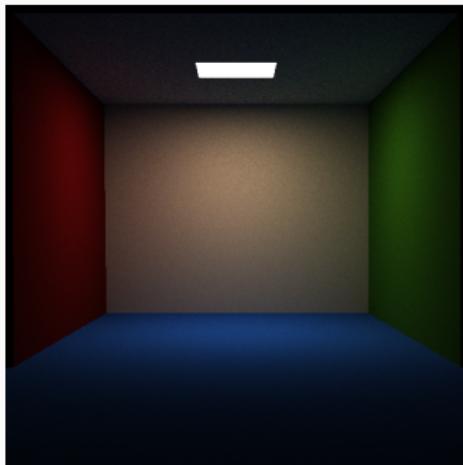


# Informática gráfica

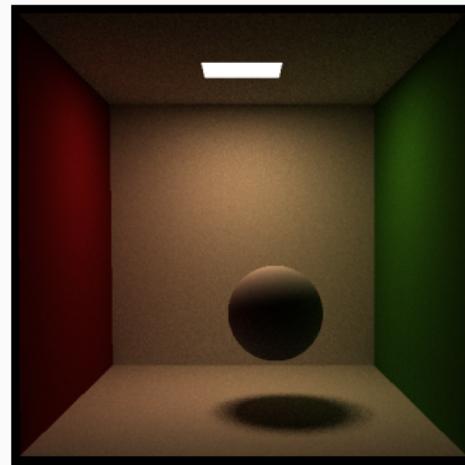
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2018-09-10

# Geometría

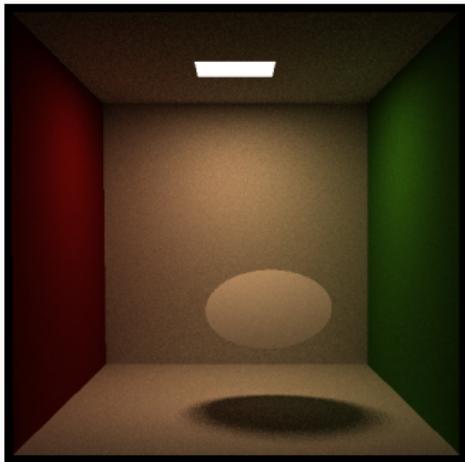


Plano (objeto azul)

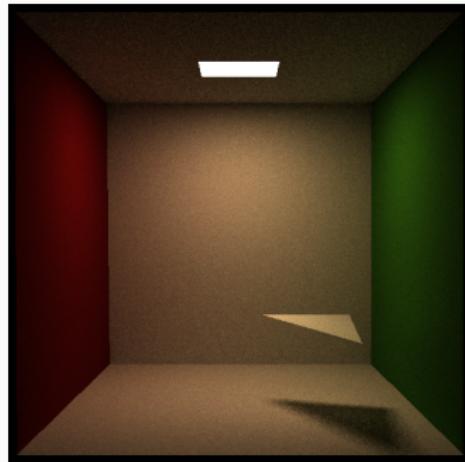


Esfera

# Geometría

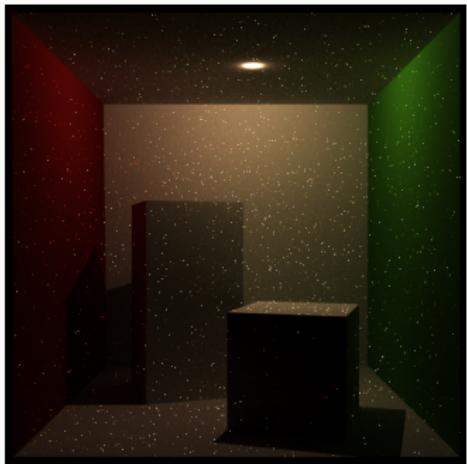


Disco

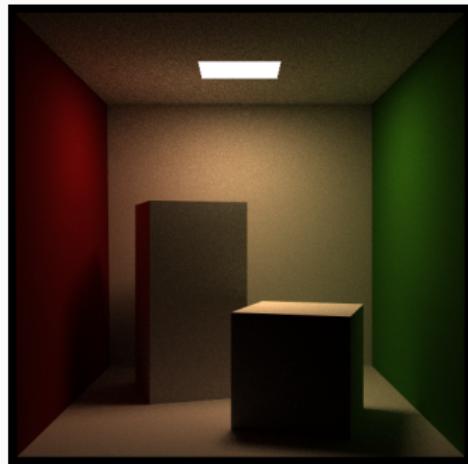


Triangulo

# Fuentes de luz



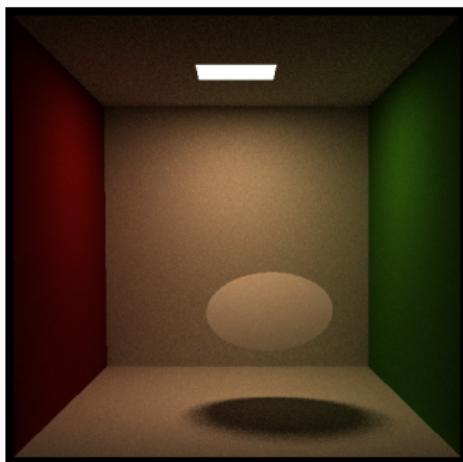
Luz de punto



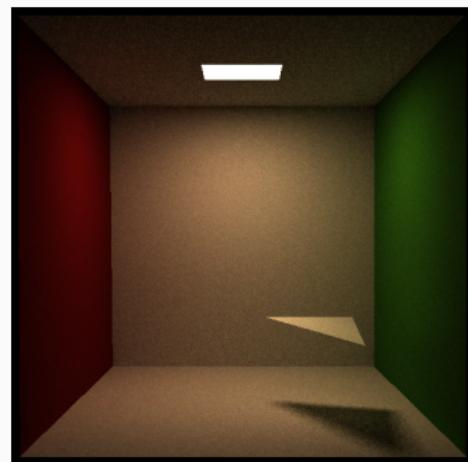
Luz de area lambertiana

# BSDF | Lambertiana

- Muestreo:  $pdf(\omega) \propto \cos \theta$



Disco



Triangulo

# BSDF | Phong

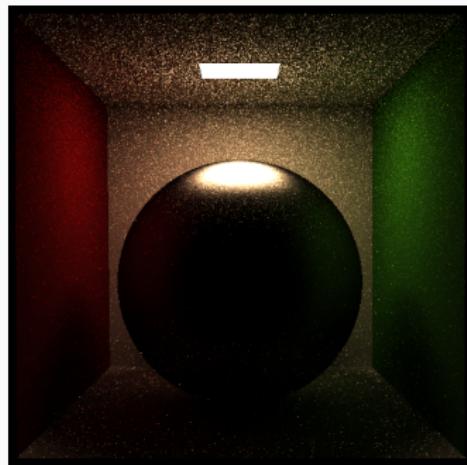
Dos estrategias de muestreo utilizadas:

1.  $pdf(\omega) \propto \cos \theta$
2.  $pdf(\omega) \propto \cos^n \alpha$

# BSDF | Phong



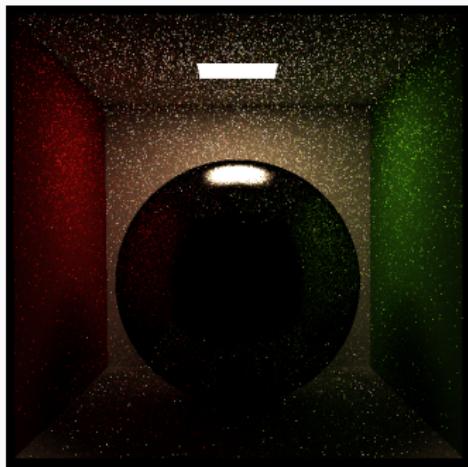
$n = 10$



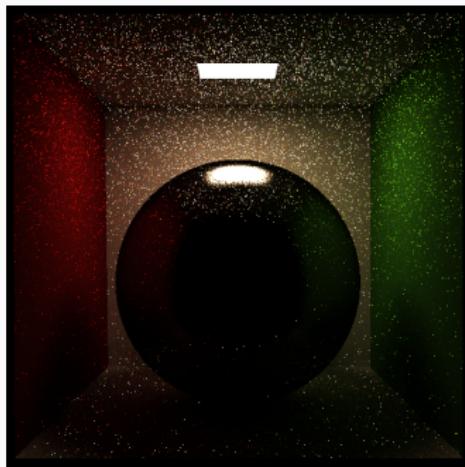
$n = 10$

**Figura 1:** 32 SPP sin AA,  $K_s = 0.8$  y  $Kd = 0.0$

# BSDF | Phong



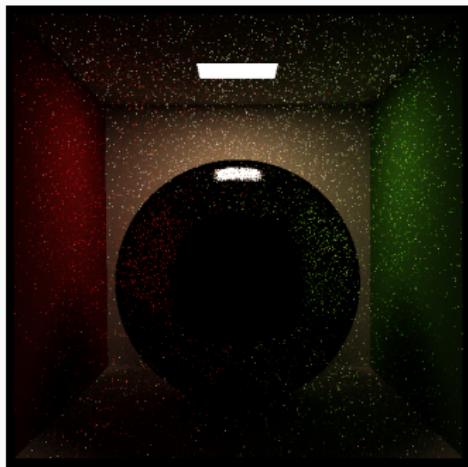
$n = 100$



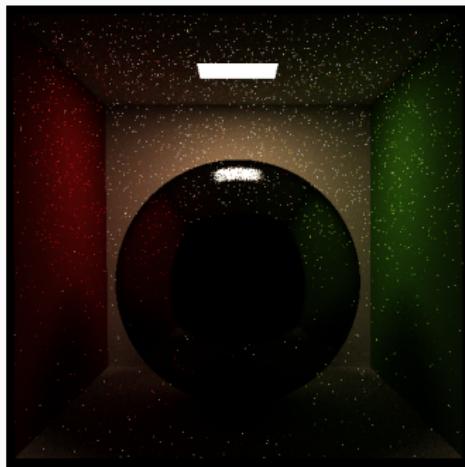
$n = 100$

**Figura 2:** 32 SPP sin AA,  $K_s = 0.8$  y  $Kd = 0.0$

# BSDF | Phong



$n = 1000$



$n = 1000$

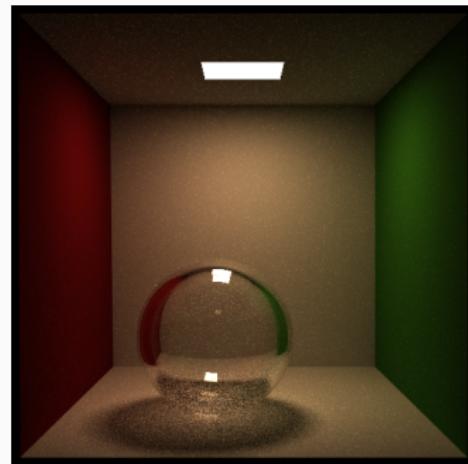
**Figura 3:** 32 SPP sin AA,  $K_s = 0.8$  y  $Kd = 0.0$

# BSDF | Refracción

- Fresnel: fracción de luz reflejada. Ruleta rusa para elegir una de las dos direcciones.
- Ley de Snell: calcular dirección de refracción.



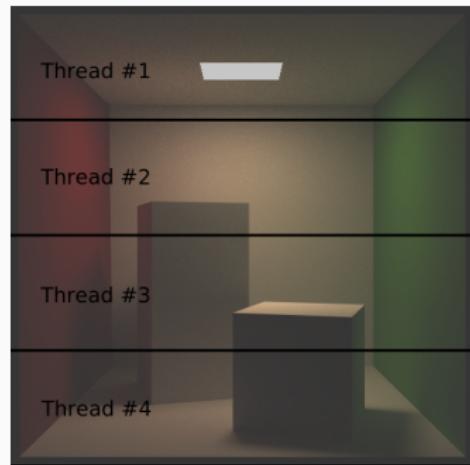
Esfera completamente de cristal.



Esfera de cristal con grosor y con aire dentro.

# Paralelización

- Dividir la imagen horizontalmente en tantos trozos como threads
- Asignar esos trozos a los threads
- Sencillo de implementar
- Pero carga no uniforme

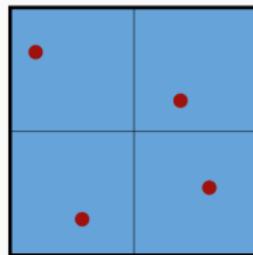


# Out of gamut

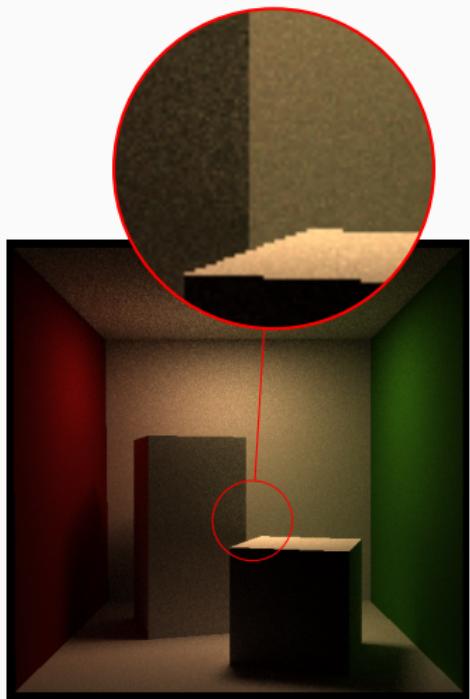
- Cuando escribimos imagen en disco duro, *clamp* valores dentro del rango  $[0, 1]$
- Alternativas: tecnicas mas avanzadas de *tone mapping*, *gamma correction*, etc.

# Antialiasing

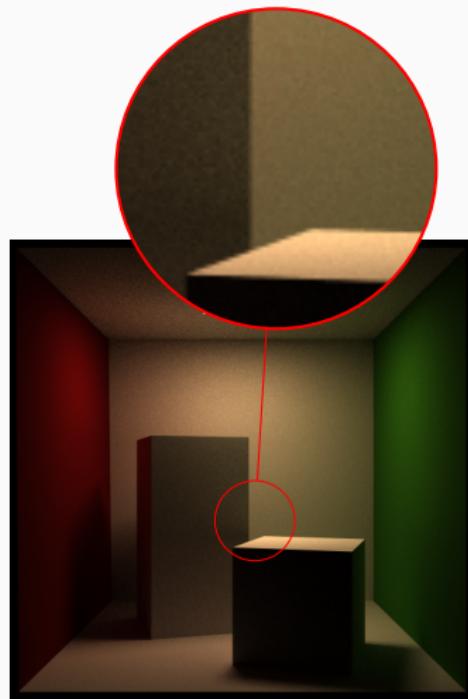
- Sin antialiasing: disparar rayos por el centro de los píxeles
- Con antialiasing: dividir 1 píxel en 4 subpixeles (stratified sampling)



# Antialiasing



(c) 64 SPP sin AA



(d) 64 SPP con AA

# Ruleta rusa

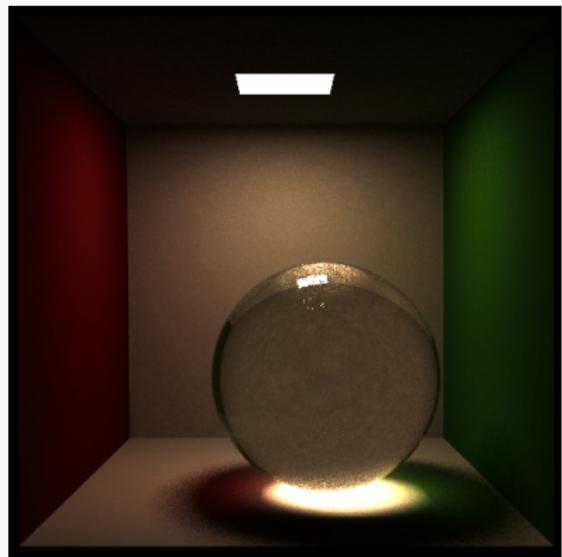
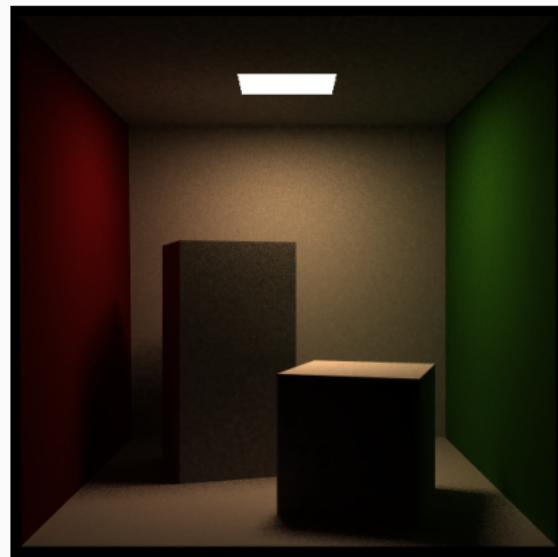
- En path tracing:
  - Mínimo 5 saltos
  - Después, ruleta rusa con probabilidad de finalización:  
$$\max\{0.1, 1 - \max\{t.r, t.g, t.b\}\}$$
- En photon mapping:
  - Probabilidad de sobrevivir:

$$\min\left\{1, \frac{\max\{tnew.r, tnew.g, tnew.b\}}{\max\{told.r, told.g, told.b\}}\right\}$$

# Photon mapping

- Iluminación directa con *shadow rays*
- Estimación cogiendo los 100 fotones mas cercanos
- Otras técnicas: aplicación de filtros, *final gathering* . . .

# Photon mapping



**Figura 4:**  $ph_i = 10000000$ ,  $ph_c = 50000$ ,  $ph_n = 100$