Photon Mapping with Caustics

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ECS 275A Advanced Computer Graphics

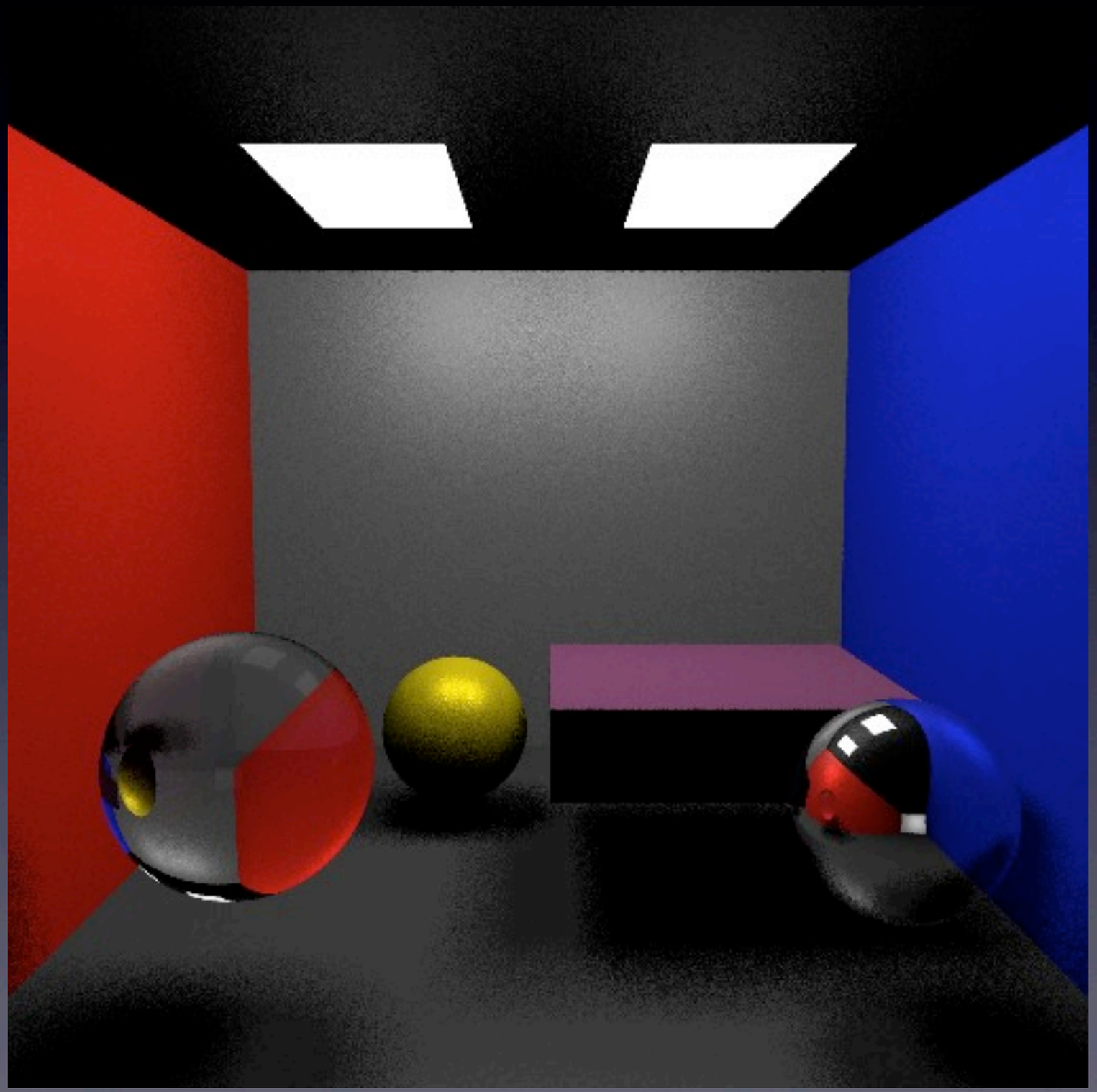
Photon Mapping

- Direct Illumination
  - Based on conventional Phong Shading without ambient
- Indirect Illumination
  - Photon mapping of diffuse and specular with Russian Roulette
- Caustics
  - Caustics photon mapping of reflection and refraction

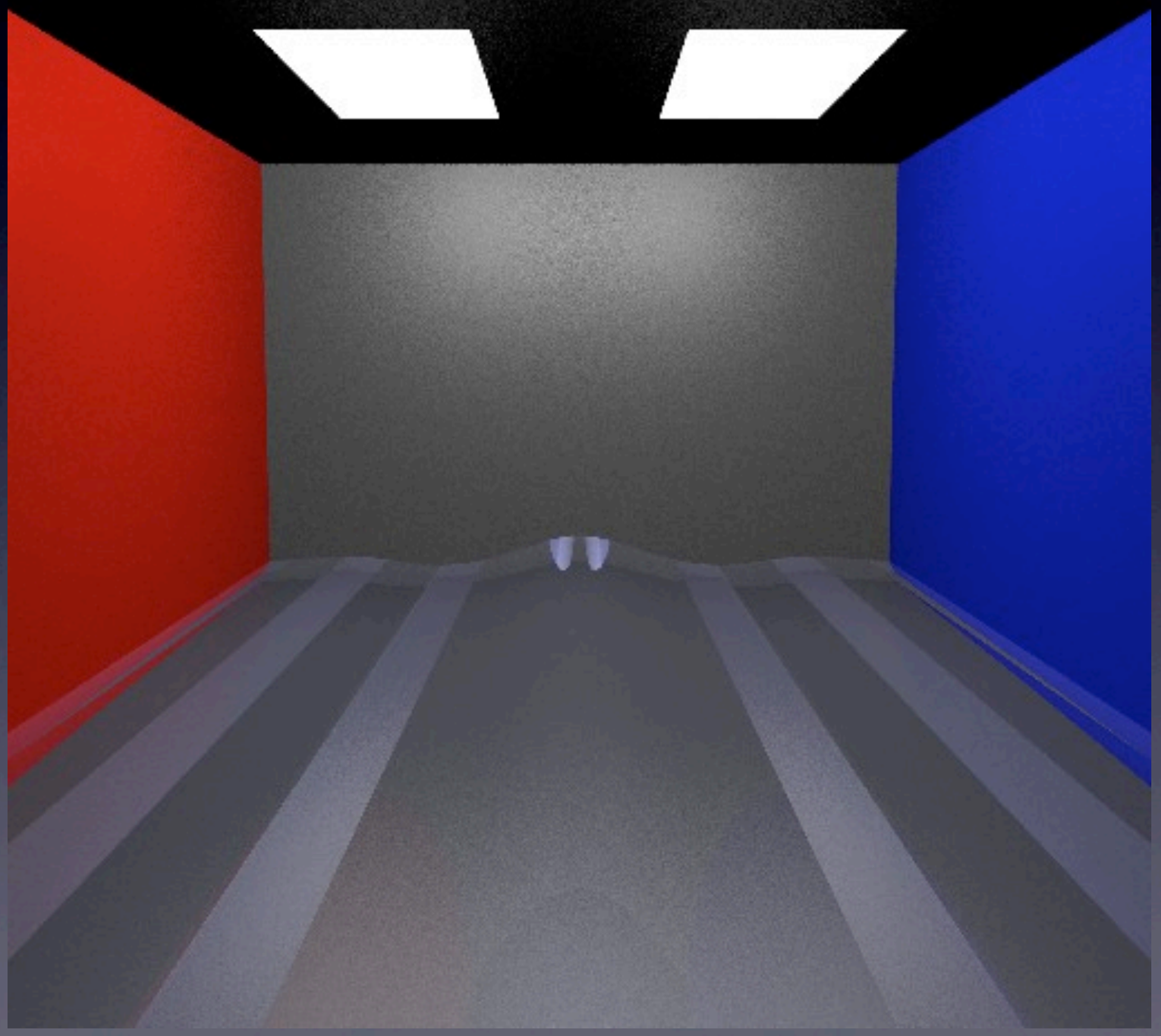
Direct Illumination

- glassy objects based on Snell's Law with critical angle constraint conditional statements
- Diamond object is created by importing .obj file
- Water object based on SINC function using Newton's method to approximate the intersection points
- Pluker Coordinates for intersection algorithm
- Step by step to arrange the scene

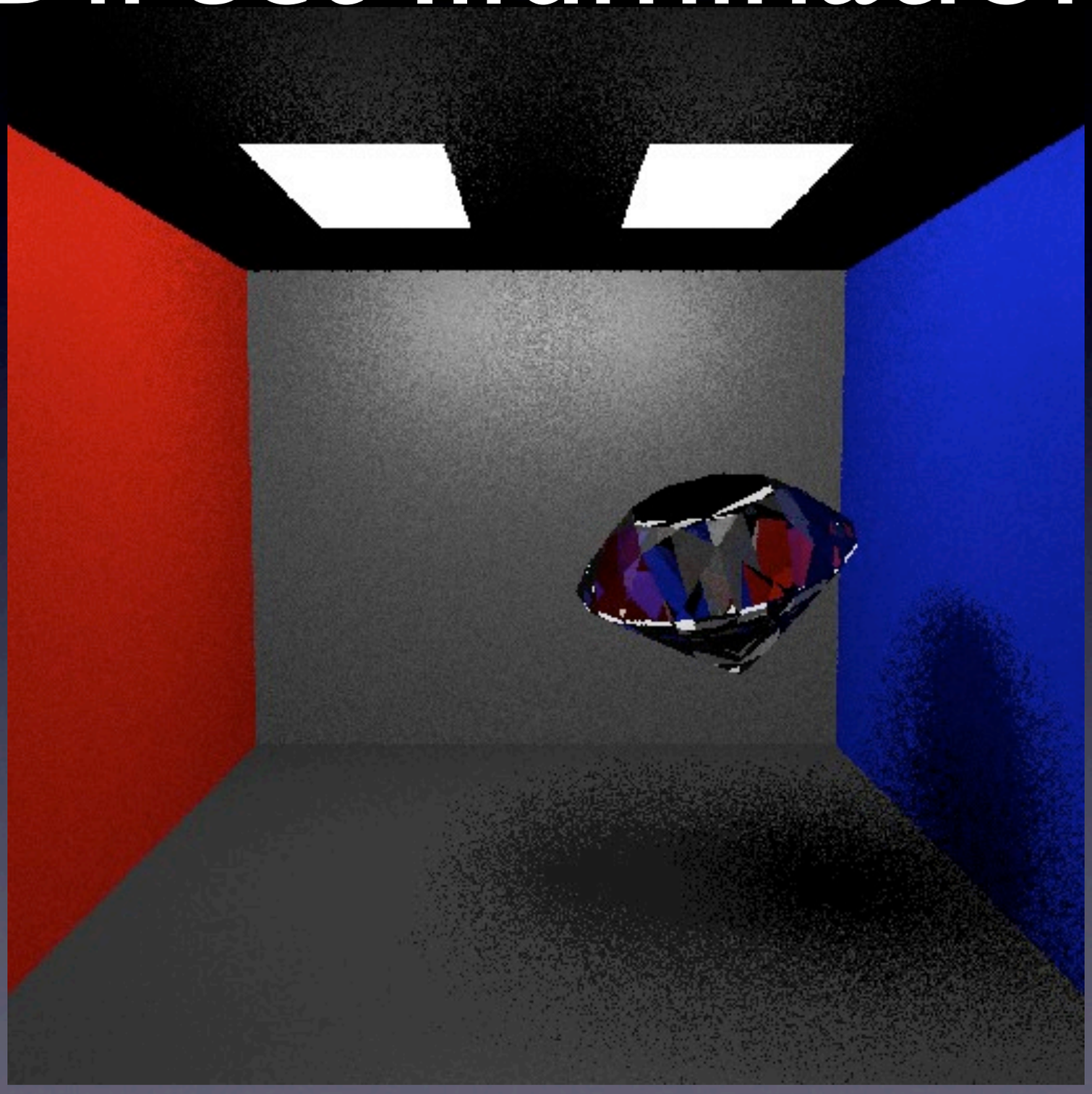
Direct Illumination



Direct Illumination



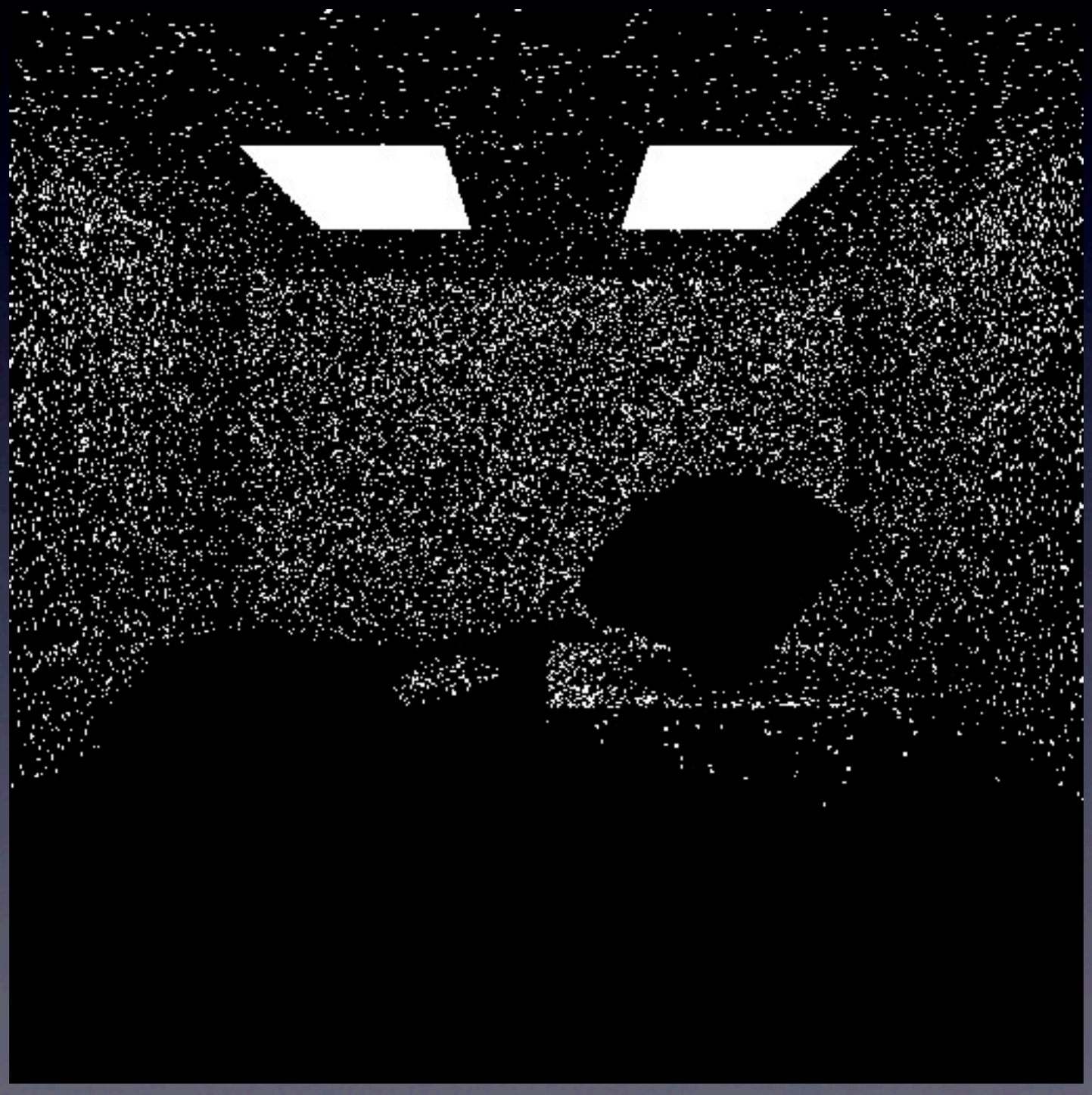
Direct Illumination



Indirect Illumination

- 50,000 photons from each area light
- Kd-tree with radius search of radius 3
- Jitter Sampling

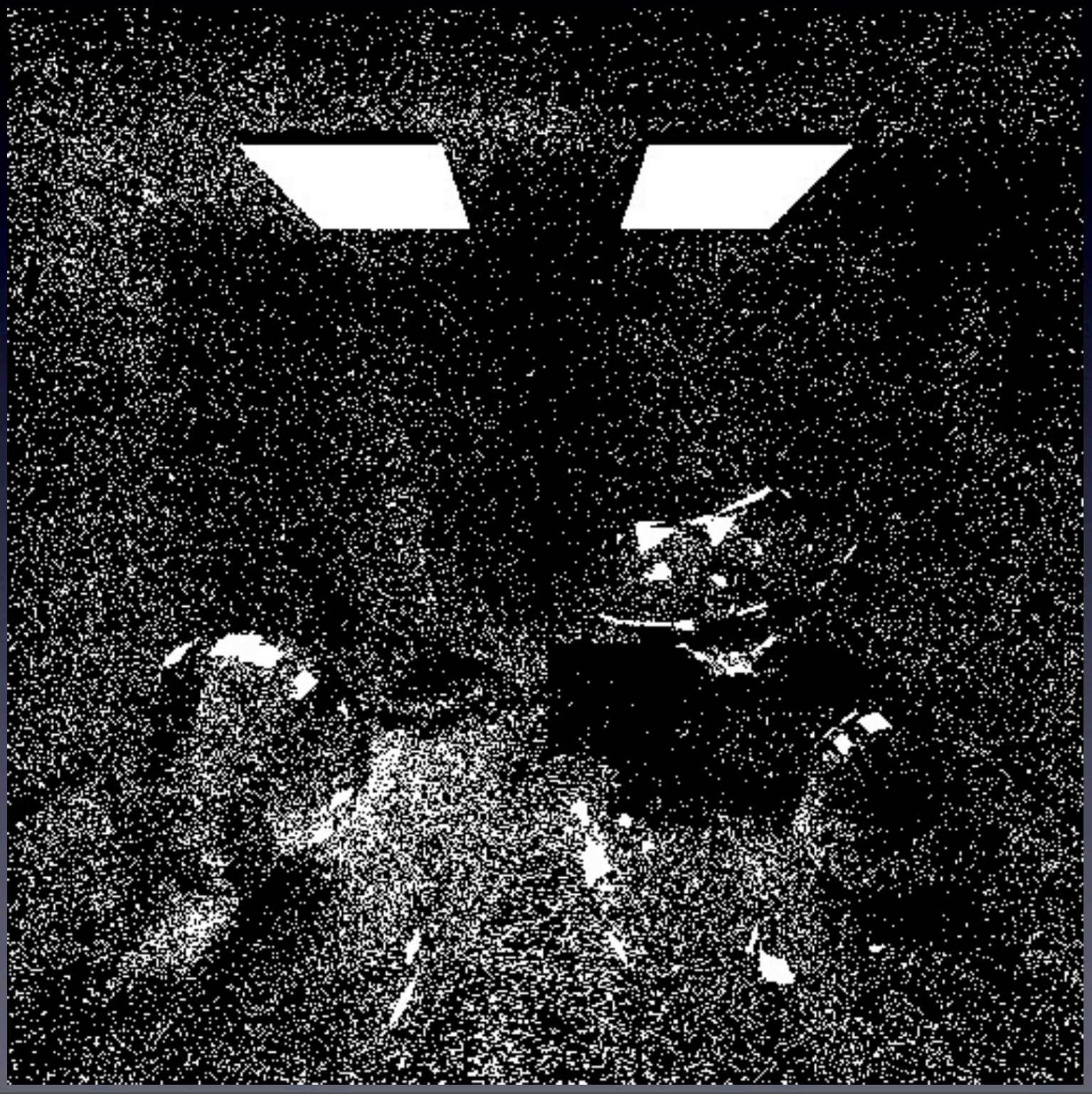
Indirect Illumination



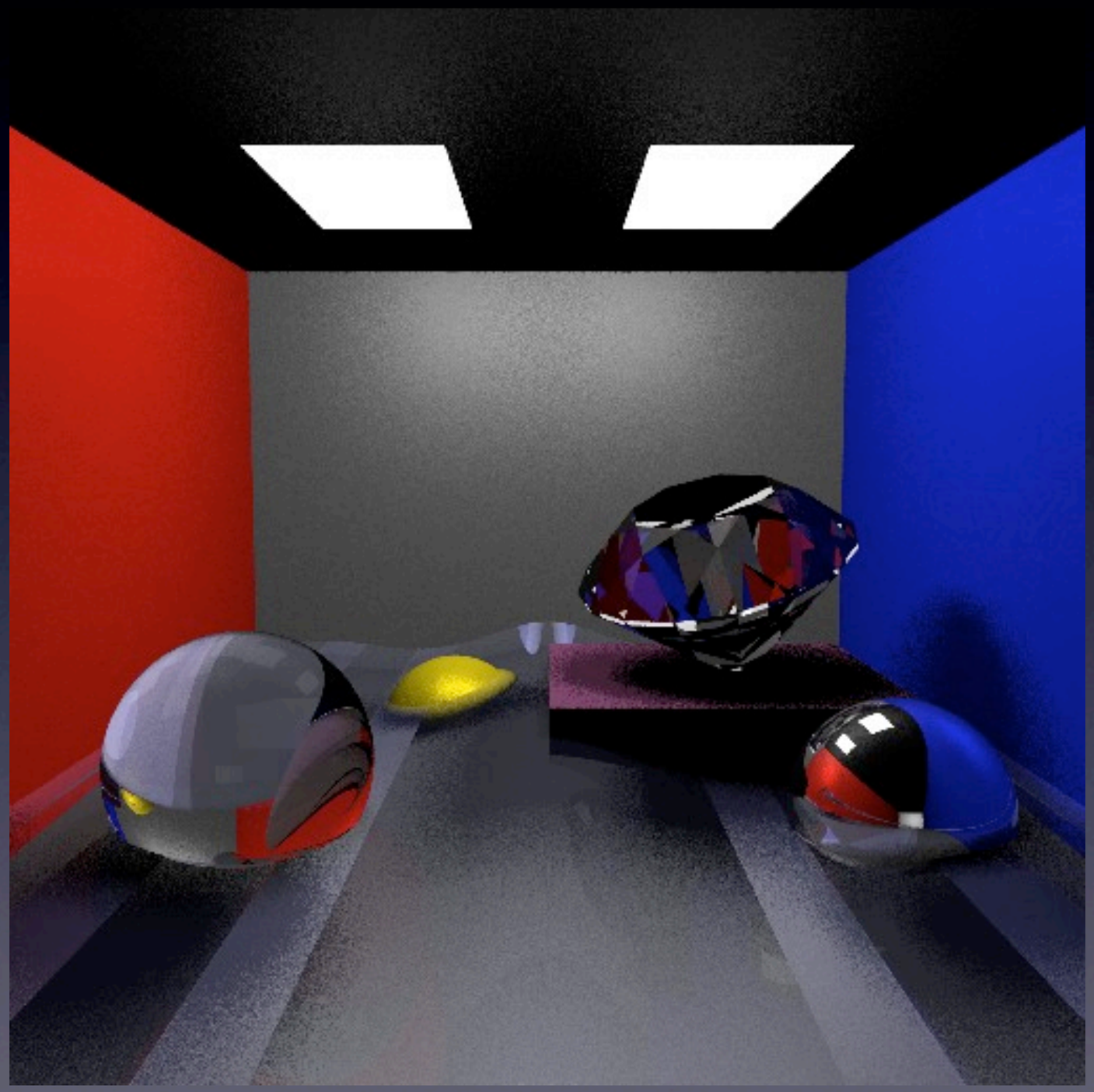
Caustics

- 100,000 photons from each area light
- Kd-tree with radius search of radius 0.5
- Jitter Sampling
- Collect photon also by reflection and refraction

Caustics

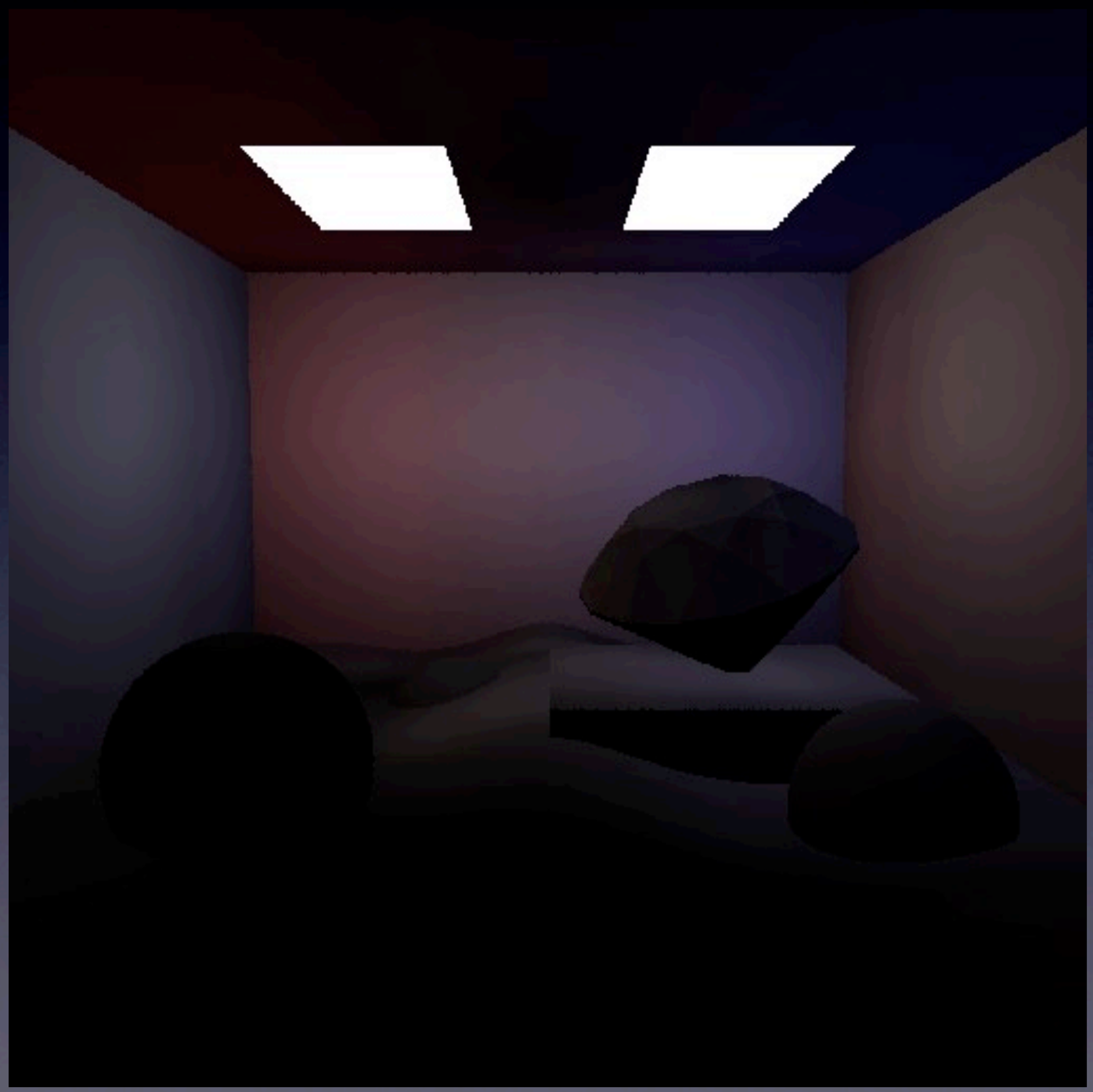


Full Scene - Direct



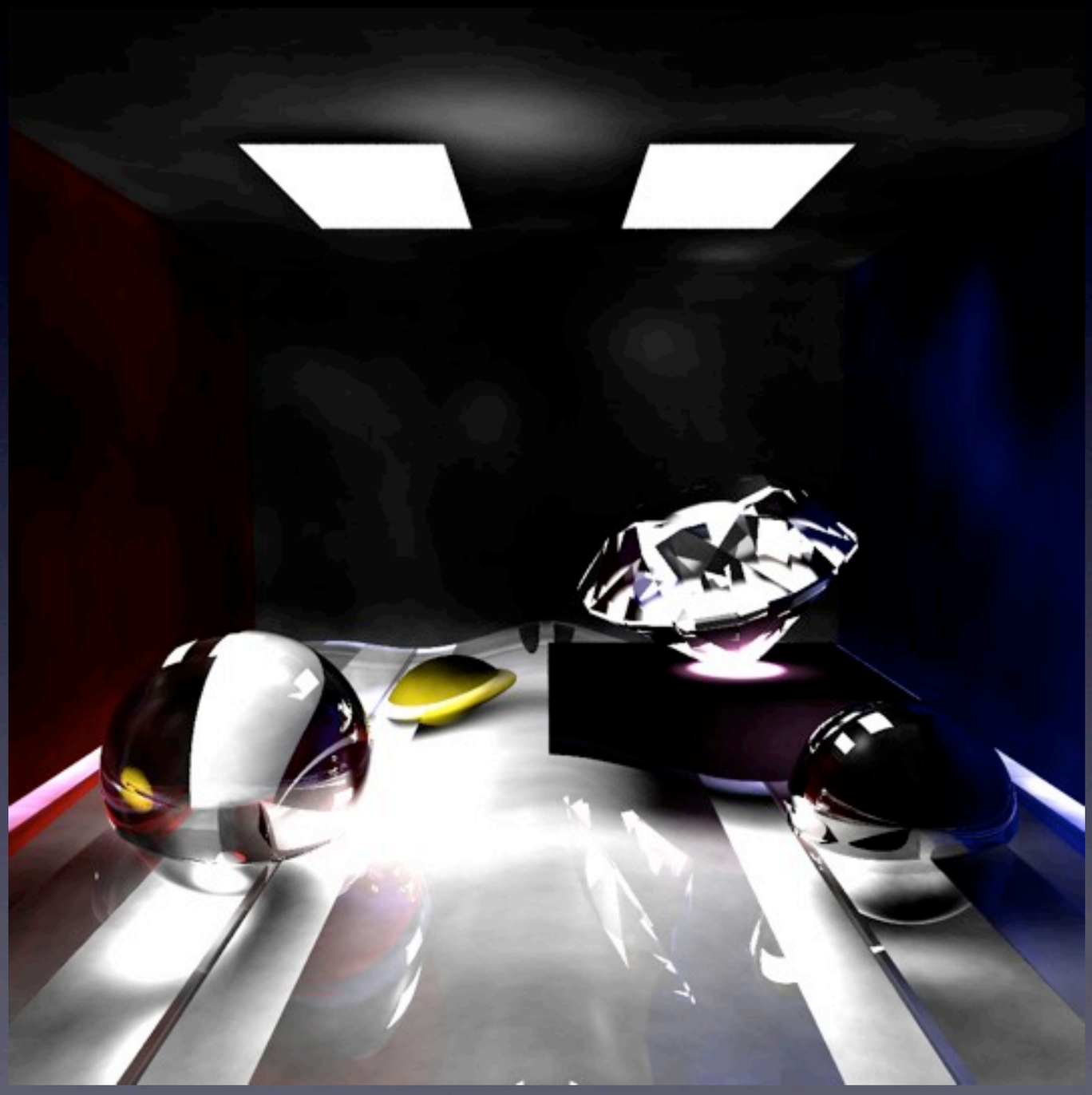
Direct Illumination, 1024x1024 with 36, 4, 4 sampling times respectively (1.58e+04 seconds).

Full Scene - Indirect



Indirect Illumination, 1024x1024 with 36, 4, 4 sampling times respectively (3.11e+03 seconds).

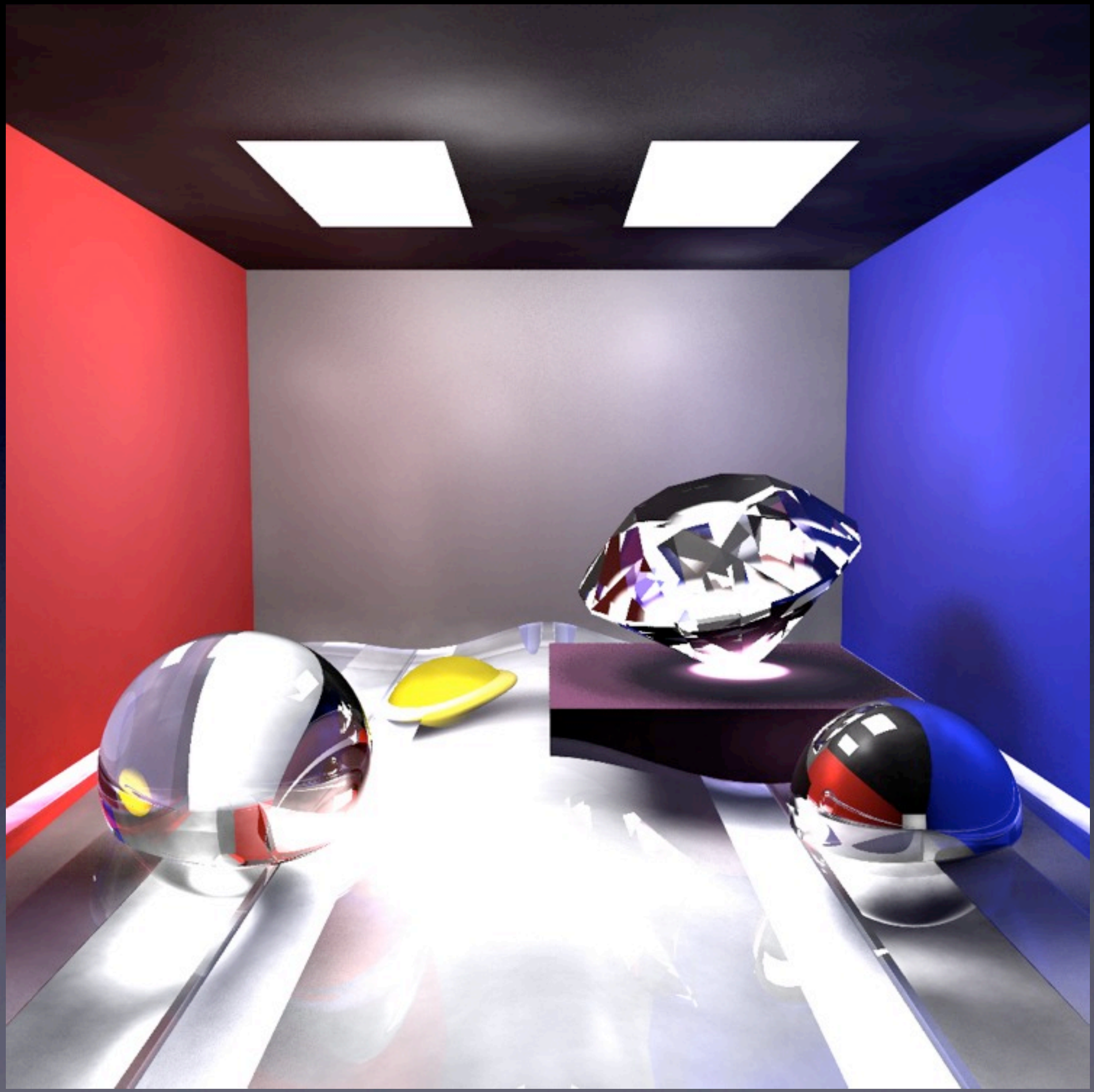
Full Scene - Caustics



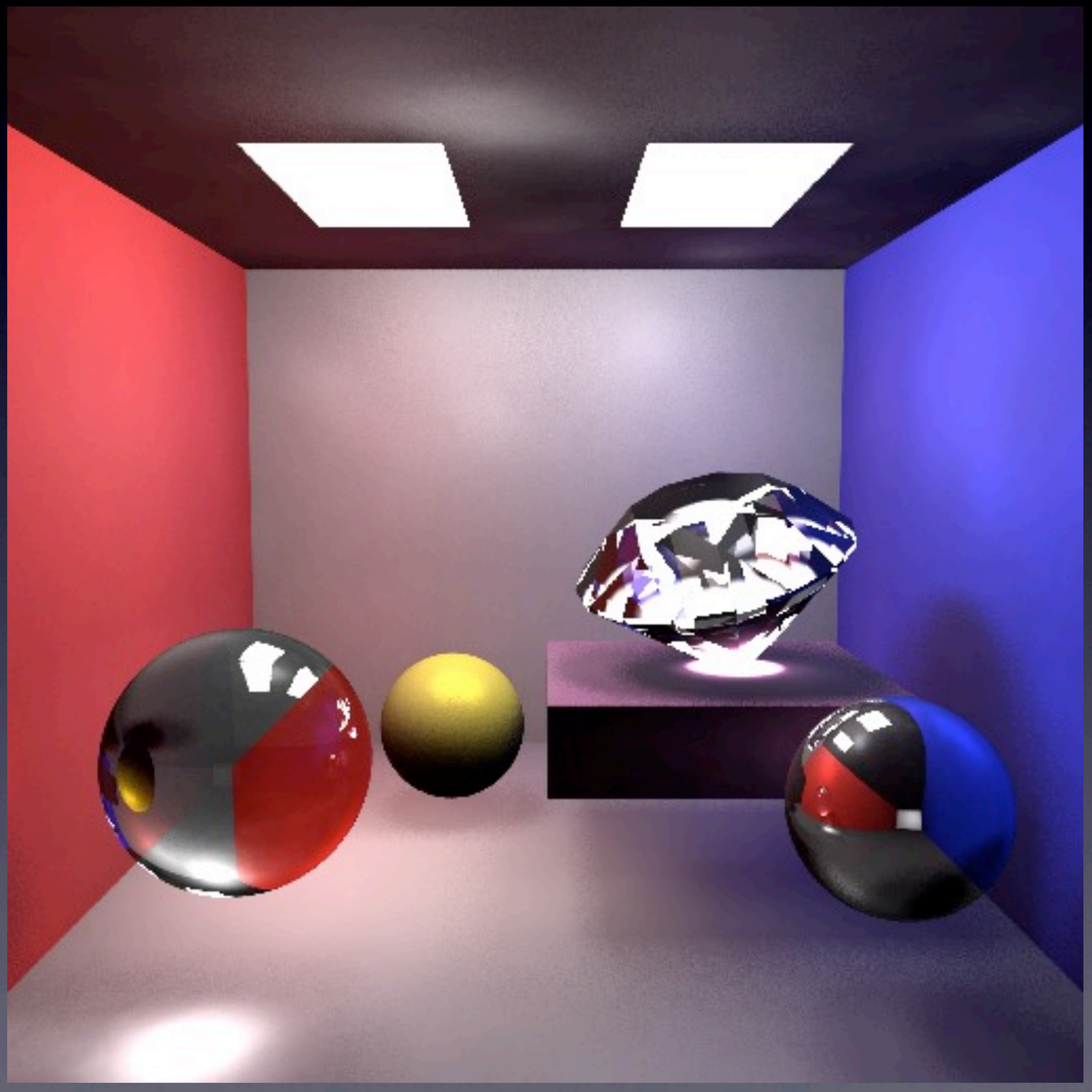
Caustics, 1024x1024 with 36, 4, 4 sampling times respectively (2.97e+03 seconds).

Full Scene - All Effects

- Caustics, 1024x1024 with 36, 4, 4 jitter sampling times respectively (2.1e+04 seconds).



Full Scene - No Water



Q & A