

Assignment 3: PathTracer

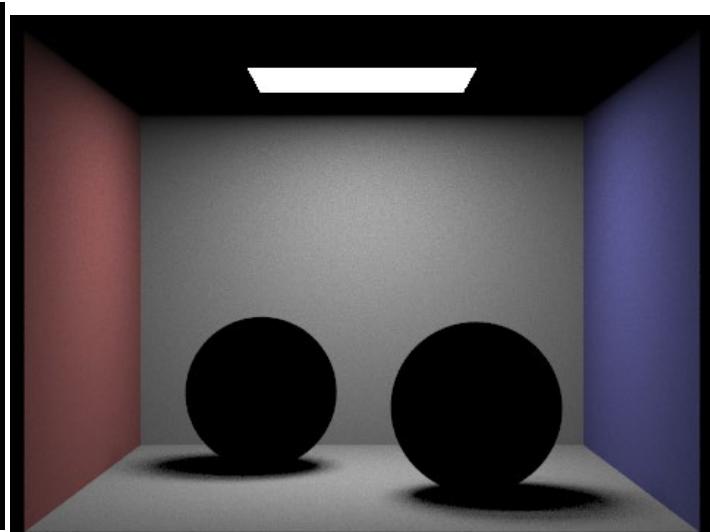
Ruixin Huang, cs184-aed

A further expansion of project 3-1, where we add more parameters for the ray tracer such as how many bounces the camera ray has, sampling method, depth of field and how focus the camera is.

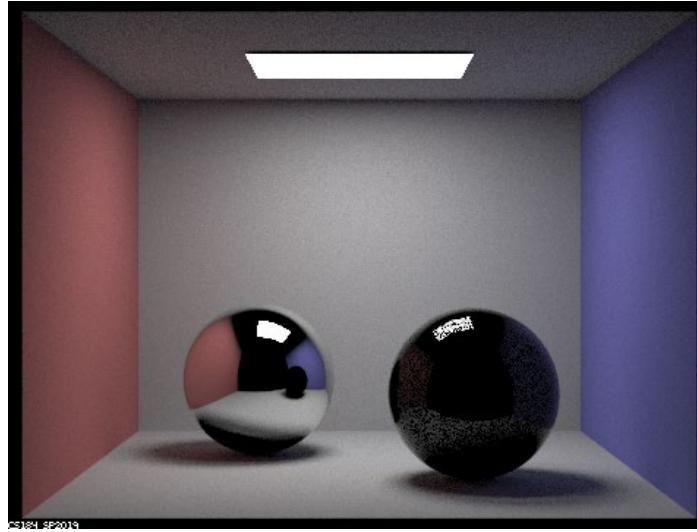
Part 1: Ray Generation and Intersection



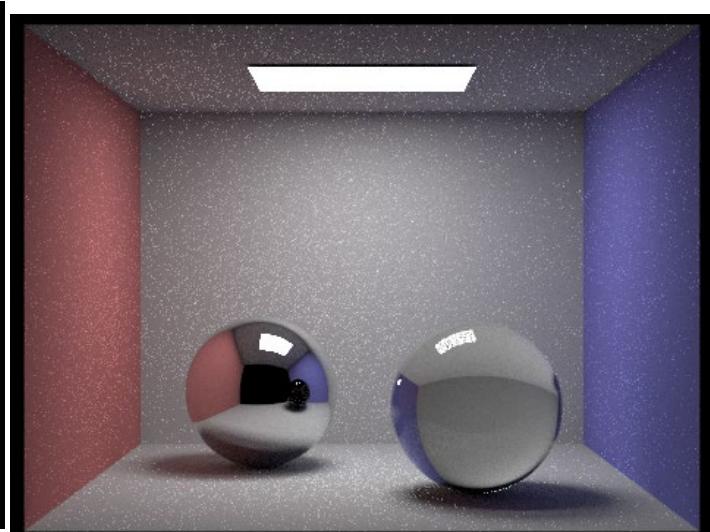
m = 0. only light source.



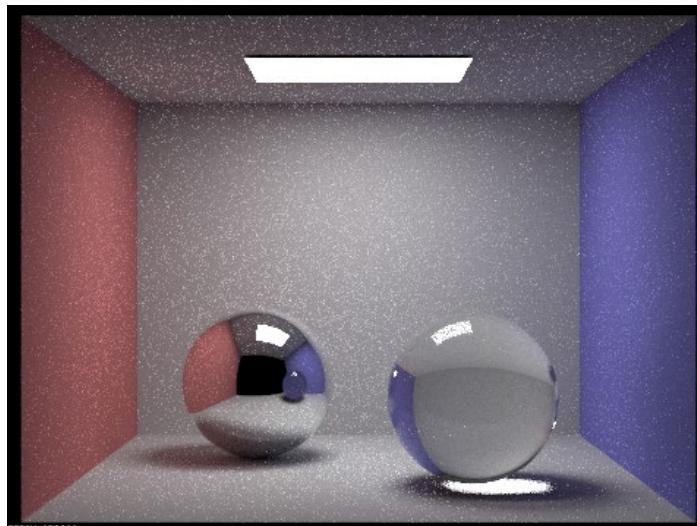
m = 1. dark spheres



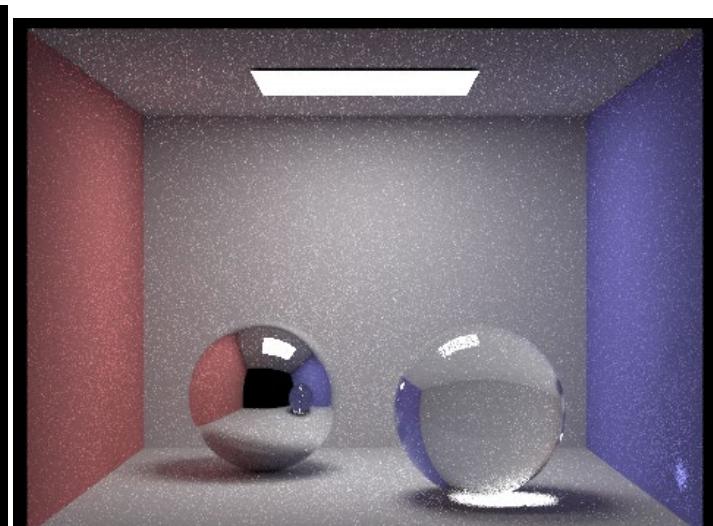
m = 2. can see reflections between the spheres. the right sphere and the small sphere inside the left sphere looks dark.



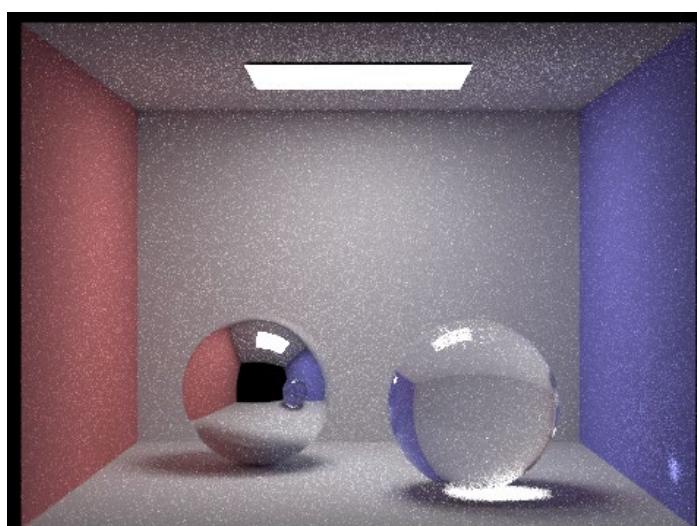
m = 3. The small sphere reflected on the mirror sphere still looks dark but the right sphere isn't dark anymore because of refractions.



m = 4. the small sphere is not dark anymore.



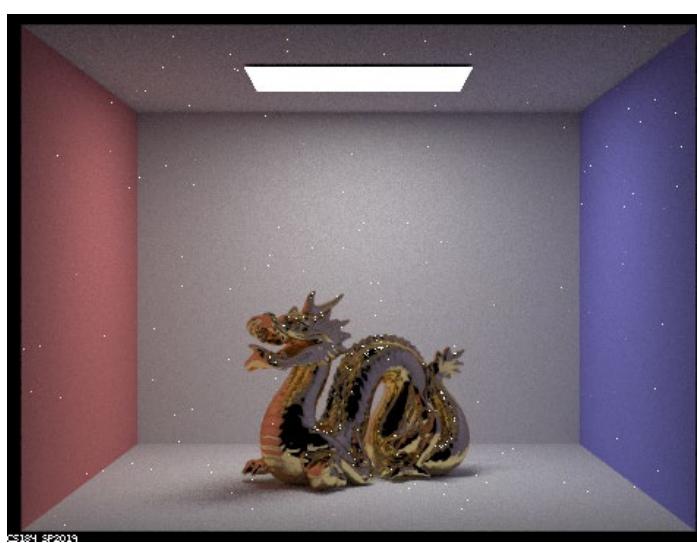
m = 5. not much change.

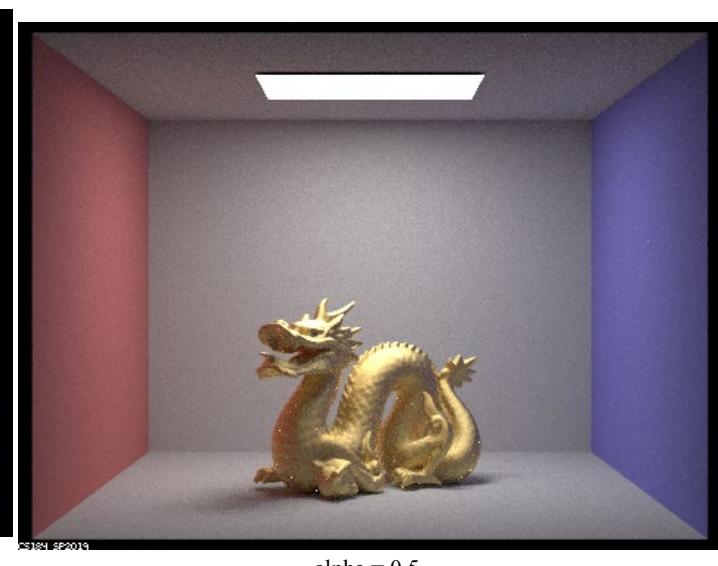
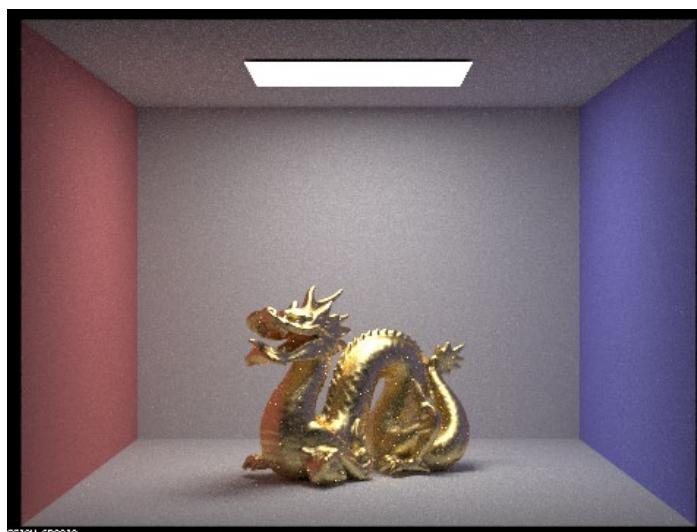
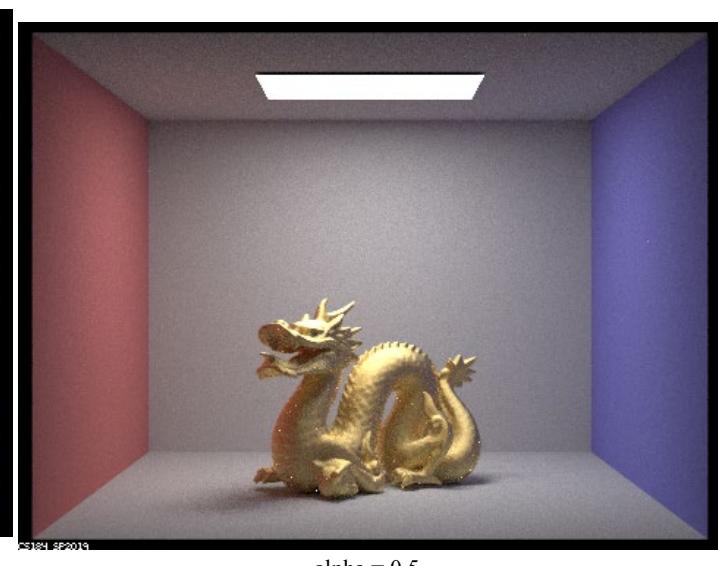
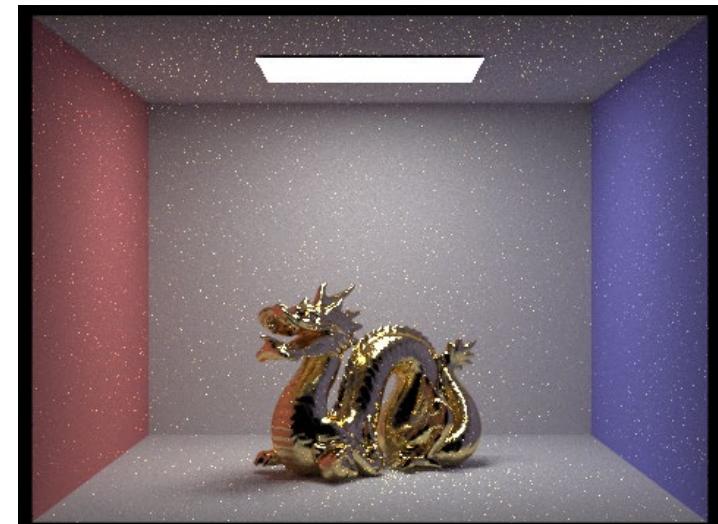


m = 100. gives brighter image.

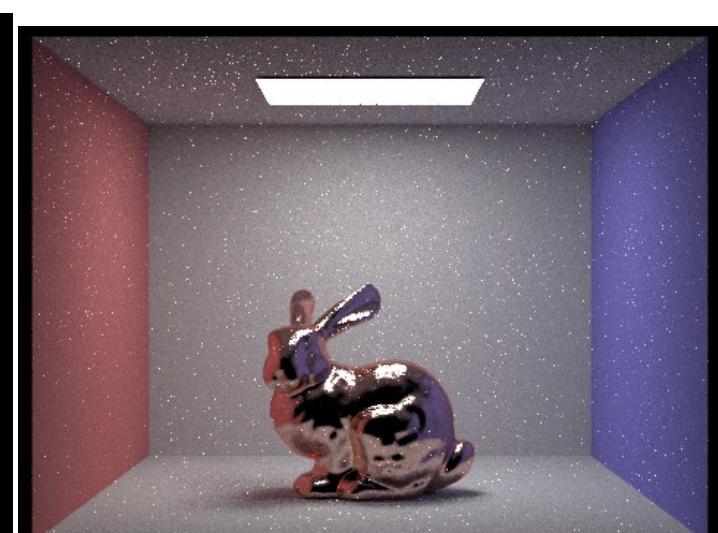
Part 2: Microfacet Material

decrease the alpha value make the surface smoother. It becomes more of a mirror as alpha decreases.

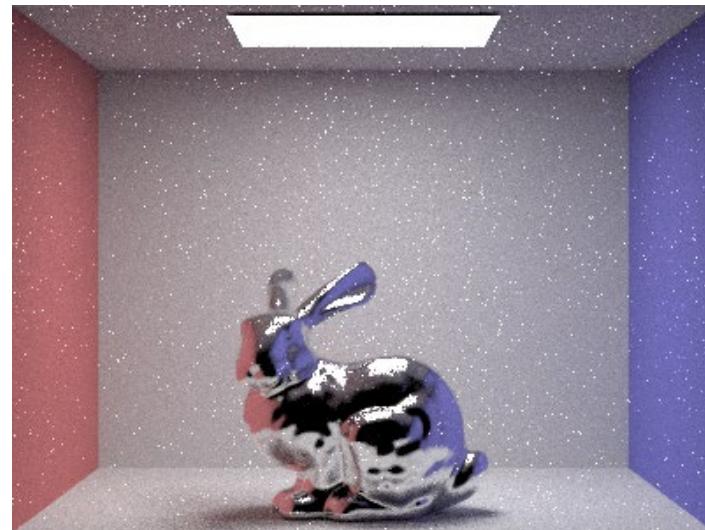




Using cosine hemisphere sampling gives a more noisy image than using importance sampling. there are more randomness in cosine hemisphere sampling and so there are more noise.



eta are 0.059193, 0.059881, 0.047366. corresponding k are 4.1283, 3.5892, 2.8132. material is silver.



silver bunny.

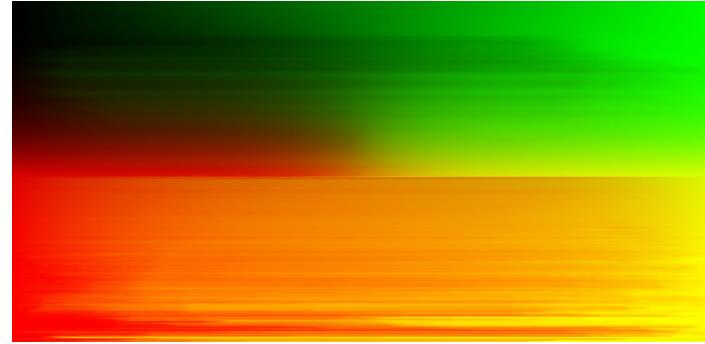
Part 3: Environment Light

we use environment lightening such that if the camera ray doesn't intersect with anything, it will eventually hit the environment light in the background, which is like a new light source.

The .exr file used is field.exr.



field.jpg



probability_debug.png

slightly Less noise in importance sampling.



Uniform sampling.



Importance sampling.

Less noise in importance sampling, especially on edges.



Uniform sampling.

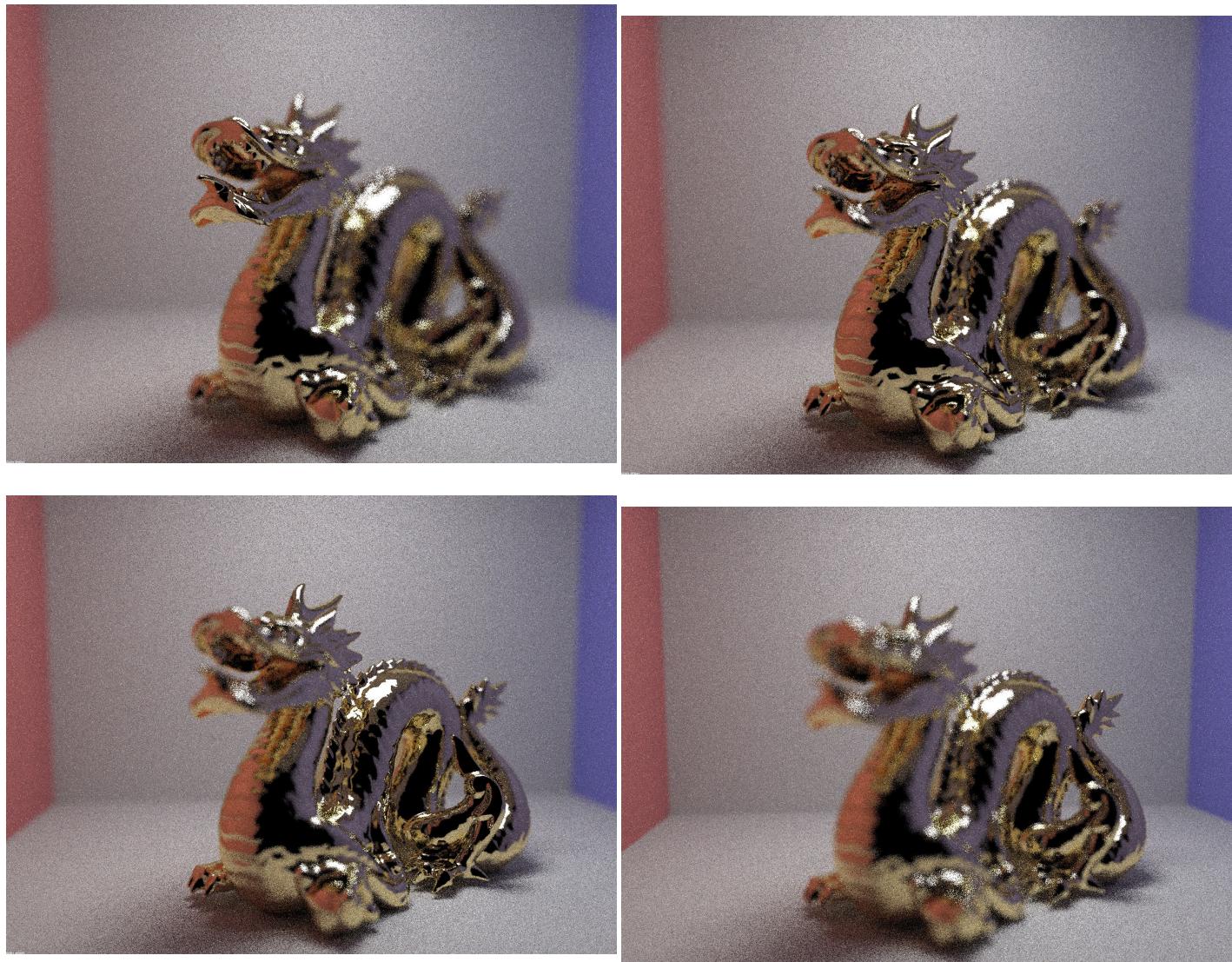


Importance sampling.

Part 4: Depth of Field

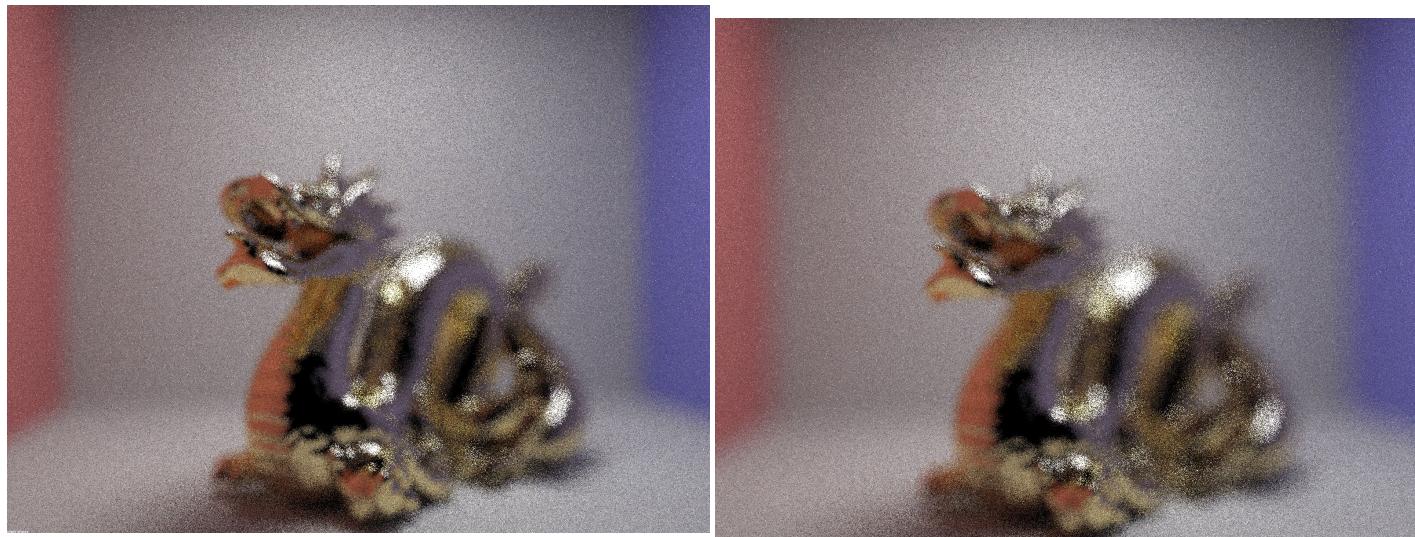
a this-lens camera doesn't focus through one point as a pin-hole camera does. the larger the aperture, the less focused it becomes. on the other side, a thin-lens camera with aperture equals zero is a pin-hole camera.

"focus stack" with 4 visibly different depths.



a sequence of 4 pictures with visibly different aperture sizes





A Few Notes On Webpages

Here are a few problems students have encountered in the past. You will probably encounter these problems at some point, so don't wait until right before the deadline to check that everything is working. Test your website on the instructional machines early!

- Your main report page should be called index.html.
- Be sure to include and turn in all of the other files (such as images) that are linked in your report!
- Use only *relative* paths to files, such as

```
"./images/image.jpg"
```

Do *NOT* use absolute paths, such as

```
"/Users/student/Desktop/image.jpg"
```

- Pay close attention to your filename extensions. Remember that on UNIX systems (such as the instructional machines), capitalization matters.

```
.png != .jpeg != .jpg != .JPG
```

- Be sure to adjust the permissions on your files so that they are world readable. For more information on this please see this tutorial: <http://www.grymoire.com/Unix/Permissions.html>
- And again, test your website on the instructional machines early!