

# **CMSC 635**

## Global Illumination

# Global Illumination

- Local Illumination
  - light – surface – eye
  - Throw everything else into *ambient*
- Global Illumination
  - light – surface – surface ... – eye
  - Multiple bounces

# Global Illumination

ambient



no  
ambient



global illumination

# “Backward” algorithms

- Follow light transport: eye to light
  - Traditional ray tracing
    - Follow primary reflection
  - Path tracing
    - Follow other rays
    - Monte-carlo integration



# “Forward” algorithms

- Follow light transport: light to eye
  - Lights are emitters
  - Everything else both emitter & receiver
  - Integrate bounce to bounce
    - All surfaces for each bounce (*radiosity*)
    - All bounces for one photon (*photon map*)

# Radiosity

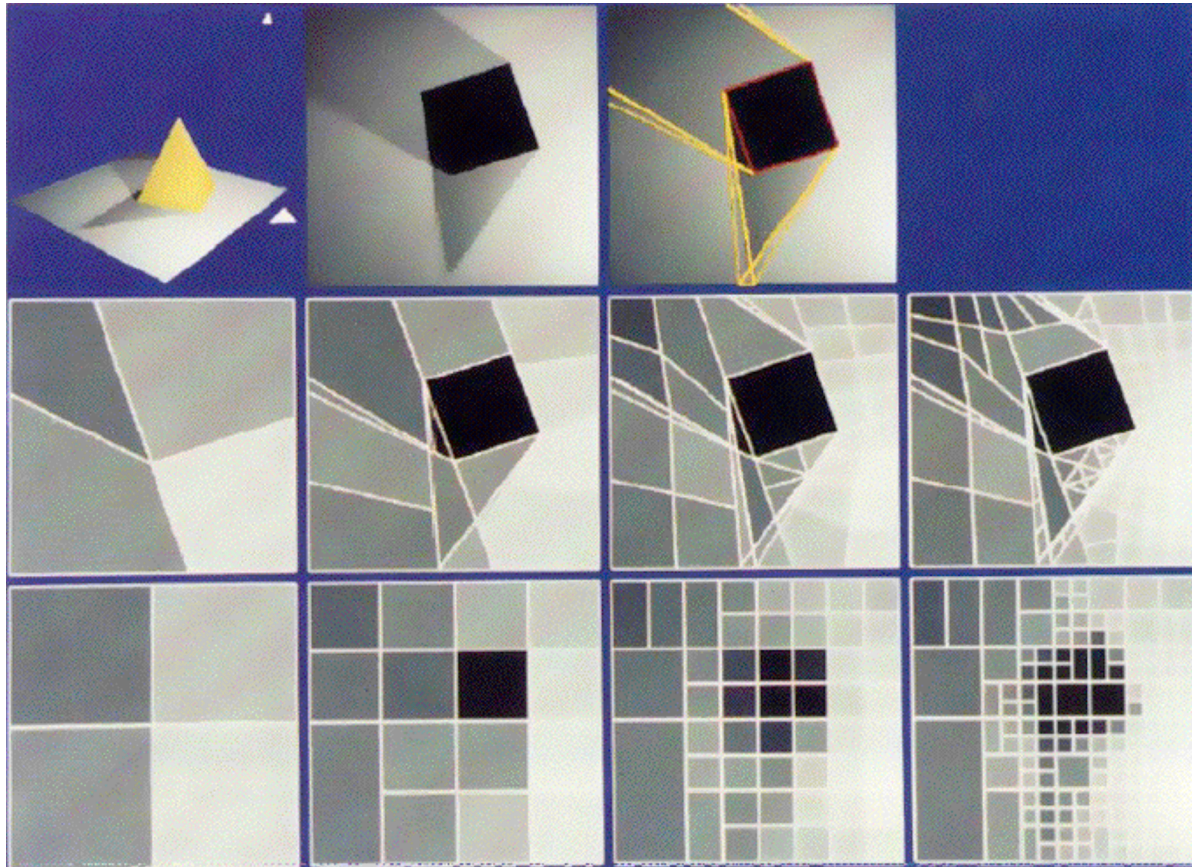
- Based on radiant heat transport
  - Diffuse surfaces only
  - Try to find *steady state* solution

# Sample Locations

- Usually need more samples than provided by geometric patches
  - Uniform subdivision
  - Adaptive regular subdivision
  - Adaptive irregular subdivision

# Discontinuity Meshing

Lischinski,  
Tampieri and  
Greenburg,  
“Combining  
Hierarchical  
Radiosity and  
Discontinuity  
Meshing”,  
*SIGGRAPH 93*





# Discontinuity Meshing

Lischinski,  
Tampieri and  
Greenburg,  
“Combining  
Hierarchical  
Radiosity and  
Discontinuity  
Meshing”,  
*SIGGRAPH 93*



# Interactive Rendering

- Diffuse surfaces only
  - viewpoint independent
- Pre-compute and store radiosity
  - As patch/vertex colors
  - As texture
- Separate solution for each light
  - Linear combination to change lights

# Two pass

- Radiosity for diffuse
- Ray tracing for reflection
- Doesn't handle radiosity of specularly reflected light