1. Visualizing memory access patterns

- How well do we use the full memory hierarchy?
- Are we getting row buffer hits within DRAM chips?
- Should we reorganize data, and how?

2. Advanced materials, shading, sampling

- Dielectrics, glossy, translucent

2. Advanced materials, shading, sampling

- Multiple importance sampling, area light sources

Reflection of a circular light source by a rough surface

Sampling the light source  Sampling the BRDF

Source: Veach and Guibas

Source: https://graphics.stanford.edu/courses/cs348b-02/lectures/multipleimportance/walk004.html
2. Advanced materials, shading, sampling

- Dielectrics, glossy, translucent
- Multiple importance sampling, area light sources
- How do we process/cast multiple seconds rays when evaluating materials?
- Should we add a shading queue (to STRaTa)?
- Additional materials cache?
3. Dedicated texture memory

- How do we access memory coherently? Texture cache?
- Gather operations. Anisotropic filtering.
- Interpolation and fetch units
4. Advanced rendering techniques

- How do these map well to TRaX?
- What hardware changes would help make these run quickly? Read/Write memory / framebuffer?
  - Photon Mapping
  - Lightcuts
  - Metropolis Light Transport
  - Radiosity
  - …

- Volume rendering
- Beam tracing

Source: https://graphics.stanford.edu/courses/cs348b-02/lectures/multipleimportance/walk004.html
My past project: Beam Tracing

**Primary Beams**
- First beam is the view frustum
- Split beam at the first visible triangle edge
- End with the visible surface of the scene (blue). Often, the beams cover many image pixels

**Shadow Beams**
- Beam connects surface point to area light vertices to integrate visibility

$N_S$ and $N_L$
My past project: Beam Tracing
Imp Notes – Numerical Precision
Imp Notes – Numerical Precision
Beam-Tracing Visually
Beam-Tracing Visually

Ray Tracing: Comparable Time

- With Jittering
- Without Jittering

5 Seconds / 9 Shadow Rays 9 Seconds / 25 Shadow Rays 1.84 Seconds / 4 Shadow Rays 3 Seconds / 4 Shadow Rays

Beam Tracing: Reference Quality

5 Seconds 9 Seconds 1.78 Seconds 3 Seconds