "GI" - Indirect Lighting

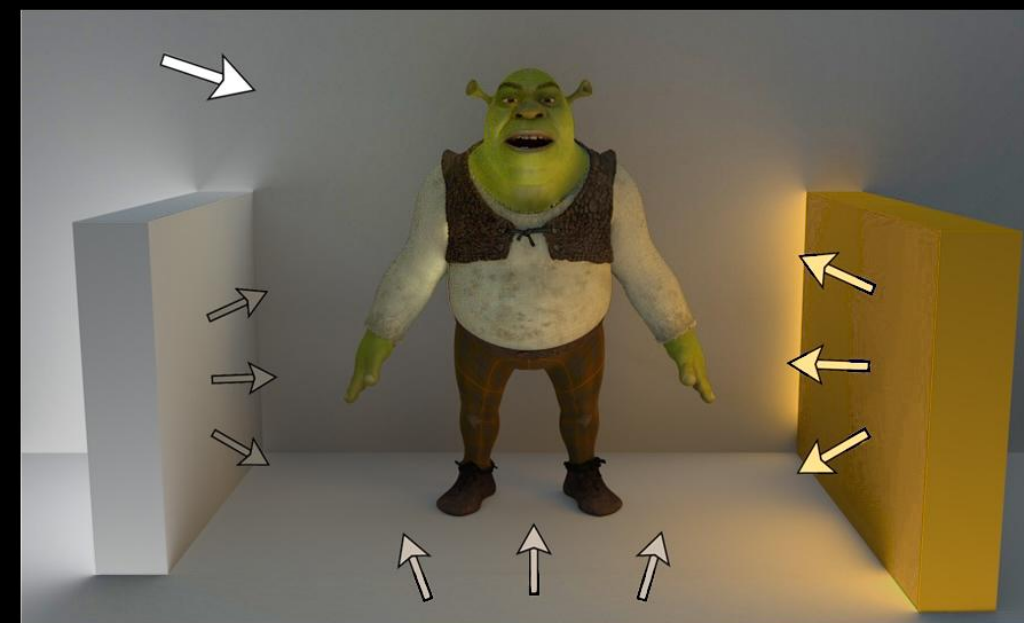
- Global Illumination or "GI" involves various techniques to calculate the indirect lighting that occurs when light **bounces** around in a scene.
- This process helps to subtly illuminate shadowed areas and contributes to the overall color and intensity of the scene, especially around areas that are hit by direct lighting.
- There are often many number of bounces allowed, depending on render time and settings. Each bounce inherits color from objects and materials and further distributes light into the scene.
- The result is a more realistic and natural-looking shot, as it mimics the complex ways light interacts in the real world.



Direct Lighting Only



Indirect Lighting Only

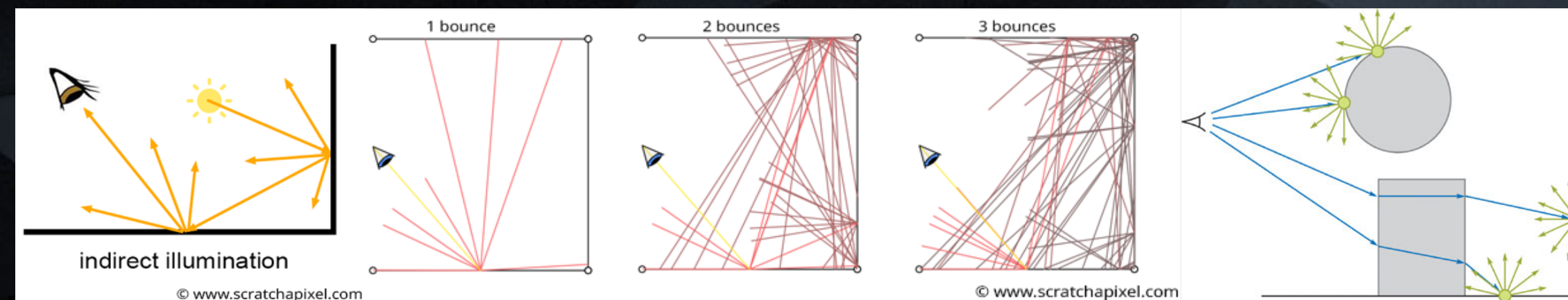


Indirect Only

CG COMPOSITING SERIES

Global Illumination "GI" - Indirect Lighting

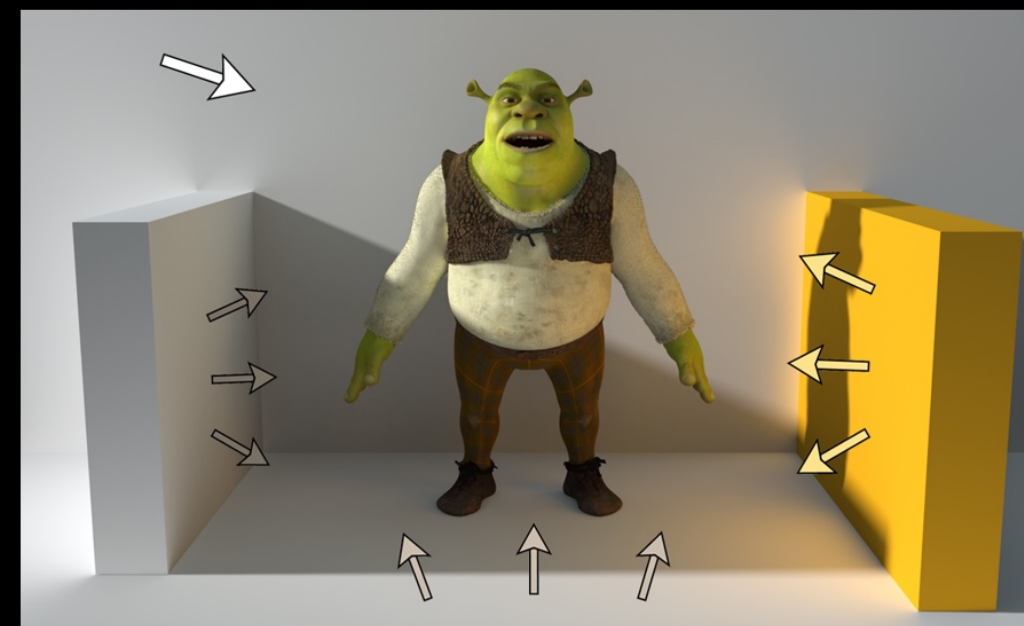
- Global Illumination or "GI" involves various techniques to calculate the indirect lighting that occurs when light **bounces** around in a scene.
- This process helps to subtly illuminate shadowed areas and contributes to the overall color and intensity of the scene, especially around areas that are hit by direct lighting.
- There are often many number of bounces allowed, depending on render time and settings. Each bounce inherits color from objects and materials and further distributes light into the scene.
- The result is a more realistic and natural-looking shot, as it mimics the complex ways light interacts in the real world.



Direct Lighting Only



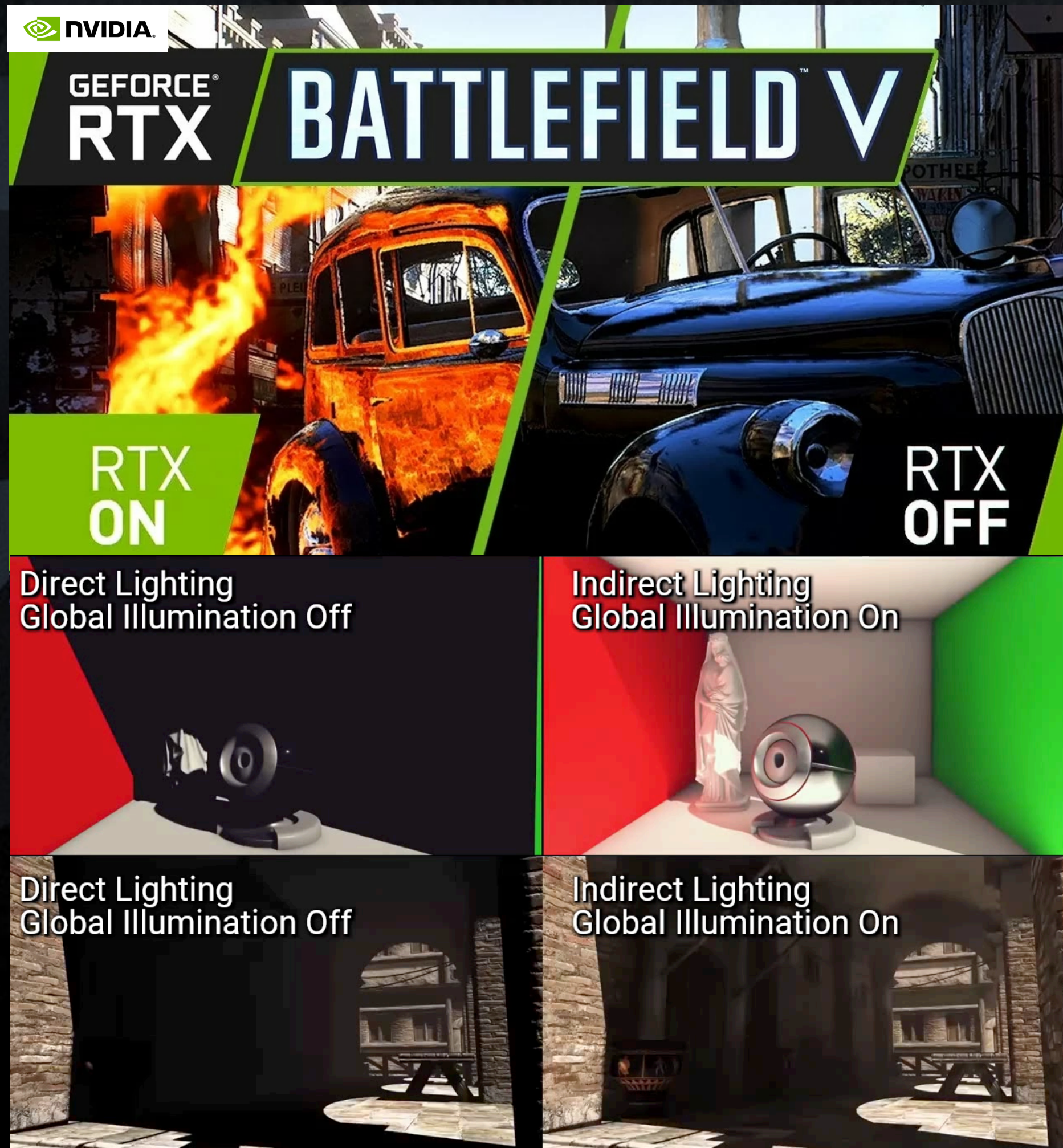
Direct + Indirect Lighting



Direct + Indirect

CG COMPOSITING SERIES

Real-Time Raytracing, Global Illumination, RTX Graphics



Reallusion - iClone 7 Tutorial - Global Illumination
www.reallusion.com/iclone https://youtu.be/wun_Vms_cYQ



**DIVE INTO REAL-TIME
RAY TRACING FOR
ARCHVIZ WITH
UNREAL ENGINE**

WEBINAR



WEBINAR

**Ray tracing with HDRP
NVIDIA webinar**

CG COMPOSITING SERIES

Direct & Indirect

How can we use them in Compositing?

1. Contrast / Color Correction

- Individual control of the mids/lows and highlights. Gives more flexibility over the color correction in order to increase or decrease contrast and better match CG to plate.

2. Filters and FX

- Adding glow filters to Direct Lighting pass to “punch” the lighting and adding some realistic camera lens fx. Using direct or indirect lighting passes to drive other FX and filters.

3. Denoising CG

- Indirect passes (and Sub Surface Scattering) are very expensive renders, and often arrive with some unwanted render noise and chattering. Instead of applying denoise techniques to the whole beauty render, applying denoise to only necessary passes can help preserve details and improve final quality of your renders in comp.