CS 563 Advanced Topics in Computer Graphics
Light Sources

by Robert W Martin

Introduction

- “Color and Radiometry : Part II – The Light Sources”
- Focused previously on importance & role of color in rendering
- But where does it originate?
- Light needs to travel to your eye, or you cannot see

Lighting in Graphics

- Many lighting models have been used
- Cool, flexible controls
  - Attenuation/falloff
  - Which objects/lights cast shadows?
- Useful for art
- Useless to PBRT, so they aren’t included

Lights in PBRT

- Use the `Light` interface
- Light transport algorithms don’t care which light you have
- Focus on basic functionality, Chapter 15 dives in more deeply

`Light` Interface

- Needs transformations
  - Light → World, World → Light
- Key method: `Sample_L()`
- Get radiance at a specific point
- `VisibilityTester` checks for occlusion
- Section 15.6 introduces a more complex version

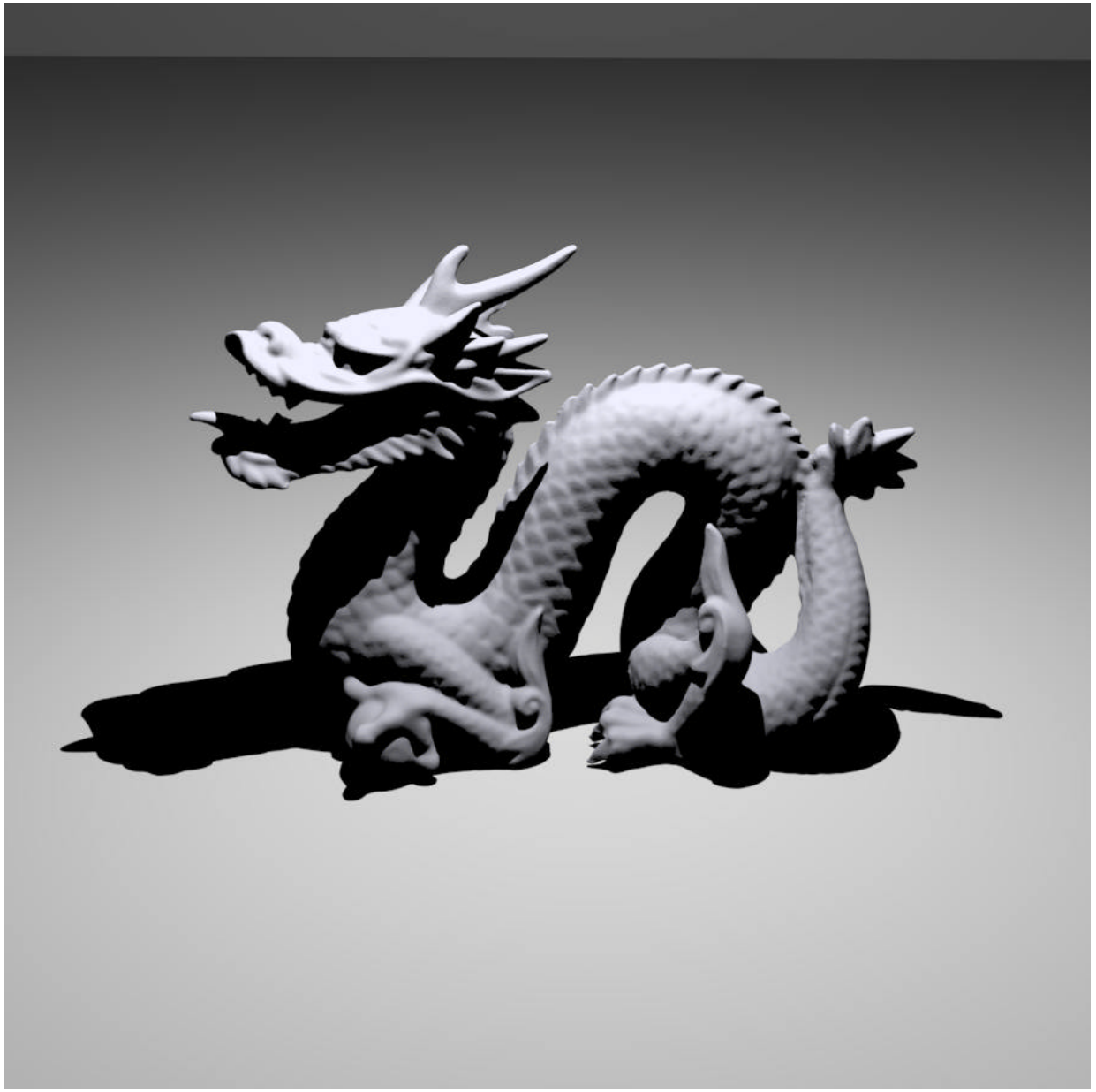
Types of Light Sources

- Point Light
- Spotlight
- Projection Light
- Goniophotometric Light
- Distant Light
- Area Light
- Infinite Area Light

Point Light

- Isotropic
- All light comes from one point
- Easy to compute
- Not very realistic
- “Hard” Shadows

Point Light



Spotlight

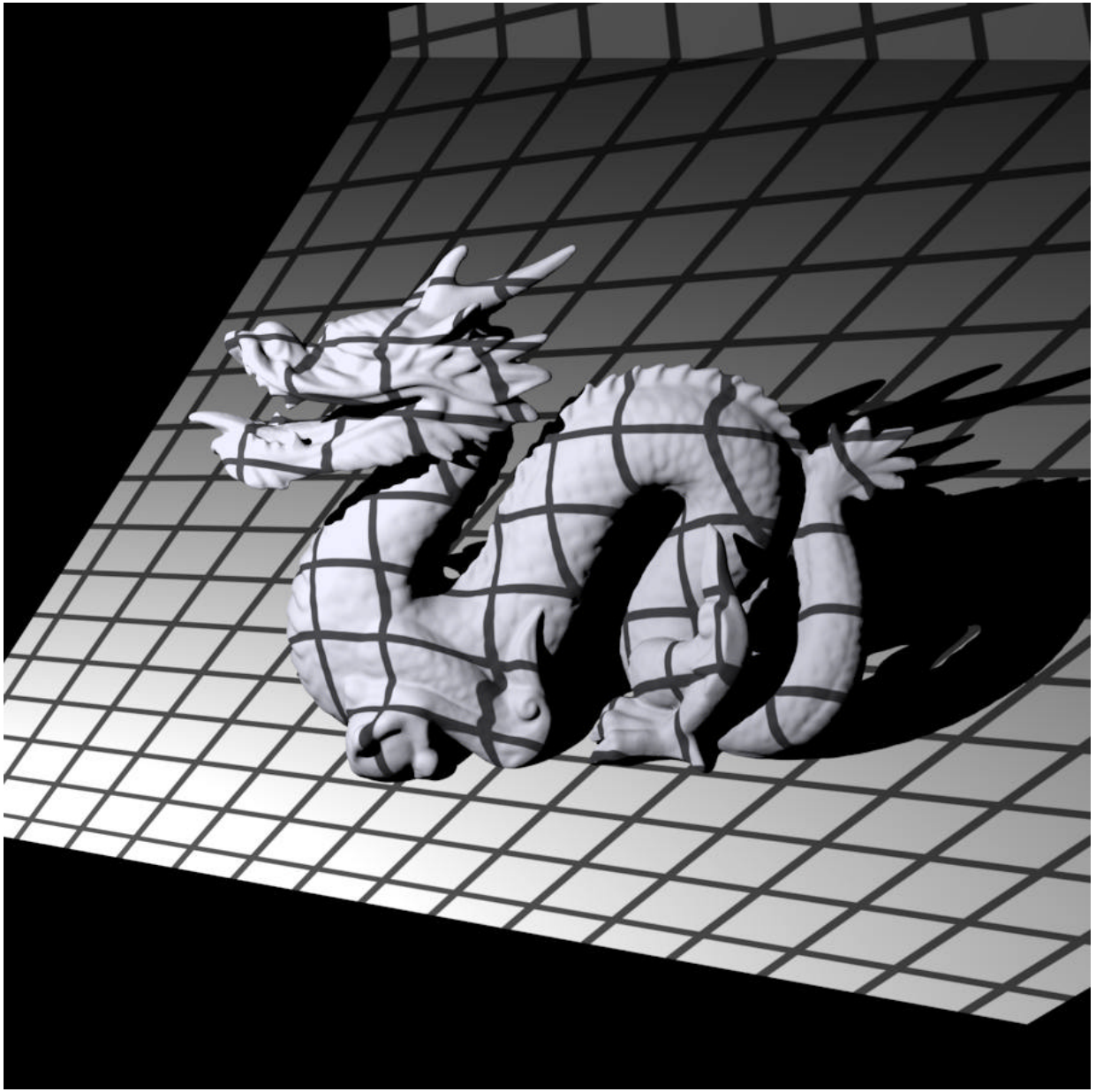
- Anisotropic
- Extension of Point Light
- Emits light in a cone of directions
- Easy to compute
- “Hard” Shadows

Spotlight

Projection Light

- Extension of Point Light
- Acts like a slide projector
- Anisotropic
- Produces some cool results

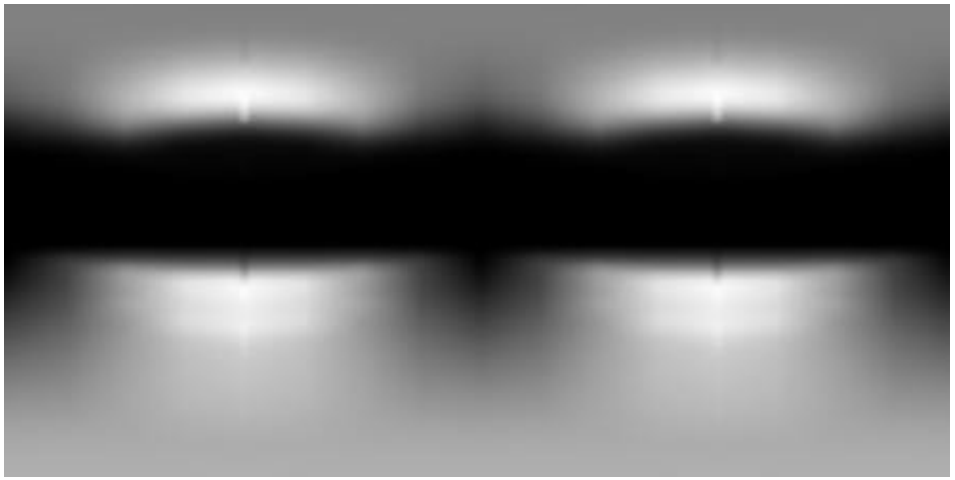
Projection Light

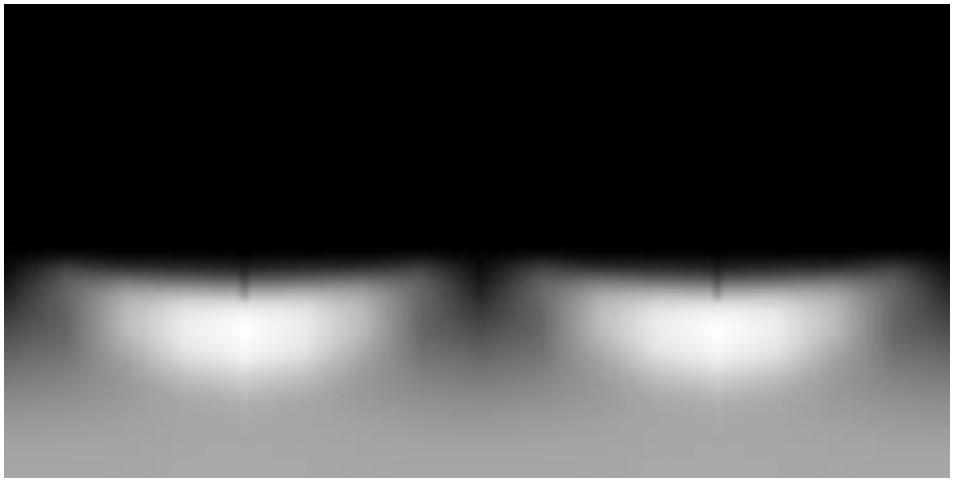


Goniophotometric Light

- Extension of Point Light
- Anisotropic
- Adds some realism

Goniophotometric Light





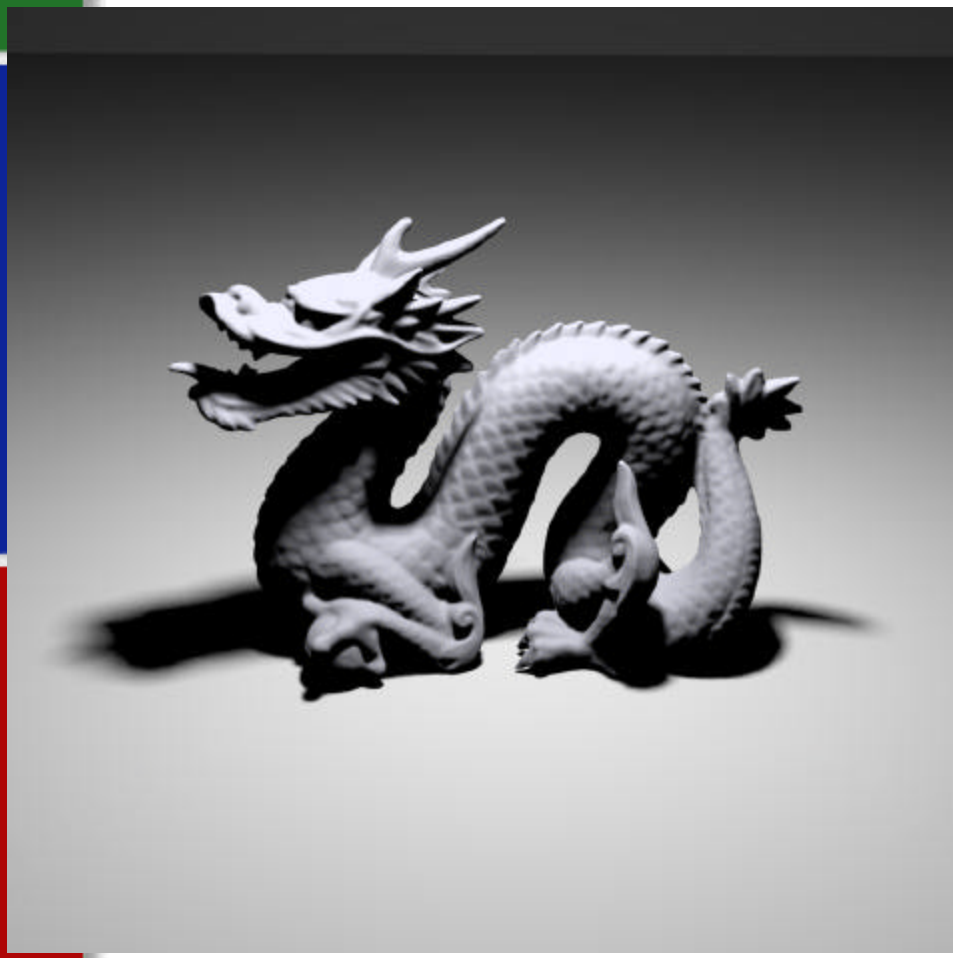
Distant Light

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

Area Light

- Extremely Realistic
- Emits light from a surface
- Computationally difficult
- Enables:
  - Soft shadows
  - Smoother lighting
- More detail in Section 15.6

Area Light



Infinite Area Light

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

Infinite Area Light

Questions?

Comments?

Concerns?

References

- Matt Pharr, Greg Humphreys “Physically Based Rendering”, Chapter 13
- All images from the CD