CS 563 Advanced Topics in Computer Graphics
Light Sources

by Emmanuel Agu

- Award: SIGGRAPH best new researcher
- Recipient: Matusik Wojciech
- PhD from MIT 2003
- Thesis on data-driven BRDF models
- Many good papers in many areas including BRDFs, Computational photography, etc
- Acceptance speech was insightful

Part 1   Part 2

Lighting in Graphics

- Colors/graphics you see are from light
- Light needs to travel to your eye, or you cannot see
- Many lighting models have been used
- Cool, flexible controls
  - Attenuation/falloff
  - Which objects/lights cast shadows?
- Light types:
  - Point Light
  - Spotlight
  - Projection Light
  - Goniophotometric Light
  - Distant Light
  - Area Light
  - Infinite Area Light

- Isotropic
- All light from one point
- Easy to compute
- Not very realistic
- "Hard" Shadows
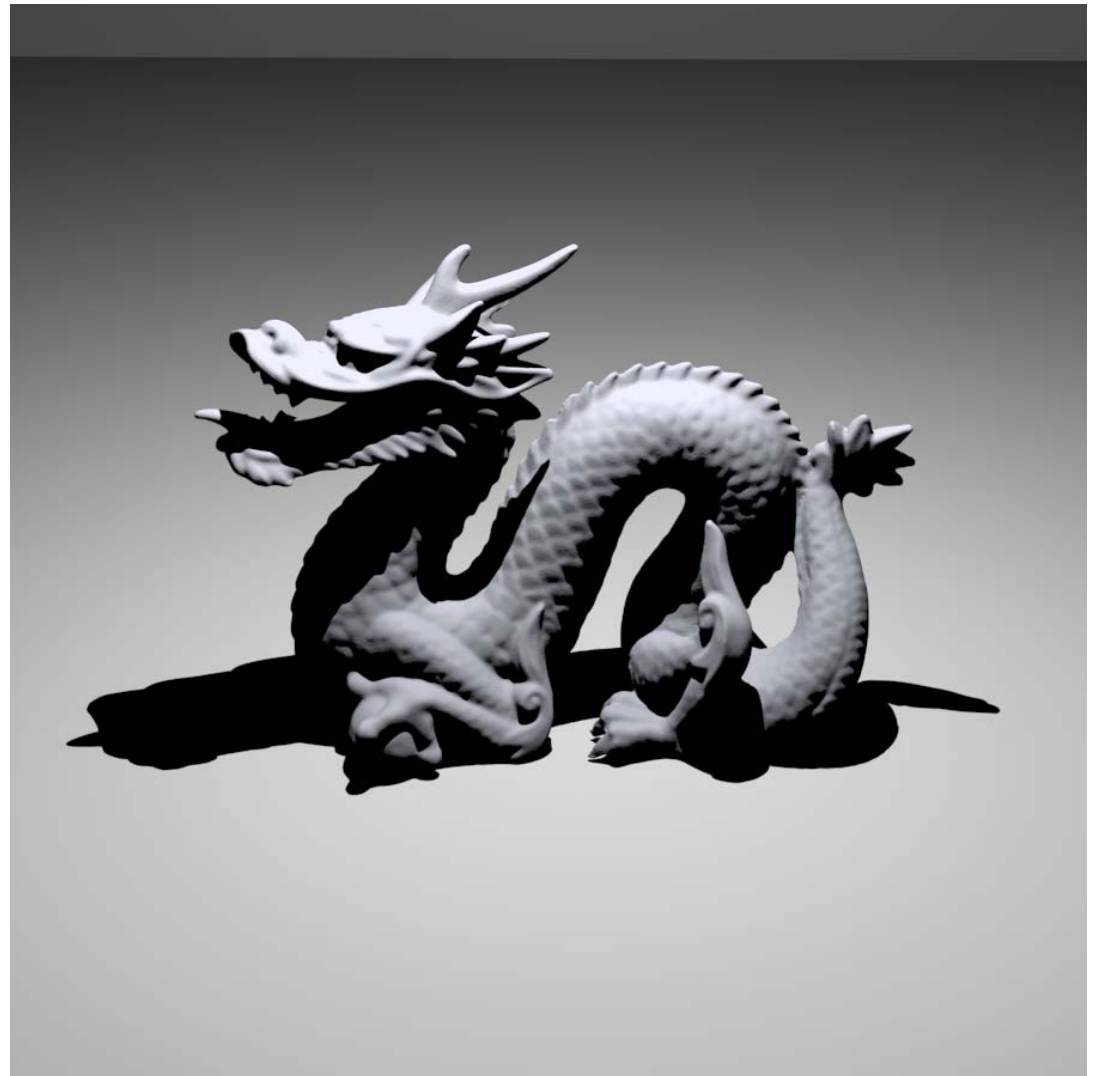
- Anisotropic
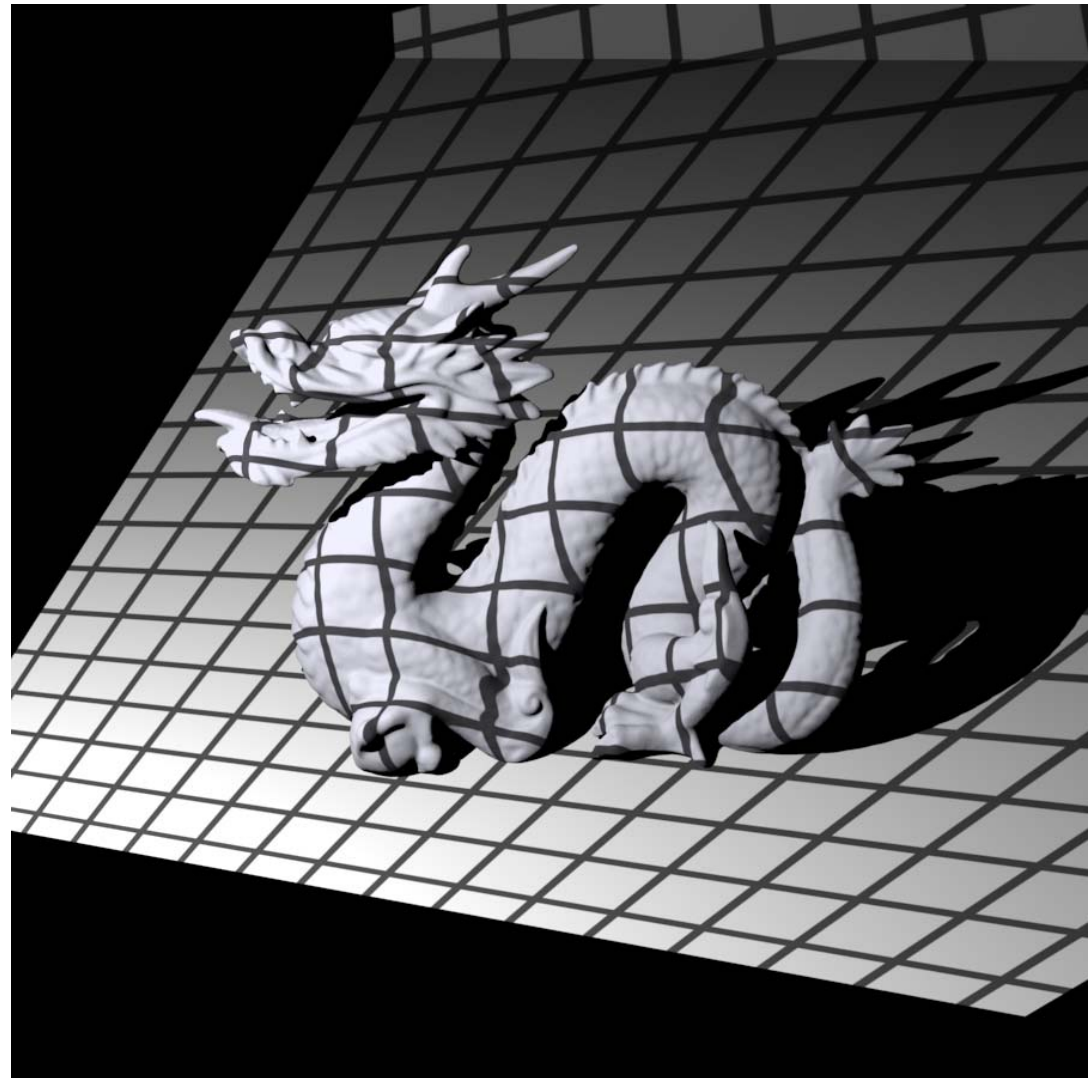- Extension of Point Light
- Emits light in a cone of directions
- Easy to compute
- "Hard" Shadows
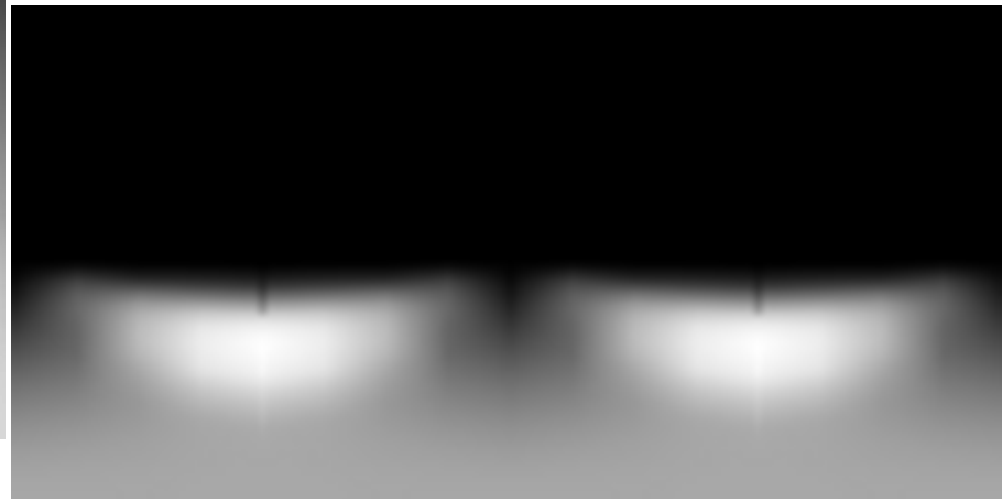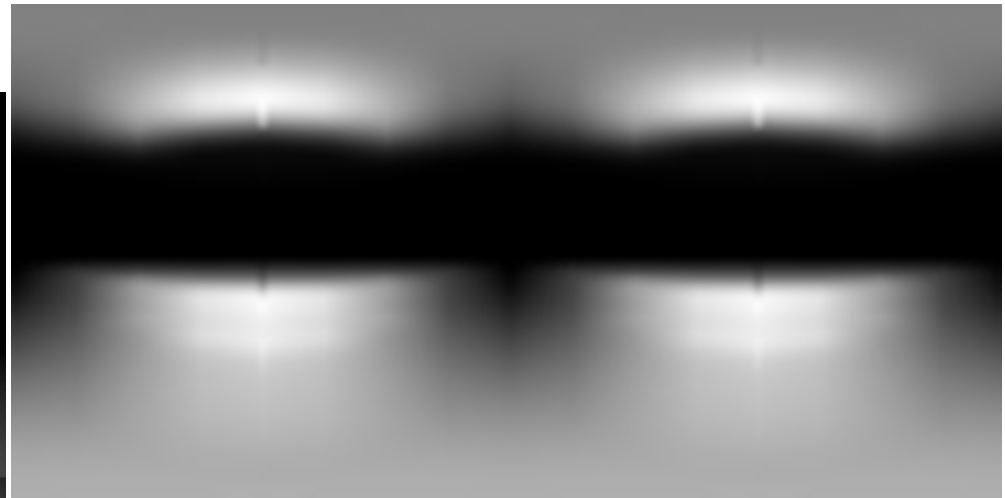
- Extension of Point Light
- Acts like a slide projector
- Anisotropic
- Produces cool results

Goniophotometric Light

- Extension of Point Light
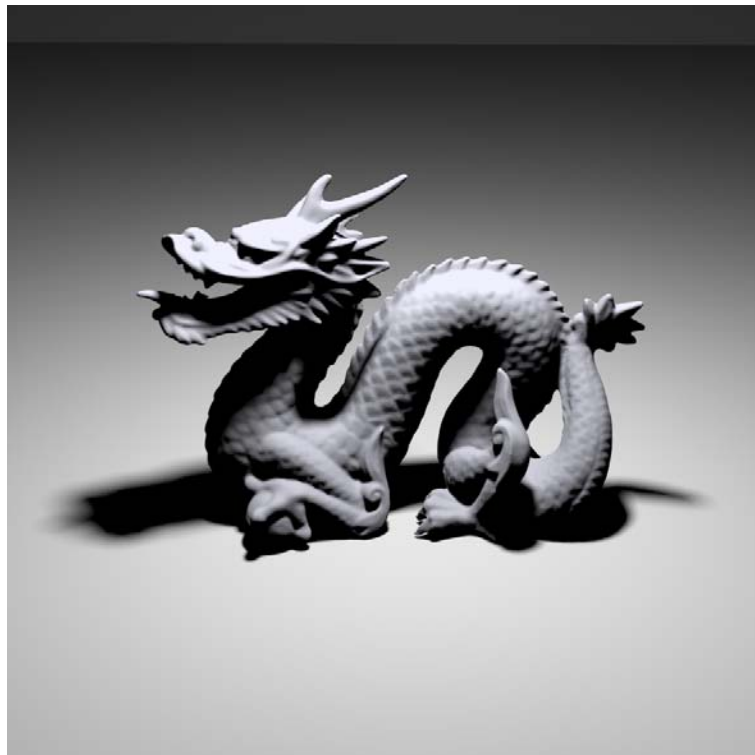- Anisotropic
- Adds some realism

Distant Light

- All light travels along same direction
- Also called "Directional Light"
- Point Light "At infinity"
- Power is related to extent of scene

- Extremely Realistic
- Emits light from a surface
- Computationally difficult
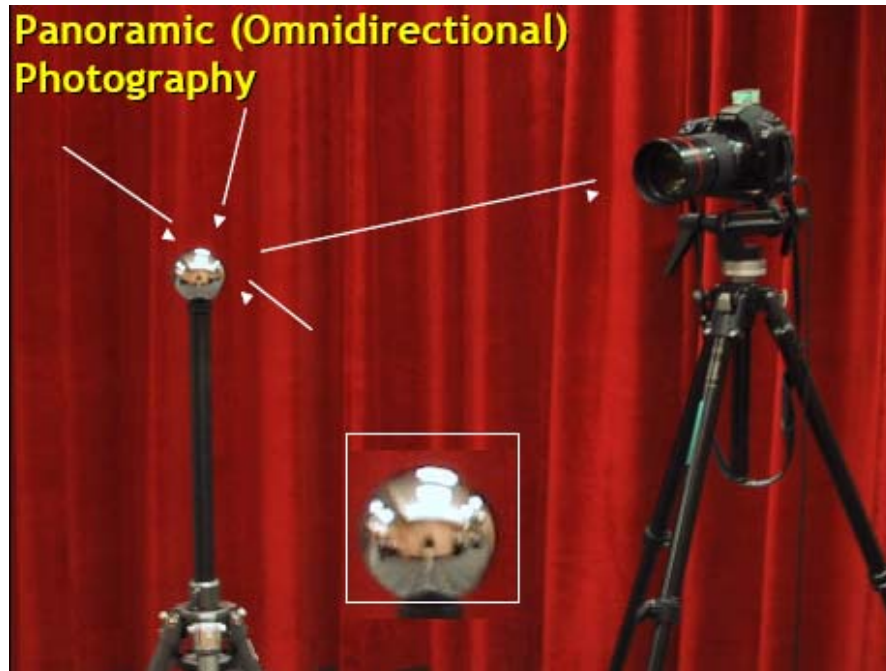- Enables:
    - Soft shadows
    - Smoother lighting

- Faraway light source that surrounds scene
- Used in environment lighting
- Provides excellent realism
- Kind of an "inverse" of goniophotometric lighting

- Debevec: Light Probes/Environment lights (in book)
- Capture

- Light probes: High Dynamic Range Images
- Light probe gallery
- **HDRShop:** Manipulate HDR images

- J Stumpfel, A Jones, A Wenger, C Tchou, T Hawkins, P Debevec , Direct HDR Capture of the Sun and Sky, *AFRIGRAPH 2004 Paper*

  [Video](#)

- Relighting is hot: Change light source and re-render

- X. Sun, K. Zhou, E. Stollnitz, J. Shi and B. Guo, "Interactive Relighting of Dynamic Refractive Objects" ACM Trans on Graphics, Vol. 27, No. 3, 2008 (Siggraph '08 Proceedings).

  [Video](#)

- K. Zhou, Y. Hu, S. Lin, B. Guo, and H. Shum, "Precomputed Shadow Fields for Dynamic Scenes", ACM Trans on Graphics, Vol. 24, No. 3, 2005 (Siggraph '05 Proceedings)

  - [Video]

References

- Robert Martin, CS 563 presentation on Light sources, Spring 2007
- Matt Pharr, Greg Humphreys "Physically Based Rendering", Chapter 13