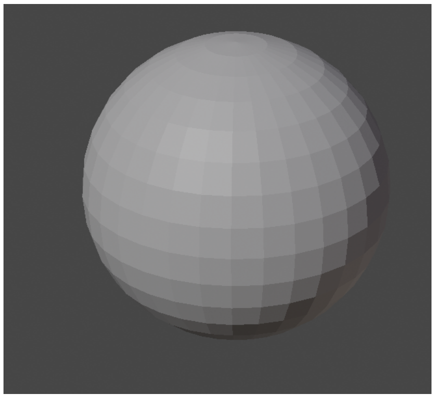
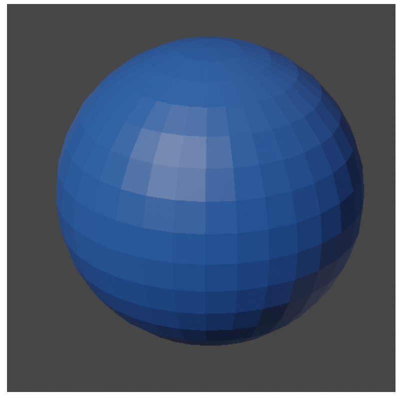
Activity 1: Blender Basics Wesley Garnes

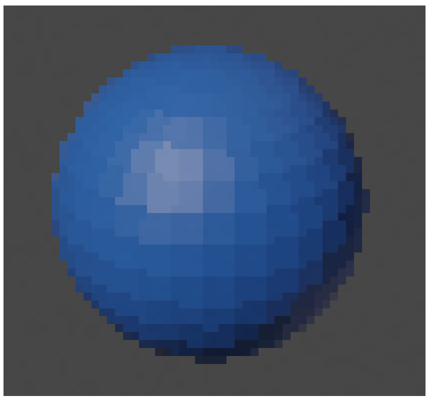
Checkpoint 1:



Checkpoint 2:

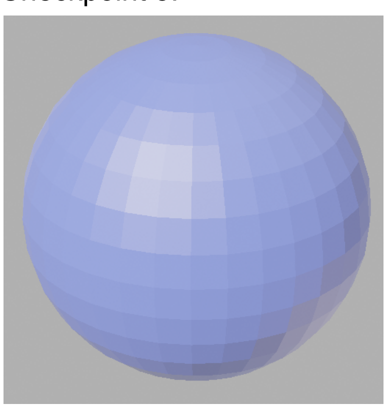


Checkpoint 3:



Checkpoint 4:
Changing the resolution makes the sphere less round. By reducing the number of pixels used for rendering the model becomes less of a realistic sphere. If you reduced it to 1x1 resolution you would have a single square pixel to represent a sphere. This effectively reduced the “realism” of the object and made the edges more blocky and jagged.

Checkpoint 5:



Making a gamma value higher will make shadows darker. A lower gamma makes them brighter. You can see in the image how the darkest visible portion of the sphere (bottom right) is now highlighted and much lighter grey instead of darker black.

1. How does light interact differently with different objects in real life? 3 examples.
   Different objects have different properties such as opacity, reflection and refraction values. A light can pass through clear water. The light will be refracted through the water and “bent”. Light can also be reflected off of the water onto other surfaces.

2. Why do objects appear to have different colors to our eyes?
   Light travels with different wavelengths and frequencies, making up a range of visible and invisible light. Colors are different wavelengths and frequencies within the spectrum of visible light.

3. What’s the advantage of using YUV color space?
   Compression artifacts can be masked or overcome.

4. How are the colors added differently for lights compared to paint? What does RBG equal in each case?
   Adding color to light involves adding colored filters (sometimes Red, Green, Blue (RGB)) for the light to pass through until the desired color is reached. Paint involves mixing different amounts of RBG paint in different quantities to reach the desired color.

5. Why are green screens green?
   Chrominance is used to select a specific hue of green (which is not widely used) to allow images to be displayed over those selected pixels.

6. Why is tone mapping needed for HDR images?
   Tone mapping makes HDR images look more realistic.

7. What’s the relationship between the wavelength of the light and the color of the light? E.g. why is 700 nm associated with red, 400 w/ purple.
   The light spectrum moves from ultraviolet (nonvisible) to visible as the wavelength increases and the frequency decreases. The first visible (from the direction of ultraviolet) is violet. As the wavelength increases from 380nm (violet) to 750nm (red) our visible color spectrum is defined.

R(Y) R(X)

Check 1.

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\frac{\pi}{4} & -\sin\frac{\pi}{4} \\ 0 & \sin & \cos \end{bmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = \begin{matrix} 1 \\ \cos\frac{\pi}{4} - \sin\frac{\pi}{4} \\ \sin\frac{\pi}{4} + \cos\frac{\pi}{4} \end{matrix}$$

$$\begin{bmatrix} \cos\frac{\pi}{4} & 0 & \sin \\ 0 & 1 & 0 \\ -\sin & 0 & \cos \end{bmatrix} \begin{bmatrix} 1 \\ \emptyset \\ \sqrt{2} \end{bmatrix} = \begin{bmatrix} \cos\frac{\pi}{4} + \sqrt{2}\sin\frac{\pi}{4} \\ \emptyset \\ -\sin\frac{\pi}{4} + \sqrt{2}\cos\frac{\pi}{4} \end{bmatrix} = \begin{bmatrix} \frac{\sqrt{2}}{2} + 1 \\ \emptyset \\ -\frac{\sqrt{2}}{2} + 1 \end{bmatrix} = P_{xy}$$

Check 2

$$\begin{bmatrix} \cos\frac{\pi}{4} & 0 & \sin \\ 0 & 1 & 0 \\ -\sin & 0 & \cos \end{bmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = \begin{bmatrix} \cos\frac{\pi}{4} + \sin\frac{\pi}{4} \\ 1 \\ -\sin\frac{\pi}{4} + \cos\frac{\pi}{4} \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos & -\sin \\ 0 & \sin & \cos \end{bmatrix} \begin{bmatrix} \sqrt{2} \\ 1 \\ \emptyset \end{bmatrix} = \begin{bmatrix} \sqrt{2} \\ \cos\frac{\pi}{4} \\ \sin\frac{\pi}{4} \end{bmatrix} = P_{yx}$$

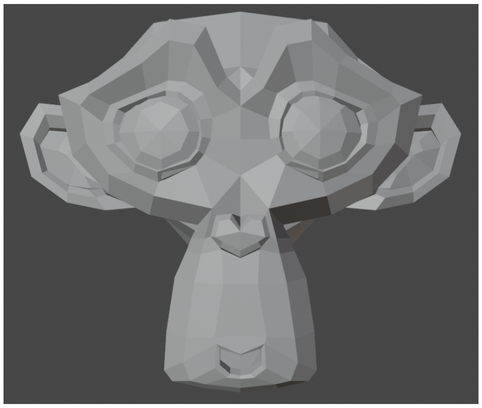
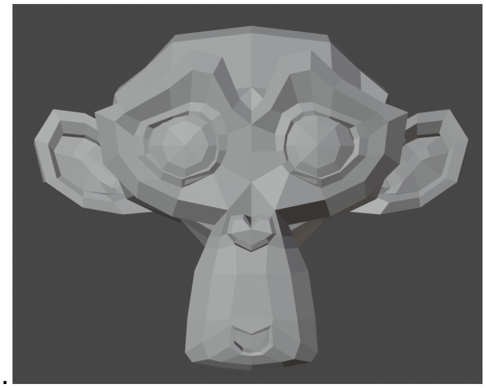
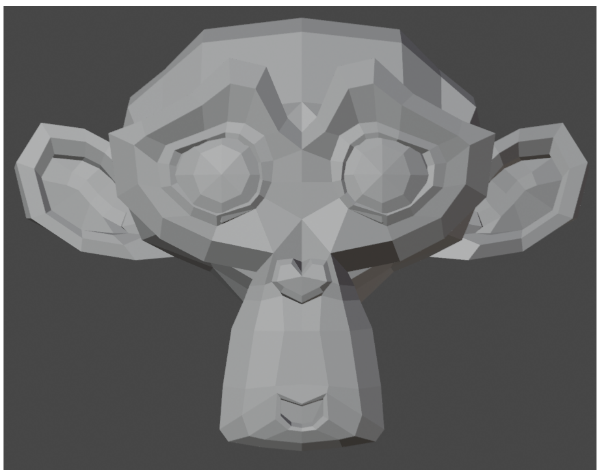
Check 3

$$\begin{matrix} 2 + 1 \\ -1 + 1 \\ 2 + 1 \end{matrix} = \begin{pmatrix} 3 \\ 0 \\ 3 \end{pmatrix} = T_1{}^{world}_{cube}$$

Check 4

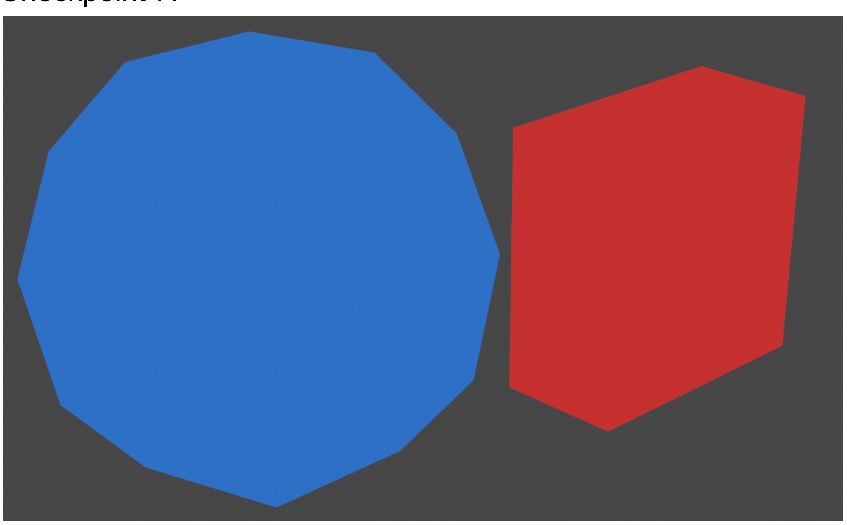
$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & \sqrt{2}/2 & -\sqrt{2}/2 & 1 \\ 0 & \sqrt{2}/2 & \sqrt{2}/2 & 2 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 2 \\ -1 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 2+1=3 \\ \frac{-2\sqrt{2}}{2} = -\sqrt{2} \\ 0 \\ 1 \end{bmatrix} = T^{world}_{cube}$$

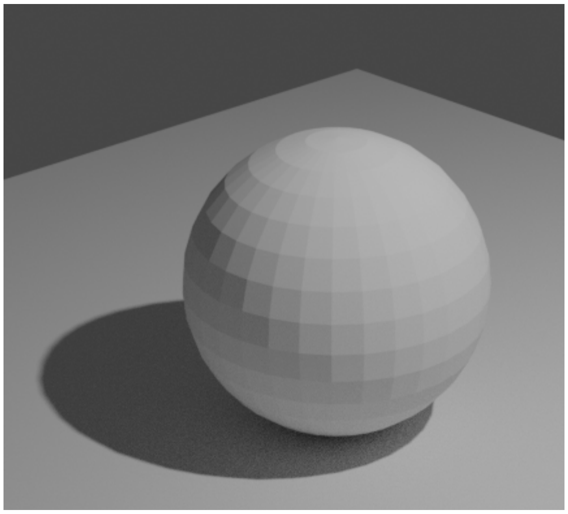
Checkpoint 5:

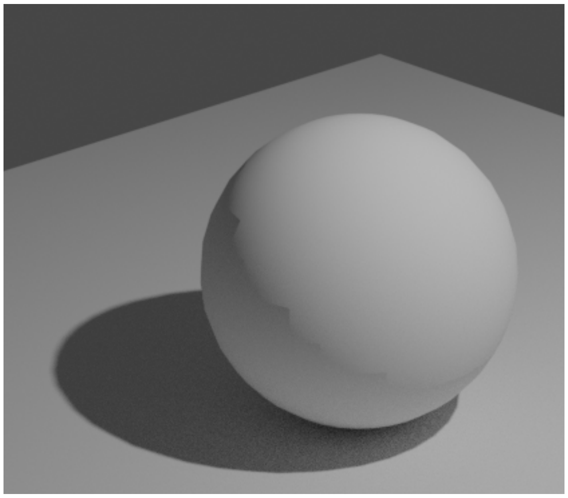
1. 
2. 
3. 

Checkpoint 6:
You can see that as the focal length increased, the focus of the camera moved from the monkeys' brows (closer to the camera) to the monkeys ears (further from the camera). The angle of view decreases and the magnification increases.

Checkpoint 7:



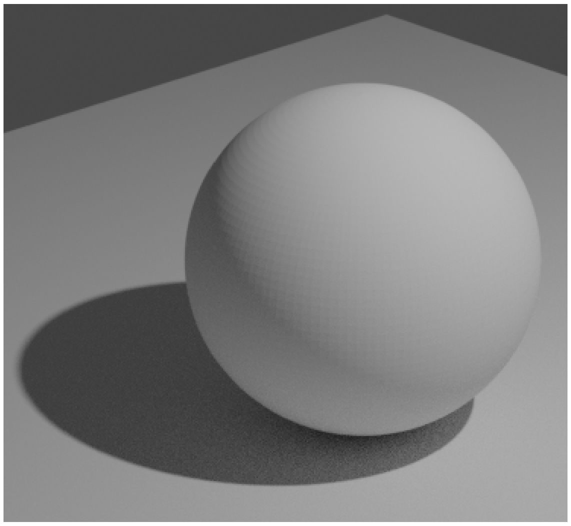
Checkpoint 1.1: 

Checkpoint 1.2: 

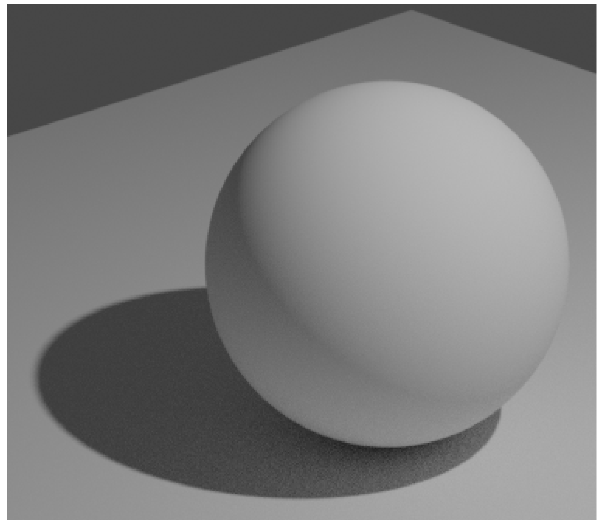
Checkpoint 1.3:

Smooth shading makes the sphere appear pretty smooth. There are still some artifacts along the curved shadow line, but it's pretty good. "The mesh faces will blur at the edges" - https://docs.blender.org/manual/en/latest/modeling/meshes/editing/face/shading.html

Checkpoint 1.4:

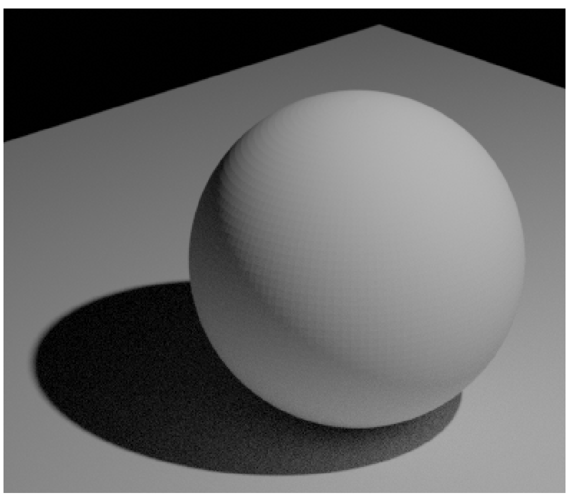


Checkpoint 1.5:



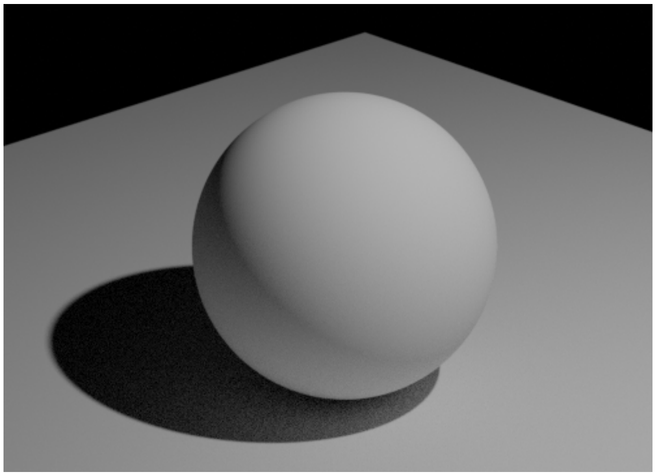
Checkpoint 1.6:
Using subdivision with the shading (smooth or flat) leads to less artifacts and a smoother transition from lighter shades to darker. Using both of these will increase the complexity of the scene, making it a higher quality image that will cost more to render.

Checkpoint 2.1:



The RGB of the lower power image is .0108. The RGB of the higher power image is .0353. The color values become higher as more light is on the pixel.

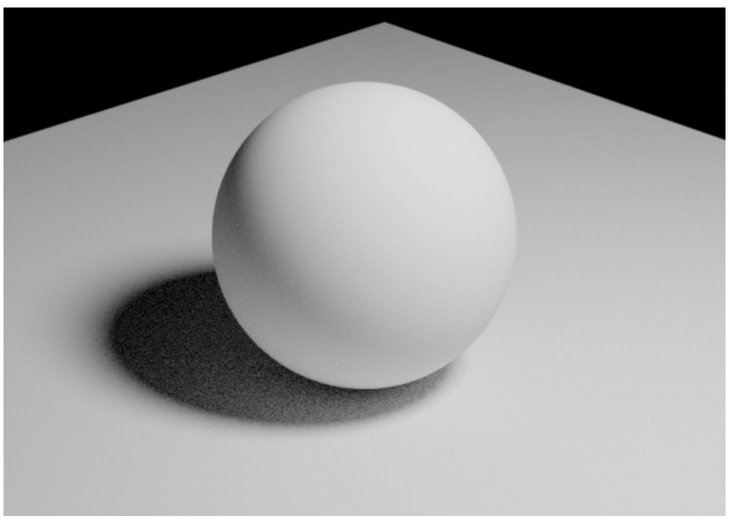
Checkpoint 2.2:
The higher your light power is, the stronger irradiance you will have.

Checkpoint 2.3: 

Checkpoint 2.4:

By moving the light closer you can see more light reaching the plane. The transition from lighter colors to darker on the sphere is also faster.

Checkpoint 2.5:



Checkpoint 2.6:

The area light places much more light onto the plane as well as the ball. The area distribution of the light makes more of the sphere brighter white/grey all around.

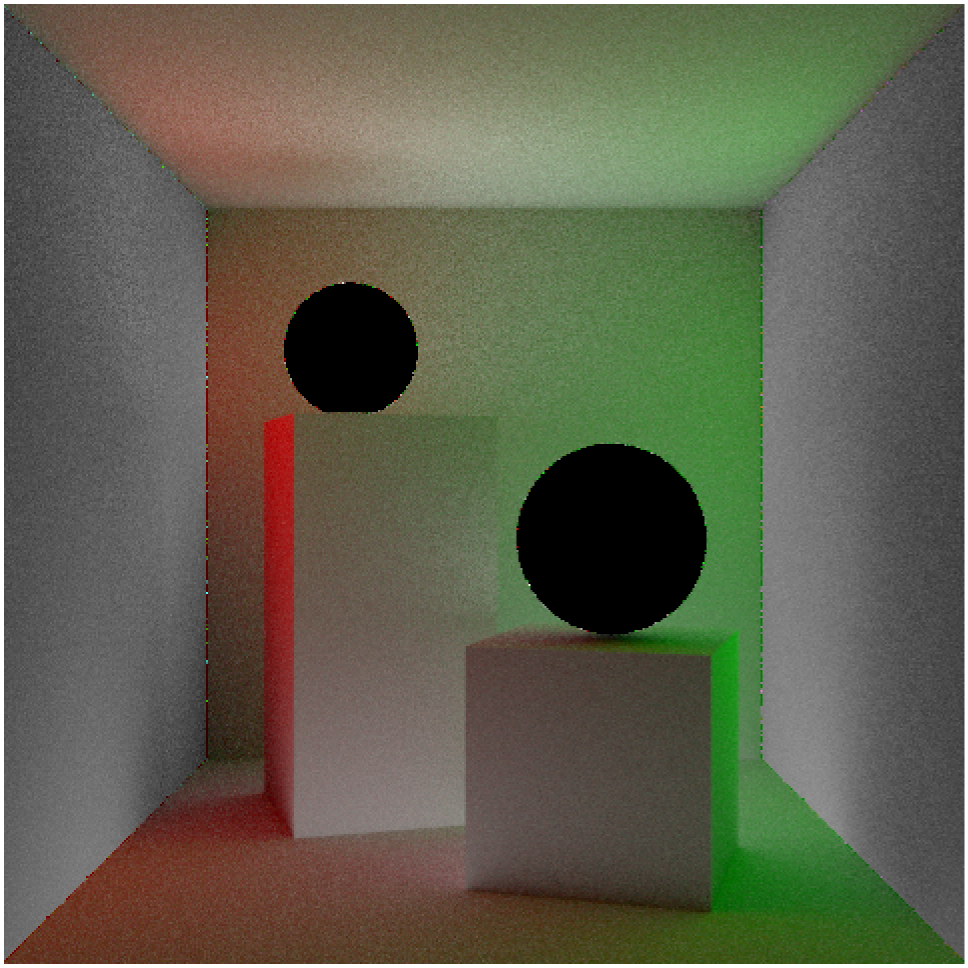
Checkpoint 3:

Checkpoint 4:

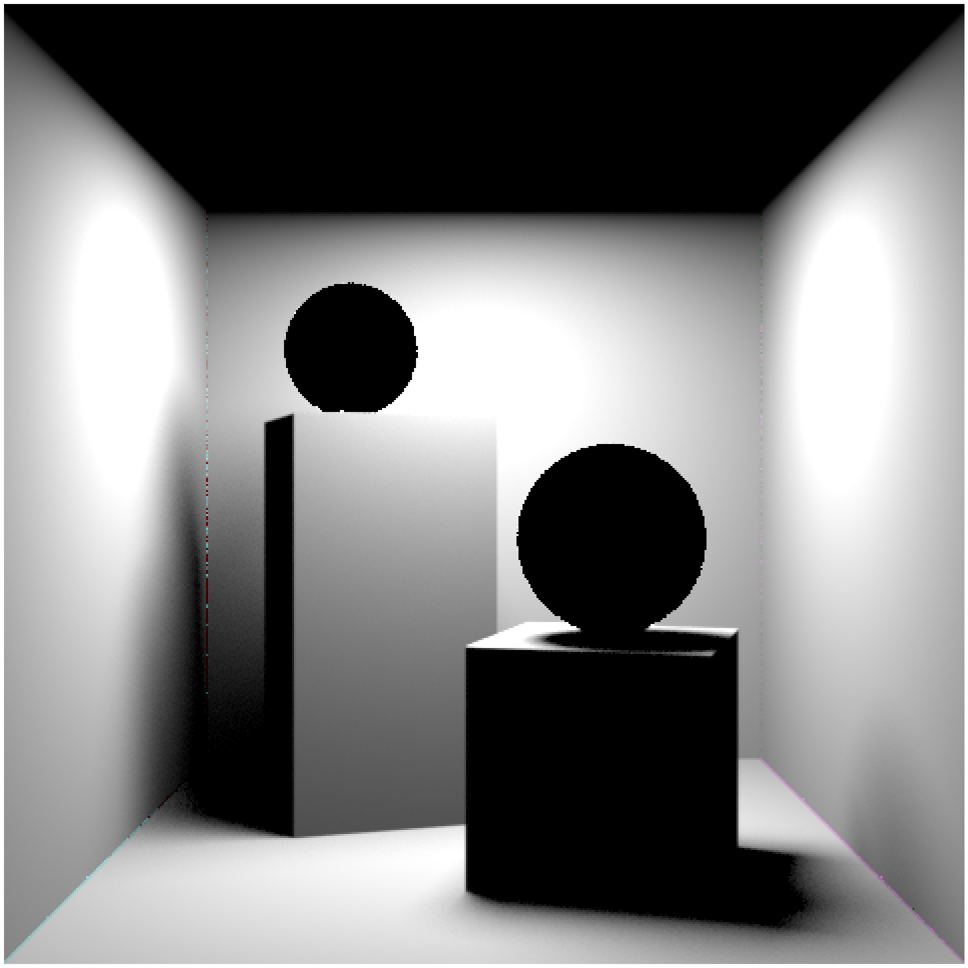
For the sphere I pushed the metallic setting to max. This gave the sphere a very metallic look in that the different pixels took on grey shine. For the plane I changed the plane color and also turned the sheen all the way up. I don't think the sheen had much effect.

For the sphere I changed the emission setting to red. This made the sphere emit a red light which reflected off of the plane. For the plane I turned the transmission to max. This made the surface of the plane greyish brown and somewhat speckled like TV static.

For the sphere I changed the anisotropic setting to max. This created 2 light bands along the top of the sphere which make it look like there are 2 light rings illuminating the area. For the plane I turned the specular setting to max. I don’t think this had much effect at all.

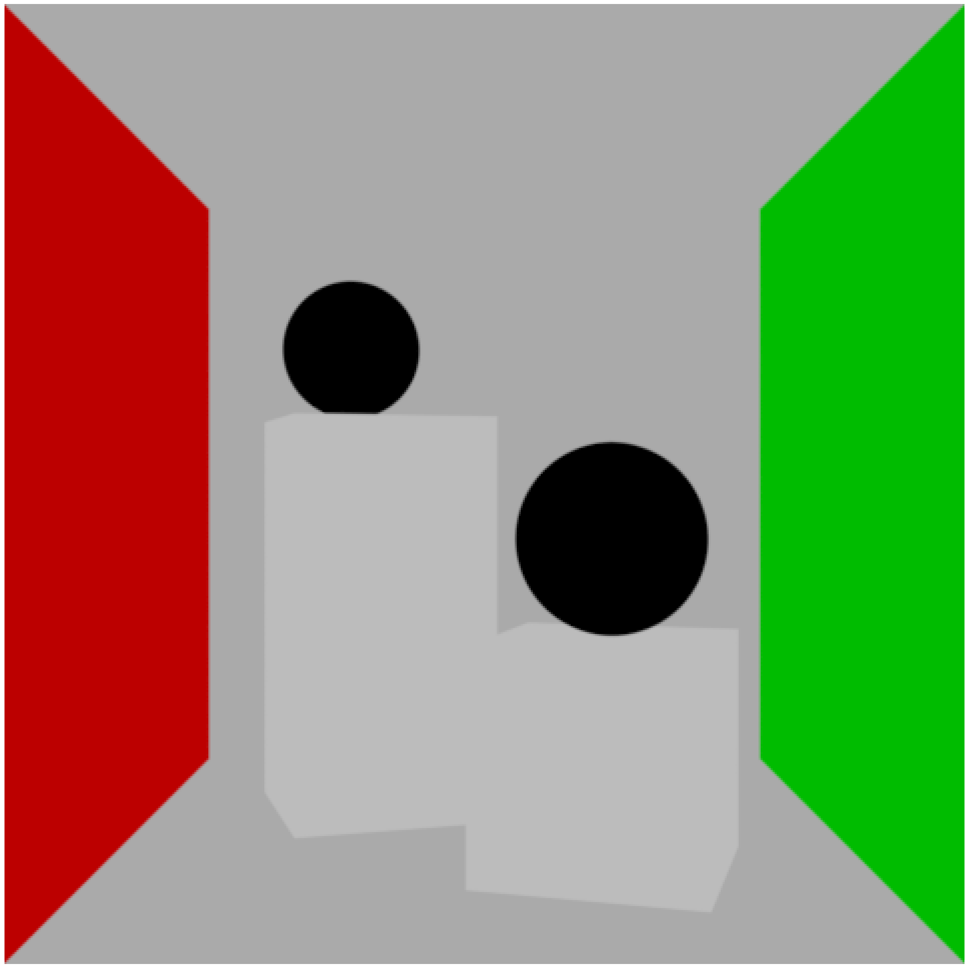
Diffuse Indirect: 

Diffuse lighting is lighting that is spread out over an area. Indirect lighting falls outside of the directed scope of the light. This pass shows only this type of lighting. Notice the spheres are black.



Diffuse Direct:

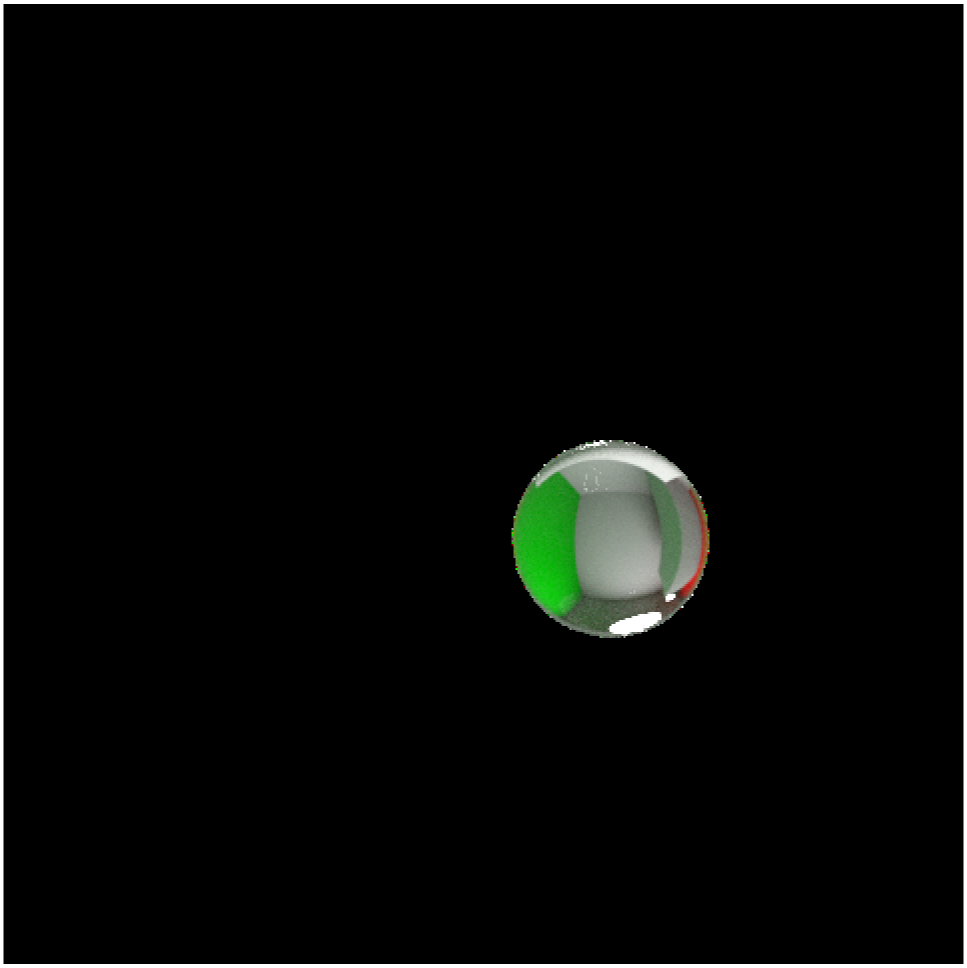
Diffuse lighting is lighting that is spread out over an area. Direct lighting falls in the direct path of the rays from the light source. This pass shows only this type of lighting.



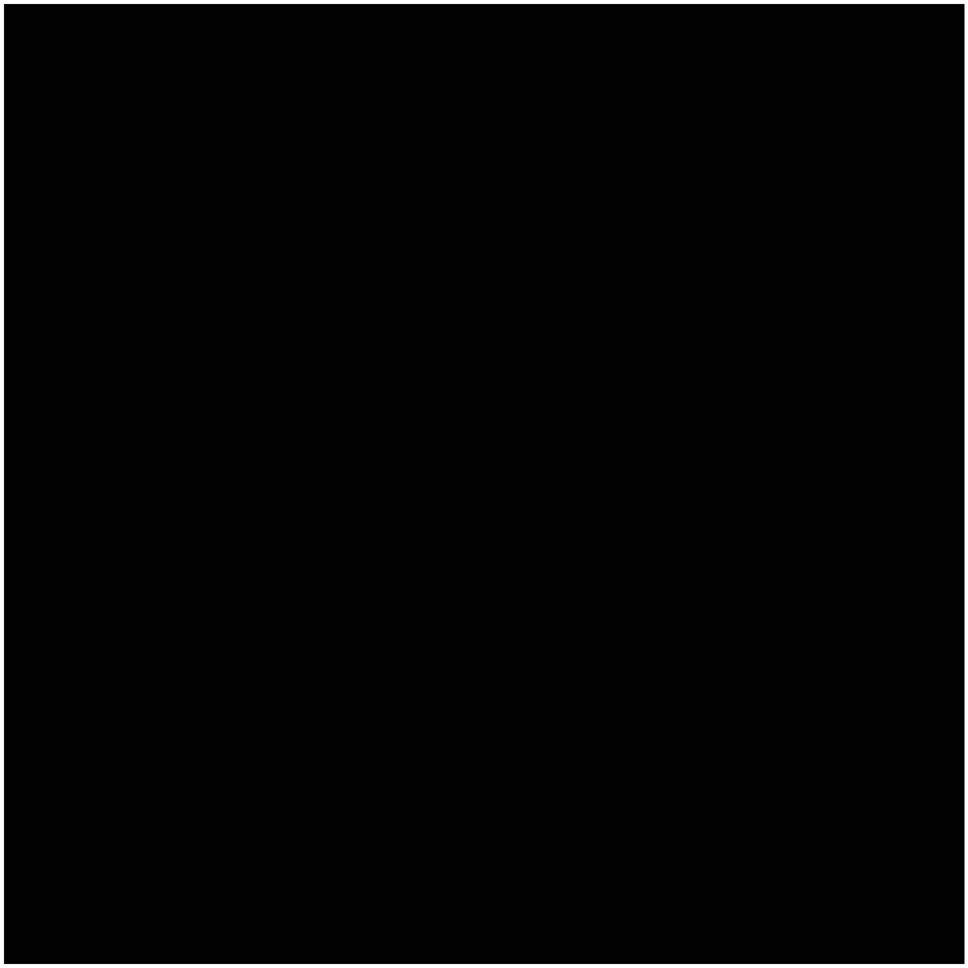
Diffuse Color:

Diffuse color is the basic color of the object. The spheres are black. The left wall is red. The right wall is green. Everything else is grey.

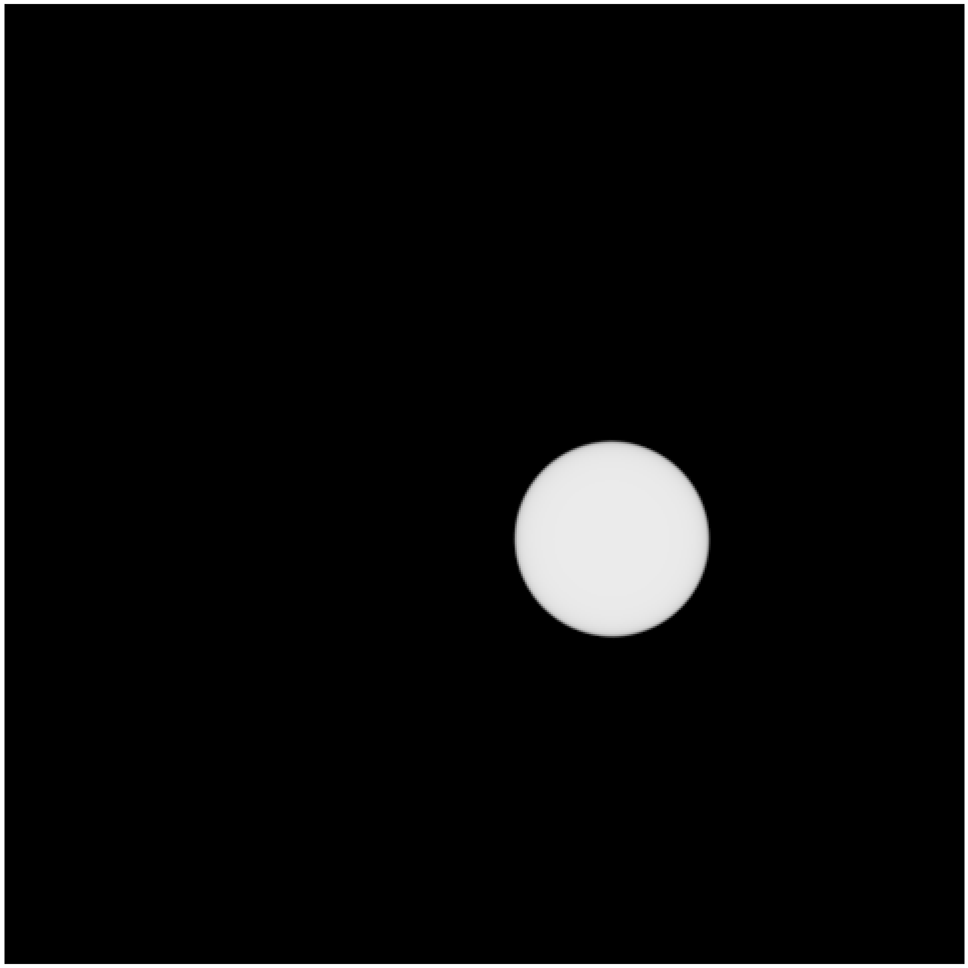
Transmission Indirect:



Transmission light is light that passes through an object. Notice that only one sphere is lit here. This is also indirect, so the light passes indirectly through the sphere.

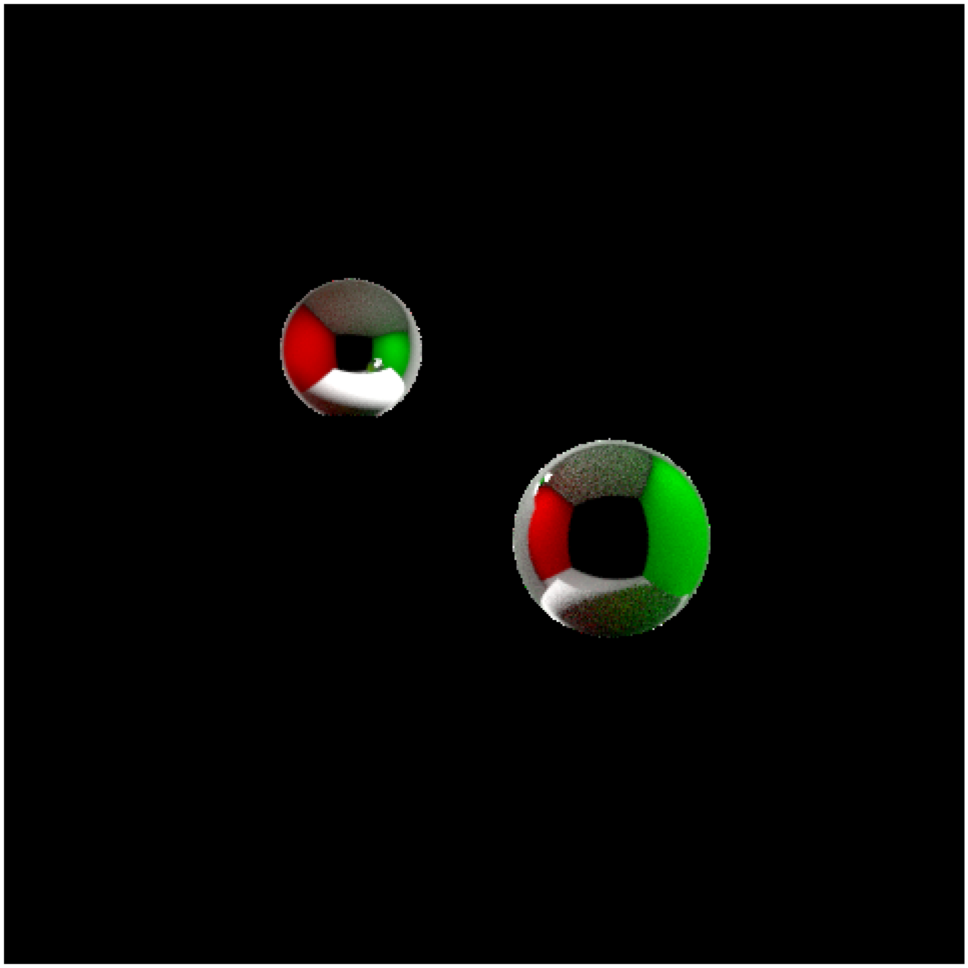
Transmission Direct: 

It appears that no light passes directly through any objects.

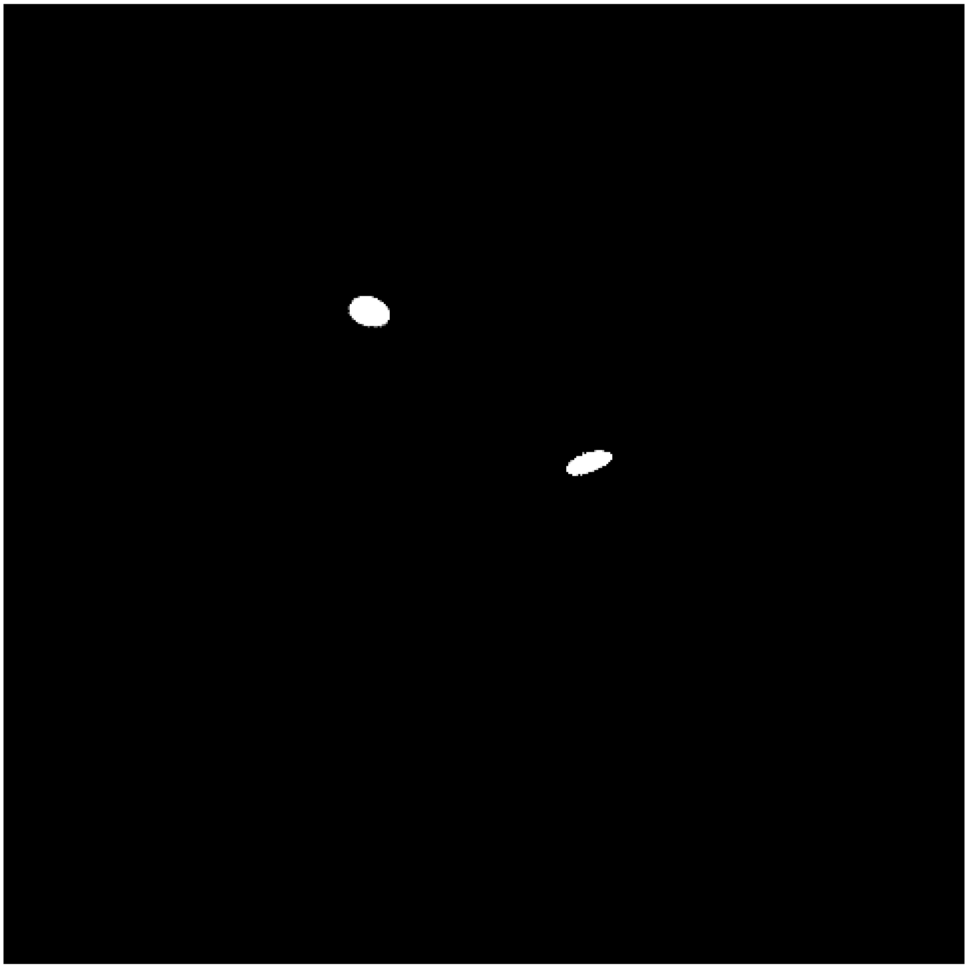


Transmission Color:

This sphere appears to transmit the color grey.

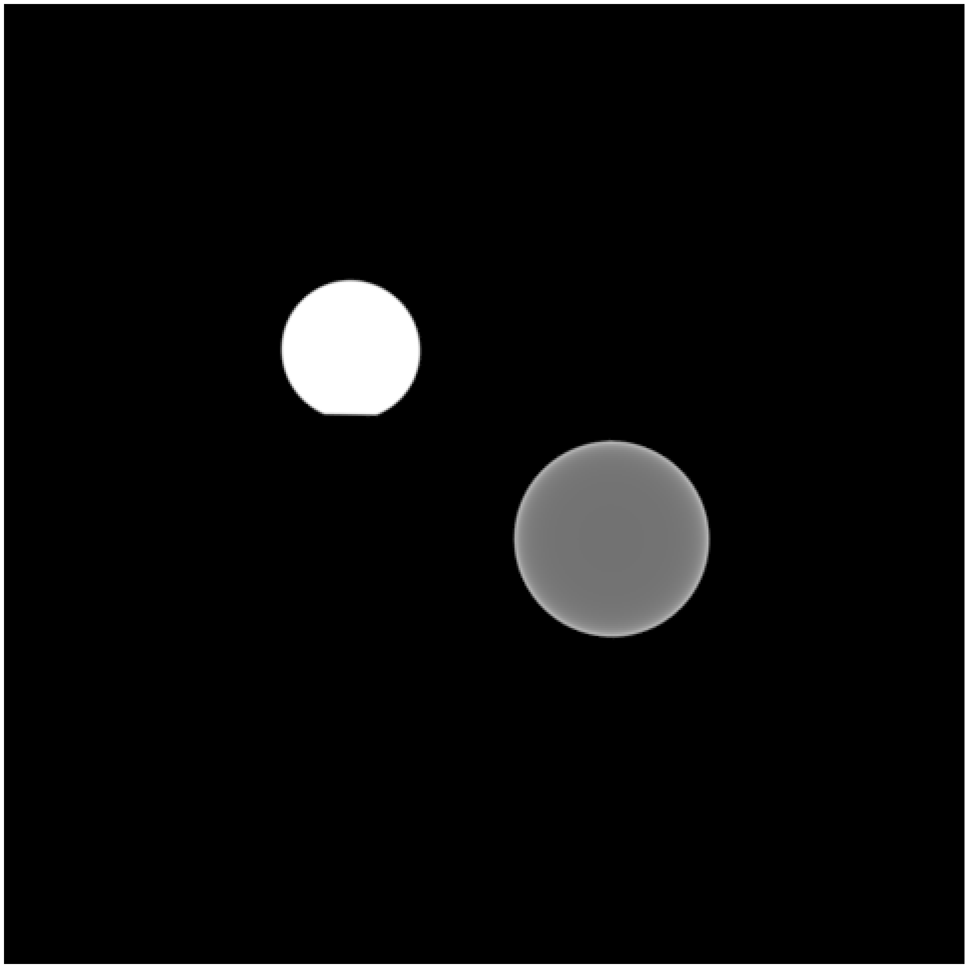
Gloss Indirect: 

Gloss light is light that is reflected off of a surface. Those reflections can be sharp or blurry. Only the 2 spheres reflect light. This light is also indirect.

Gloss Direct: 

This is the light that is directly reflecting off of the spheres.

Activity 4 Blender Wesley Garnes



Gloss Color:
The spheres have 2 different colors. One a bright white, the other a medium grey.

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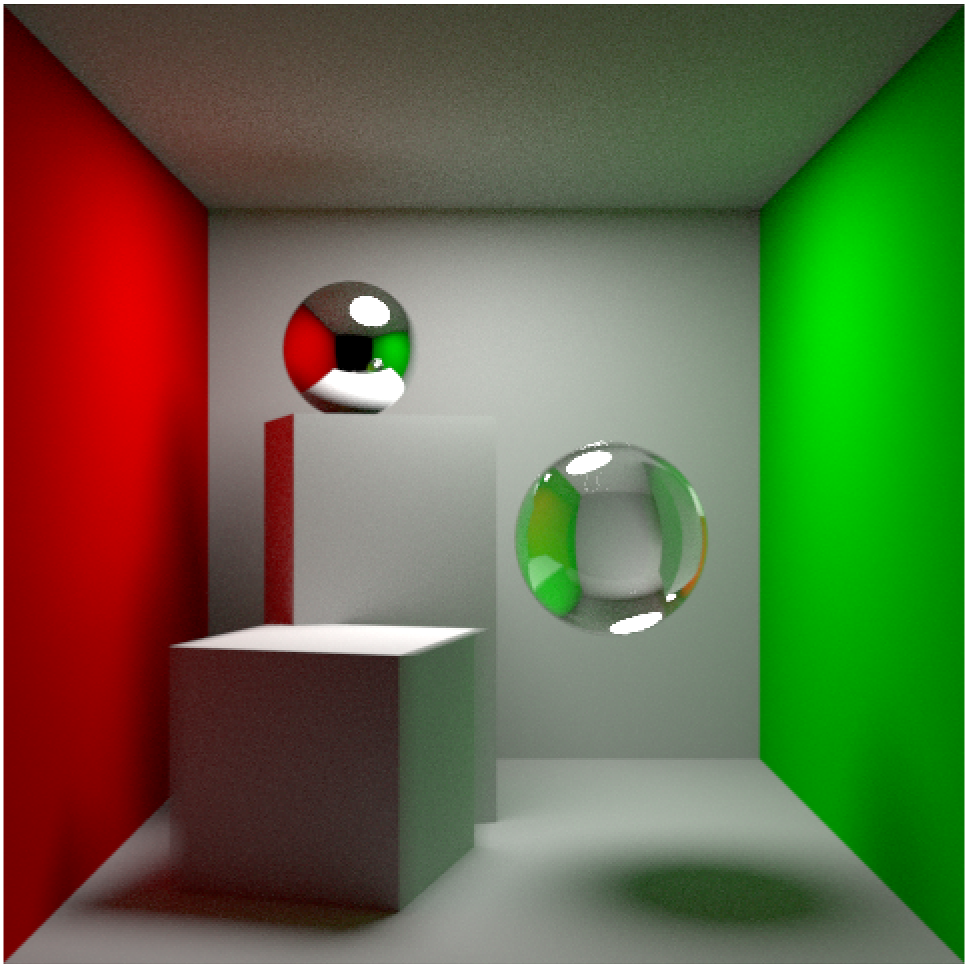
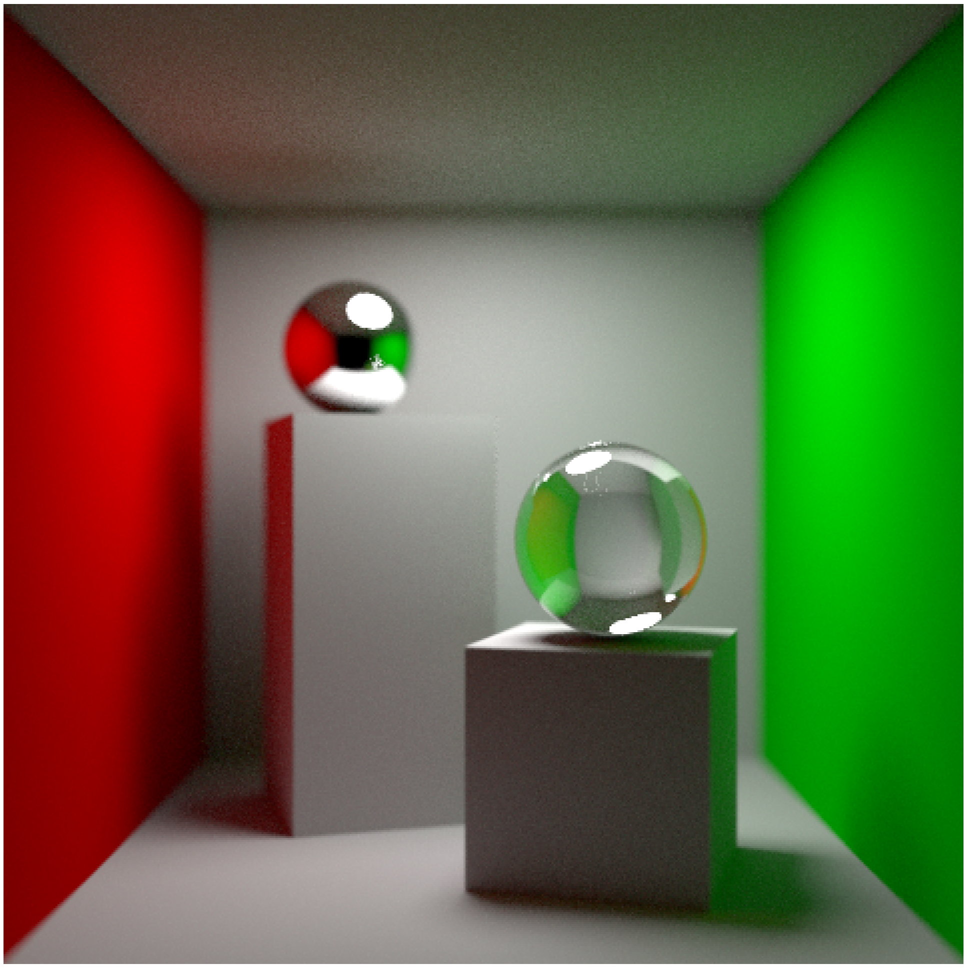
Checkpoint 2:



Blur:

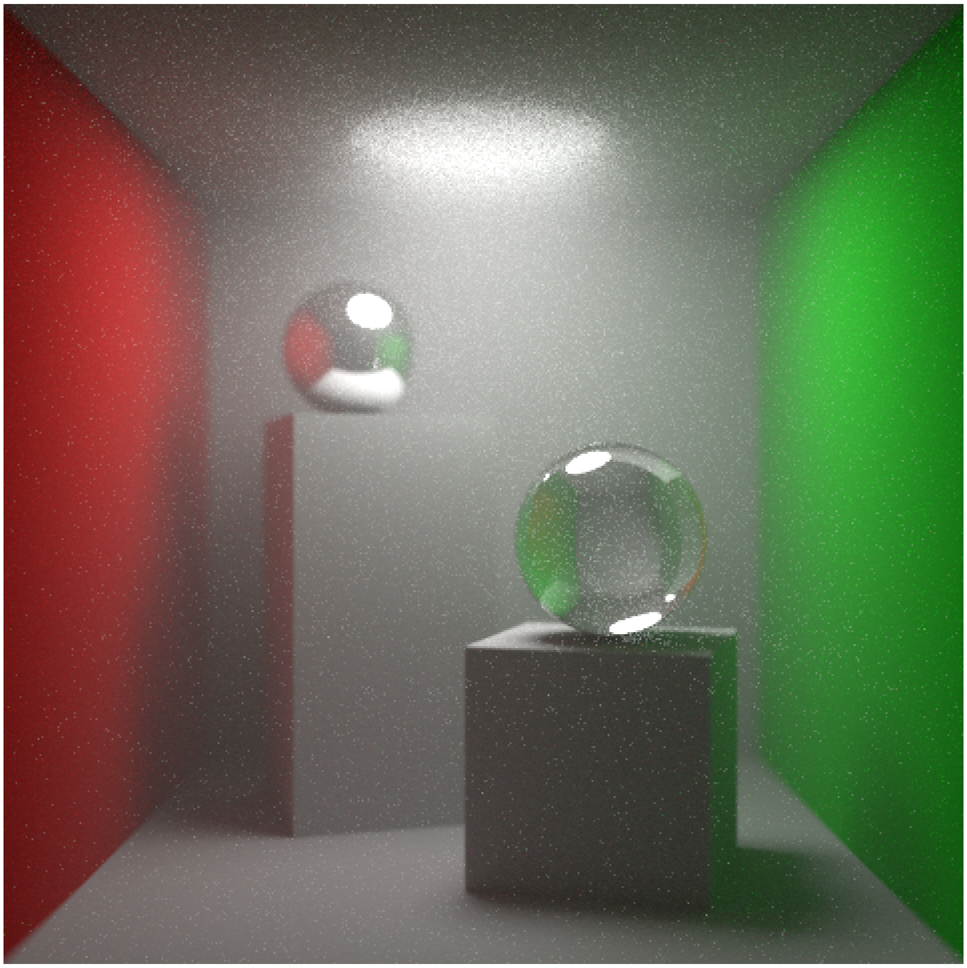
The motion blur has made the edges of the box blurry, particularly the trailing (left) edge. The box is moving to the right.

Checkpoint 3:



The camera has focused onto the frontmost sphere. The aperture is set to .1 making the majority of the sphere appear sharp in detail.

Checkpoint 4:

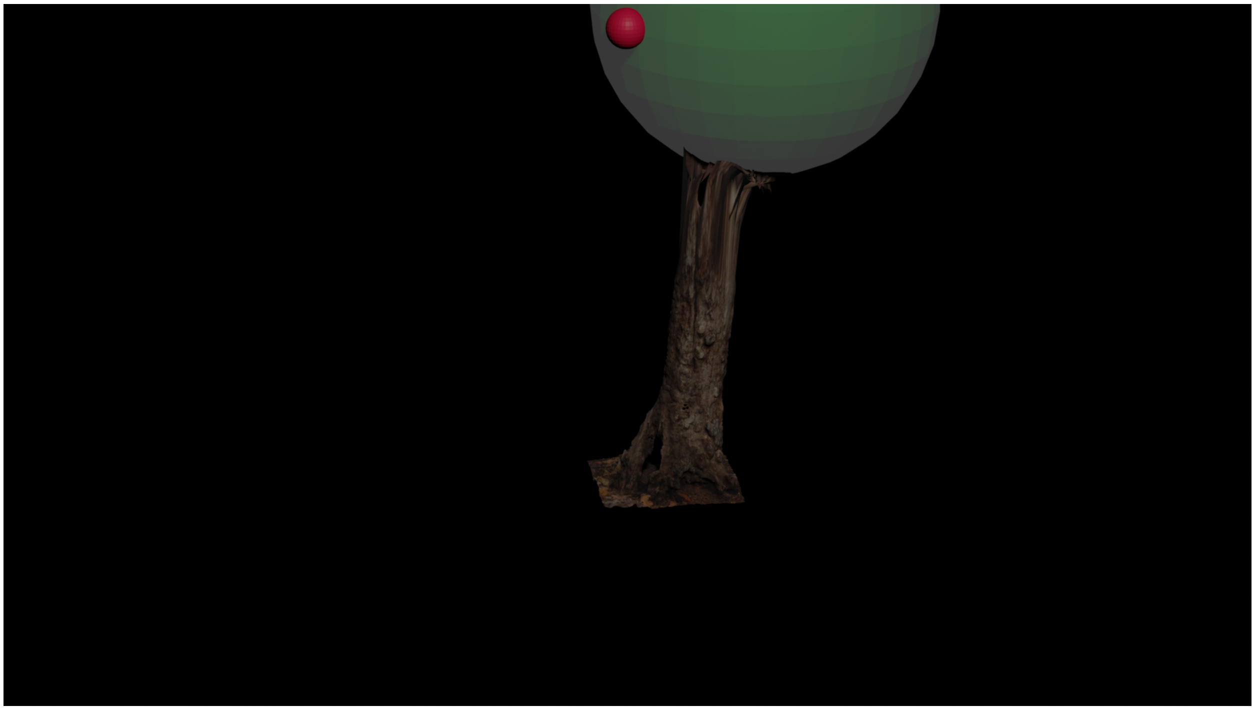


The volumetric absorption makes the scene appear entirely different. Light is absorbed as it passes through the material of the cube. This makes for a foggy effect.

Checkpoint 1:
I uploaded my own model that I built for the class project.

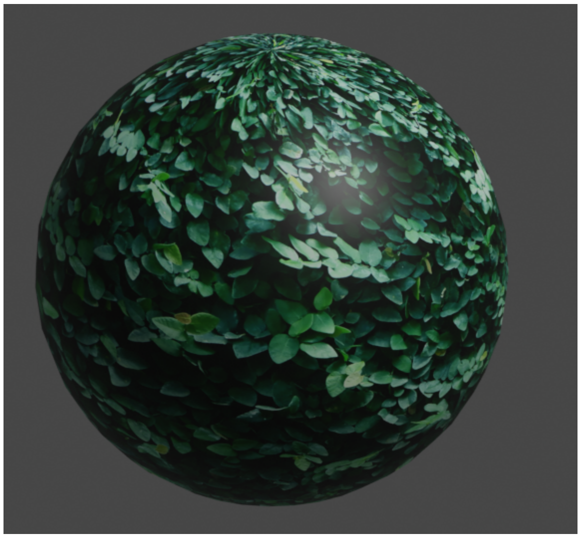
Checkpoint 2:

I extruded the top portion of the tree and used “smooth”, “blob” and a few other tools to play with the geometry. I also set a background image but it’s not working for some reason.
More Below ---V

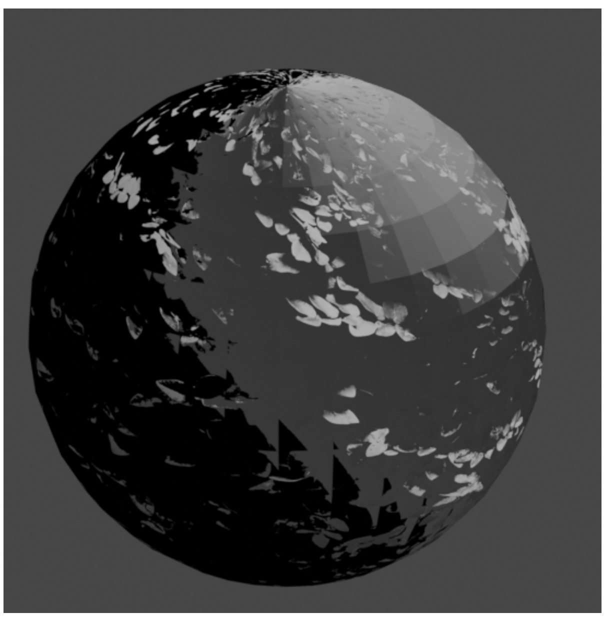


The beginnings of an apple tree.

Chkpt 2.1

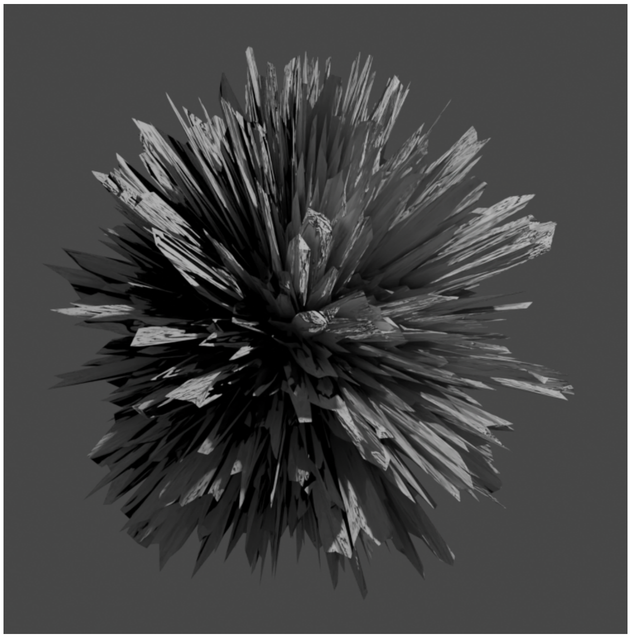


Chkpt 2.2



The normal map is supposed to help apply a texture. It doesn't seem to have changed much here.

Chkpt 2.3



The displacement map displaced points according to texture points within the image it seems. The image contained some black spots between leaves which seems to have really affected the render.

This did not look how I wanted it so I changed some of the settings.

This was a little better. More usable. Apple tree below.


The apple tree doesn’t look too bad.