New *Radiance* Developments

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Anyhere Software

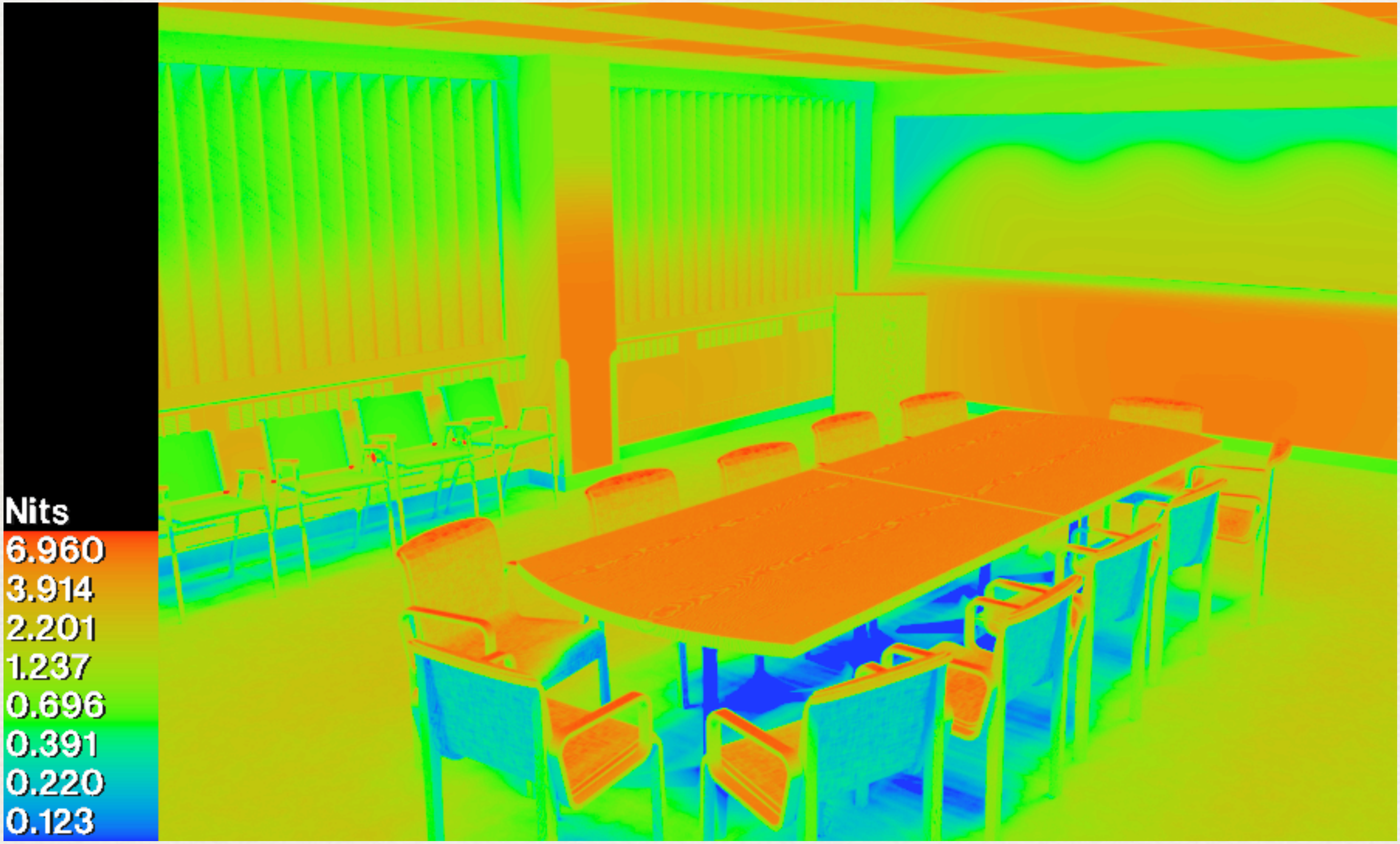
Radiance 3.9 Bug Fixes

- Prehistoric bug in octree memory usage (E. Reinhard)
- Antimatter + shadow cache (J. Mardaljevic)
- Source photometry in **ies2rad** (Z. Rogers)
- Orientation error in **replmarks** (Z. Rogers)

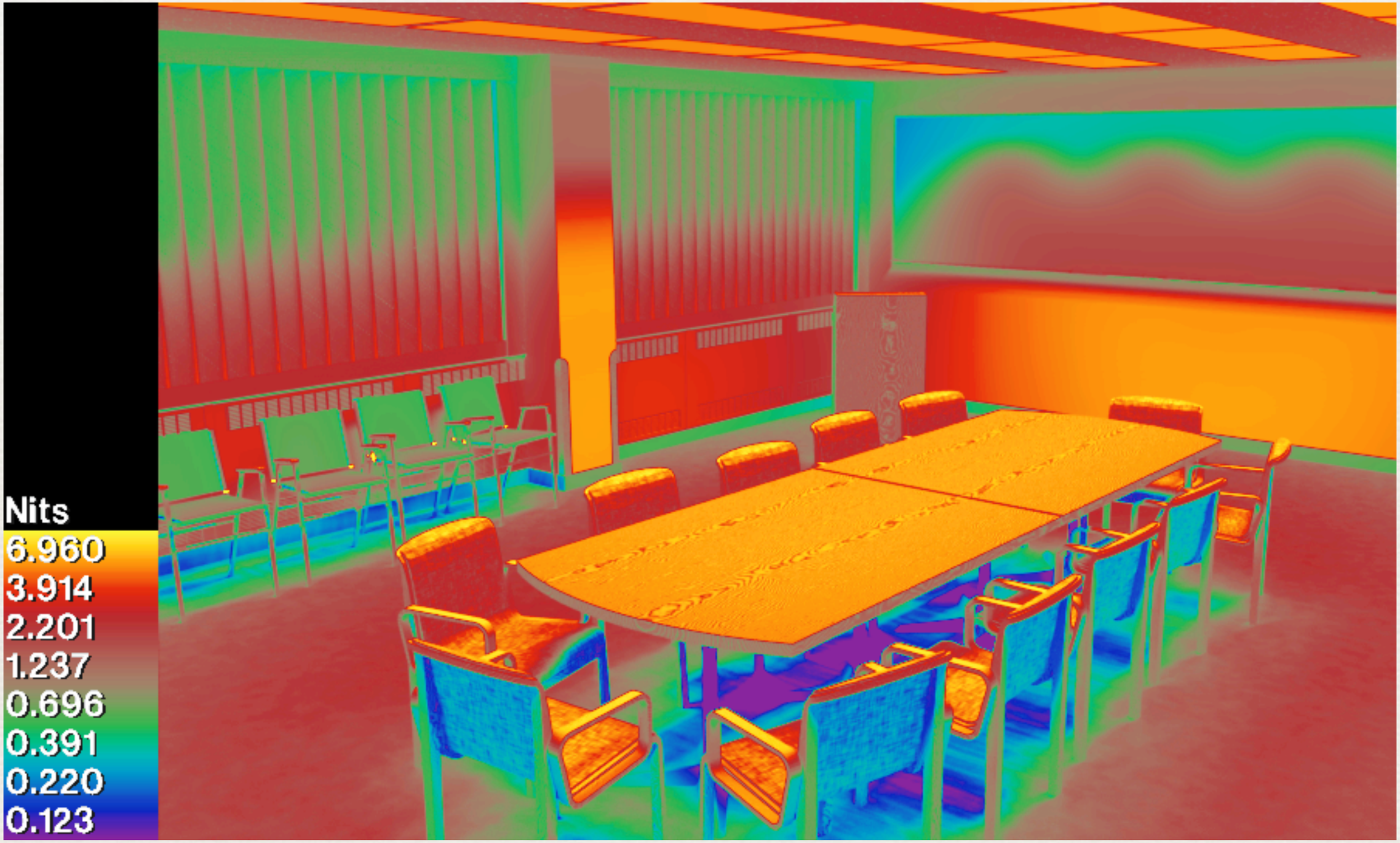
Additions in 3.9

- New **falsecolor** scale (& **-s auto**)
- Added BTDF input to **mkillum**
- Added **rtcontrib -c** option to accumulate rays
- New **rsensor** program for photosensor sim.
- New “planisphere” (stereographic) view type

Old Falsecolor Scale



New Falsecolor Scale



BTDF Input to **mkillum**

- The bidirectional transmittance distribution function (BTDF) describes how light passes through a surface
- Some devices exist for measuring BTDFs
- General ray-tracers can compute BTDFs
- Using BTDFs avoids sampling issues/limits

Doesn't *Radiance* Have a BTDF Material Already?

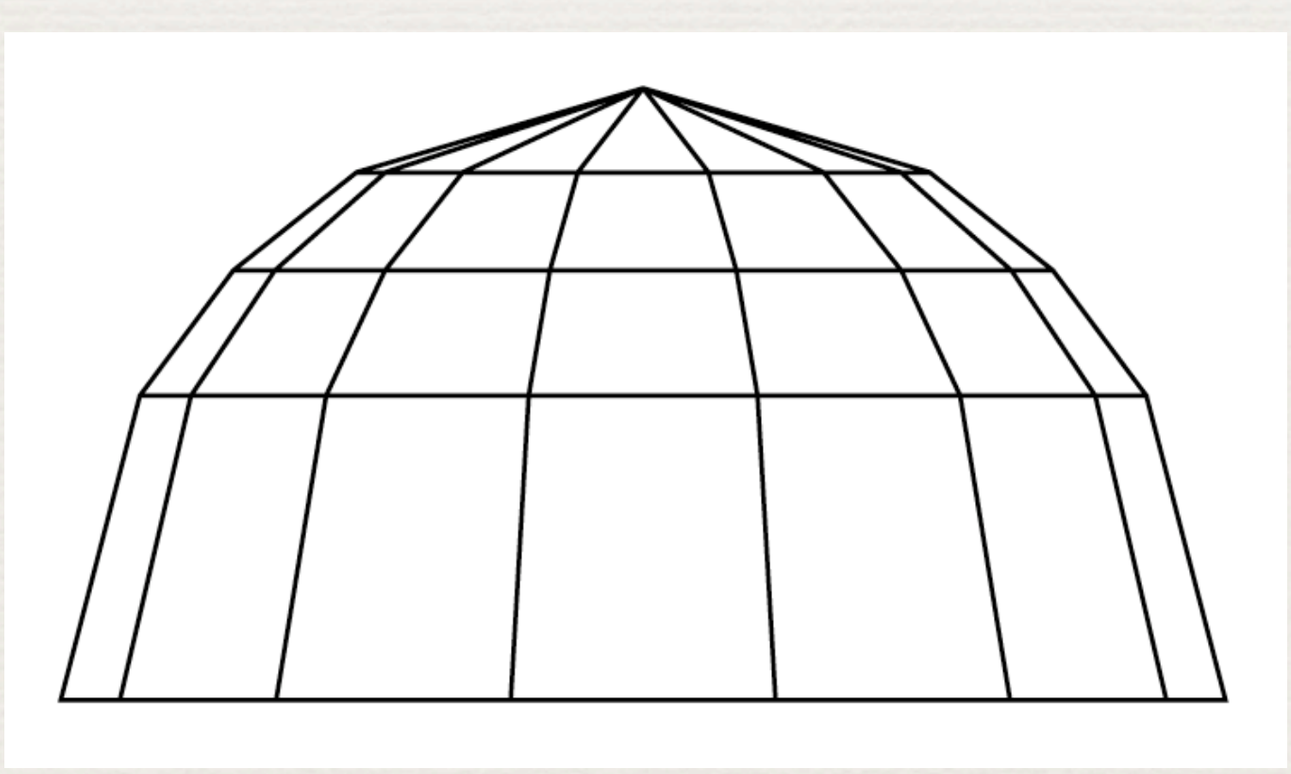
- Yes, but it only works for light sources
- Sky contributions are counted as diffuse
- This is a poor approximation for many materials
- Fully enabling the BTDF type is difficult and would be computationally expensive

How to Use a BTDF in *Radiance*

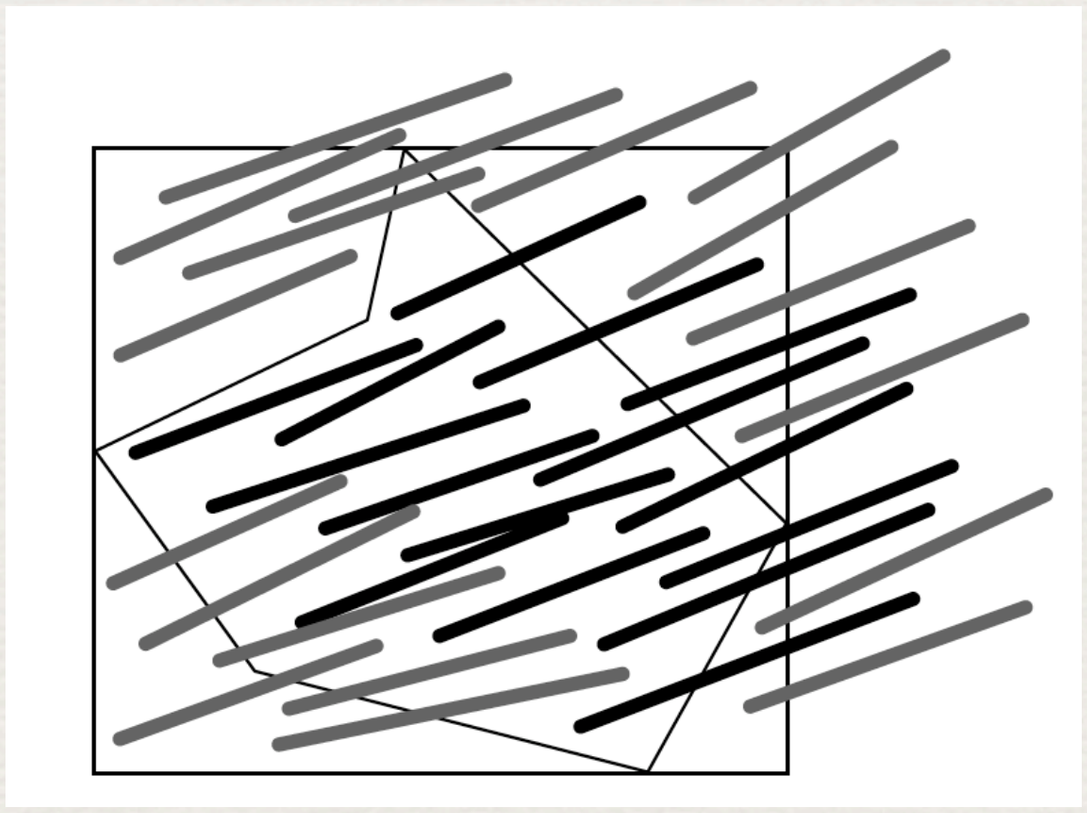
- We can insert the BTDF at the appropriate point in a **mkillum** precalculation
  - Special care is required for light sources
- Annual calculations require **rtcontrib**

Standard **mkillum**

Ray samples sent towards illum “front”

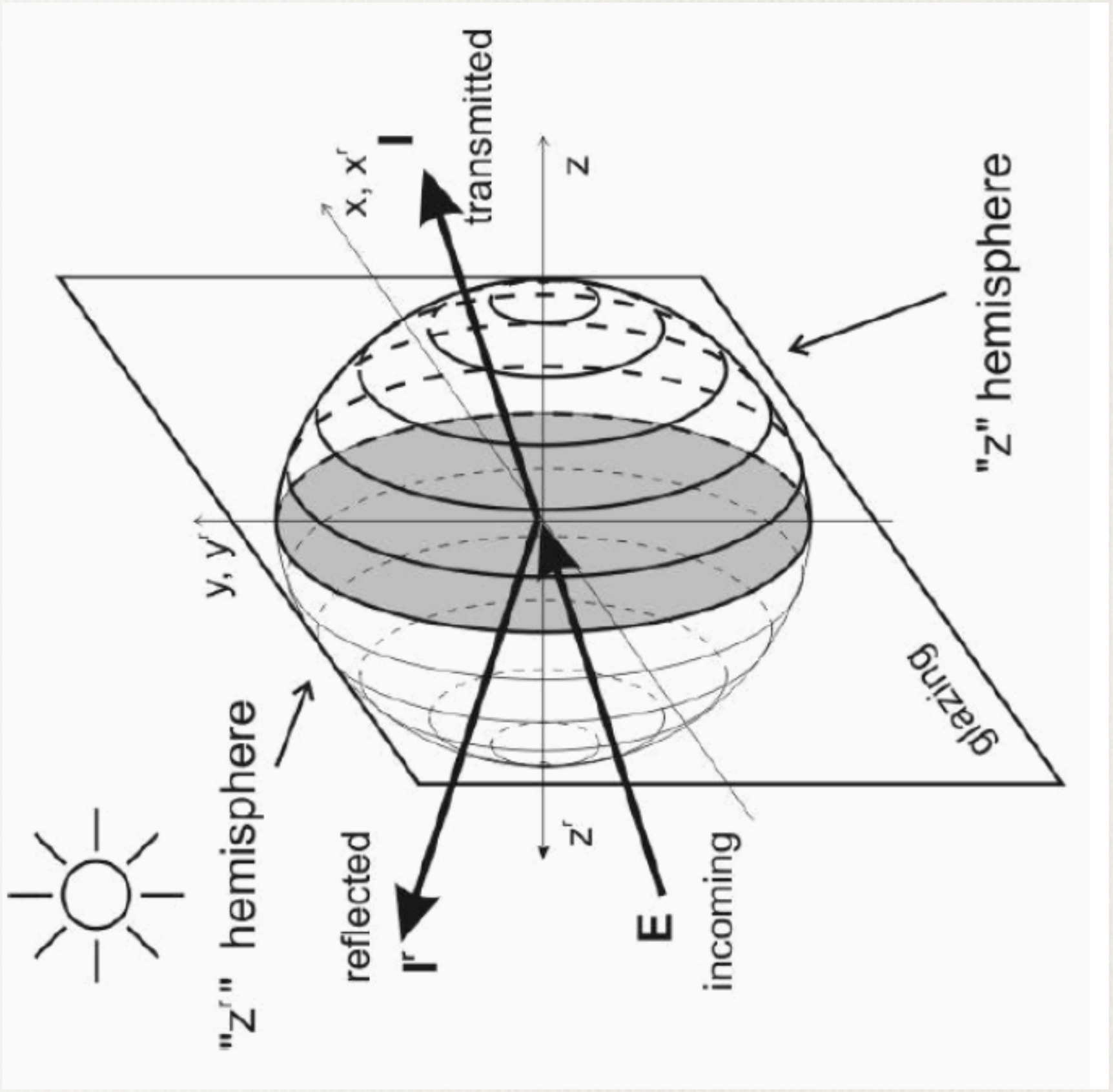


Angle Stratification



Position Distribution

145 angles for incident/exiting

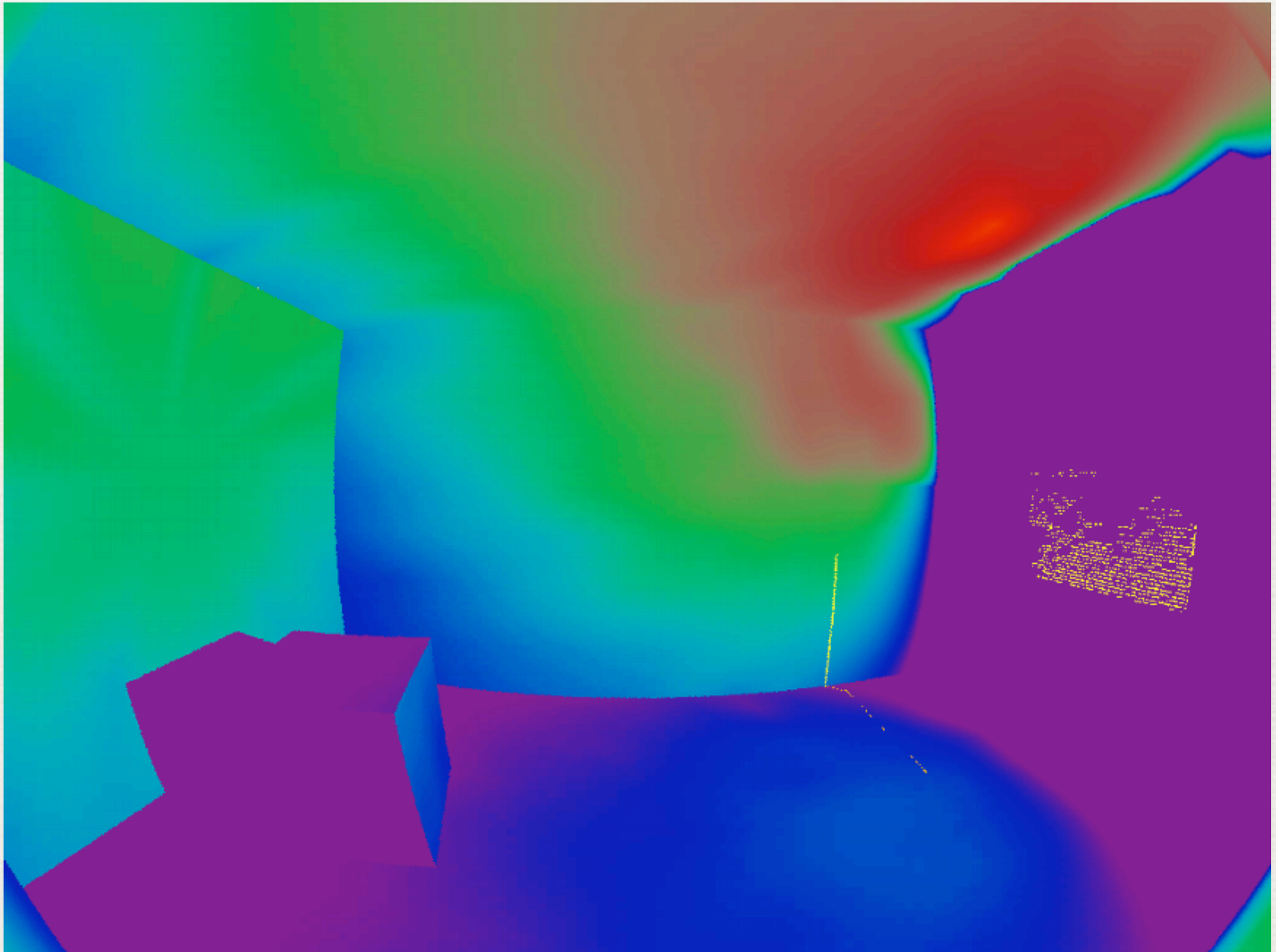


Klems BTDF angle definitions

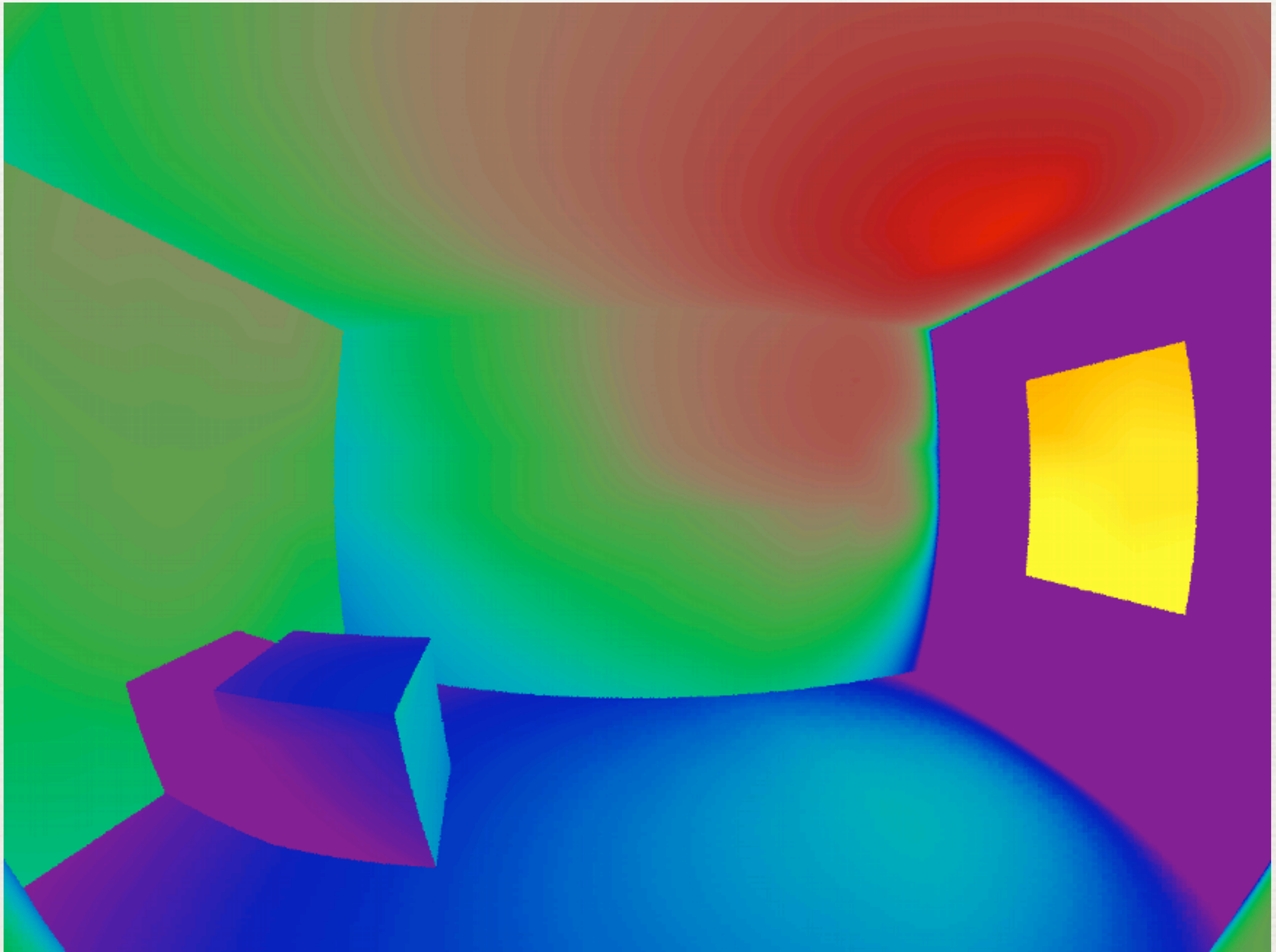
mkillum BTDF

- Send outgoing rays from opposite side of fenestration according to BTDF angles
- Sample rays to light sources if needed
- Pass incident light distribution through BTDF
- Resample transmitted light and store as window output distribution (as before)

Old **mkillum** rendering



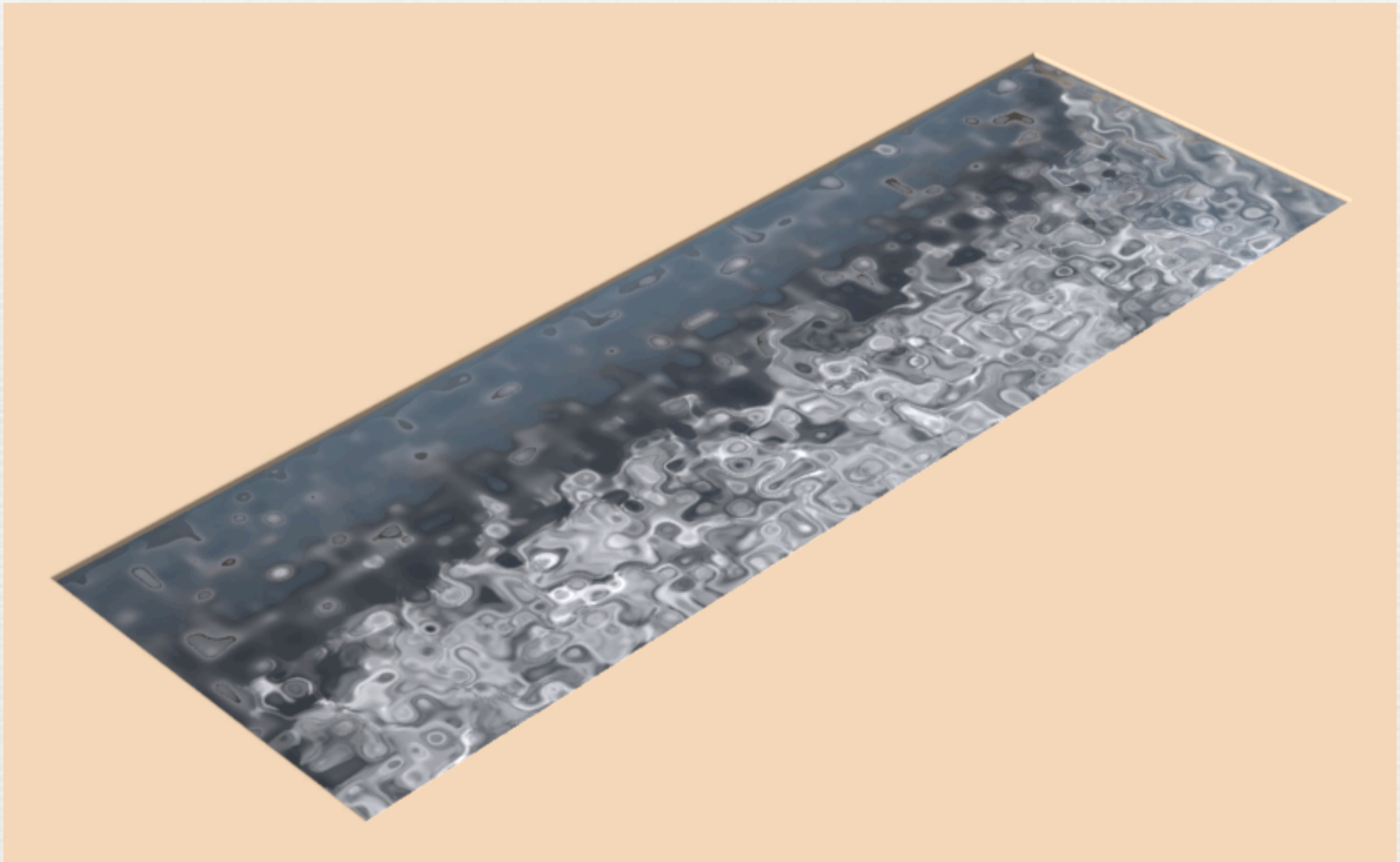
New **mkillum** rendering



New **mkillum** Settings

- Up direction (to orient BTDFs on windows): u=[+Z]
- Fenestration thickness (for sampling): t=[0]
- BTDF data file (alt. samples/steradian): d=[48]

rtcontrib -c Option



Permits optical calculations

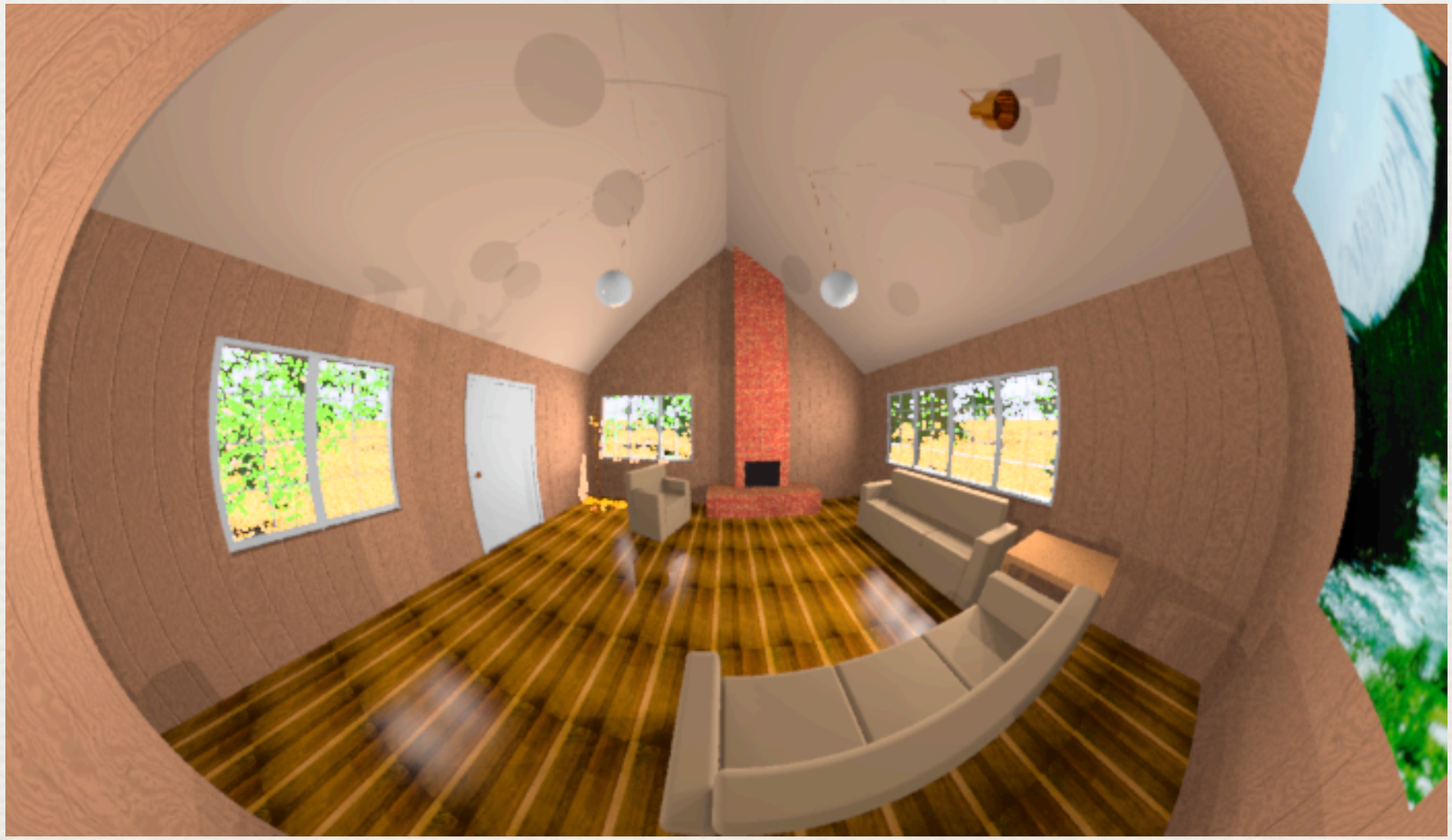
New **rsensor** Program

- Sponsored by Architectural Energy Corporation to support SPOT program
- Computes signal value for a given photometer location and spatial sensitivity distribution
- Input is octree and one or more sensor sensitivity array(s) in ASCII spreadsheet
- Output is one RGB value per sensor

Example Spatial Data

Elevation	Azimth				
degrees	0	2	4	6	8
0	9.90E-01	9.94E-01	9.94E-01	9.95E-01	9.95E-01
2	8.46E-01	8.39E-01	8.43E-01	8.33E-01	8.39E-01
4	6.89E-01	6.84E-01	6.78E-01	6.72E-01	6.68E-01
6	5.67E-01	5.96E-01	5.61E-01	5.90E-01	5.55E-01
8	5.40E-01	5.39E-01	5.40E-01	5.40E-01	5.42E-01
10	4.52E-01	4.47E-01	4.45E-01	4.43E-01	4.44E-01
12	3.60E-01	3.57E-01	3.55E-01	3.53E-01	3.53E-01
14	2.66E-01	2.62E-01	2.61E-01	2.59E-01	2.59E-01
16	1.90E-01	1.88E-01	1.88E-01	1.86E-01	1.86E-01
18	1.52E-01	1.51E-01	1.51E-01	1.49E-01	1.50E-01
20	1.30E-01	1.30E-01	1.30E-01	1.29E-01	1.29E-01

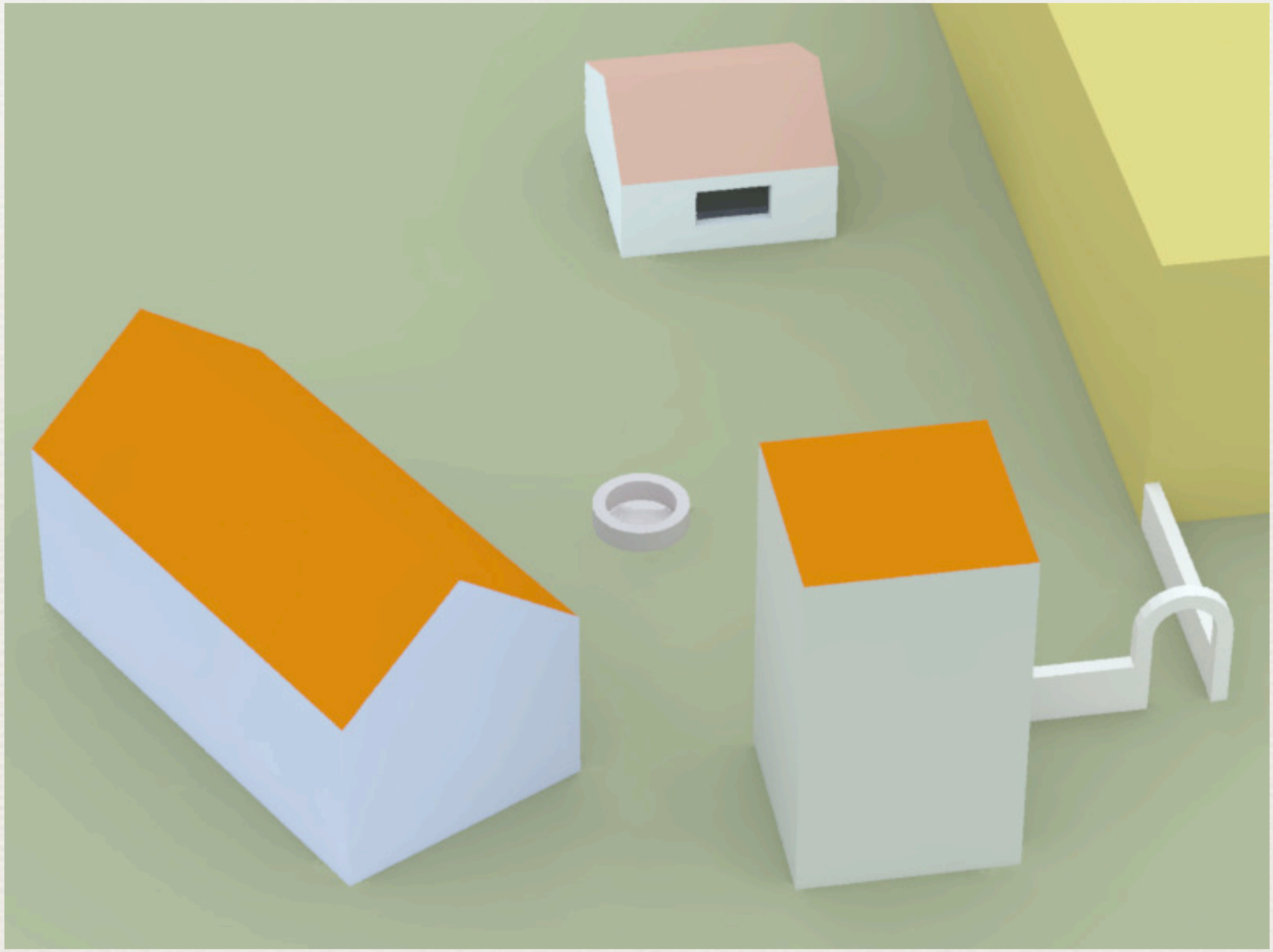
New Planisphere View



A.K.A. “Stereographic”

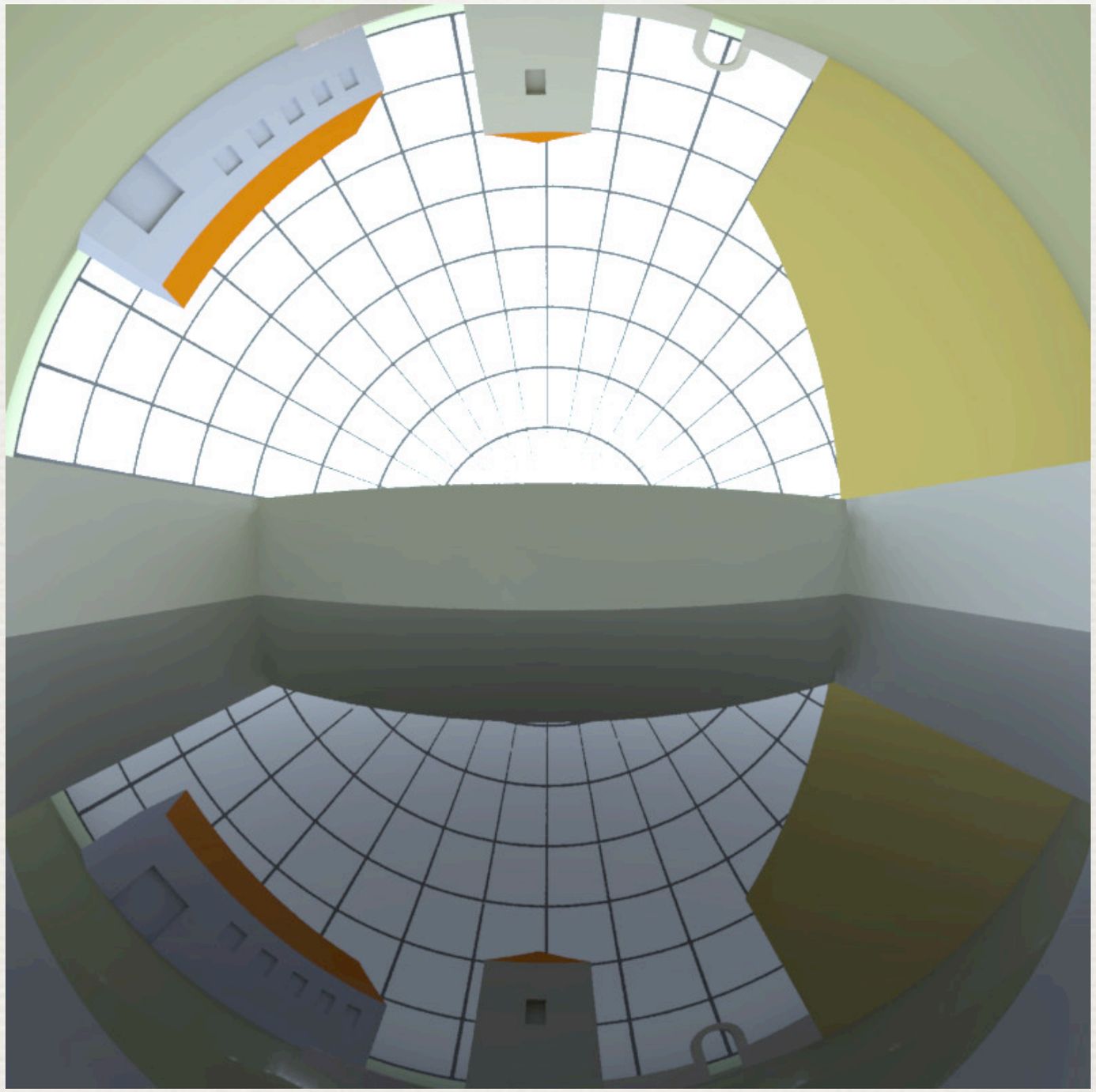
- Avoiding confusion with binocular stereo
- Requested by Axel Jacobs of LEARN
- New view type option **-vts**
- Angle-preserving projection most often used for daylighting applications
- View angles must be less than 360°

Axel's Example Scene

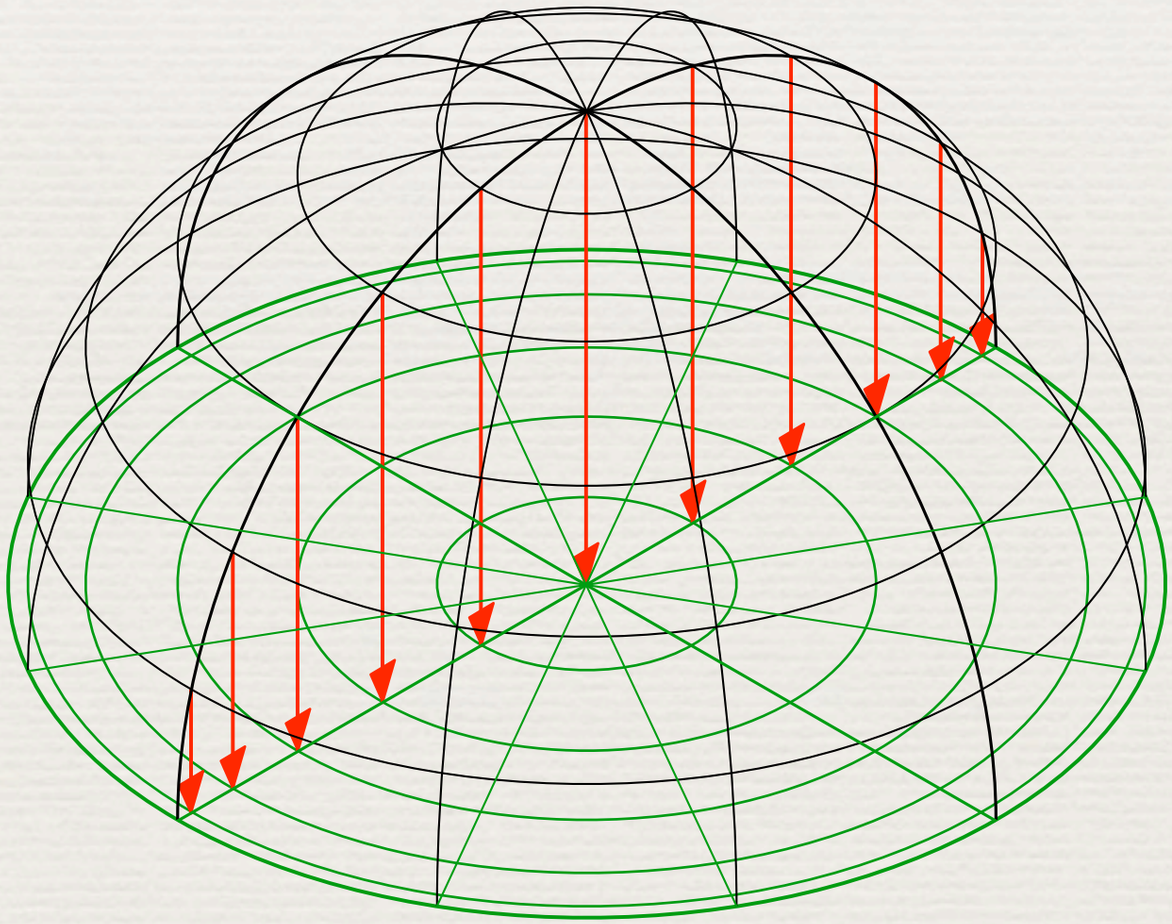


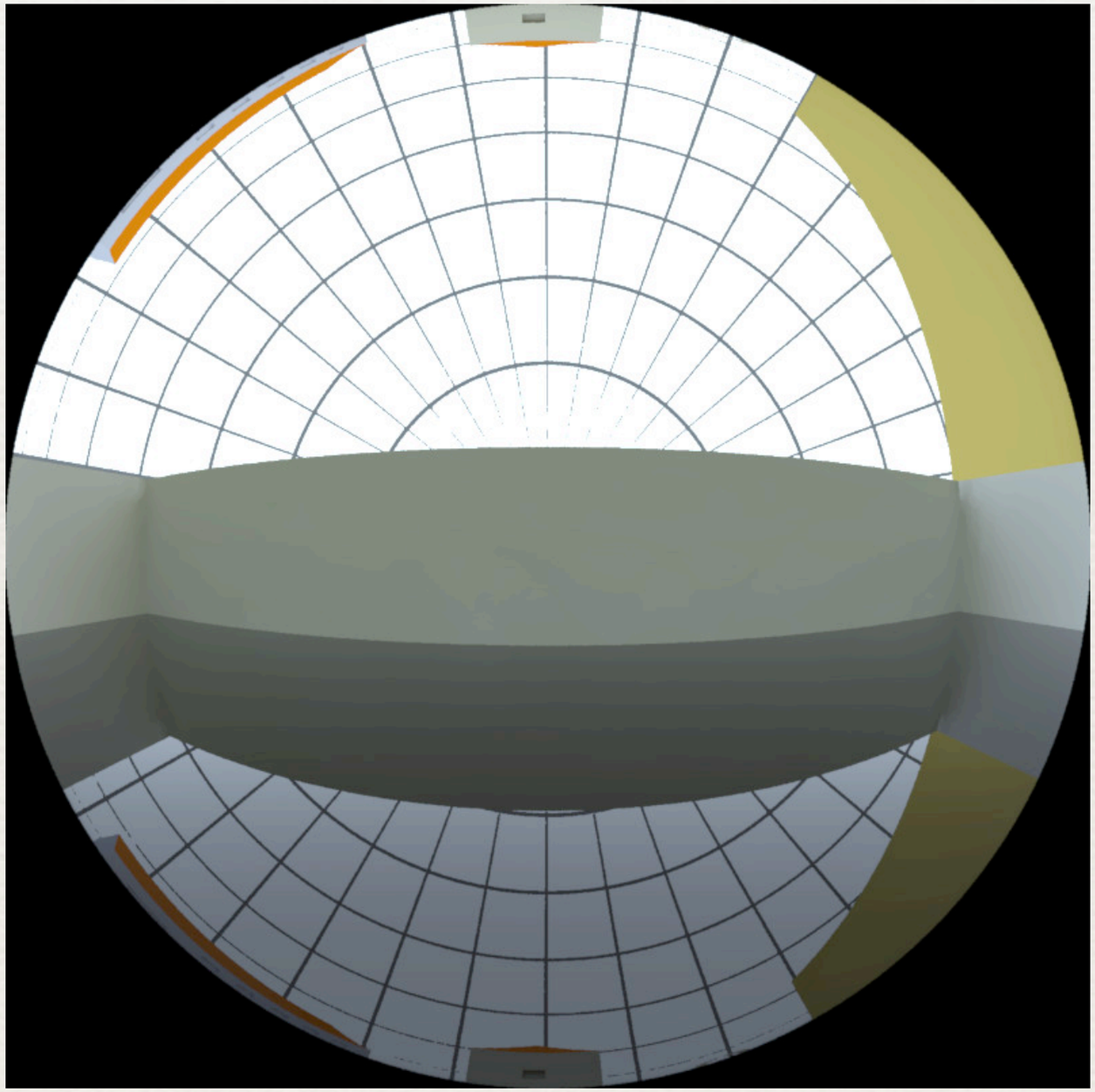
Lifted from luminance.londonmet.ac.uk/pickup/projections.pdf

Angular Fisheye View

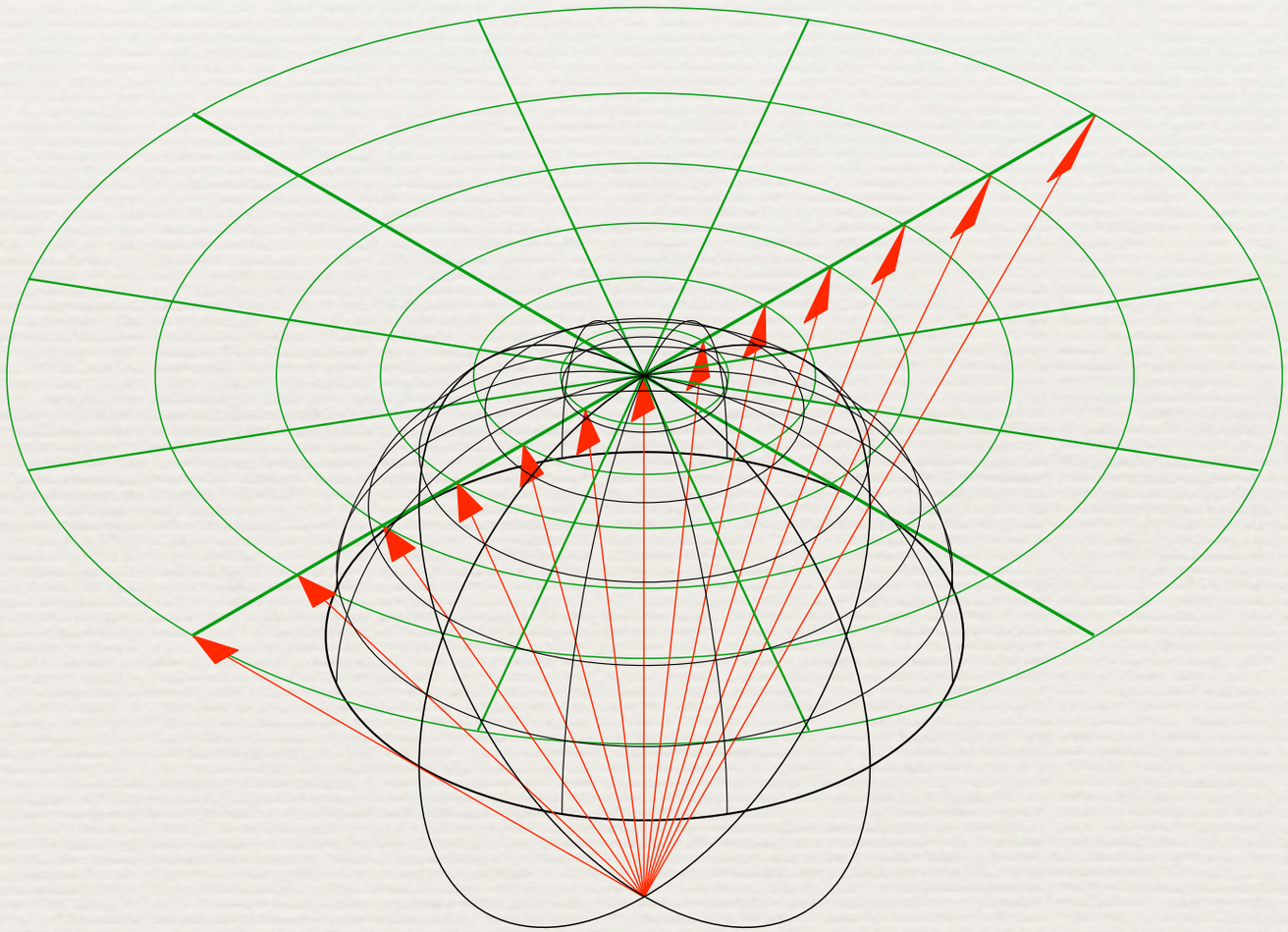


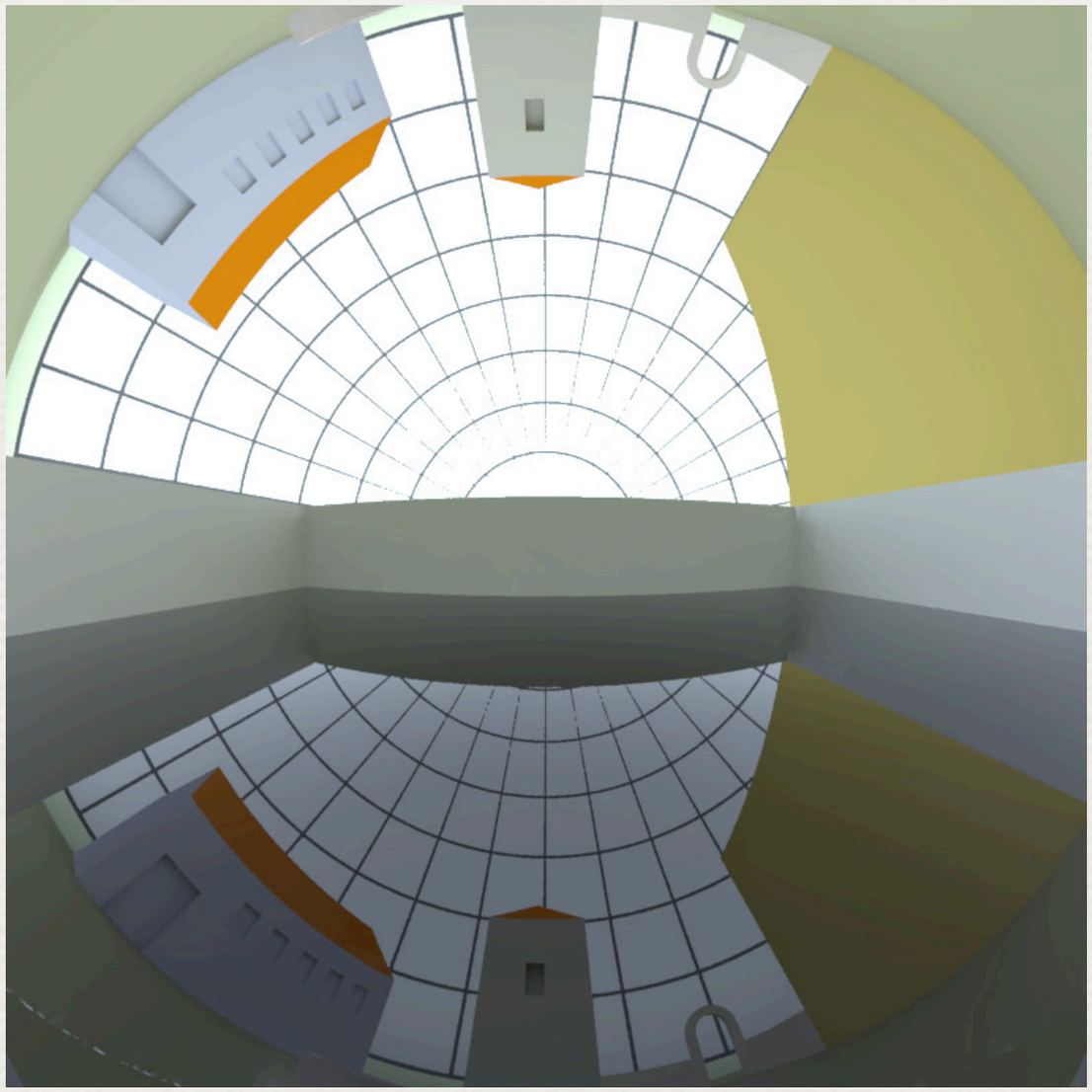
Hemispherical View





Planisphere View





So Far in 4.0

- Added **rvu -n** option for parallel processing
  - Rewrote main using raypcalls library
    - Not currently working for Windows
- Linear speed-up with number of processors
- Process count changed via “new” command
- Also supported with **rad -N** option