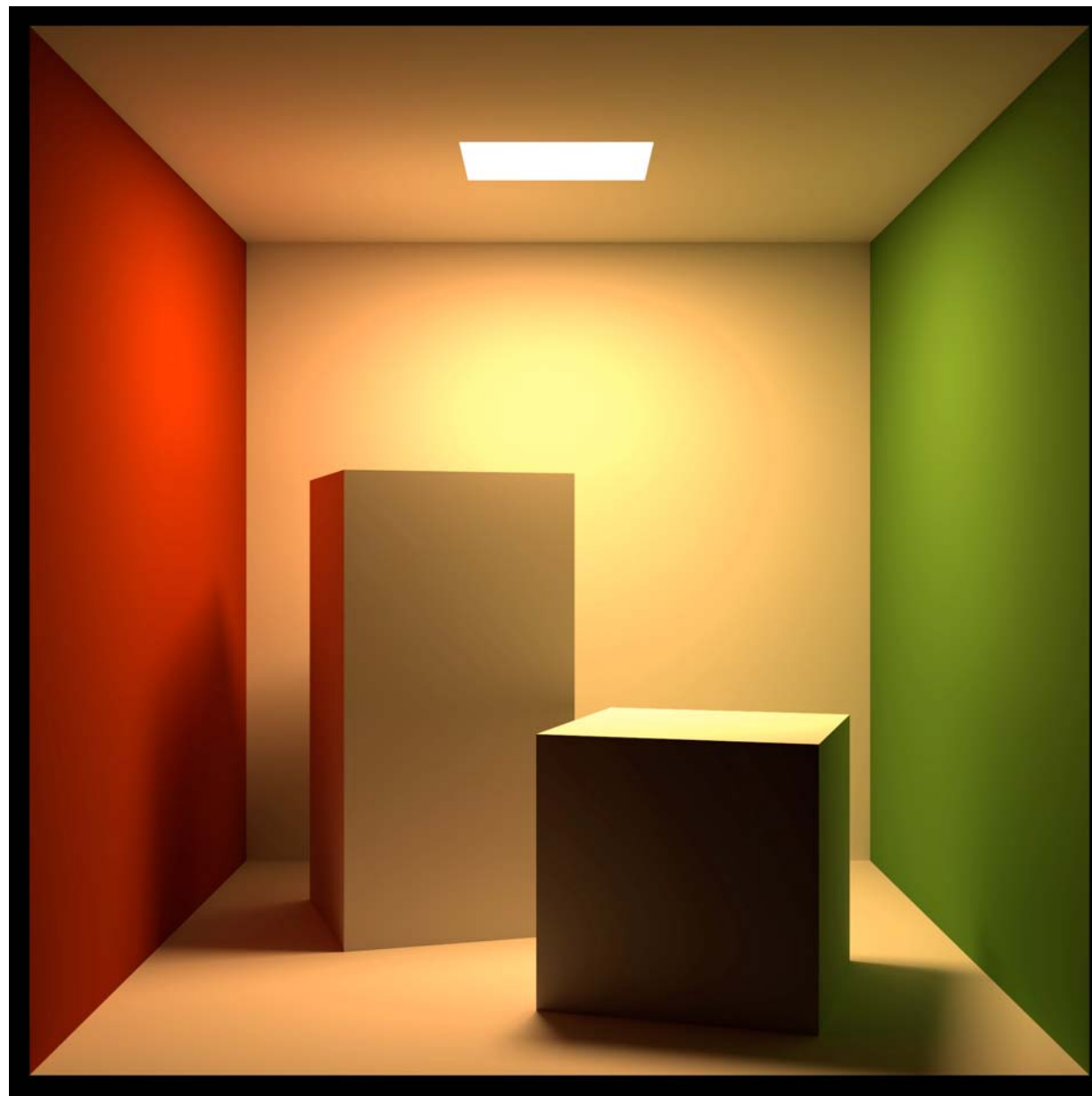




**CS 563 Advanced Topics in
Computer Graphics**
Global Illumination

by Damon Blanchette

Global Illumination



Examples

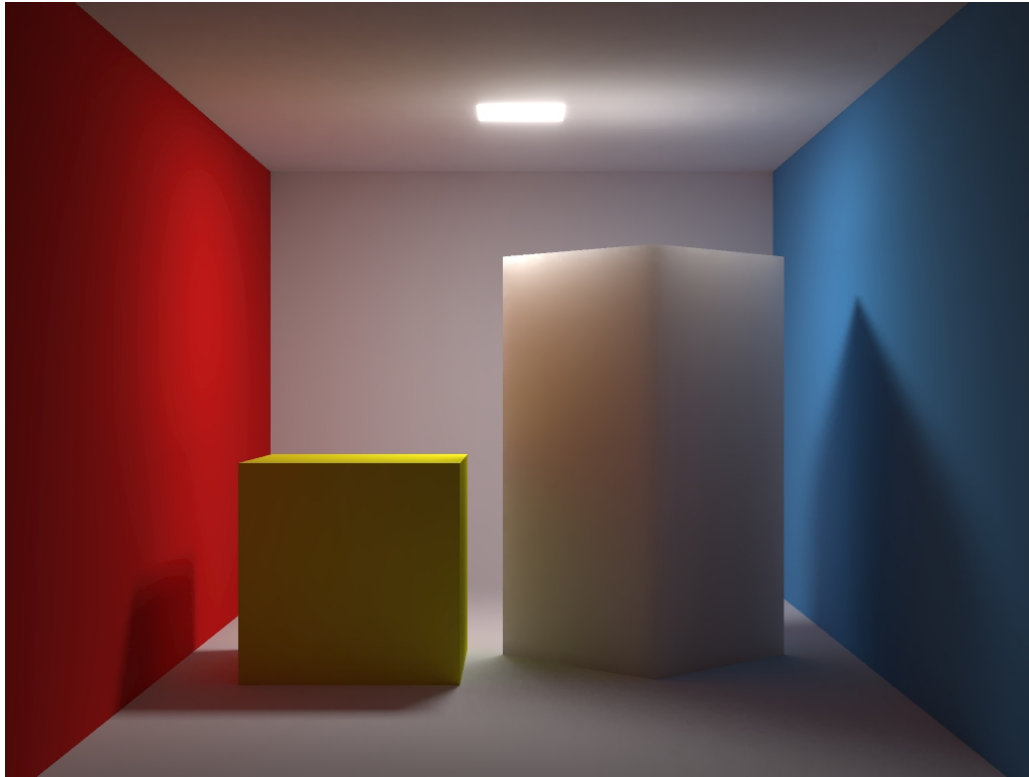


Image © Henrik Wann Jensen



Image © Henrik Wann Jensen

More examples

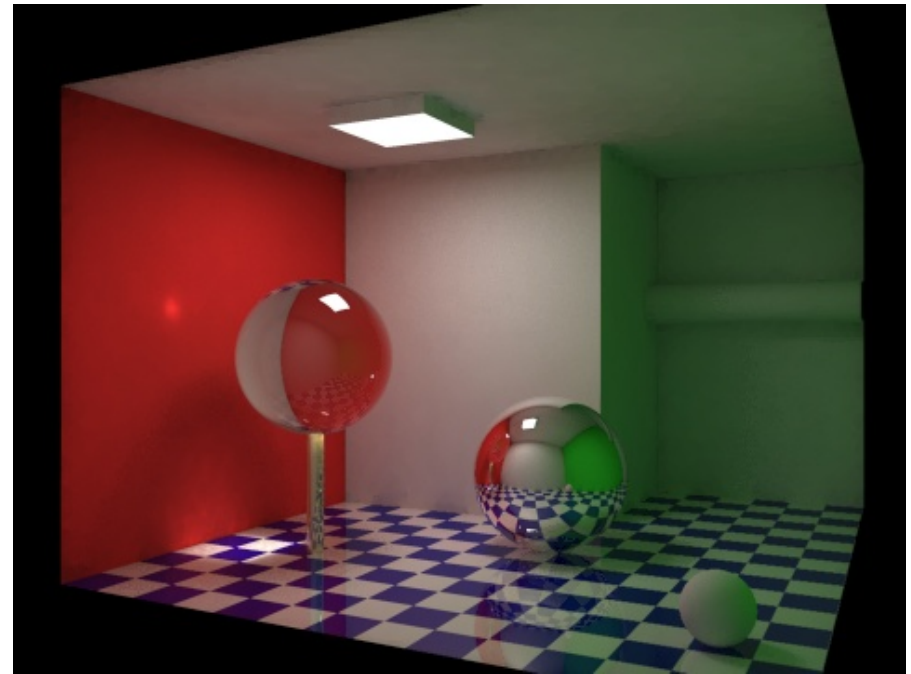
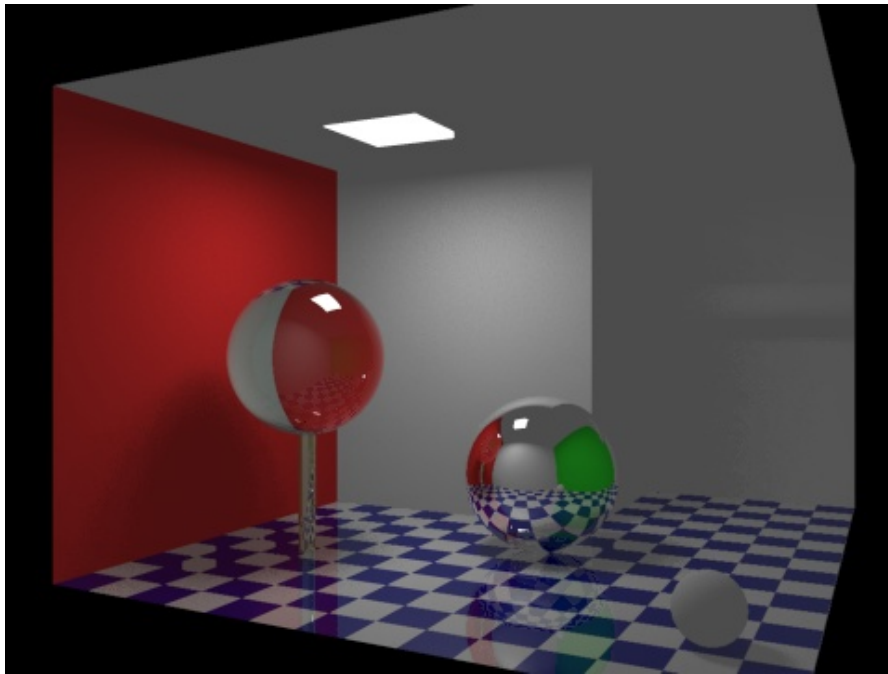
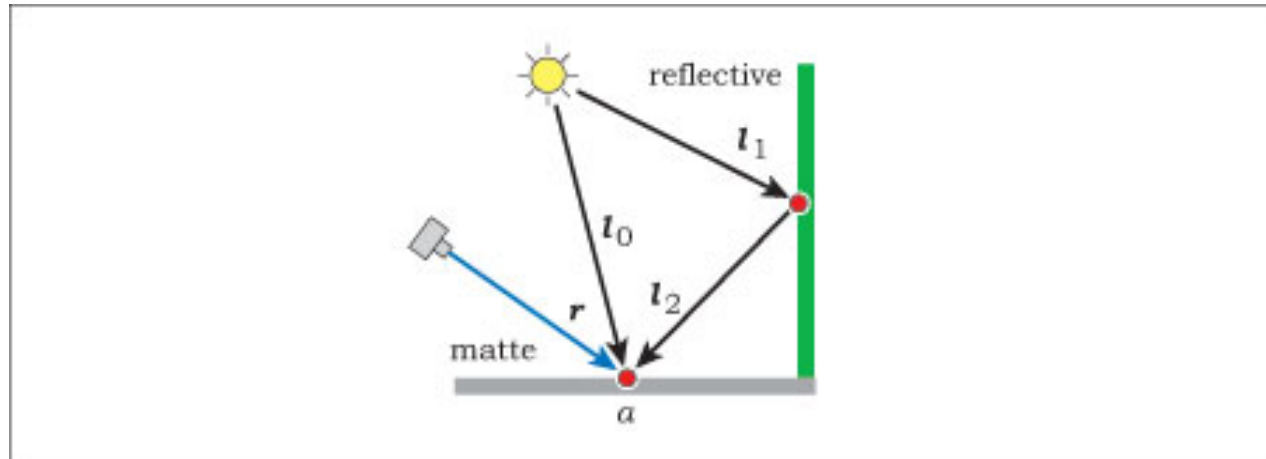


http://graphics.ucsd.edu/~henrik/papers/fast_bssrdf/



<http://www.cemyuksel.com/research/gihair/>

What is it?

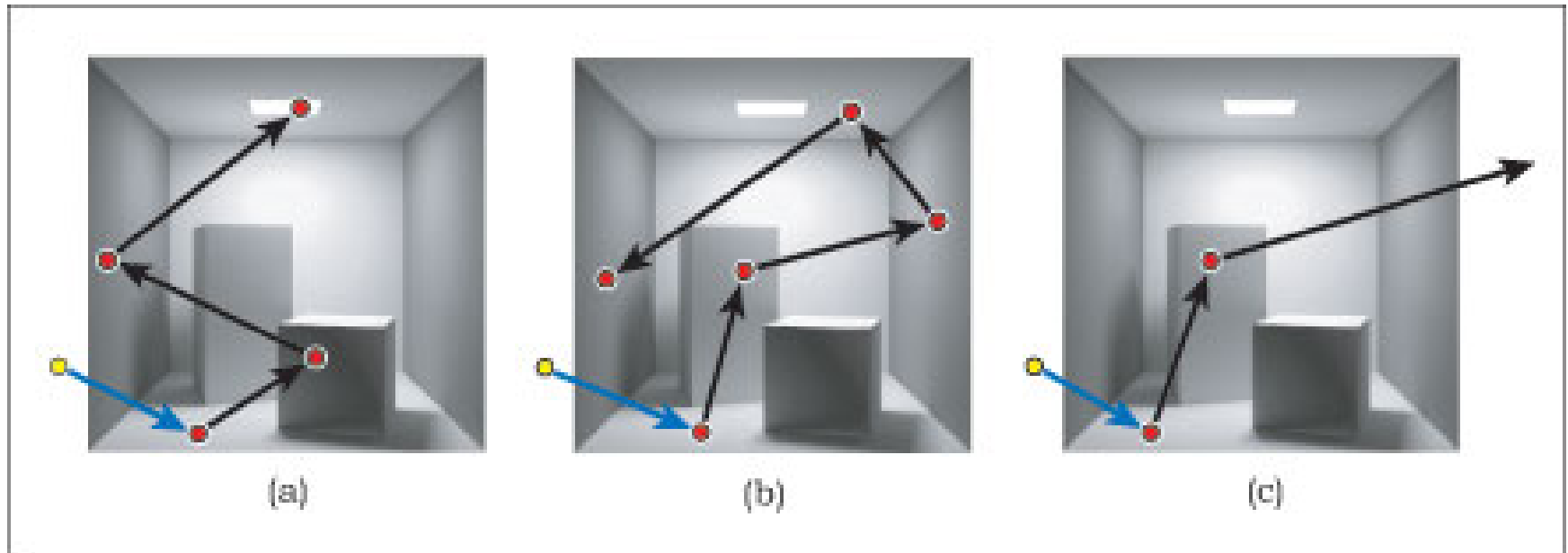


http://en.wikipedia.org/wiki/Global_illumination

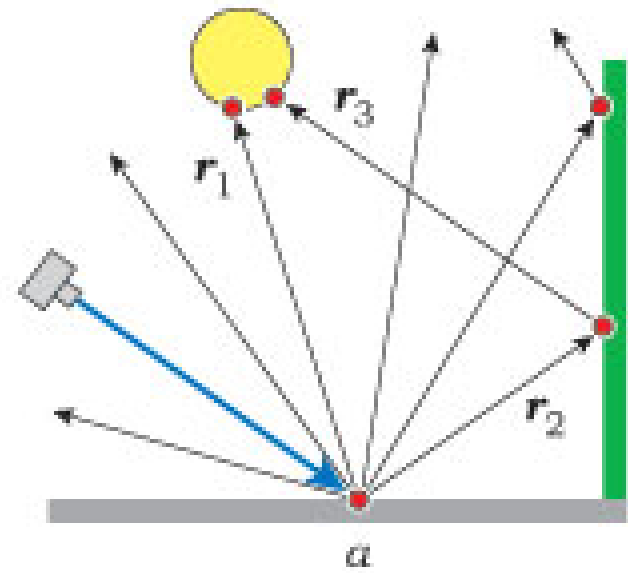
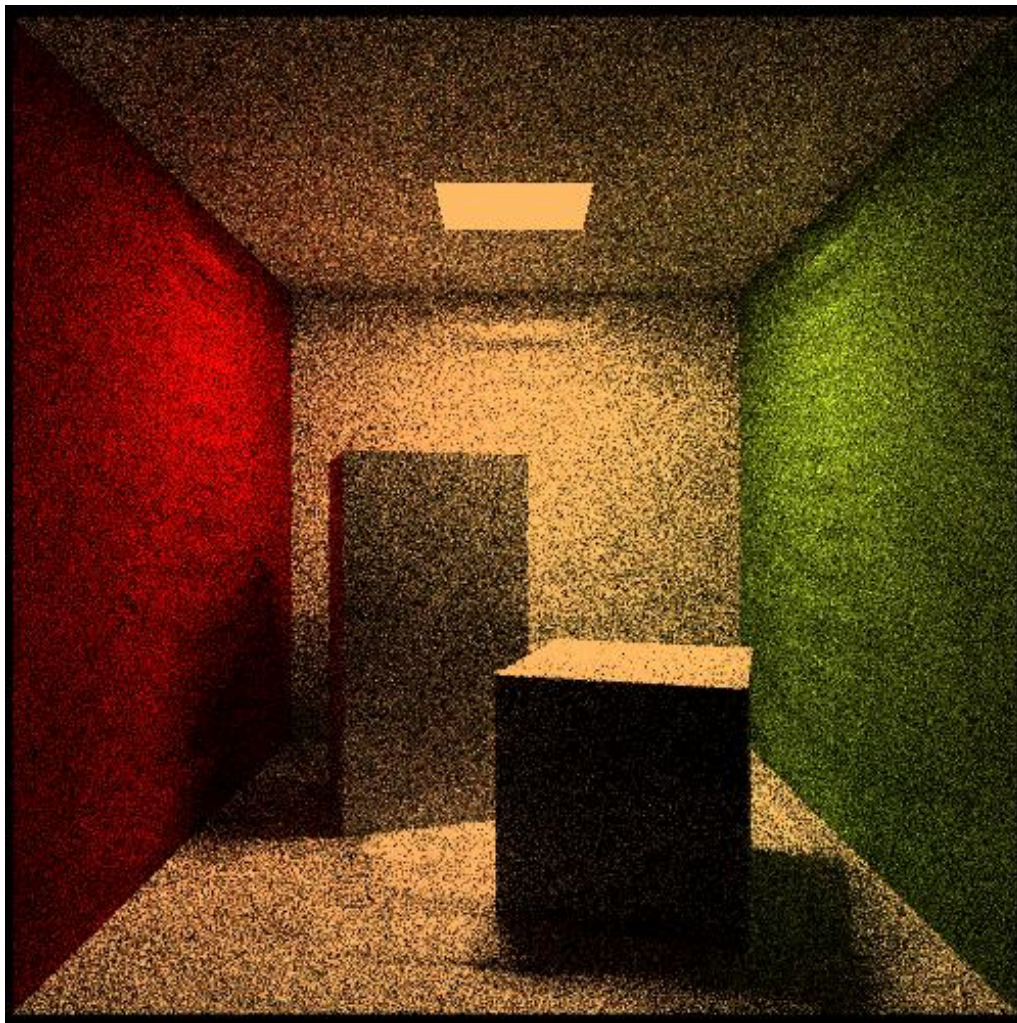
Path Tracing



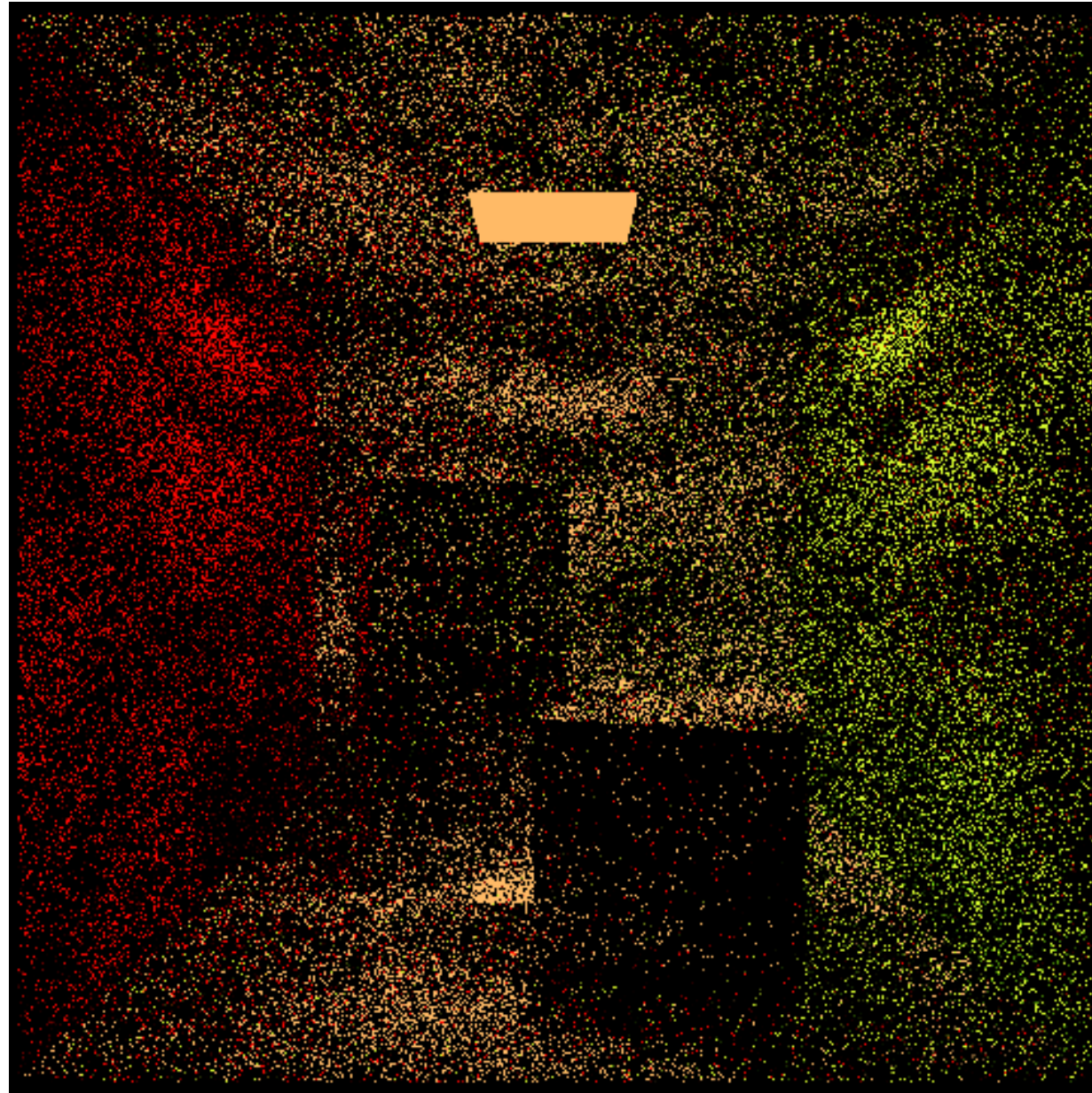
<http://en.wikipedia.org/wiki/Kajiya>



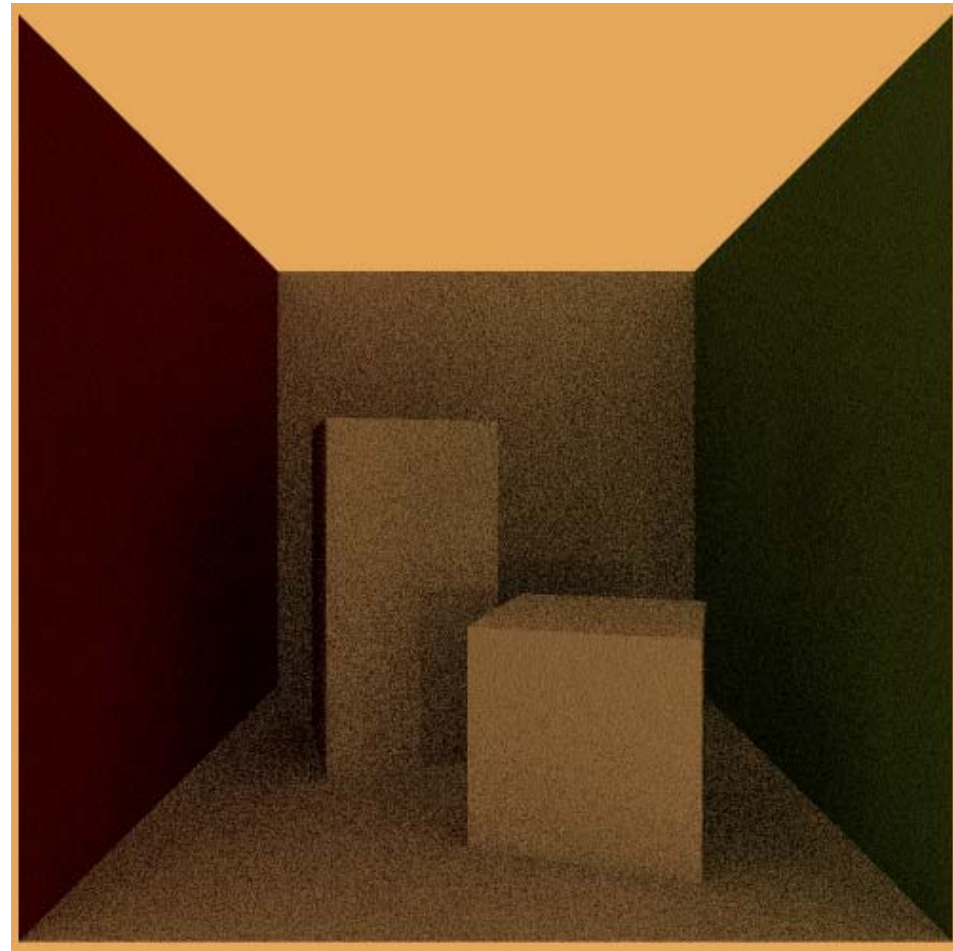
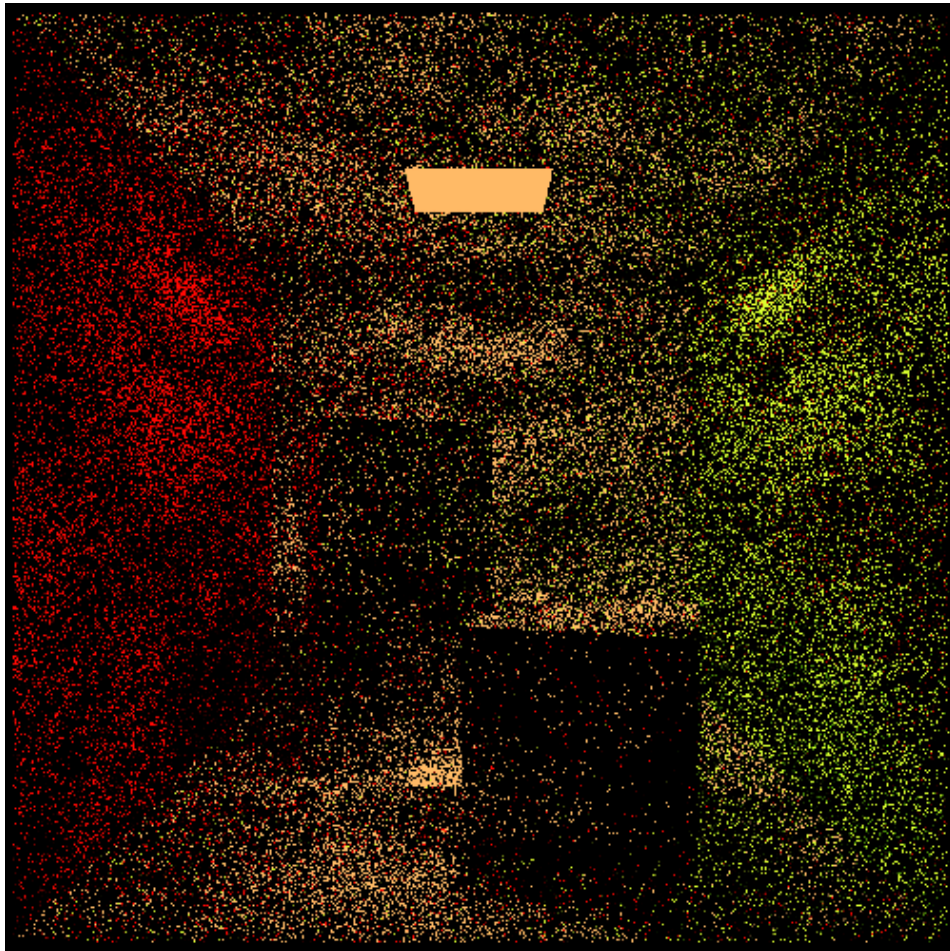
How it works



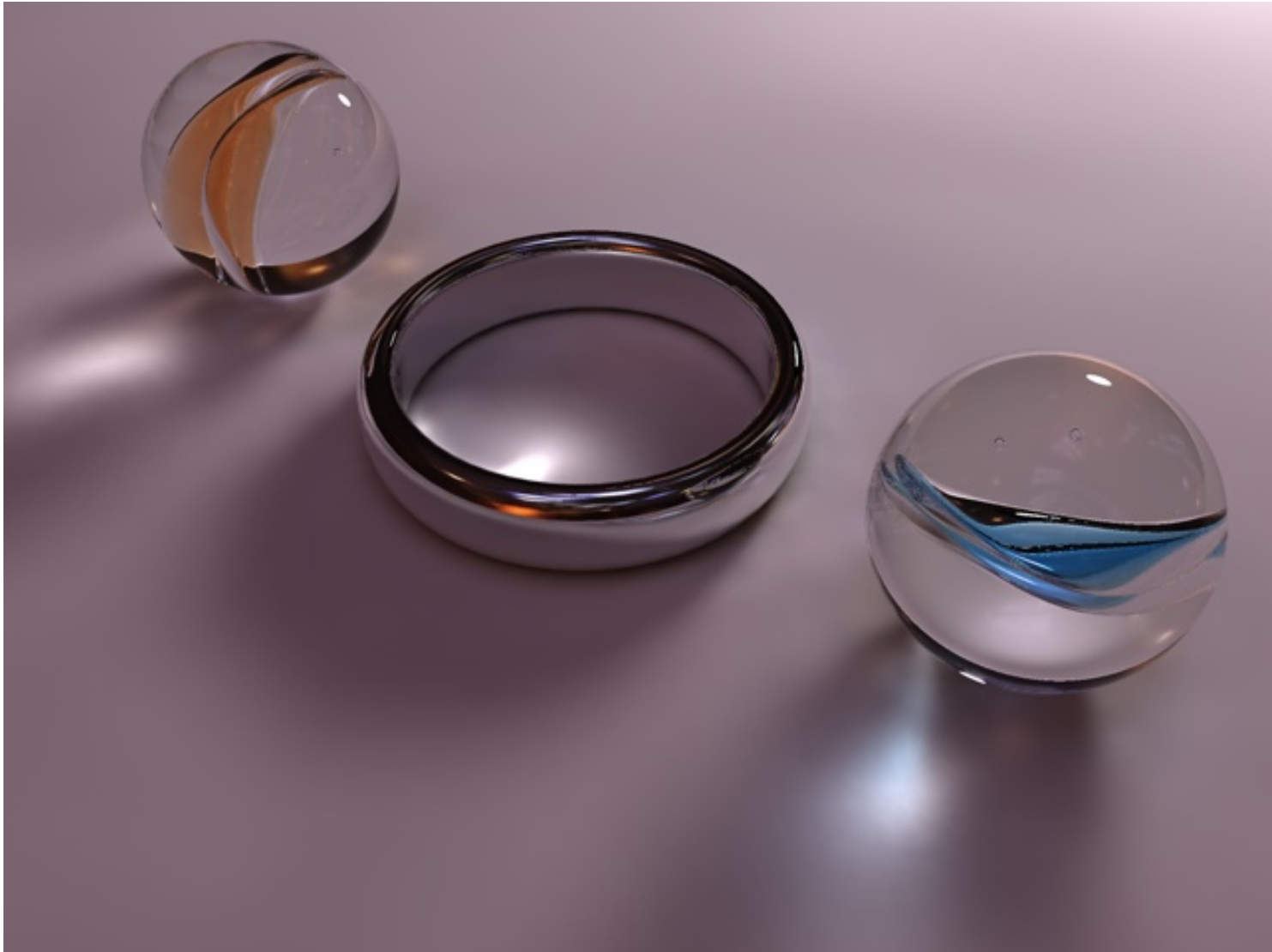
Not enough samples



Unless...

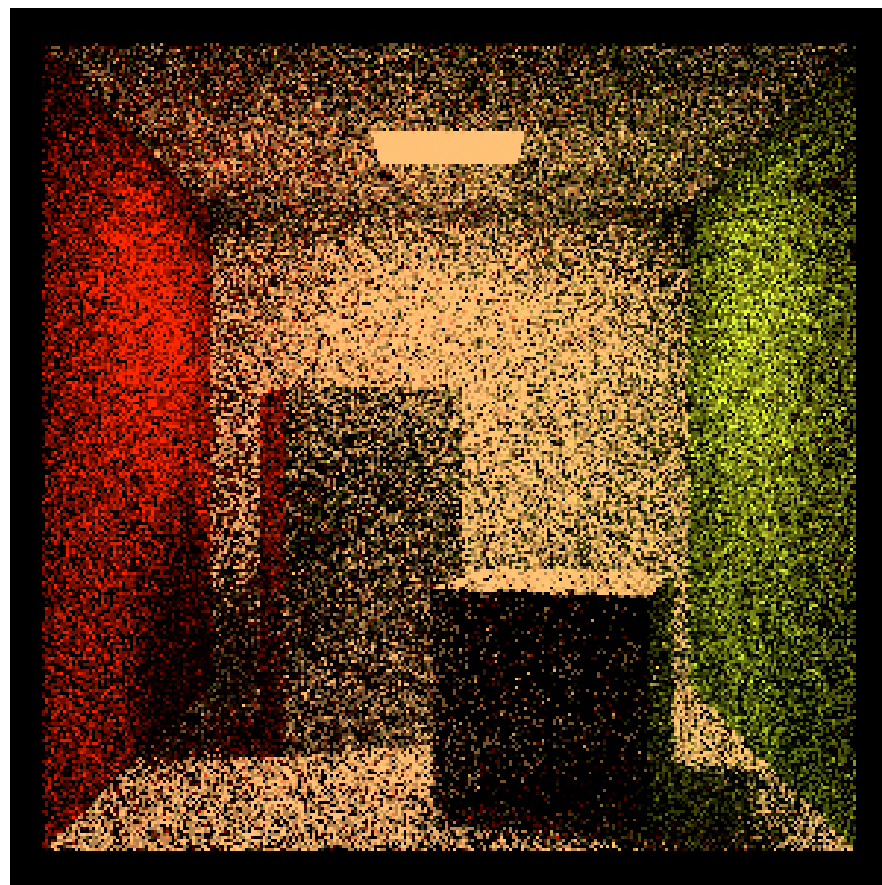
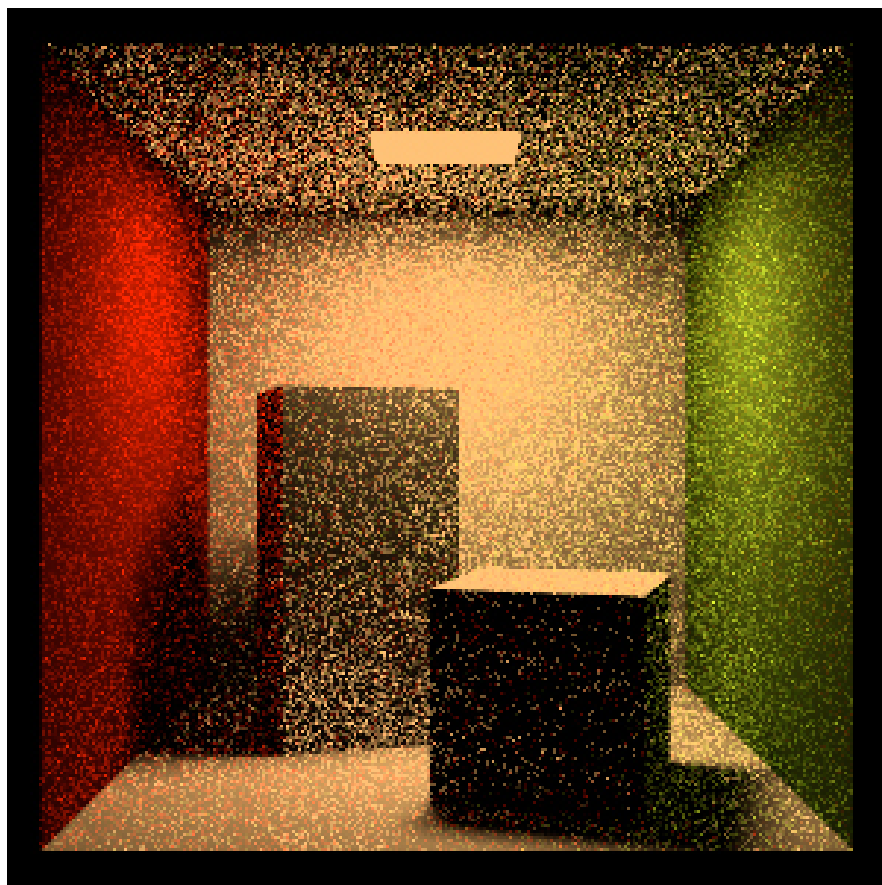


Caustics

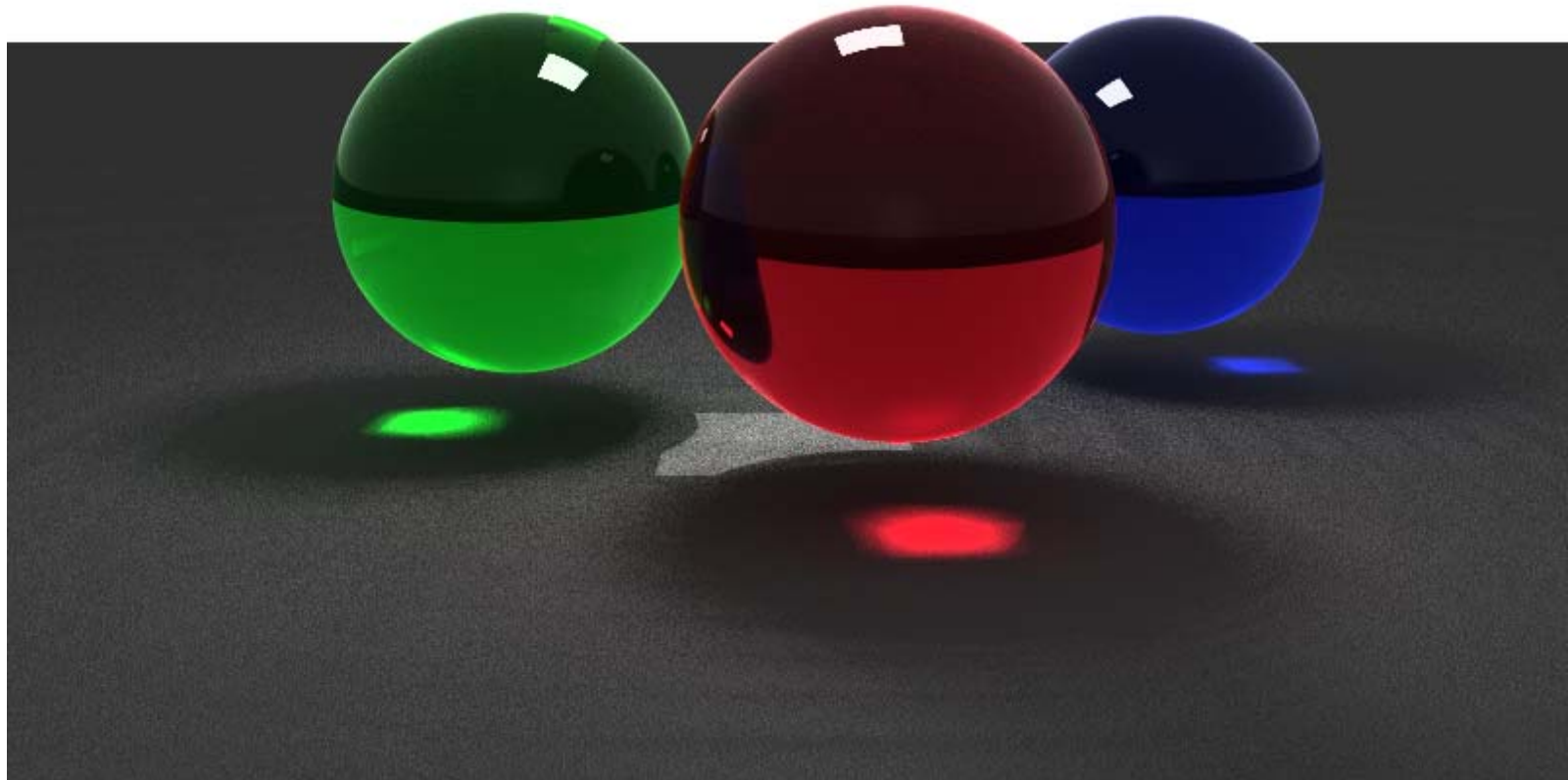


http://mvpny.com/R11GITutorial/R11GITutorial_Part1.html

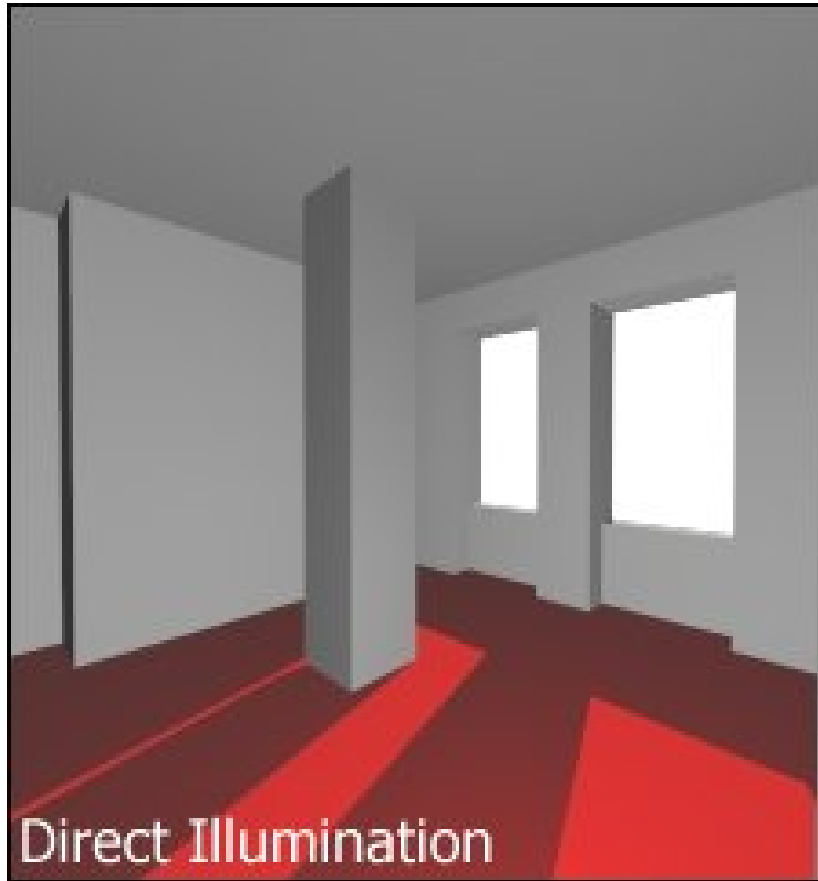
Light Sampling



Damon's Hybrid

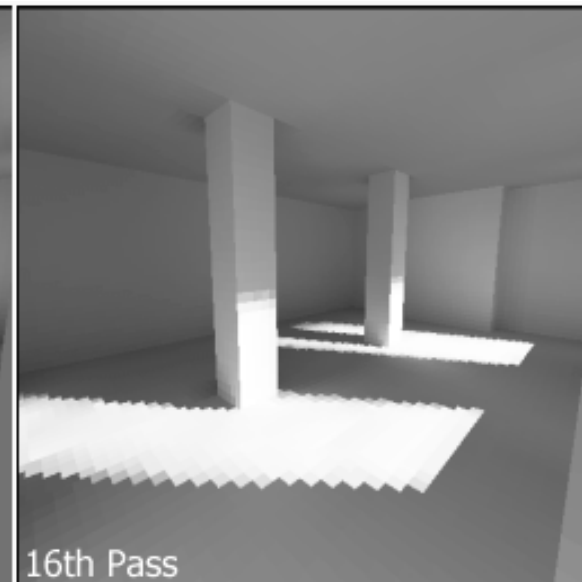
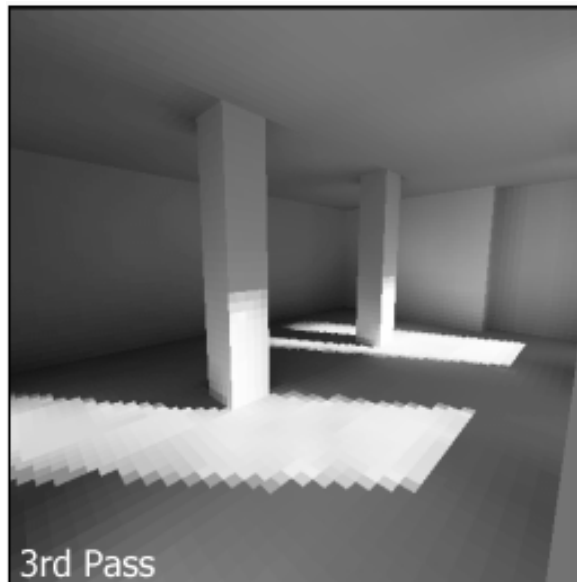
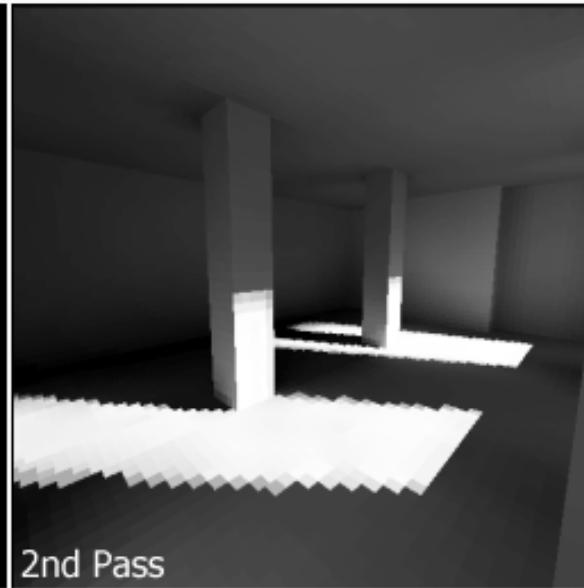
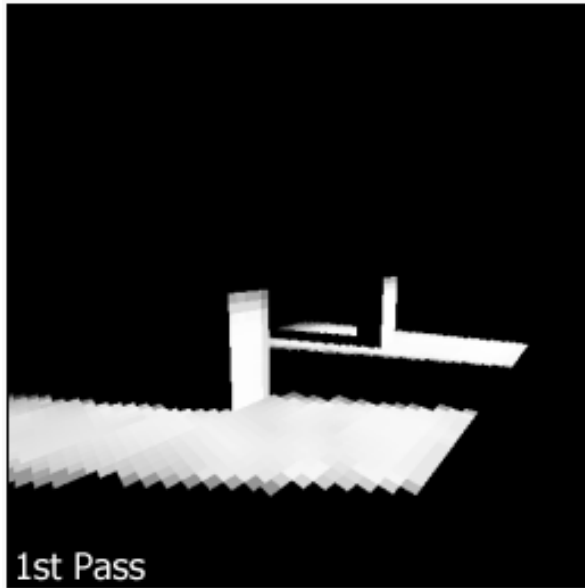


Radiosity

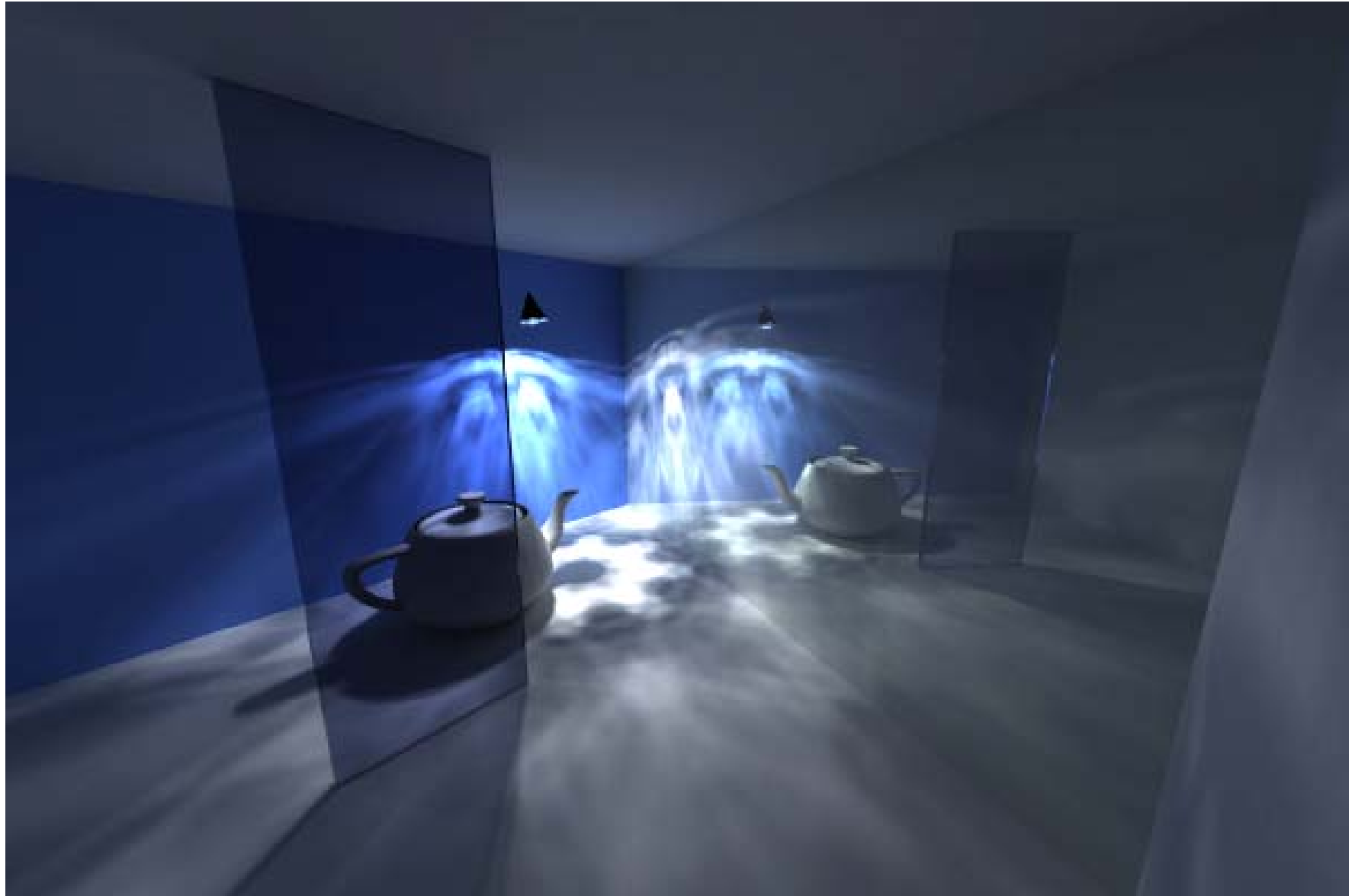


[http://en.wikipedia.org/wiki/Radiosity_\(3D_computer_graphics\)](http://en.wikipedia.org/wiki/Radiosity_(3D_computer_graphics))

How it works



Photon Mapping

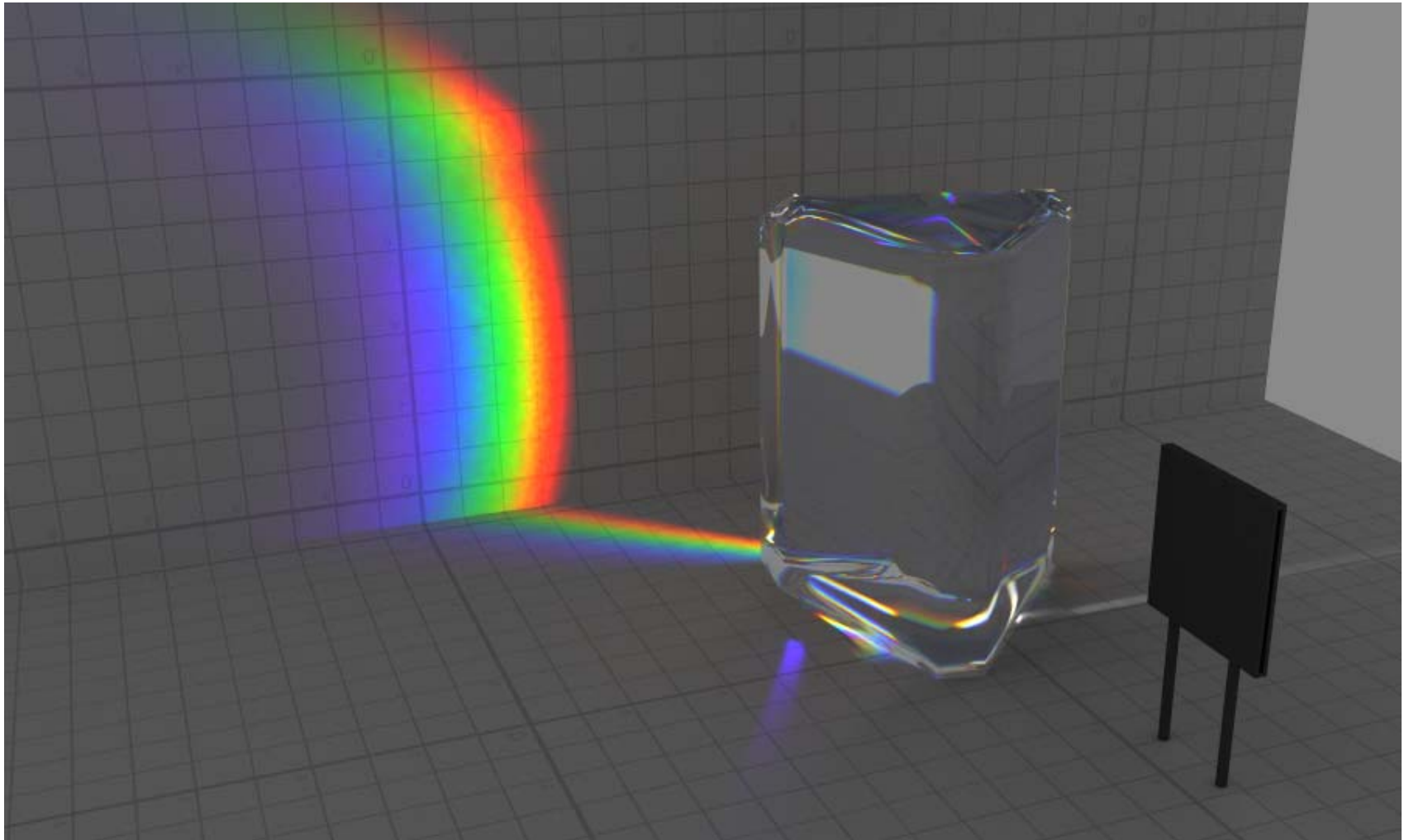


Photon Mapping Second Pass

Calculating Radiance at an intersection point:

1. Gather the N nearest photons using the nearest neighbor search function on the photon map.
2. Let S be the sphere that contains these N photons.
3. For each photon, divide the amount of flux (real photons) that the photon represents by the area of S and multiply by the BRDF applied to that photon.
4. The sum of those results for each photon represents total surface radiance returned by the surface intersection in the direction of the ray that struck it.

Nice image to offset all
that text



<http://ompf.org/forum/viewtopic.php?f=6&t=1181>

The Future?



© Crytek

Questions?



<http://cs.swan.ac.uk/~csbenjamin/cgf/>

References

- *Ray Tracing from the Ground Up*, by Kevin Suffern
- *Global Illumination using Photon Maps*, original paper by Henrik Wann Jensen, 1996
- <http://cs.swan.ac.uk/~csbenjamin/>
- http://en.wikipedia.org/wiki/Global_illumination
- http://en.wikipedia.org/wiki/Path_tracing
- [http://en.wikipedia.org/wiki/Radiosity_\(3D_computer_graphics\)](http://en.wikipedia.org/wiki/Radiosity_(3D_computer_graphics))
- http://en.wikipedia.org/wiki/Photon_mapping