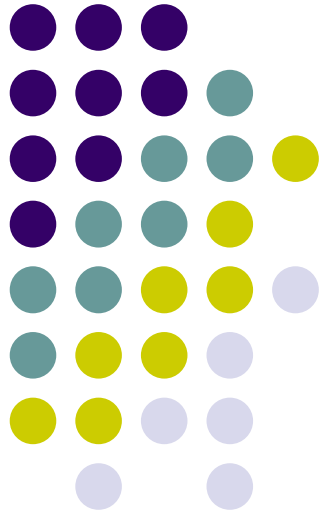
# 6.189 IAP 2007

## Student Project Presentation

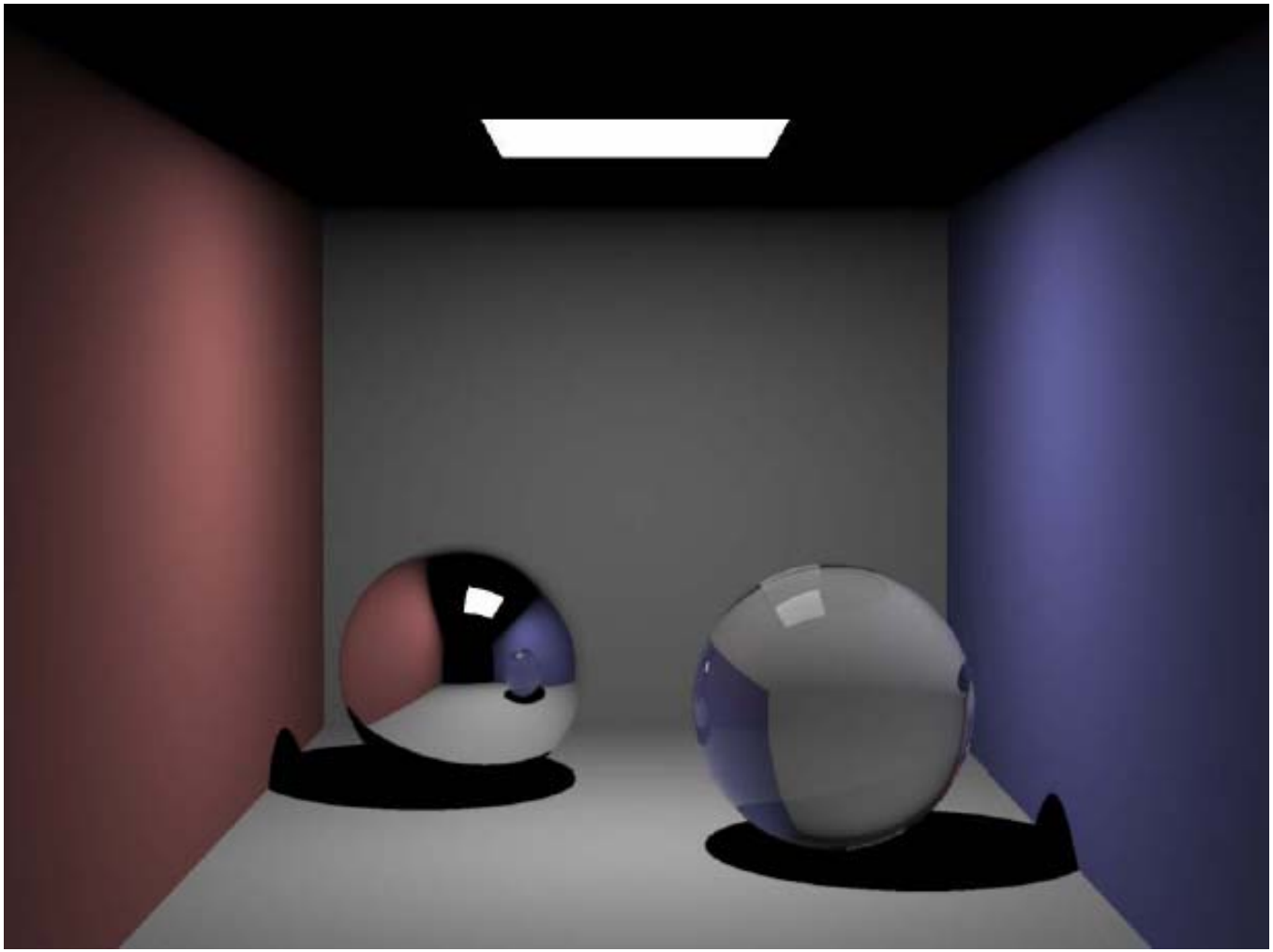
## Global Illumination

# Global Illumination

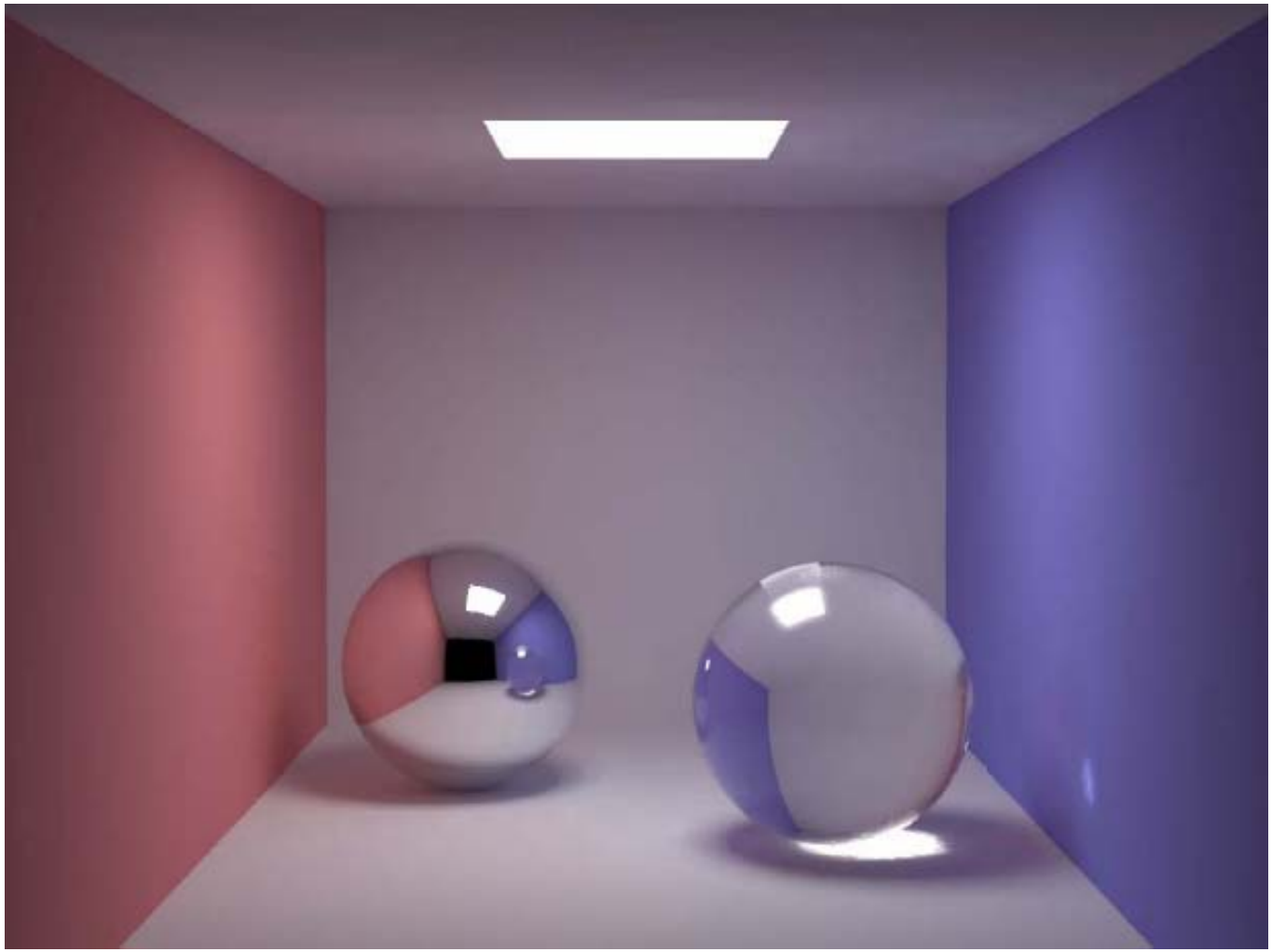
Pramook Khungurn



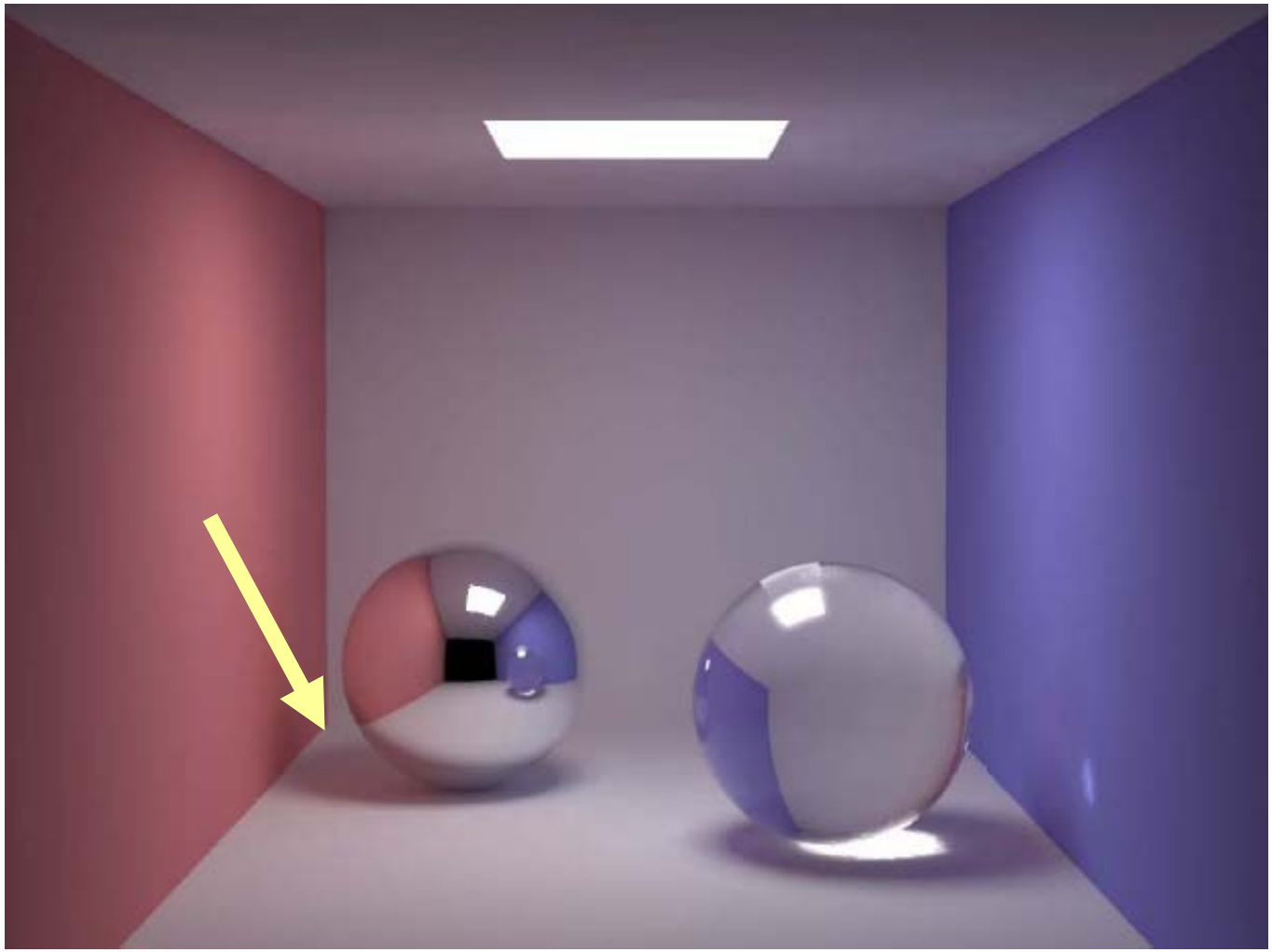
# Direct Illumination



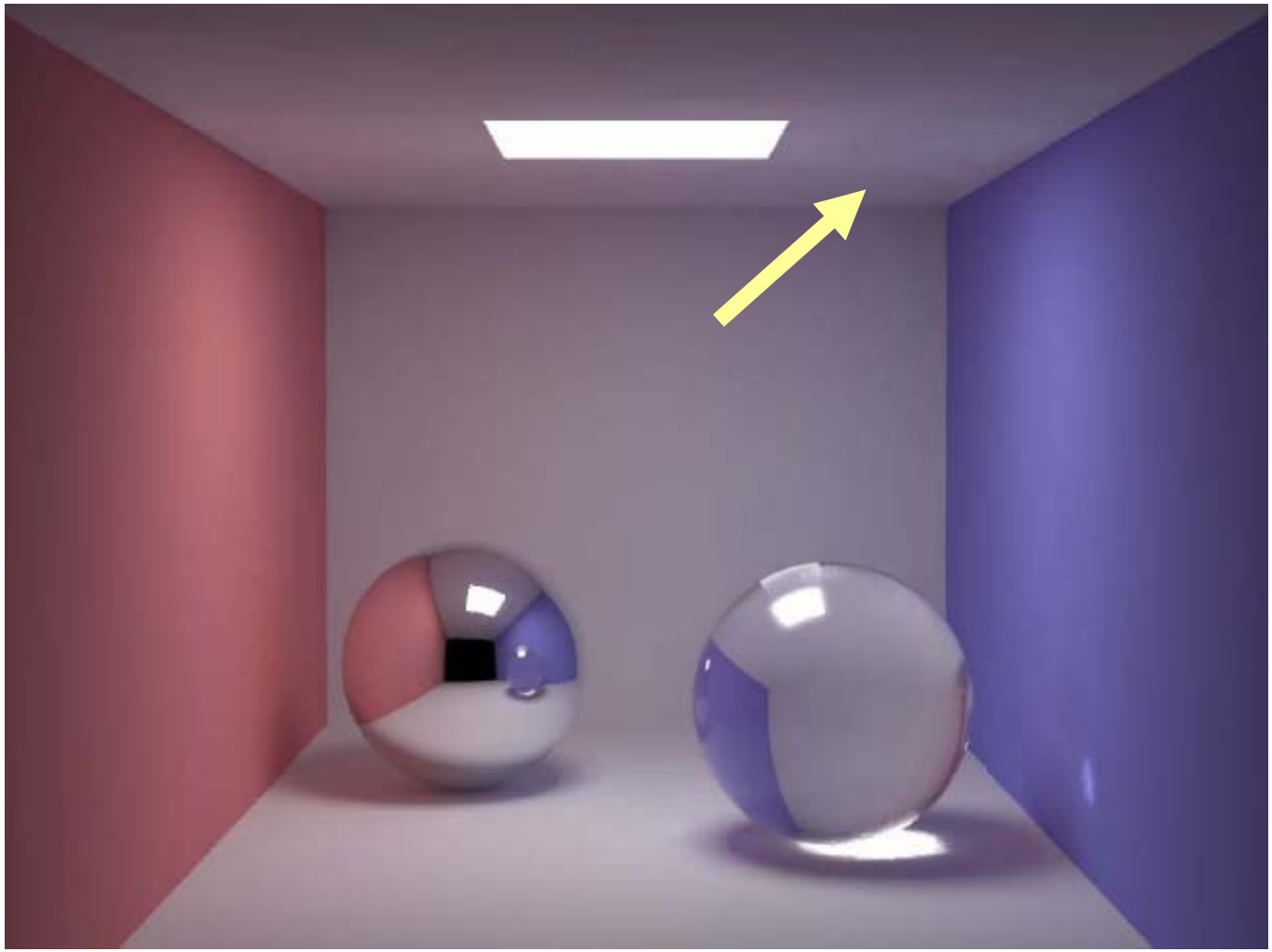
# Global Illumination



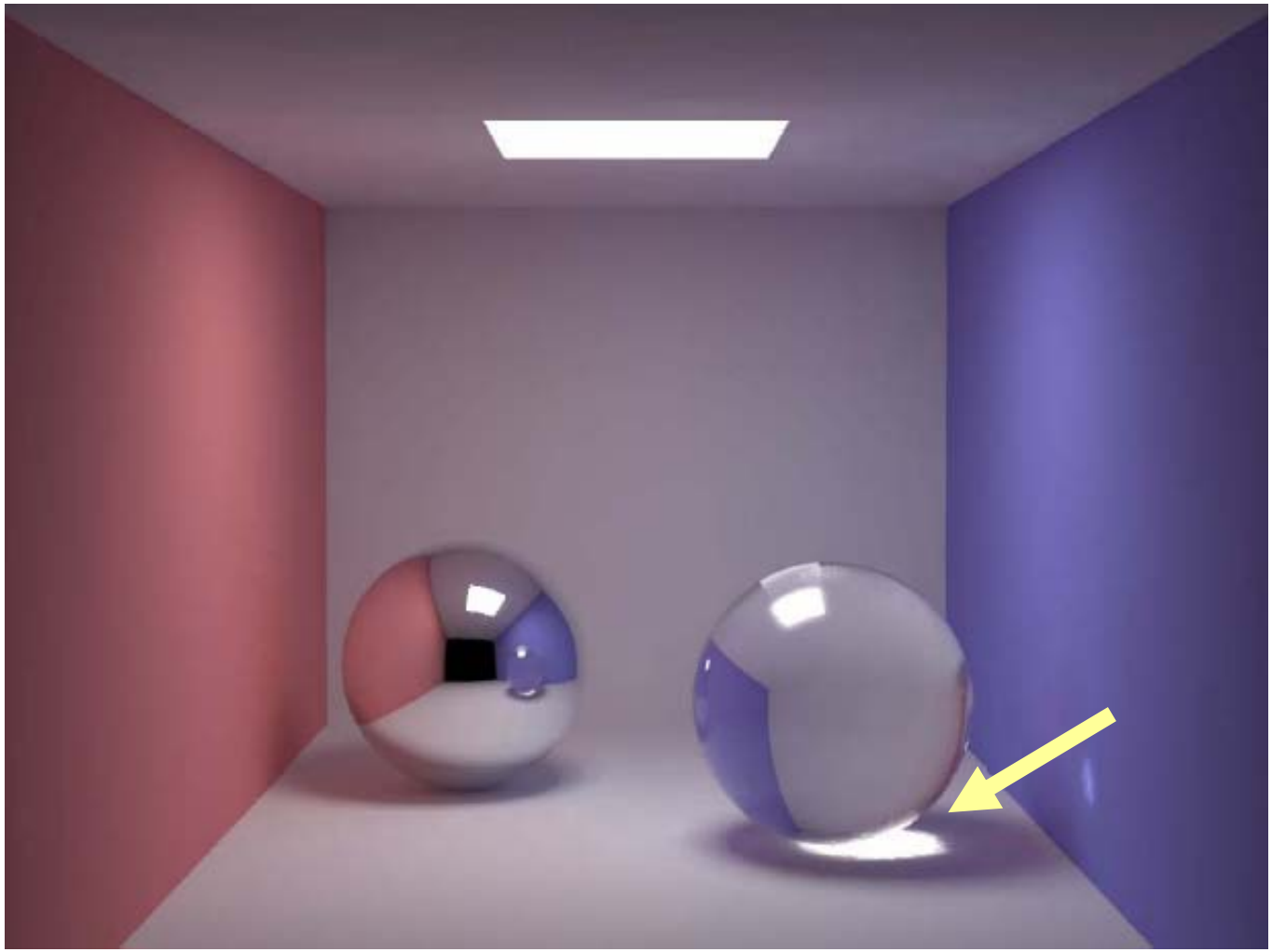
# Soft Shadows



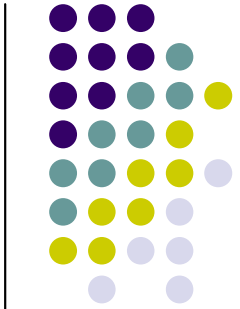
# Color Bleeding



# Caustics



# Goals

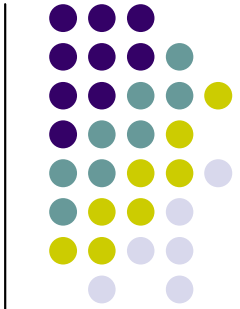


- Globally illuminate the Cornell Box.
- In real time!
- With caustics.
  - Have to use photon mapping.

# Accomplished Goals

- Globally illuminate the Cornell Box.
- ~~In real time!~~ (Too slow…)
- ~~With caustics.~~
  - ~~Have to use photon mapping.~~
- Sadly, there's still a lot of rooms for optimization.

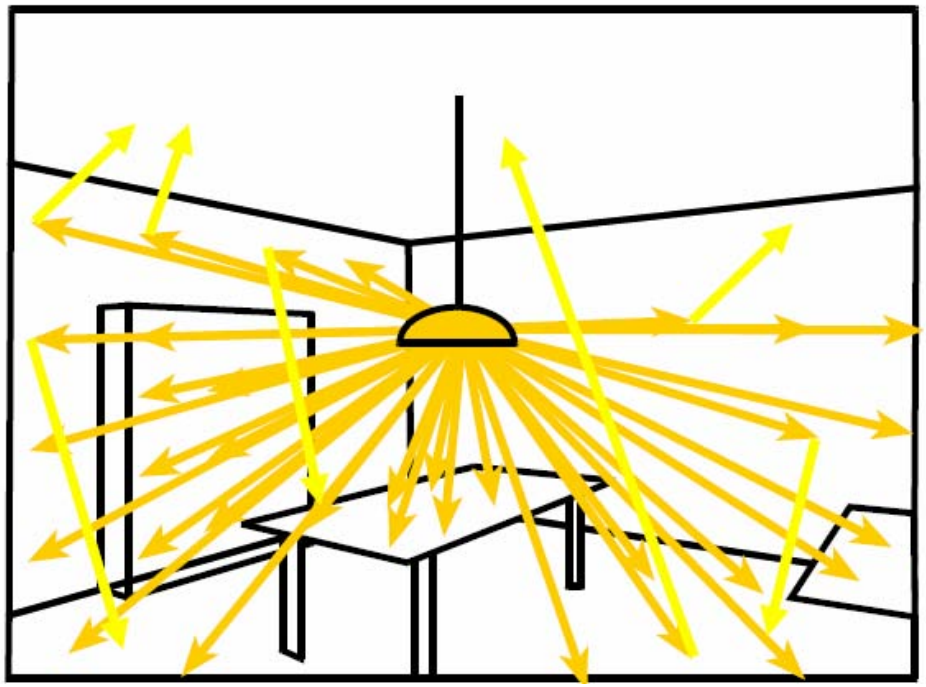
# Instant Radiosity



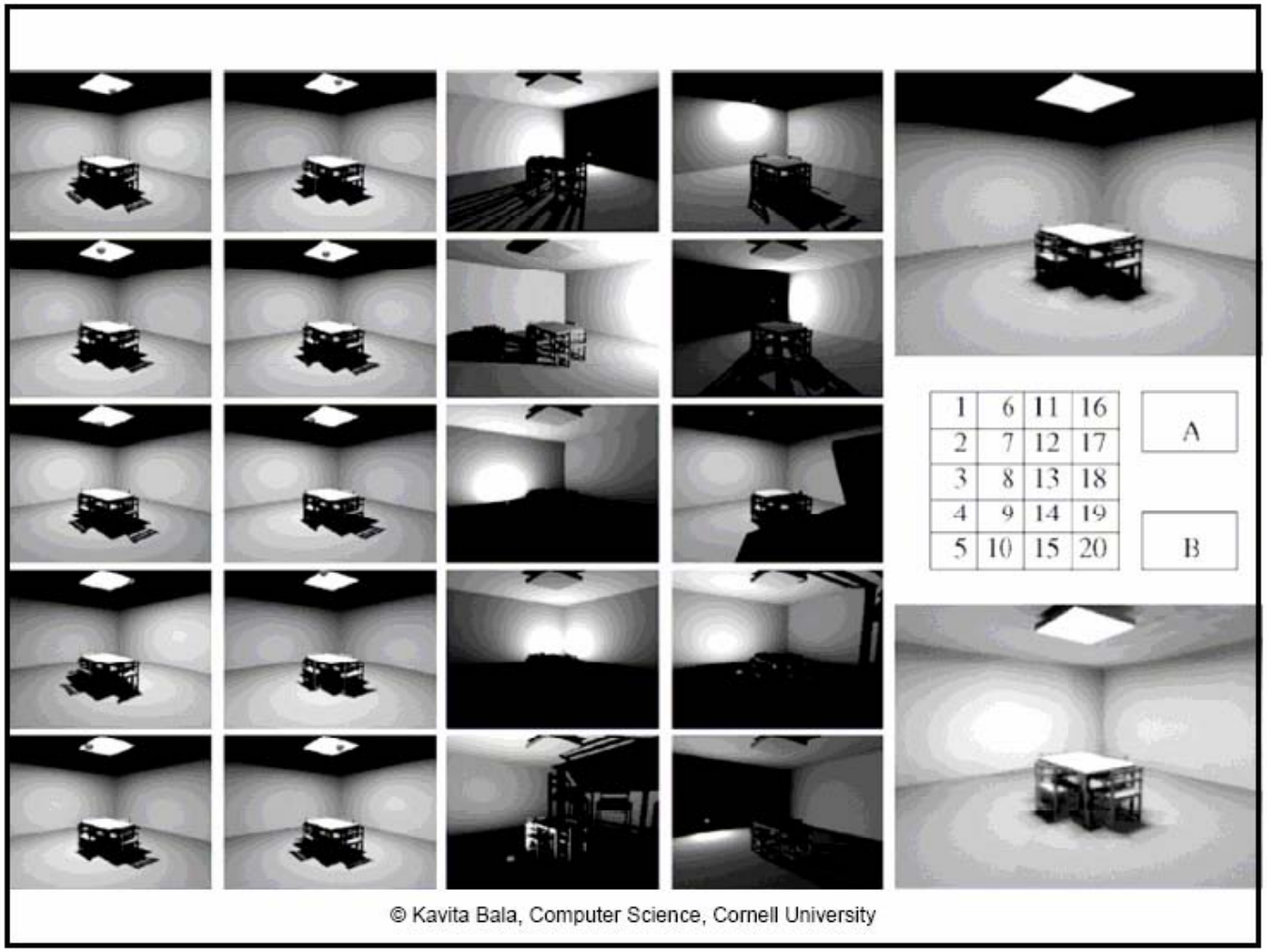
- Alexander Keller, “Instant Radiosity,” SIGGRAPH, 1997
- Good for scenes with diffuse objects.
- Can’t do caustics though.
- Very simple.

# Instant Radiosity (cont.)

- Emit “artificial light sources.”
- Each has a fixed number of “bounces.”
- Raytrace the scene with these new light sources.

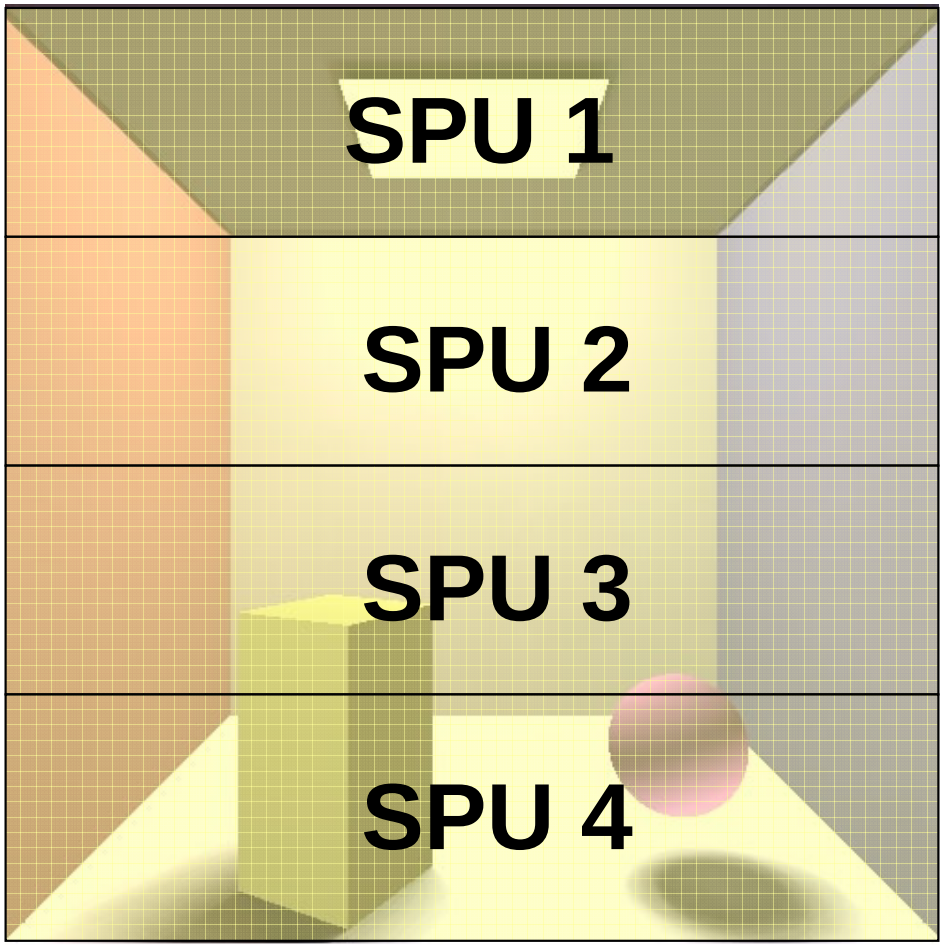


# Instant Radiosity (cont.)

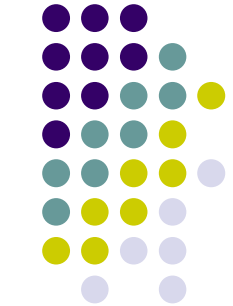


# Implementation

- Have 1 SPU scatter the artificial light sources.
- Embarassingly parallel rendering.
- Scene is small, so no worries about memory.
- Bruteforce ray shooting.



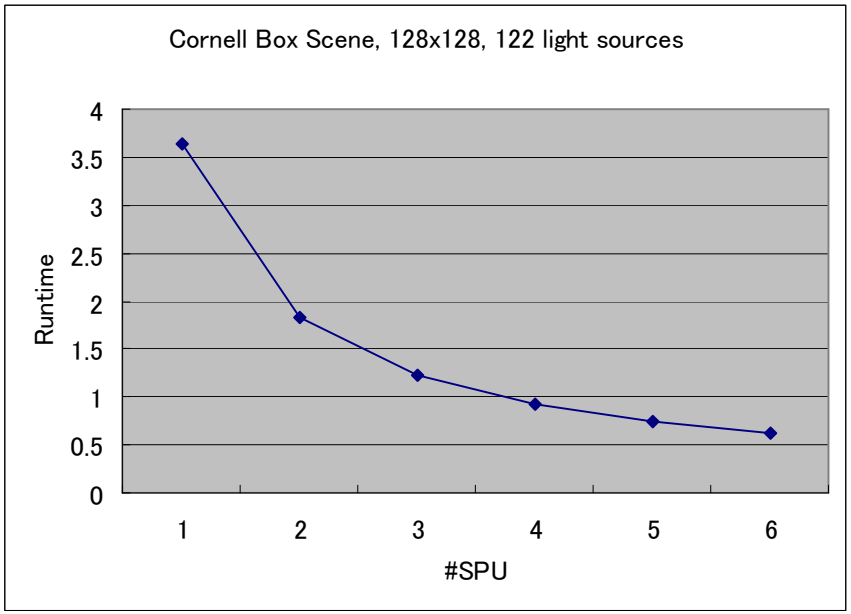
# Performance

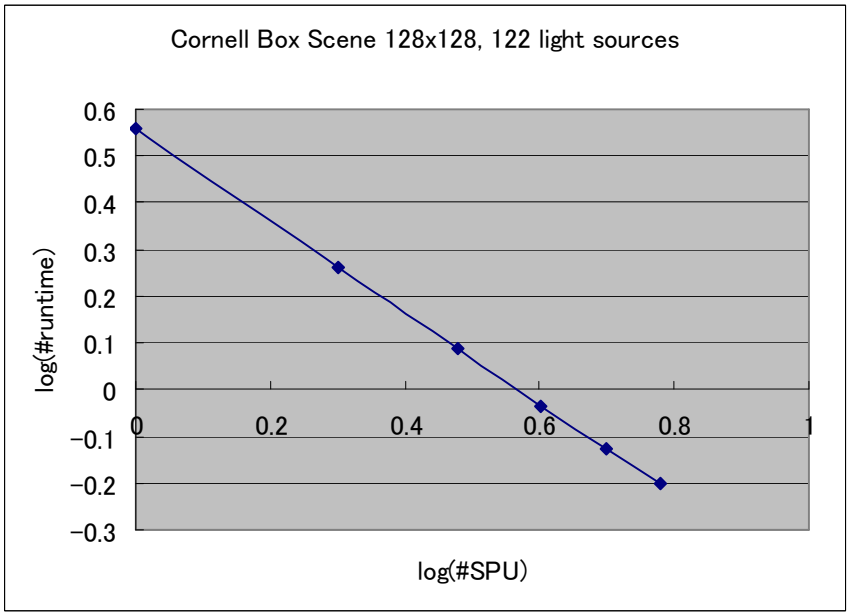


- O(image size x lights x objects)
  - Instant radiosity fast on GPU, not on Cell.
- I wish I could have done better.
  - 20 seconds to render a simple scene at 512x512
  - Still far from interactive rate.

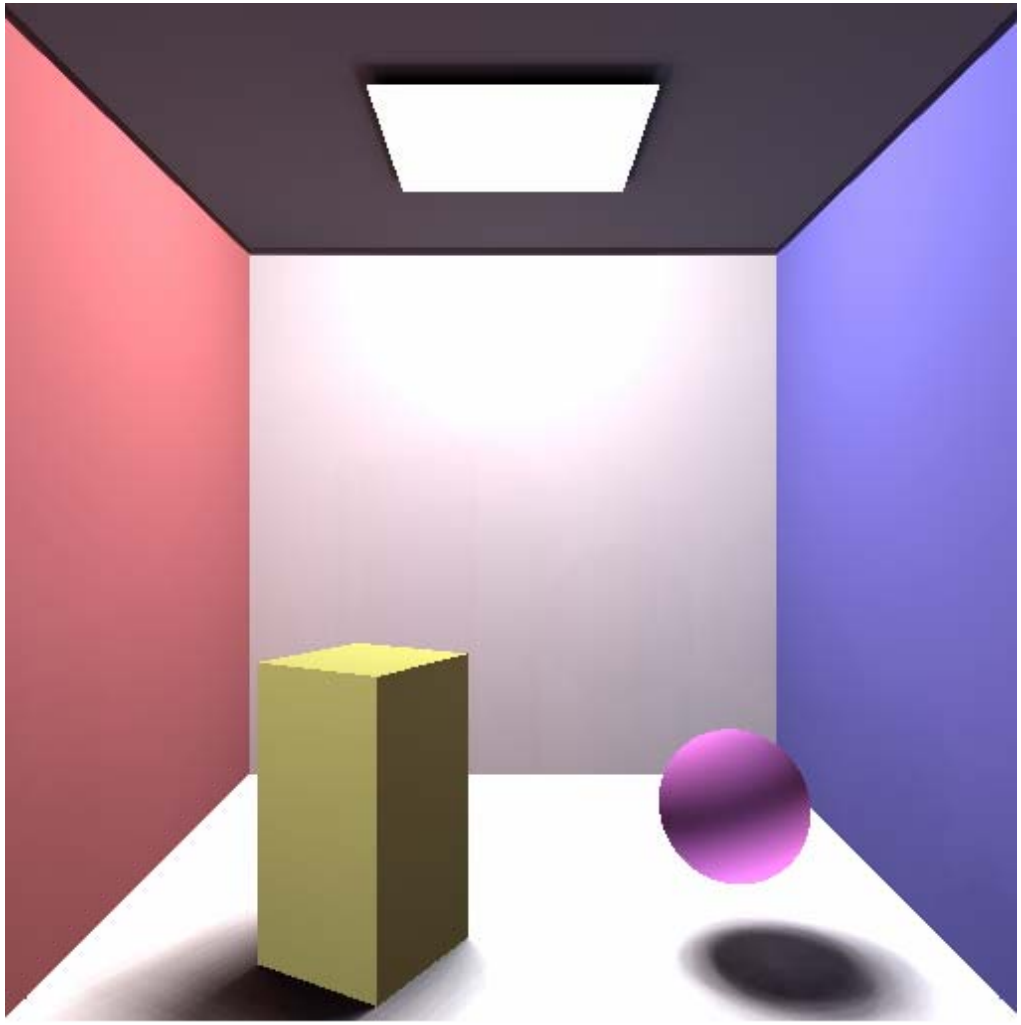
# Performance (cont.)

- Speed up = number of processors used.



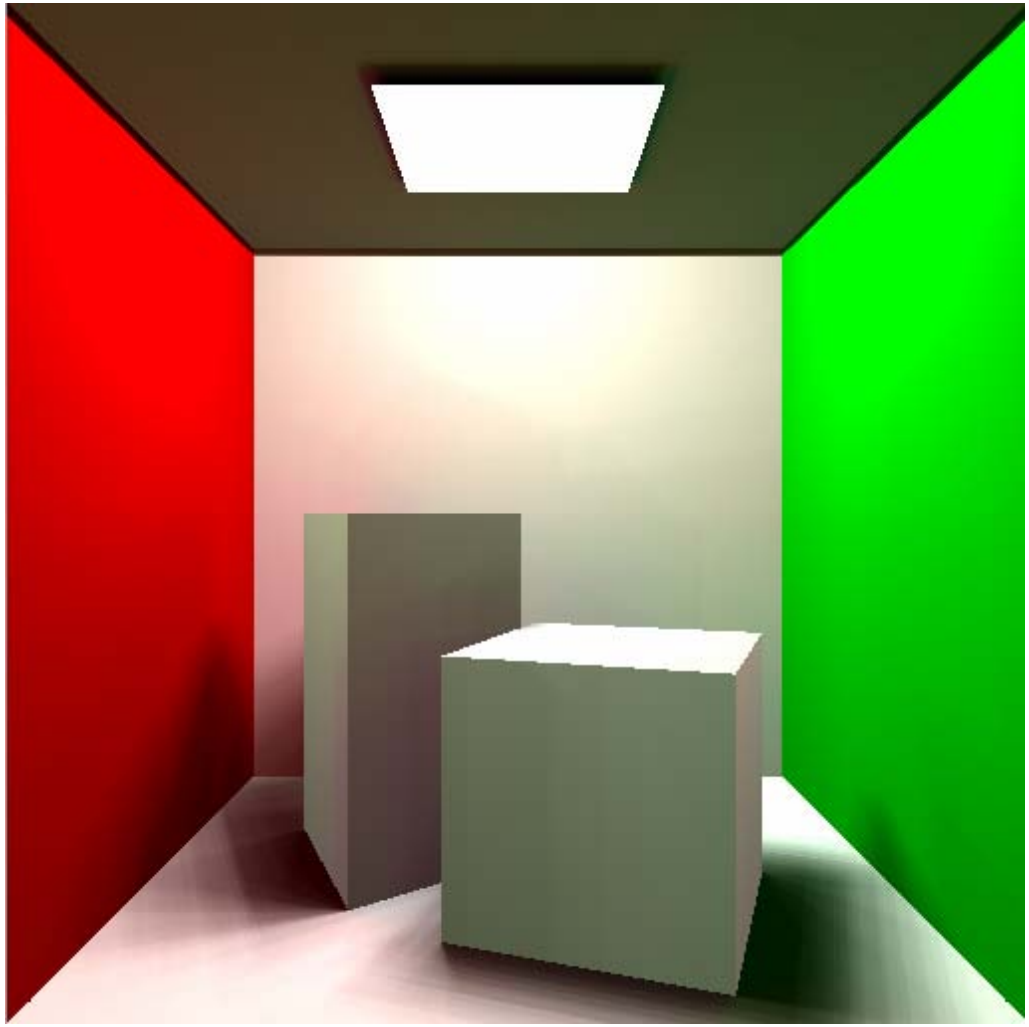



# Results



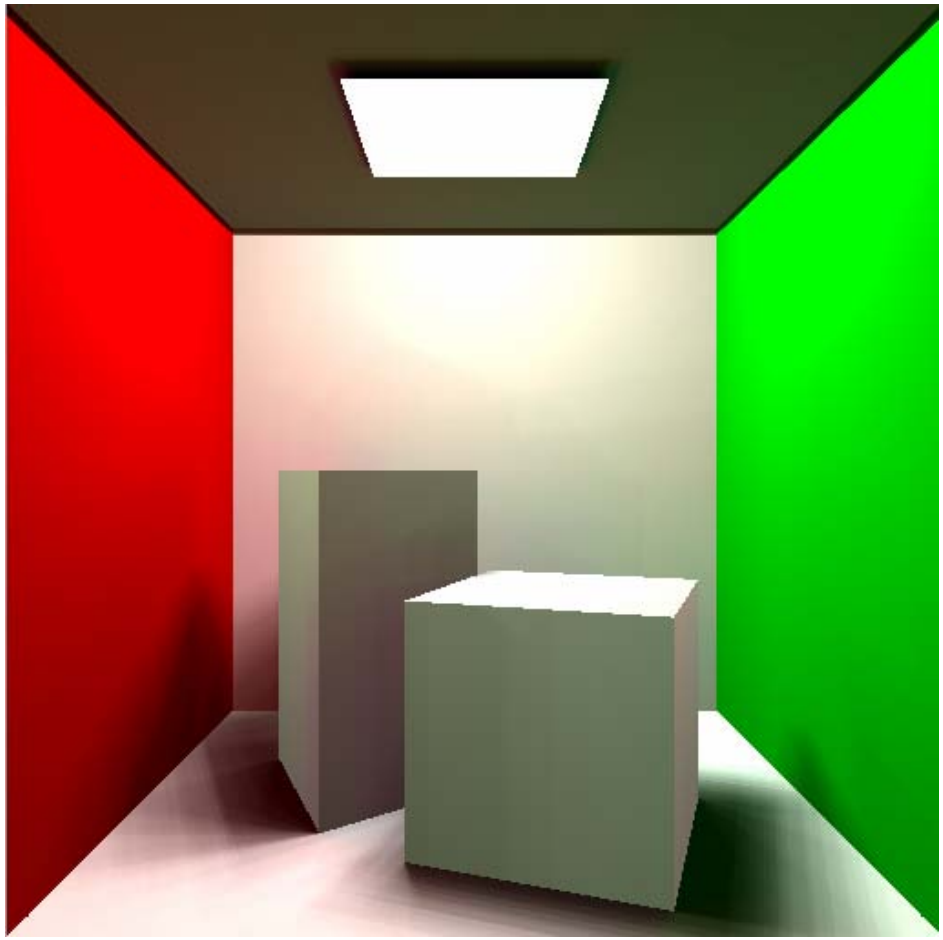
512x512, 8 objects, 251 light sources, 20.5 seconds with 6 SPUs

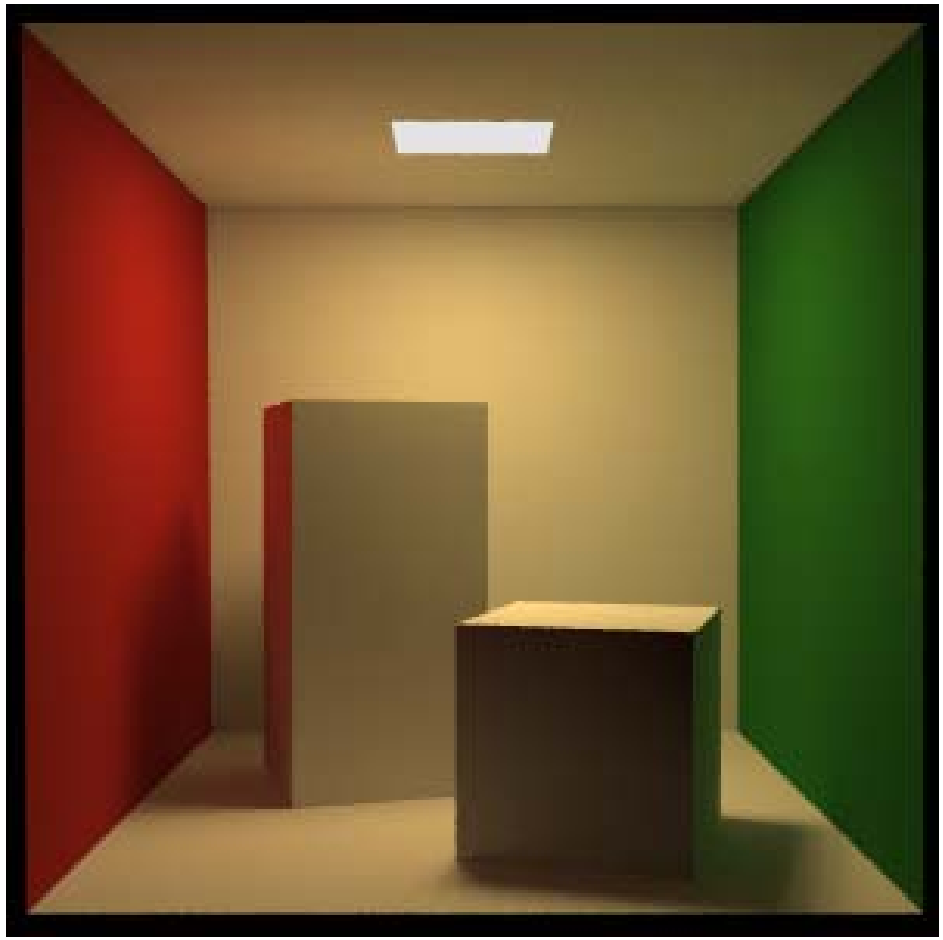
# Results (cont.)



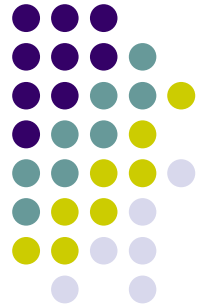
512x512, 8 objects, 253 light sources, 20.2 seconds with 6 SPUs

# Results (cont.)

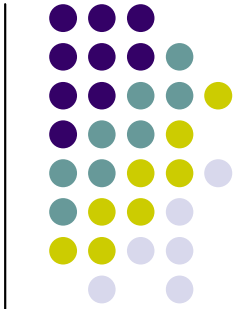




# Further Optimization



- Accelerated structure for geometries.
  - #objects → log(#objects)
  - In my case, 8 → 3. So about 3x speed up.
- Tracing packet of rays.
- Triangles as primitives.
  - Transforms are costly.



Thank you.