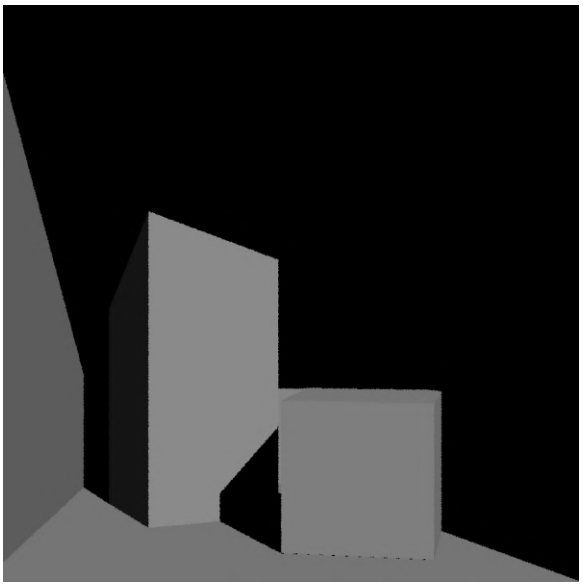
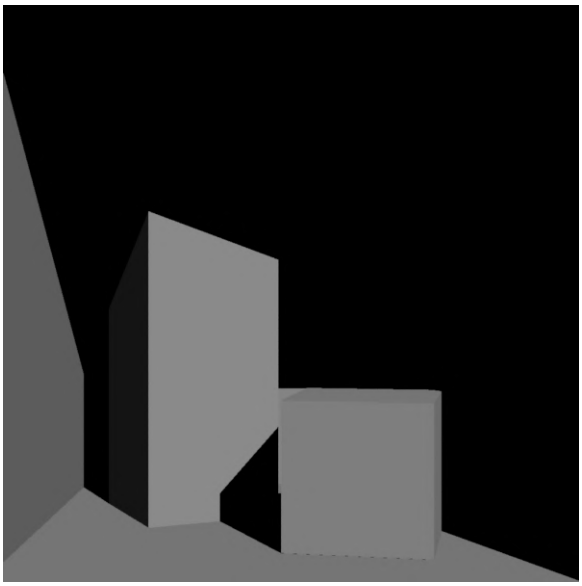
REPORT

NAME: G.Bharath

ROLL NO: 2022101044

2 Pixel Subsampling for Anti-aliasing:

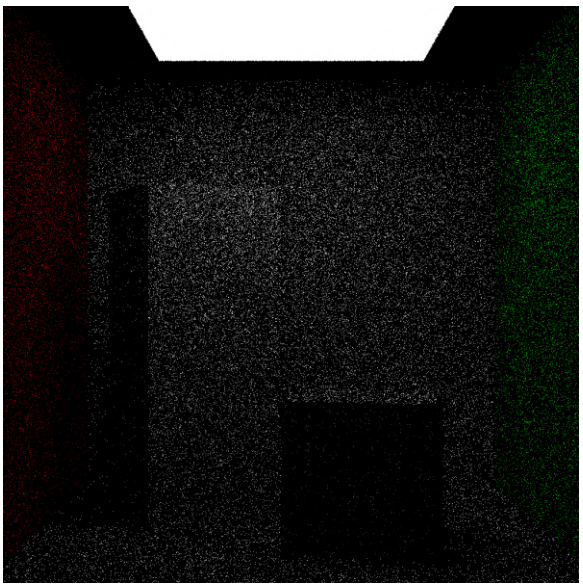


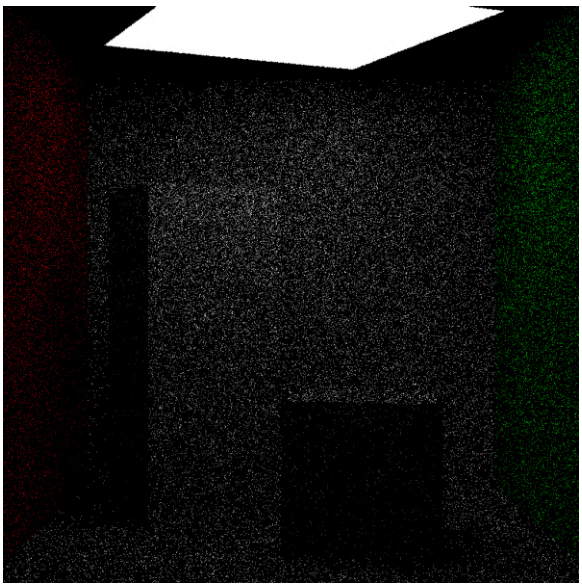


Render Time: 1015.398010 ms - 1spp(left)

Render Time: 27934.199219 ms - 32spp(right)

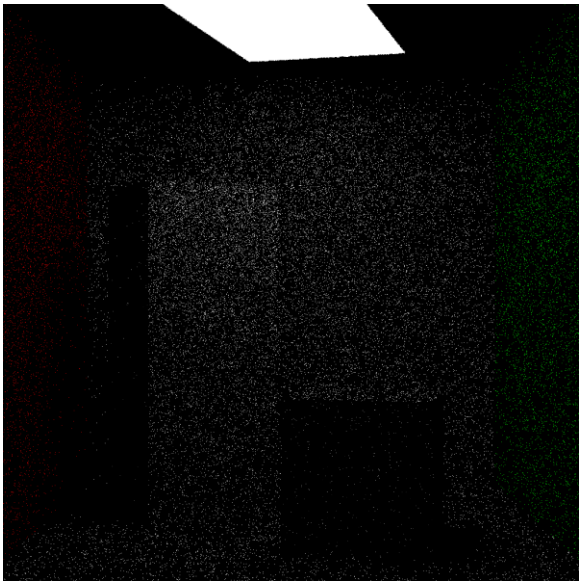
3 Area Light Support:

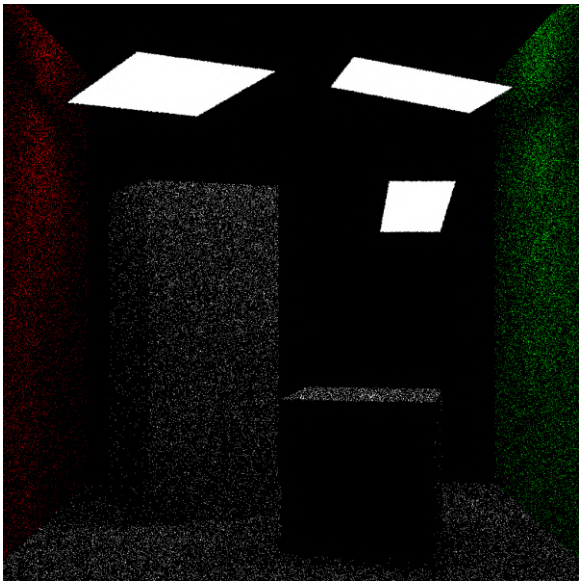




Render Time: 992.908020 ms -scene-1(left)

Render Time: 990.086975 ms -scene-2(right)

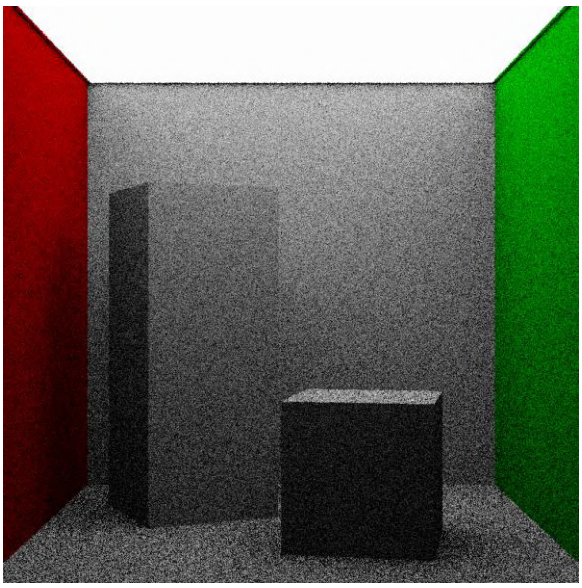


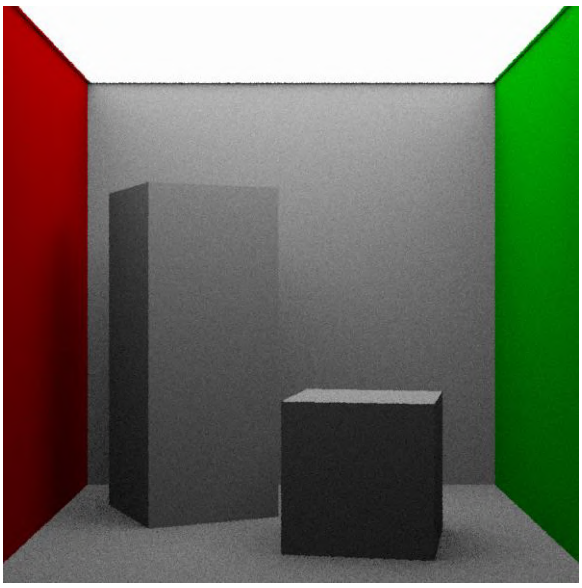


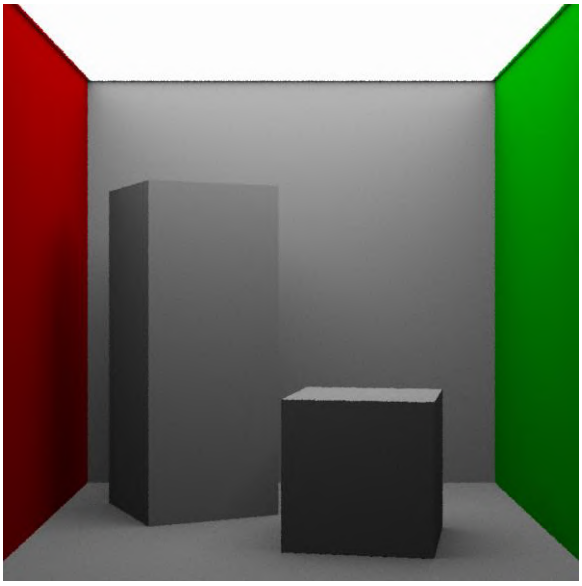
Render Time: 987.151978 ms -scene-3(left)

Render Time: 2540.245117 ms –scene-4(right)

4.1 Uniform Hemisphere Sampling:



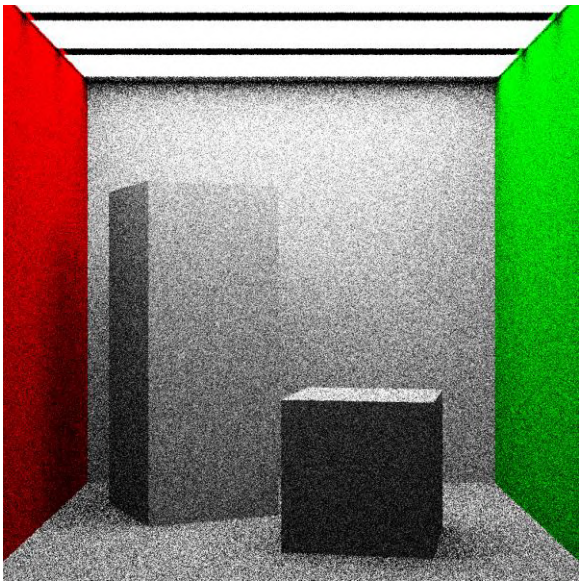


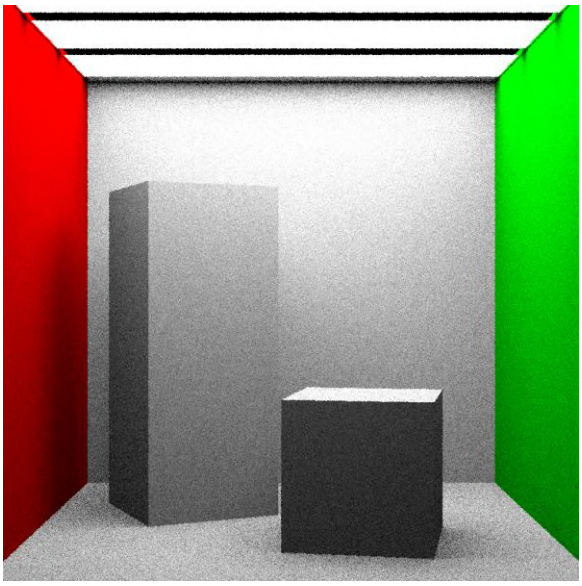


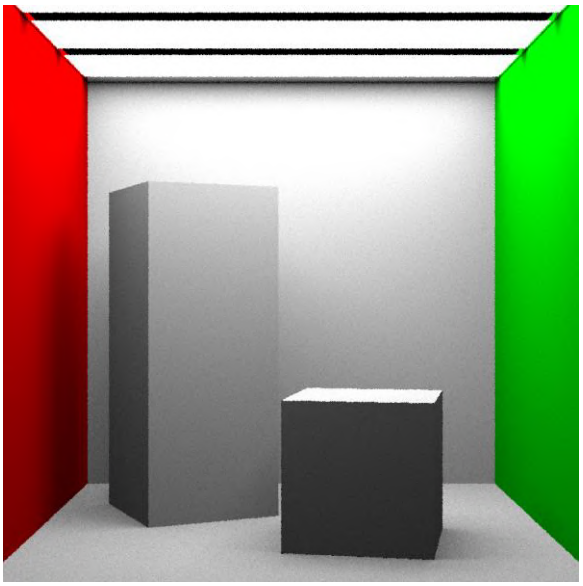
Render Time: 5718.354004 ms -big 10spp (top left)

Render Time: 51758.226562 ms -big 100spp (top right)

Render Time: 572359.375000 ms –big 1000spp (bottom)



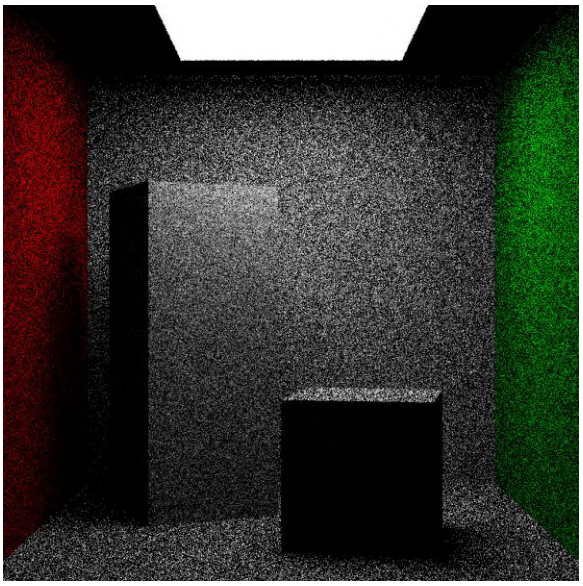


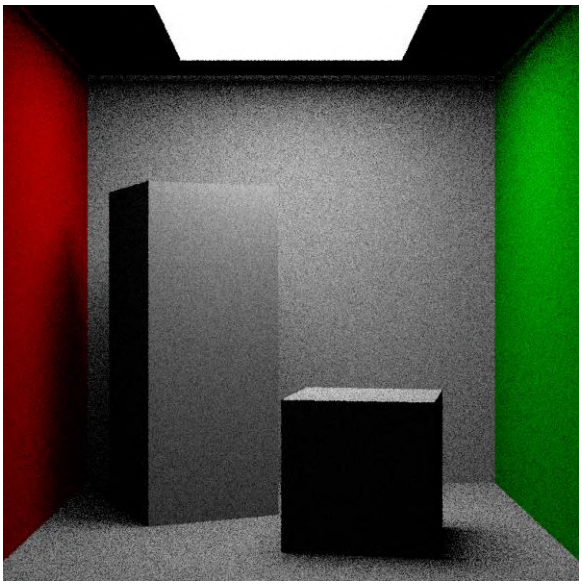


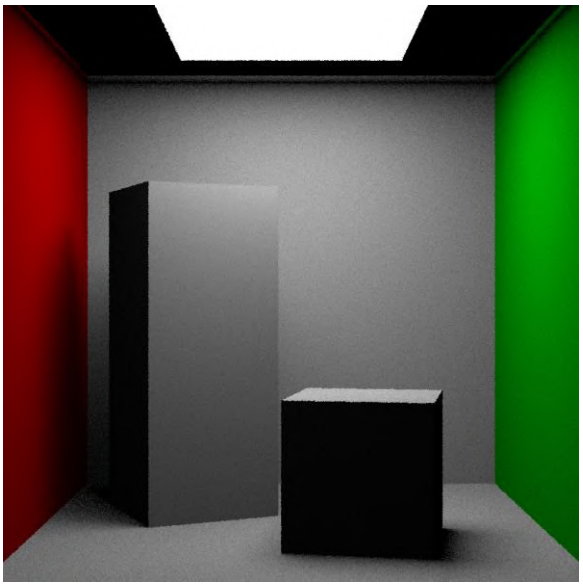
Render Time: 21494.757812 ms -many 10spp (top left)

Render Time: 214928.312500 ms -many 100spp (top right)

Render Time: 2071061.750000 ms –many 1000spp (bottom)



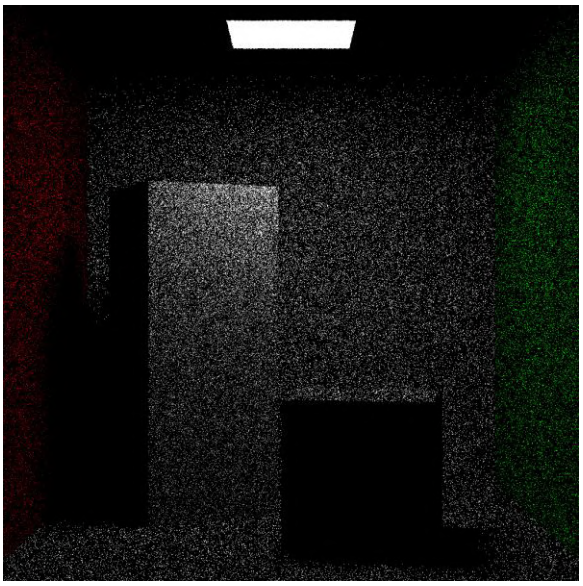


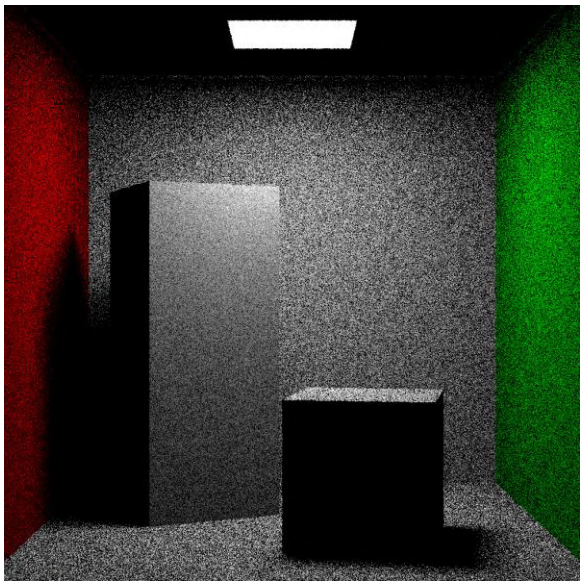


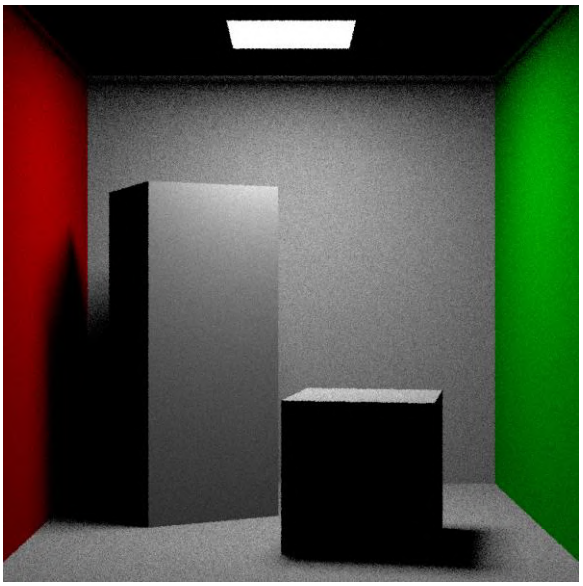
Render Time: 6725.521973 ms -med 10spp (top left)

Render Time: 58976.574219 ms -med 100spp (top right)

Render Time: 587689.125000 ms –med 1000spp (bottom)





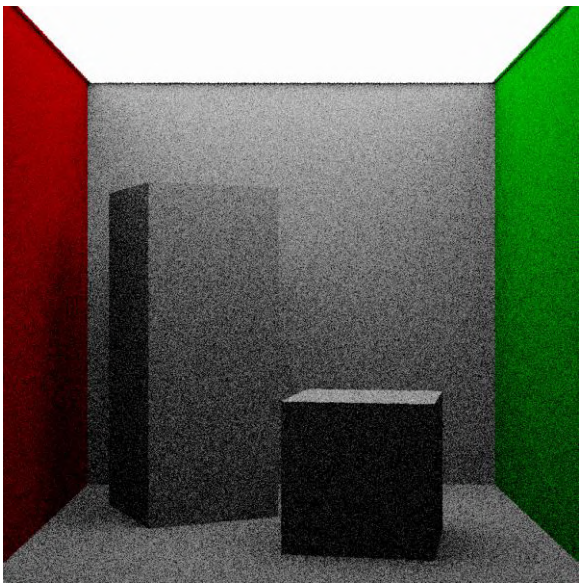


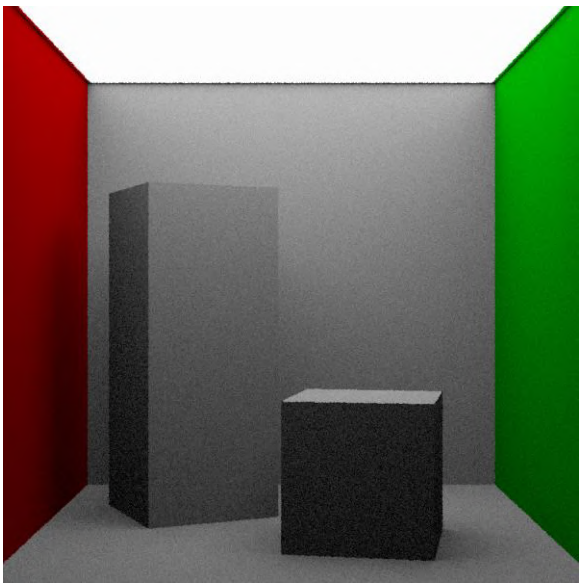
Render Time: 5734.851074 ms -small 10spp (top left)

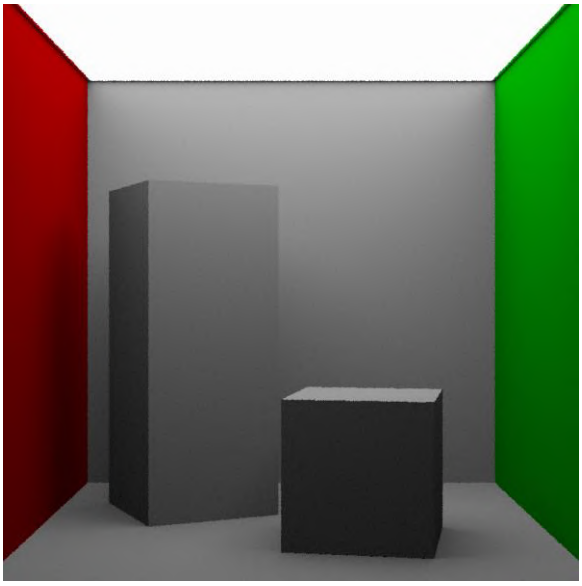
Render Time: 54719.910156 ms -small 100spp (top right)

Render Time: 561029.250000 ms –small 1000spp (bottom)

4.2 Cosine Weighted Sampling:



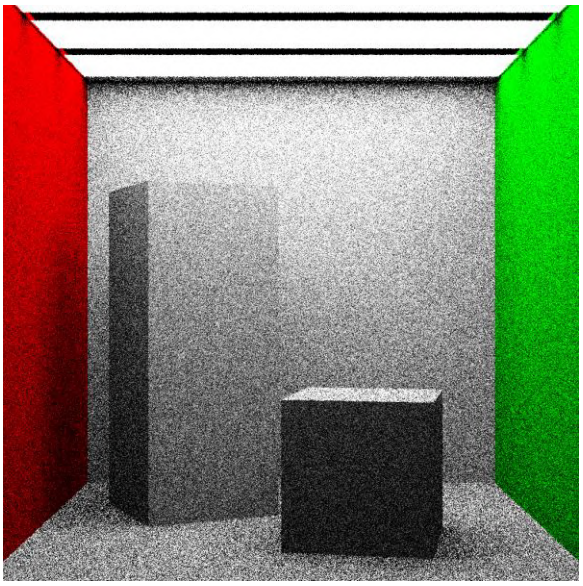


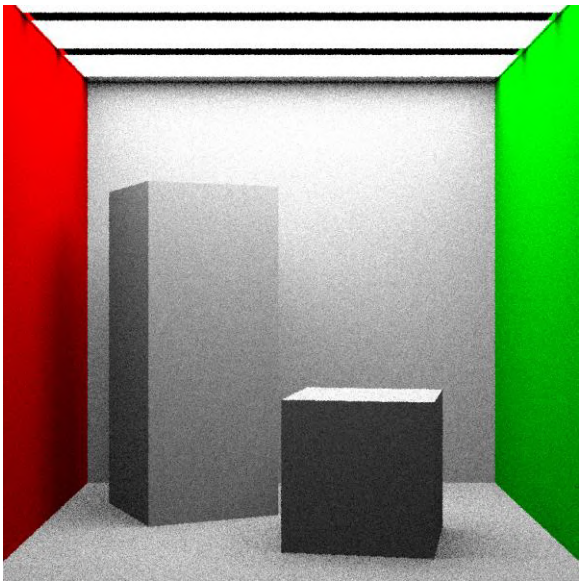


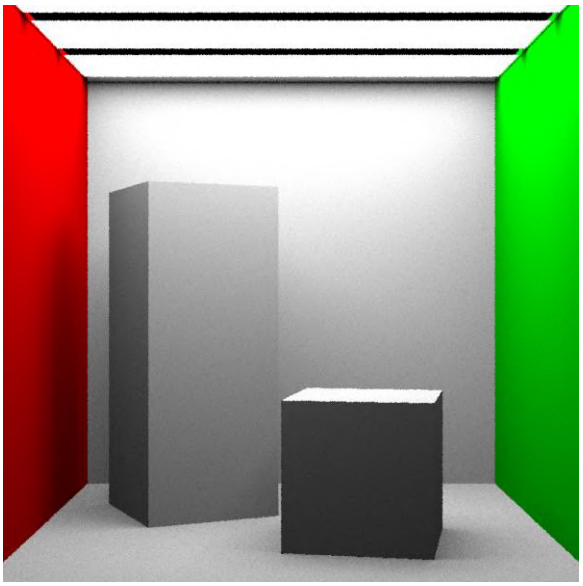
Render Time: 5820.204102 ms -big 10spp (top left)

Render Time: 53020.519531 ms -big 100spp (top right)

Render Time: 594280.562500 ms –big 1000spp (bottom)



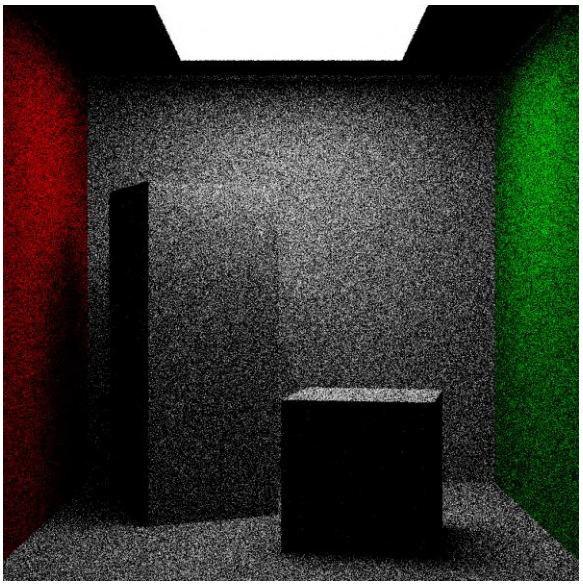


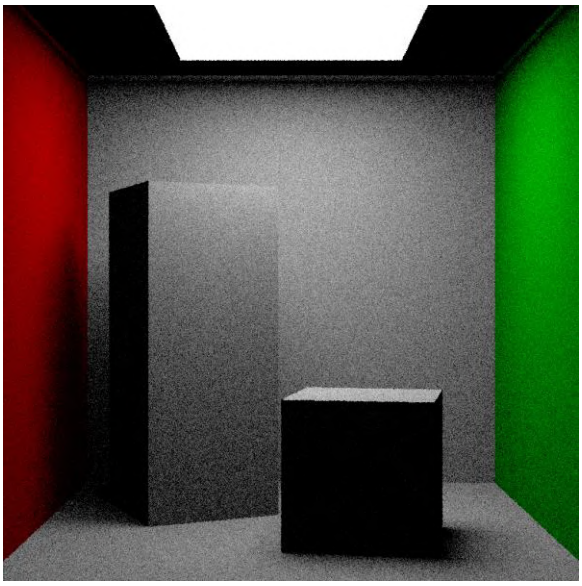


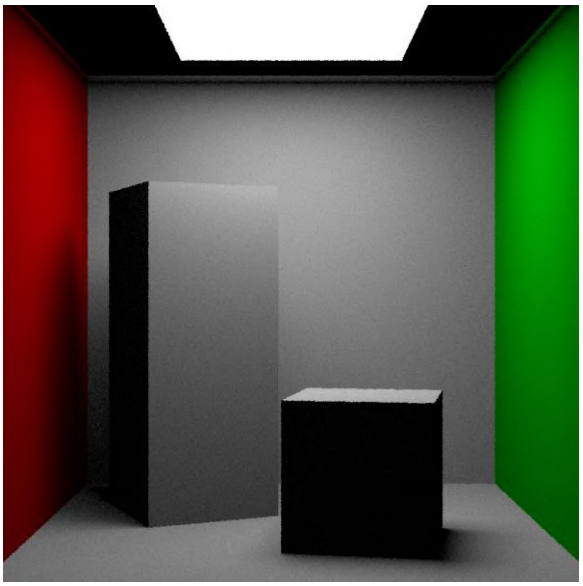
Render Time: 20998.544922 ms -many 10spp (top left)

Render Time: 207694.187500 ms -many 100spp (top right)

Render Time: 1927673.000000 ms –many 1000spp (bottom)



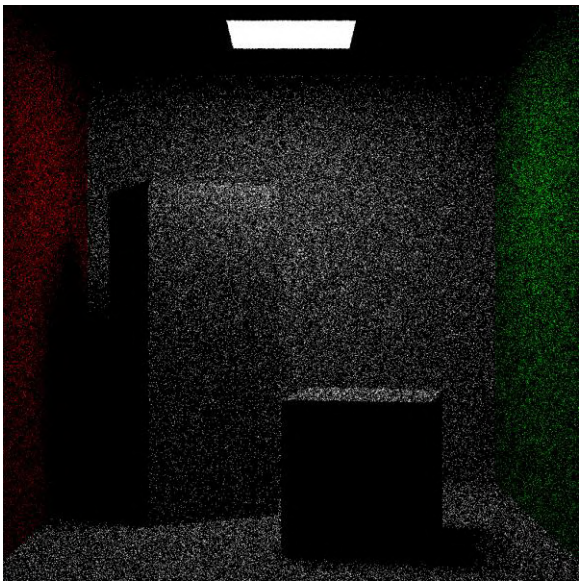


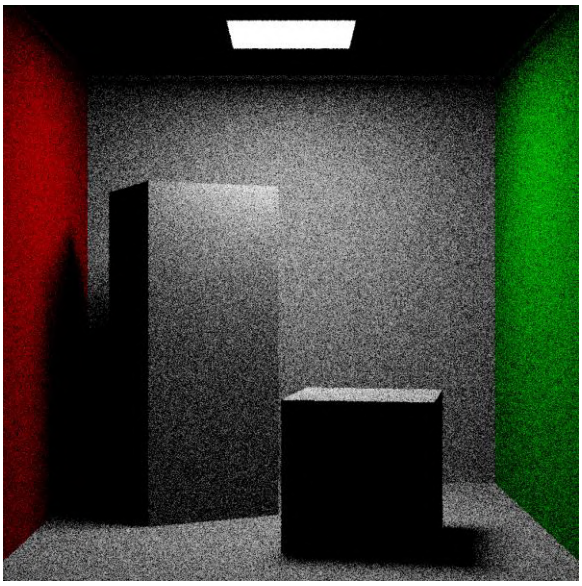


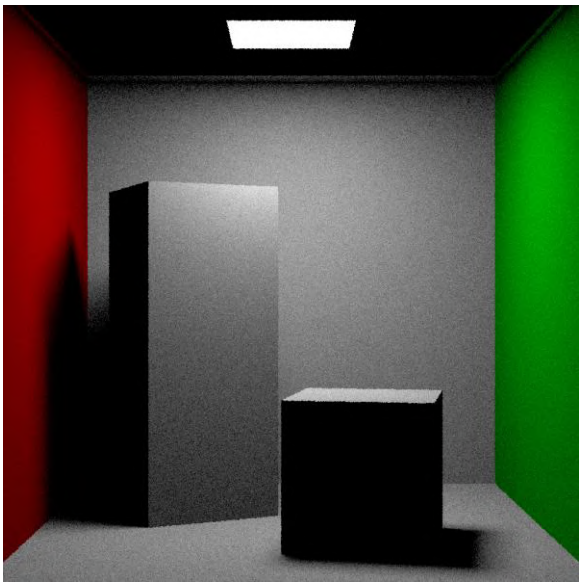
Render Time: 6789.166992 ms -med 10spp (top left)

Render Time: 58391.441406 ms -med 100spp (top right)

Render Time: 575972.312500 ms –med 1000spp (bottom)





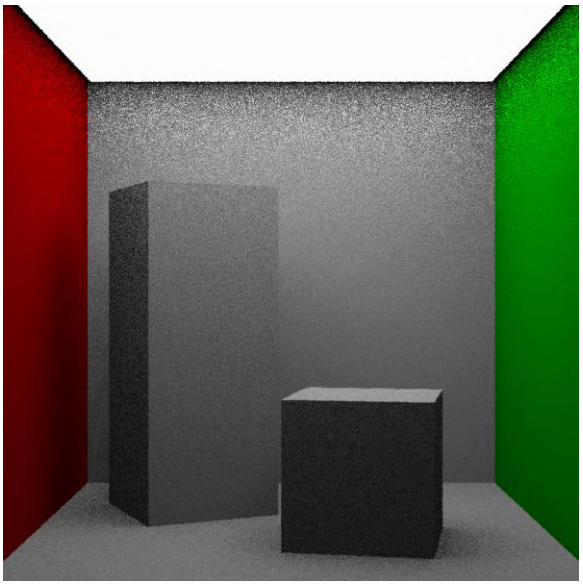


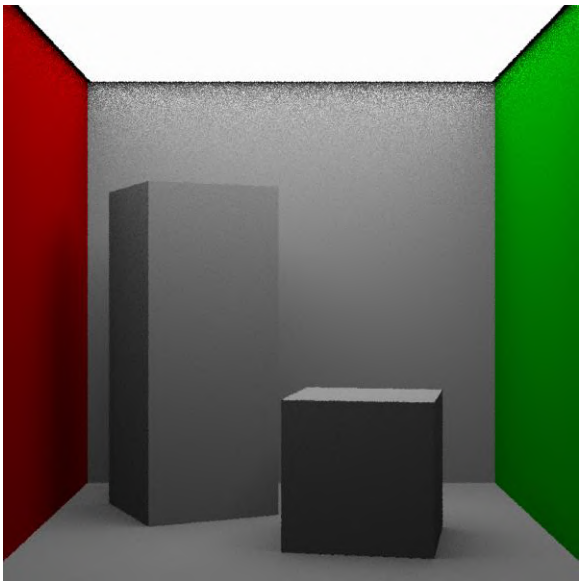
Render Time: 5947.237793 ms -small 10spp (top left)

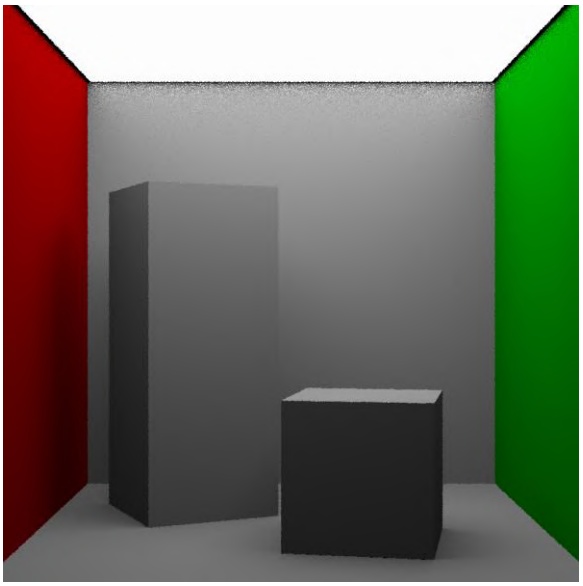
Render Time: 57526.343750 ms -small 100spp (top right)

Render Time: 587319.187500 ms –small 1000spp (bottom)

4.3 Light Sampling:



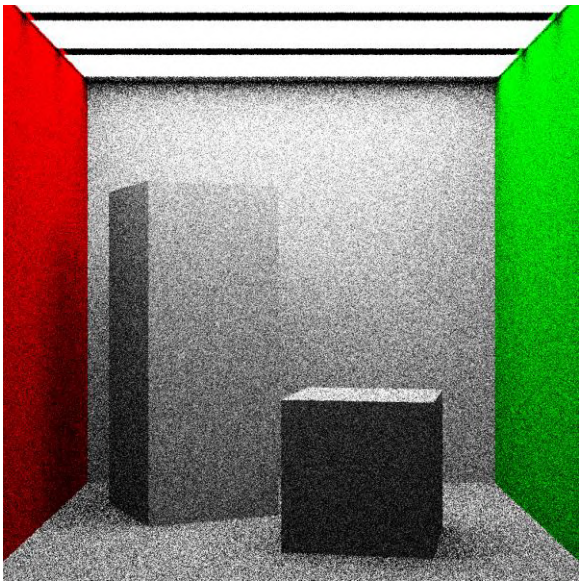


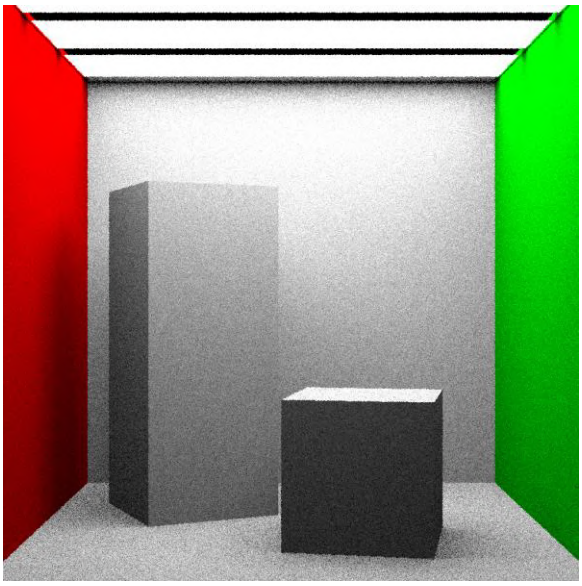


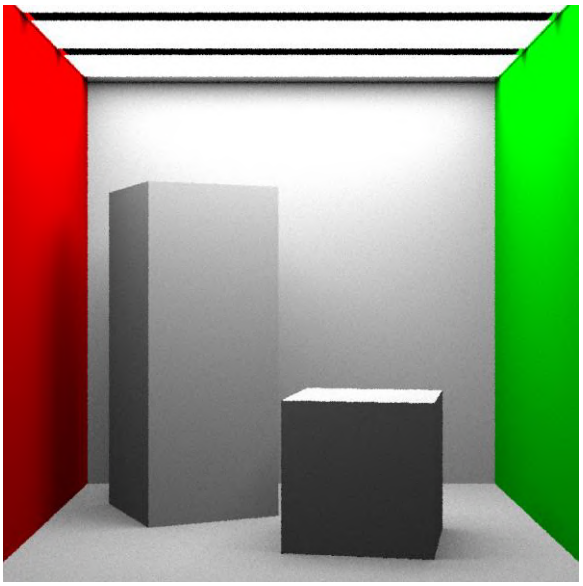
Render Time: 4285.853027 ms -big 10spp (top left)

Render Time: 38533.070312 ms -big 100spp (top right)

Render Time: 58391.441406 ms –big 1000spp (bottom)



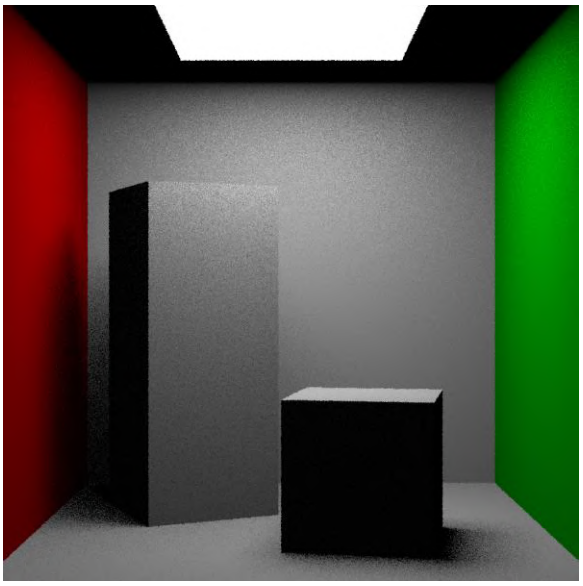


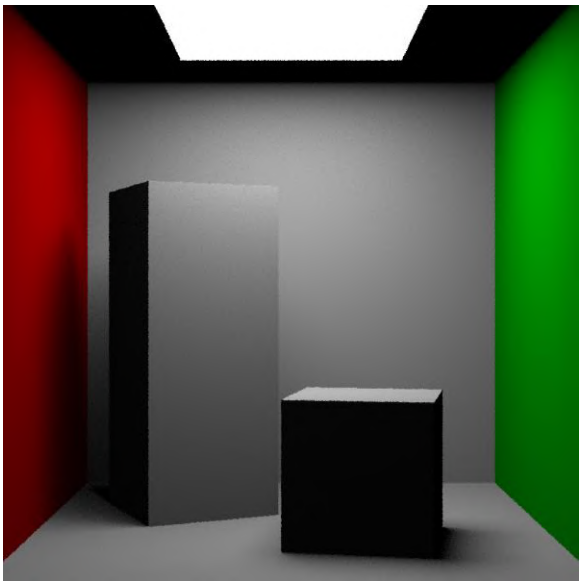


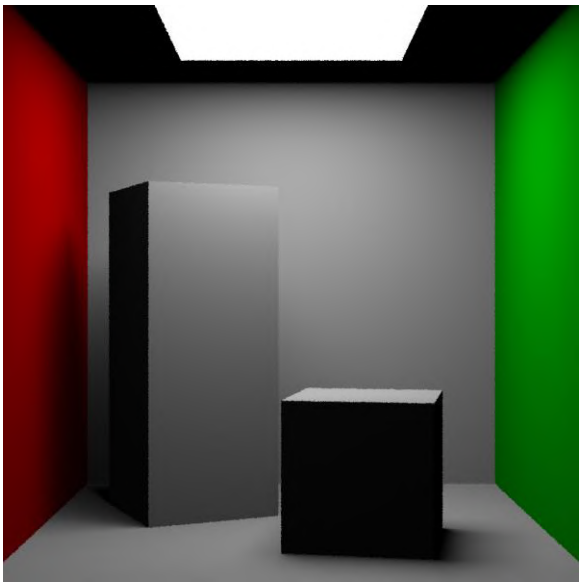
Render Time: 21200.031250 ms -many 10spp (top left)

Render Time: 206716.234375 ms -many 100spp (top right)

Render Time: 1862653.625000 ms –many 1000spp (bottom)



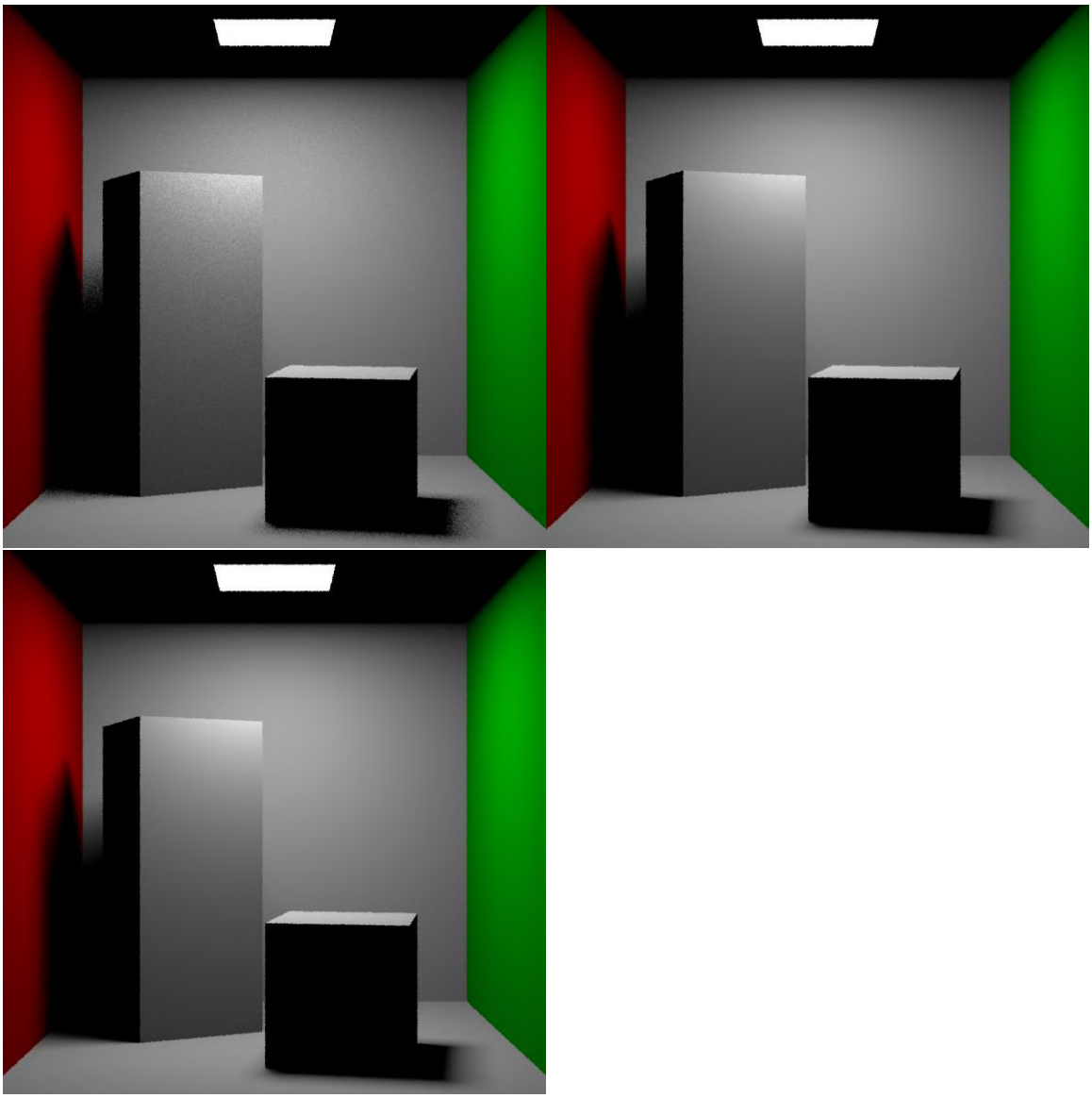




Render Time: 4819.889160 ms -med 10spp (top left)

Render Time: 42444.160156 ms -med 100spp (top right)

Render Time: 377194.531250 ms –med 1000spp (bottom)



Render Time: 4137.270996 ms -small 10spp (top left)

Render Time: 40536.406250 ms -small 100spp (top right)

Render Time: 415455.750000 ms –small 1000spp (bottom)

5.1: Why can't we render point and directional lights with uniform hemisphere sampling or cosine weighted sampling?

Uniform hemisphere sampling treats all directions equally and in cosine-weighted sampling rays are sent in all directions (like uniform hemisphere sampling) but different probabilities, now as point light is just a point, so hitting it is almost impossible (0 probability), and directional light is at infinity, so hitting it also almost impossible (0 probability). So, we cannot render point and directional lights with uniform hemispherical or cosine weighted sampling;

5.2: Why does the noise increase for the same number of samples in the case of uniform hemisphere and cosine weighted sampling as the size of the area light decreases?

As the light source shrinks, the "likely" directions to hit become narrower. Uniform and cosine-weighted sampling still cast a wide net, wasting samples outside the relevant area, and increasing noise. This will lead to more searching in irrelevant areas, increasing the noise.