

HDR + Image Based Lighting

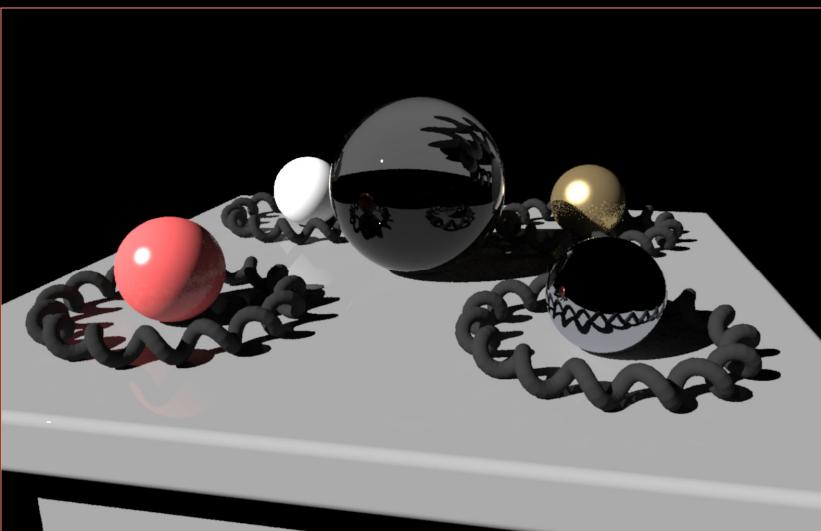


70001 – Advanced Computer Graphics: Photographic Image Synthesis

Abhijeet Ghosh

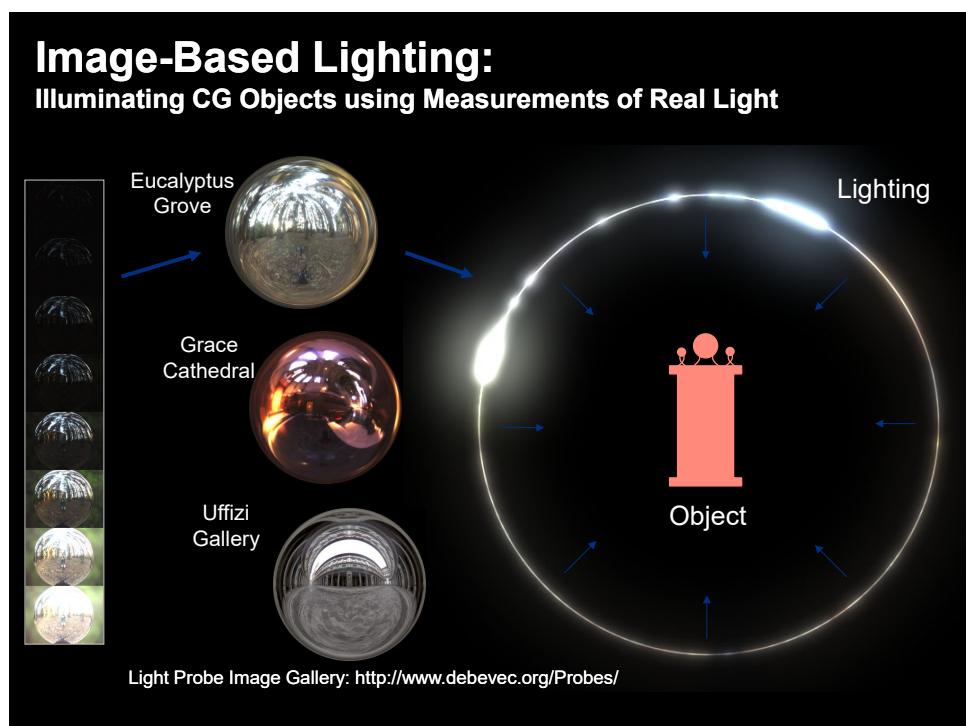
Lecture 04, Jan. 19th 2024

1



Traditional CG point light source

2



3



4



© 2006 Florian Wild

Florian Wild, IBL Tools sphericalLight shader with kitchen light probe

5



Tim Cooper, IBL in “modo” by Luxology

6



Canon Powershot G2

f/8, 1/2 sec

7



Canon Powershot G2

f/8, 1/5 sec

8



Canon Powershot G2

f/8, 1/13 sec

9



Canon Powershot G2

f/8, 1/30 sec

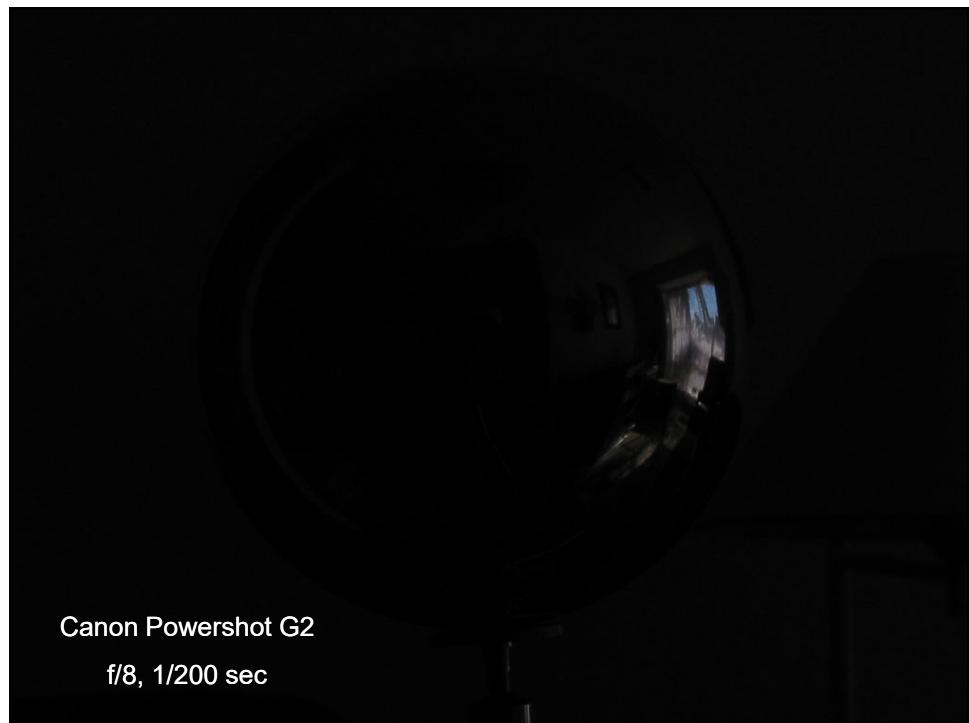
10



Canon Powershot G2

f/8, 1/80 sec

11



Canon Powershot G2

f/8, 1/200 sec

12



Nick Bertke

13

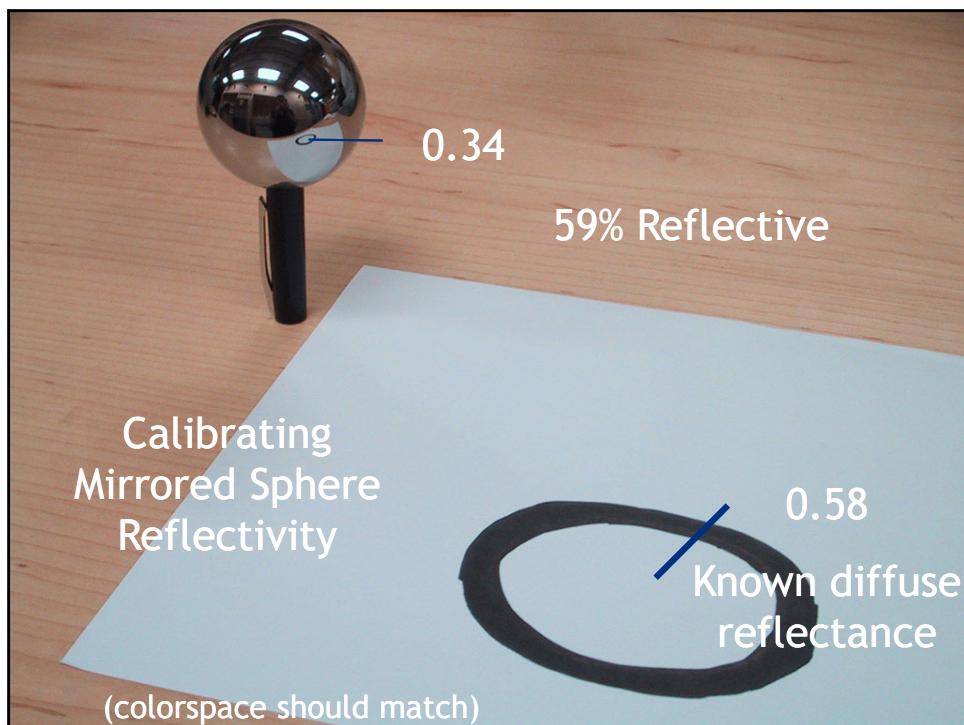
Sources of Mirrored Balls

- Hollow Spheres, 2.5in – 3.25in
 - Juggling Equipment
www.dube.com
- 6-12 inch large gazing balls
 - Lawn Ornaments



FAQ on www.hdrshop.com

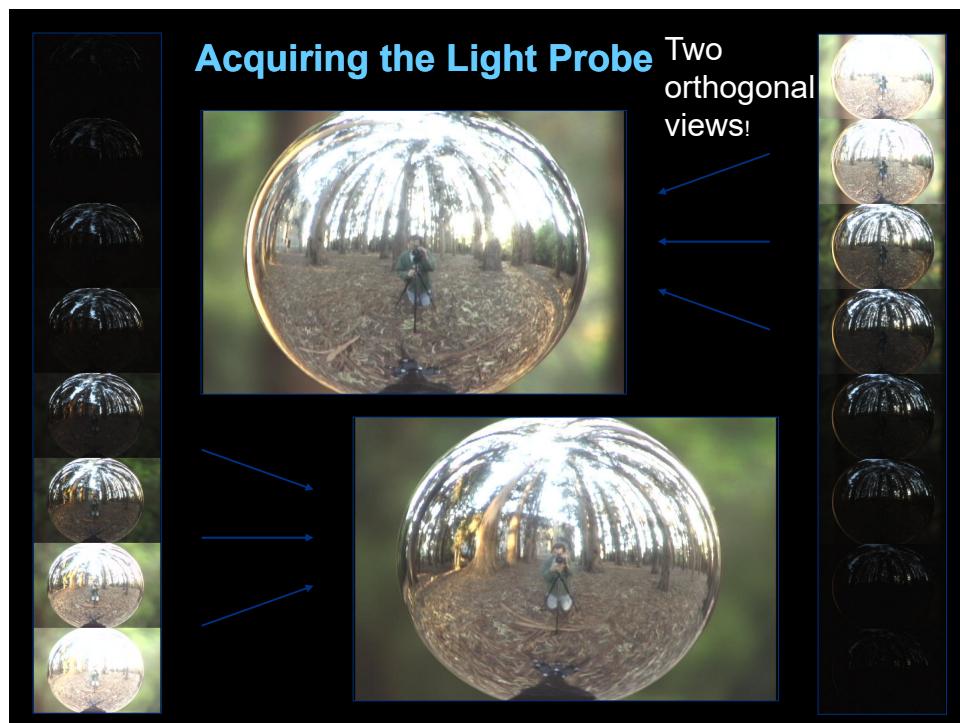
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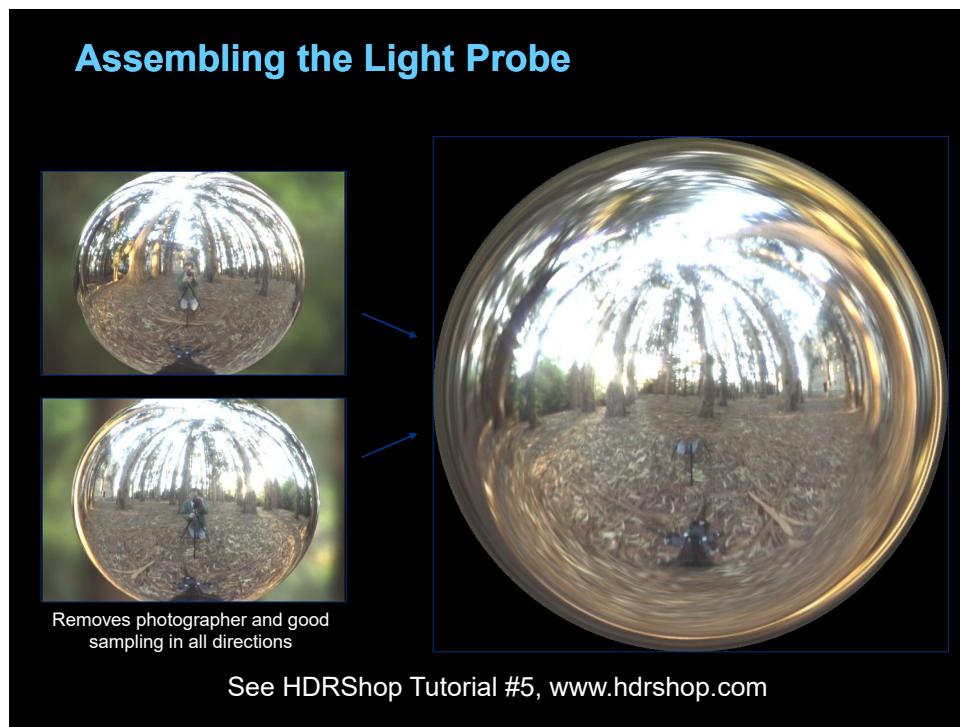
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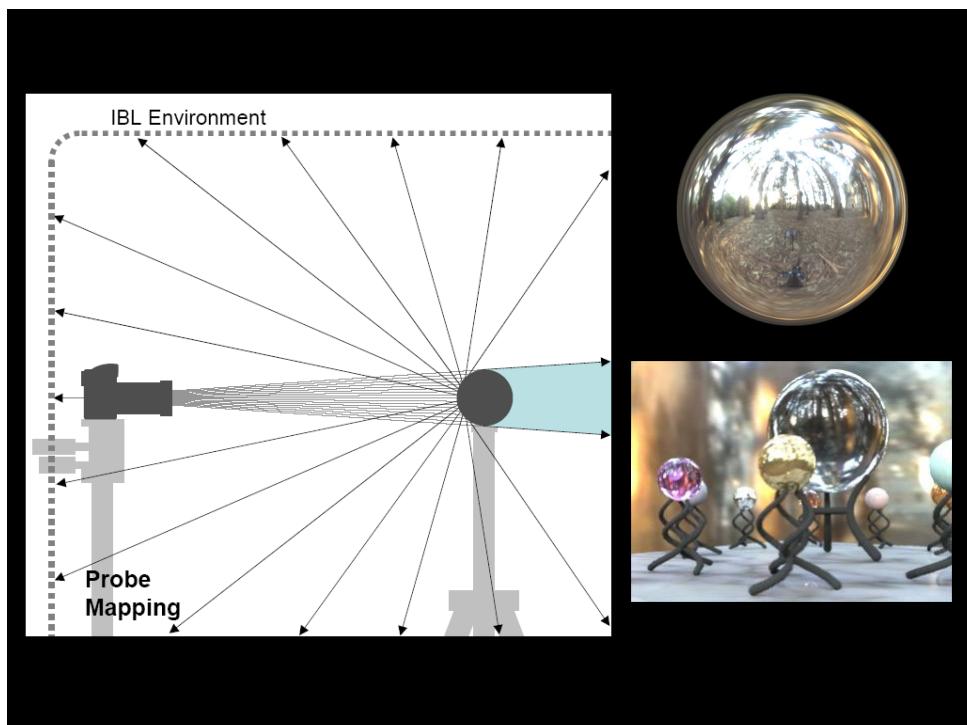
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17



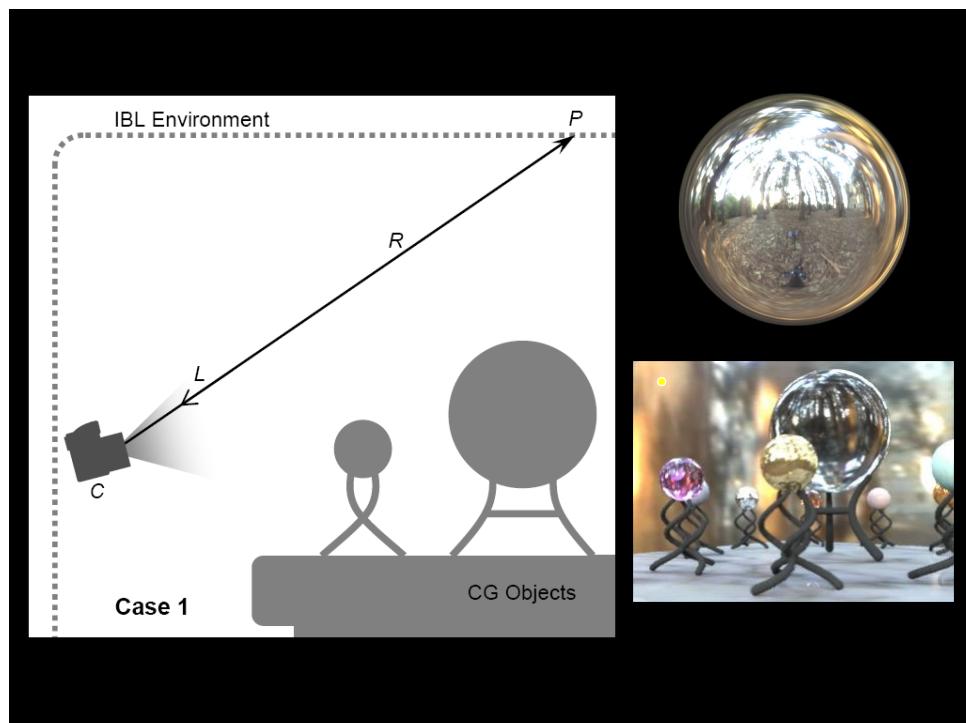
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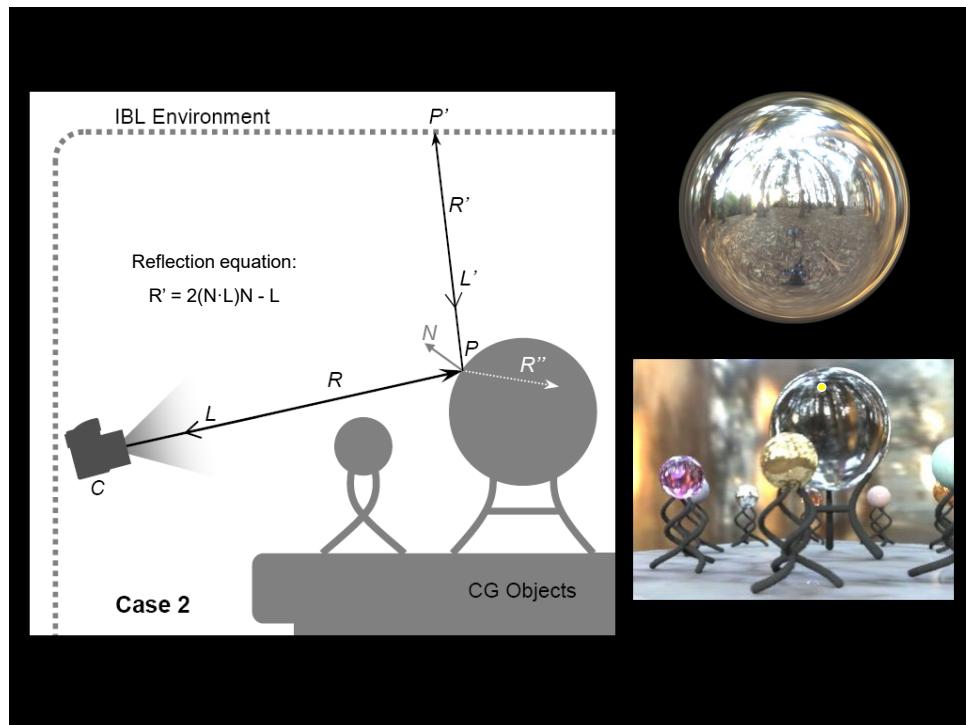
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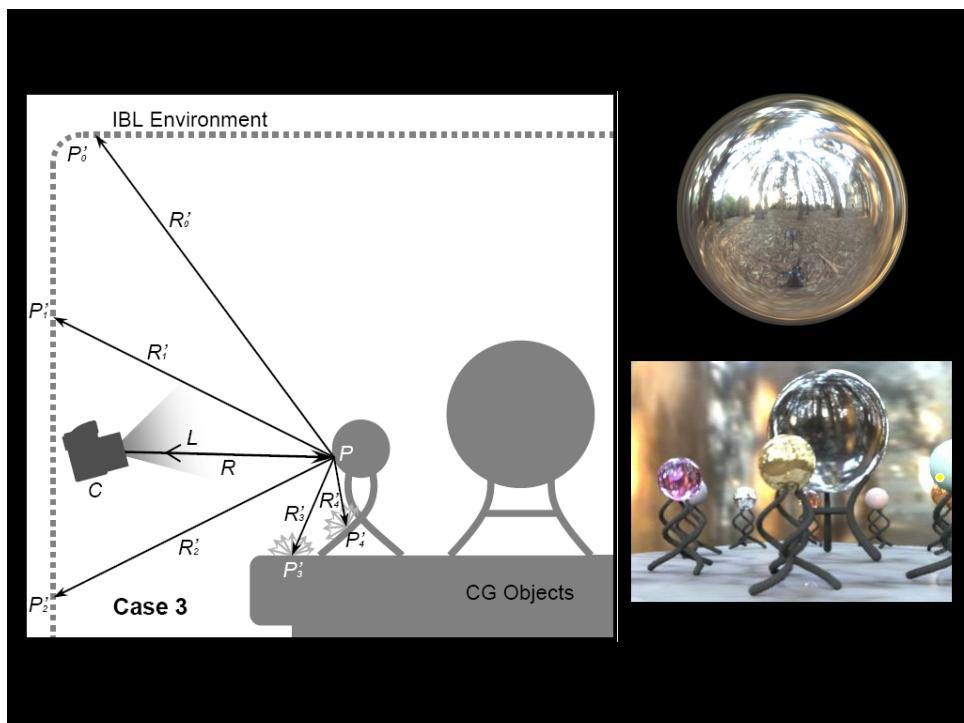
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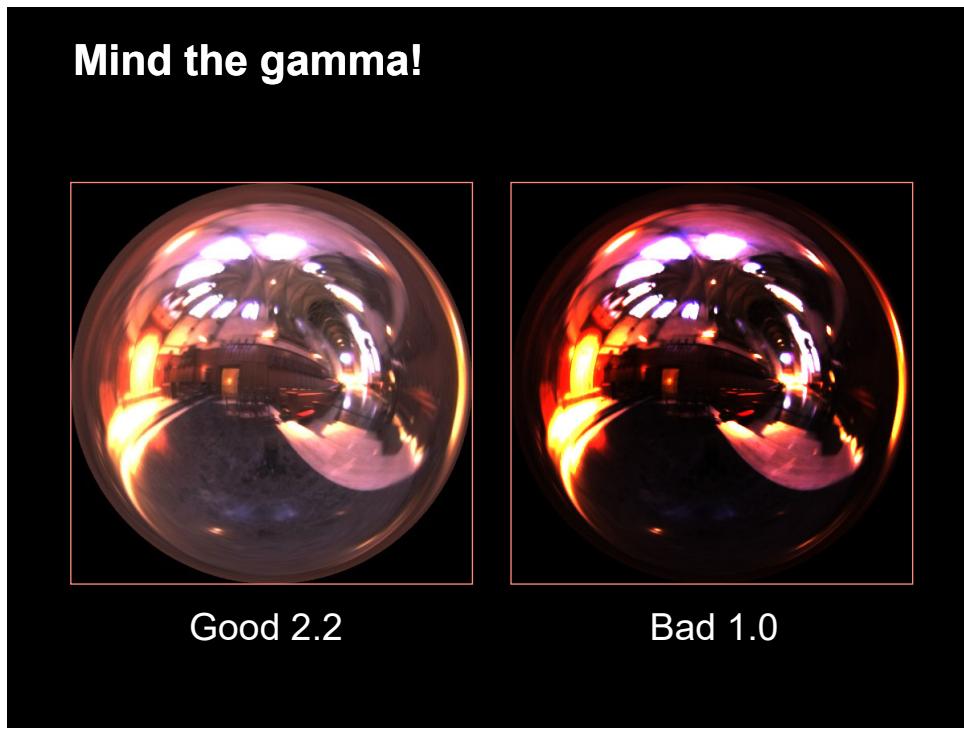
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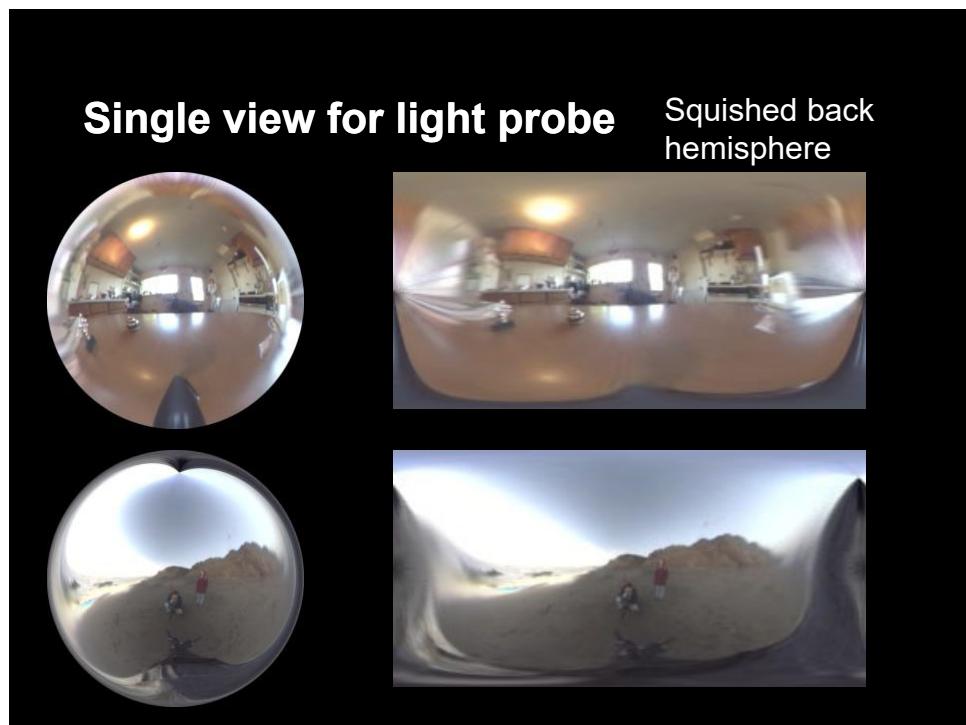
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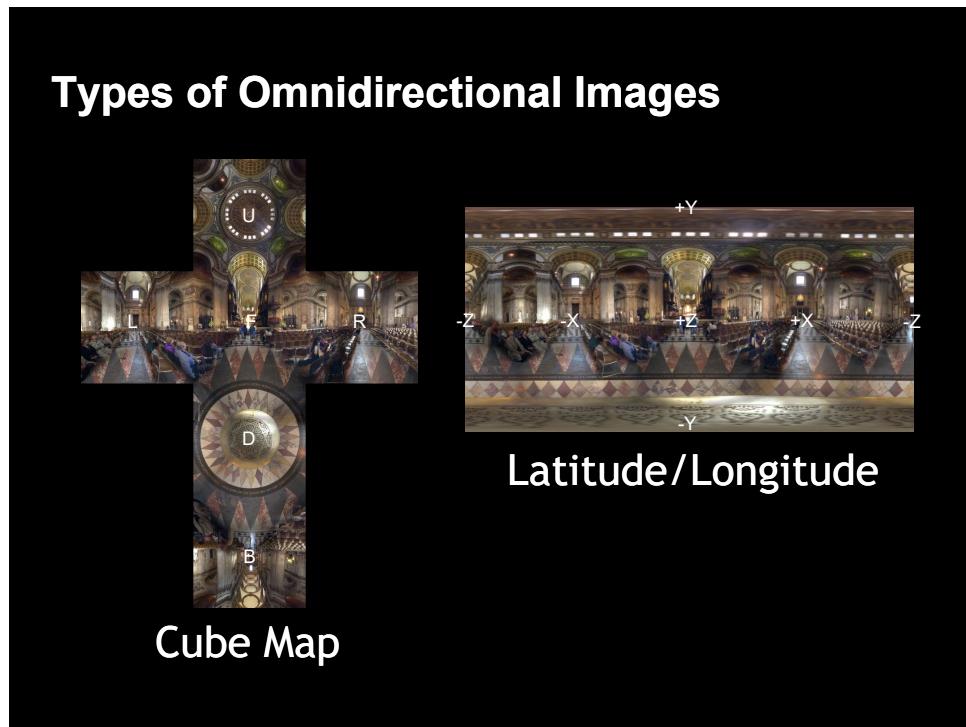
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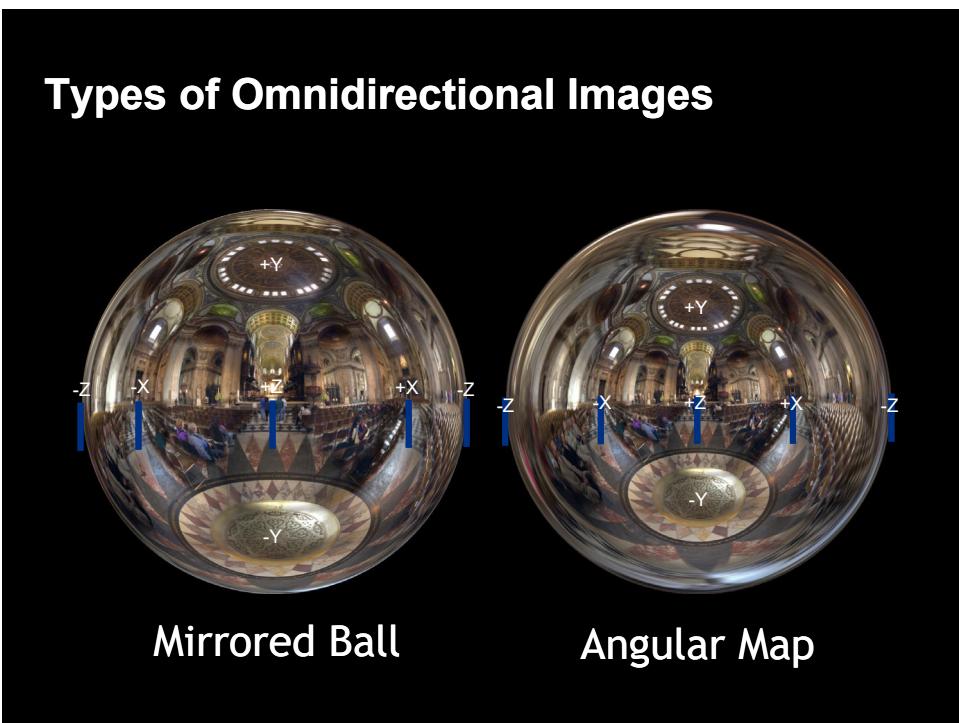
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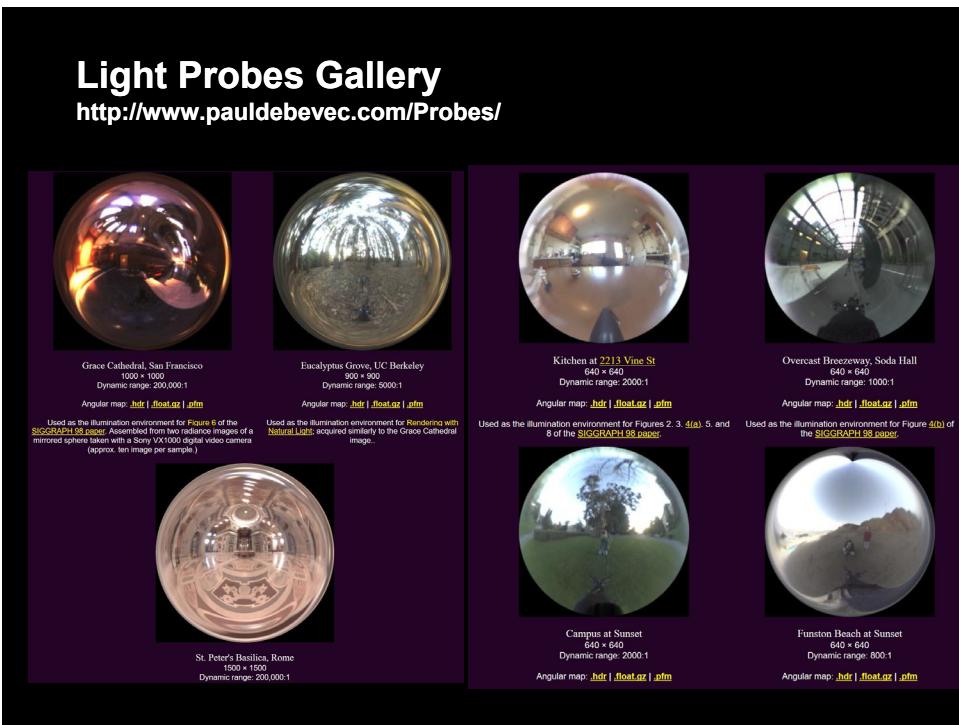
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26

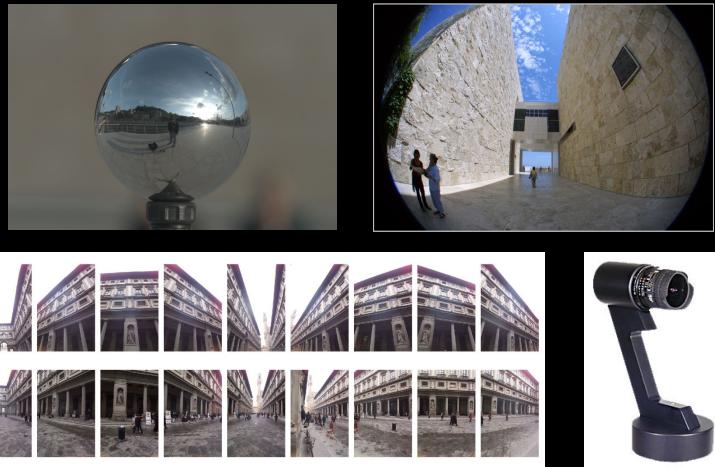


27



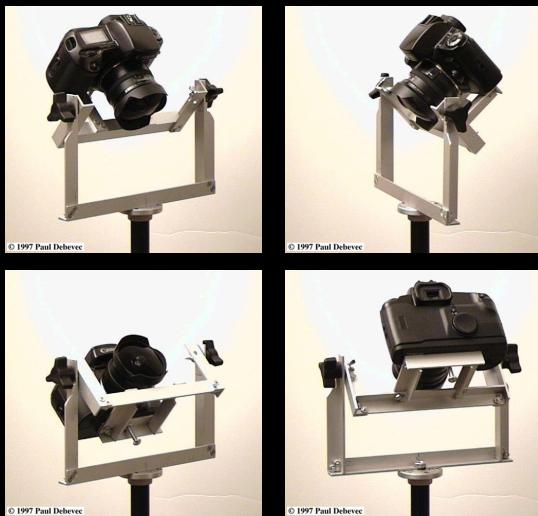
28

Acquiring light probes - mirrored ball, fisheyes, stitched photos, scanning



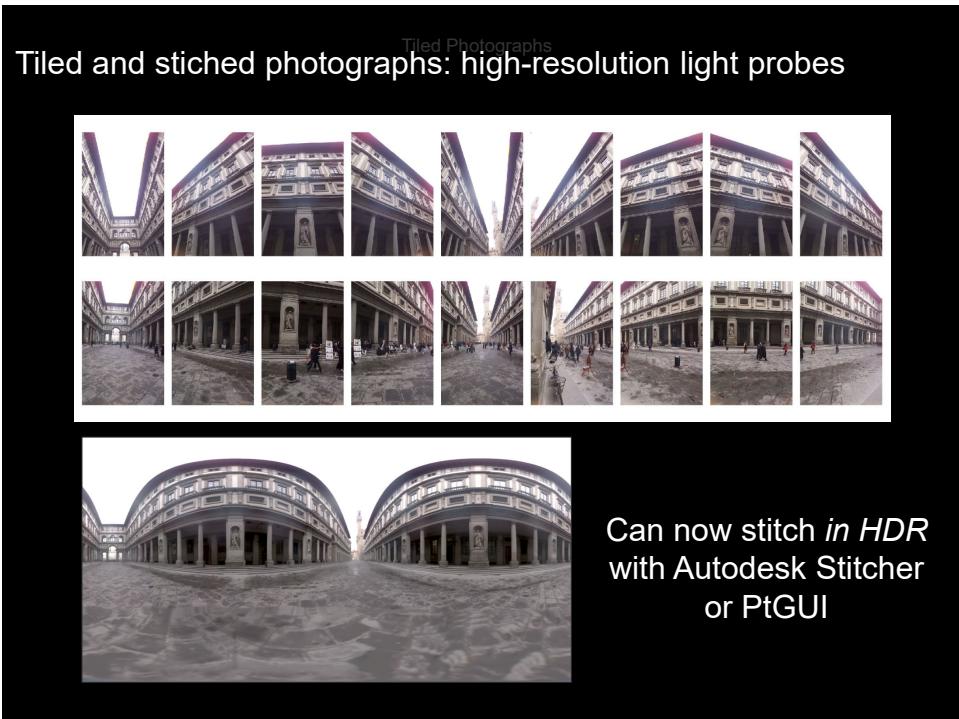
29

Tiled Photographs – Nodal Acquisition Rig

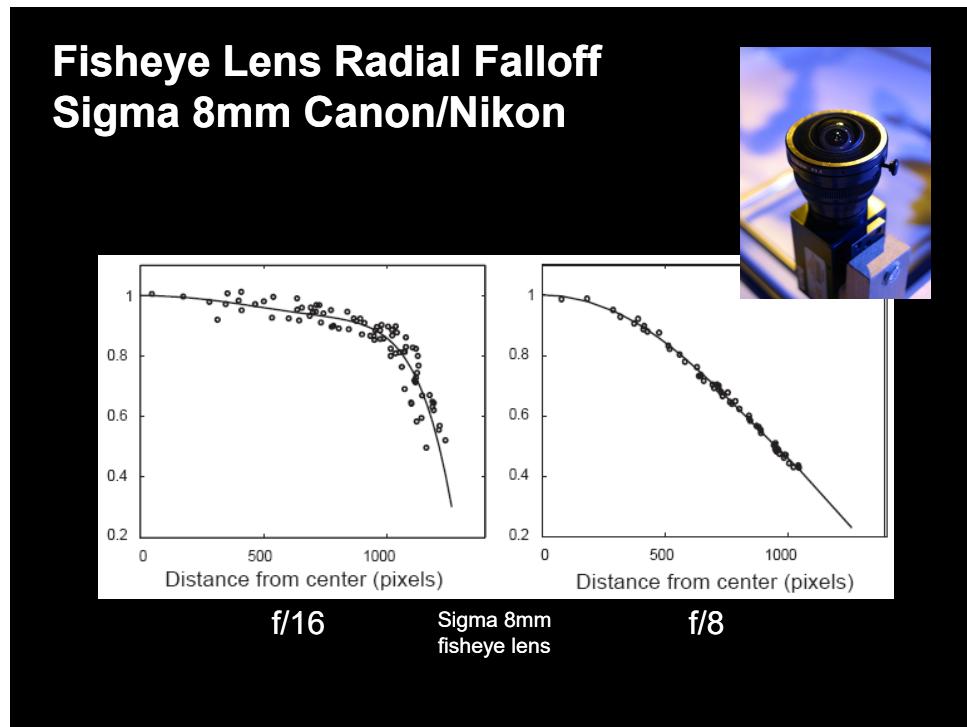


See also www.kaidan.com

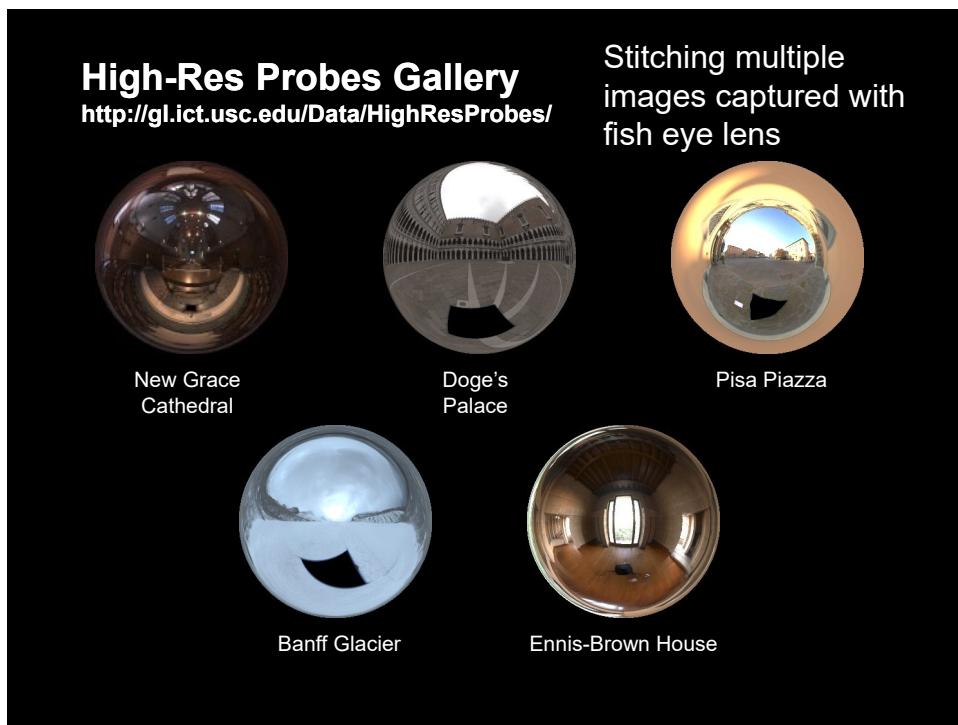
30



31



32



33

**Scanning Panoramic Cameras
 (Panoscan, Spheron)**

- Pros:
- very high res (10K x 7K+)
- Full sphere in one scan – no stitching
- Good dynamic range, some are HDR
- Issues:
- More expensive
- Scans take a while





34

HDR-Cam

www.hdr-cam.com

8 sec – 1/8000 sec, 2 stops apart

24 stops of latitude

<30 sec. capture



35

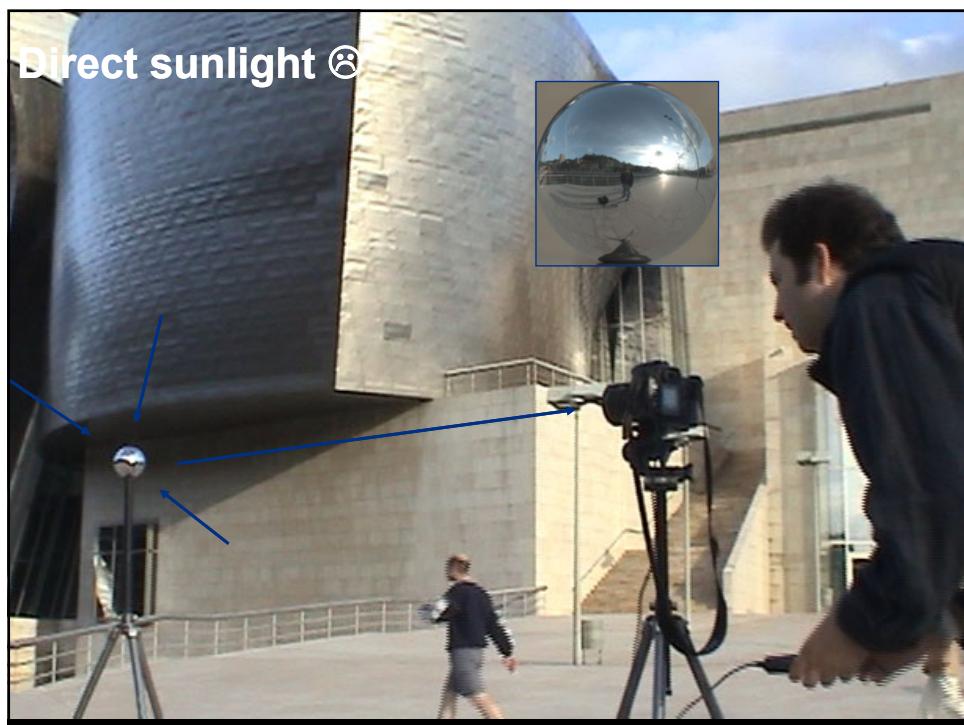
Consumer technology – Ricoh ThetaV

14MP – high resolution panorama

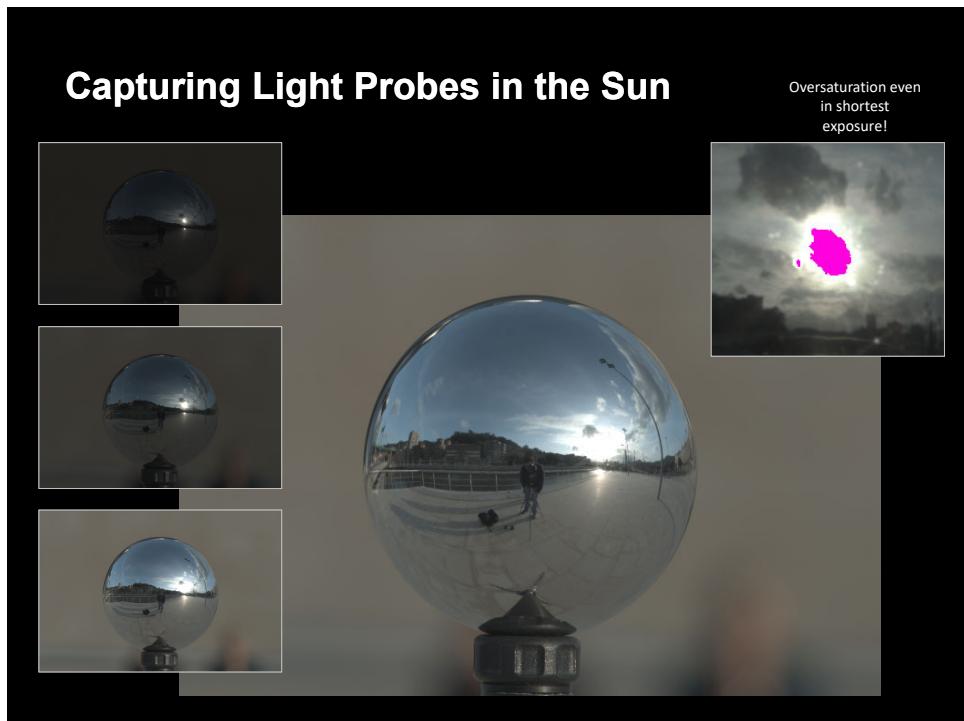
4K video!



36



37



38

19

Can we recover the sun?



Saturated
light probe

$$+ \alpha \quad \approx \quad \text{Point light}$$



Unsaturated
light probe

39

Photograph Diffuse Sphere

Diffuse sphere
unsaturated in direct
sunlight



40

20

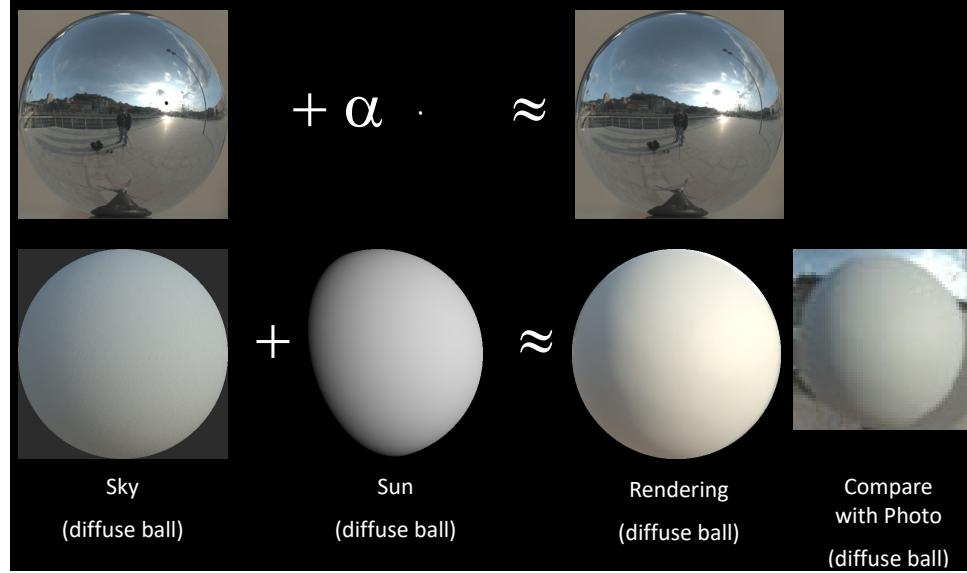
Can we recover the sun's energy α ?

- Solution: use both the saturated mirror ball and the unsaturated diffuse ball together to estimate α



41

Inverse rendering for unknown α



42

Solve for Sun Scaling Factor



$+ \alpha$



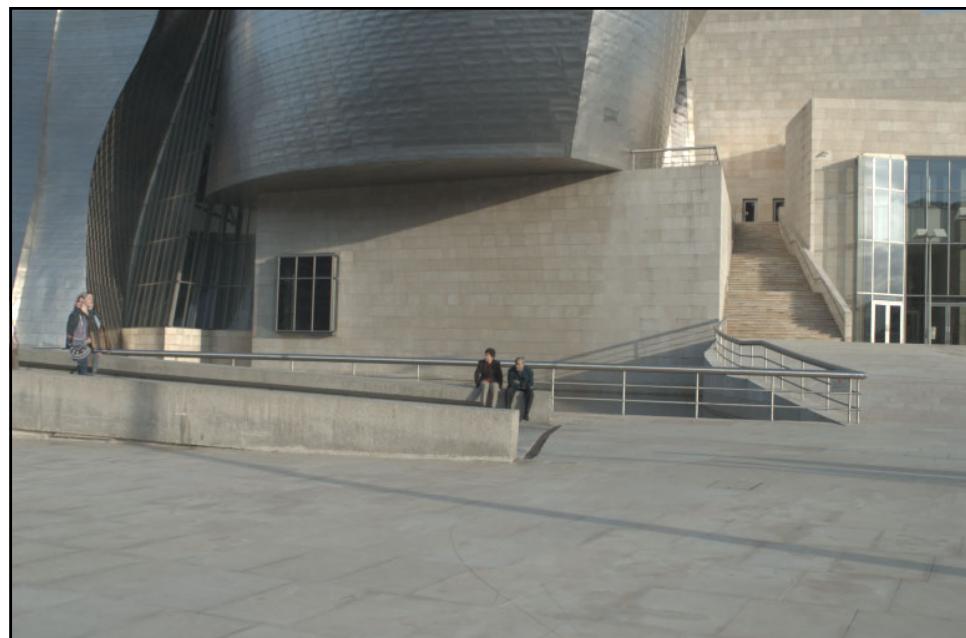
\approx



Diffuse Ball

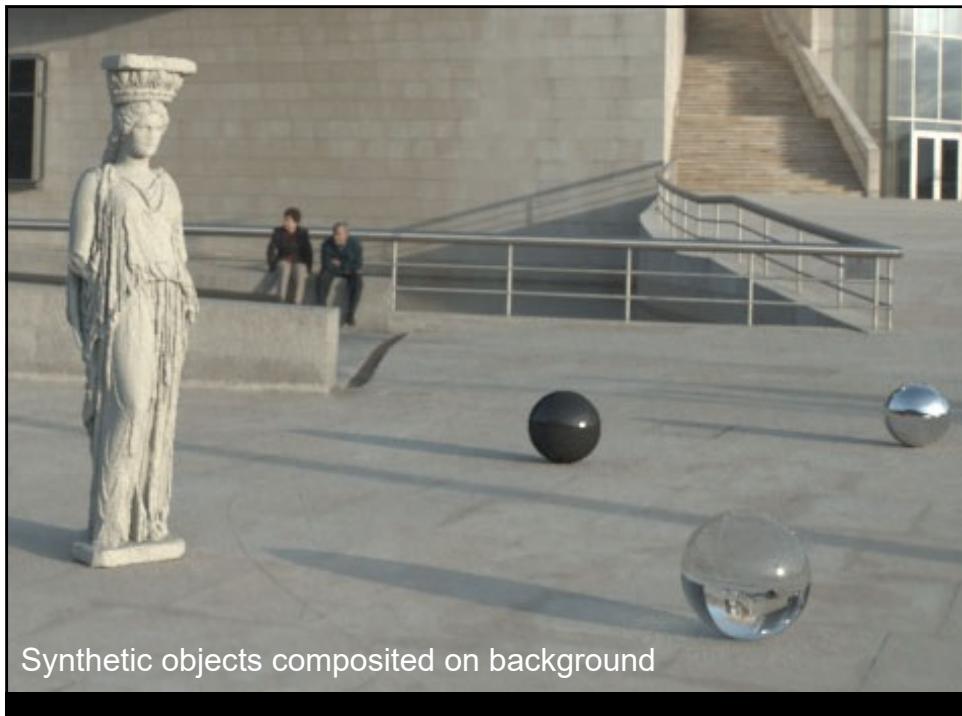
$$\alpha = (1.166, 0.973, 0.701)$$

43



Background plate

44



Synthetic objects composited on background

45

Measuring Natural Illumination in single shot



46

Measuring Natural Illumination in single shot

- Mirror ball for sky

- Diffuse ball for unsaturated sun

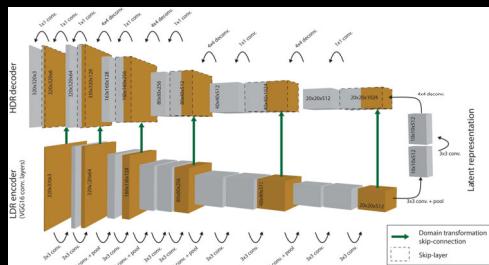
- Black ball for accurate sun position!



47

Deep HDR from LDR

[Eilertsen et al. 2017]

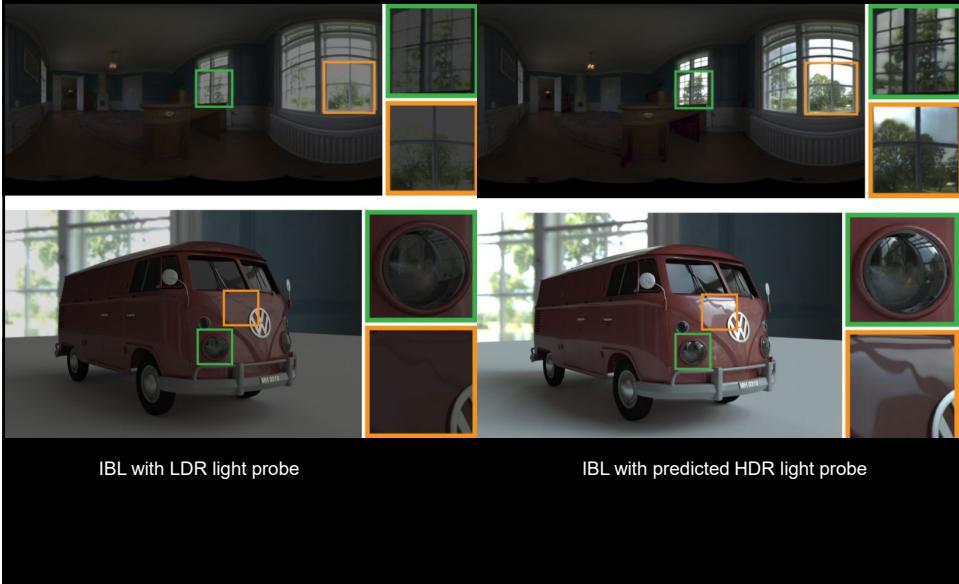


U-net like architecture

48

Deep HDR from LDR

[Eilertsen et al. 2017]



49

Deep HDR from LDR

[Eilertsen et al. 2017]



50

25