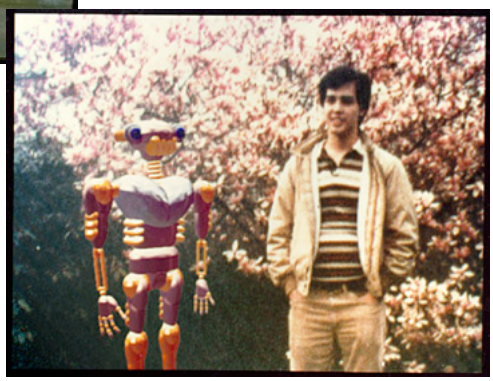
Environment mapping

Blinn, J. F. and Newell, M. E. Texture and reflection in computer generated images. Communications of the ACM Vol. 19, No. 10 (October 1976), 542–547.

Image courtesy of Gene Miller and Ken Perlin

About 1982 or 1983

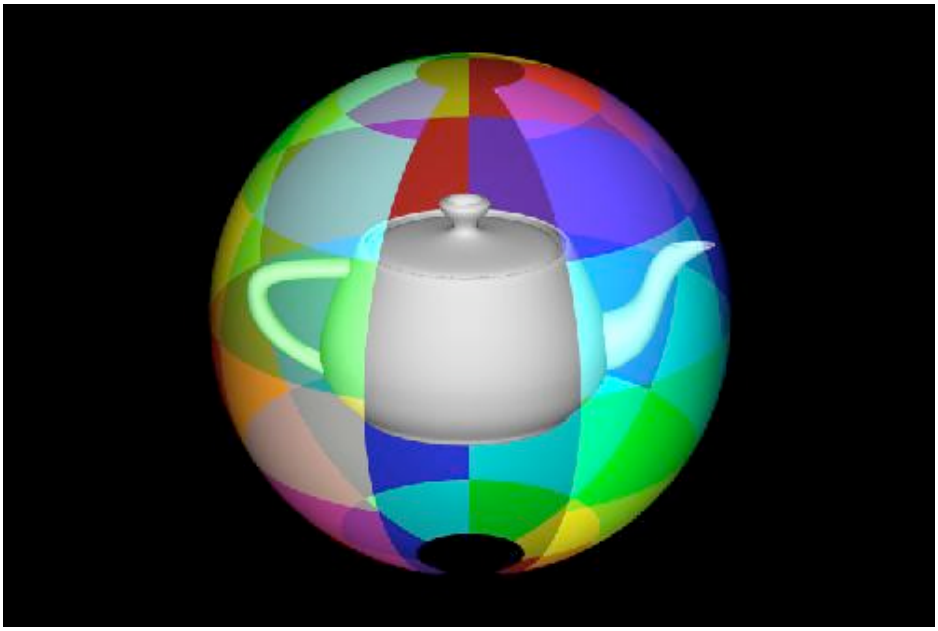
Image courtesy of
Michael Chou and Lance Williams



Interface by NYIT (Lance Williams)

SIGGRAPH 1985

10” gazing ball



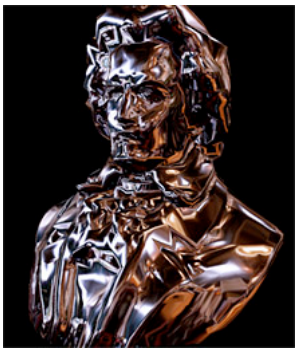
Environment Mapping

- Spherical co-ordinates are obtained with the following equations:
  - theta = arctan (y/x).
  - rho = arccos (z/R).
  - R = sqrt (x^2 + y^2 + z^2)

Paul Haeberli and Mark Segal. Texture Mapping as a Fundamental Drawing Primitive. Fourth Eurographics Workshop on Rendering. June 1993, pp. 259-266.

Figure 7. Environment Mapping.

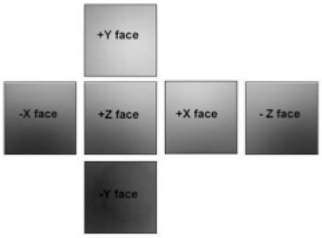
180° fish eye



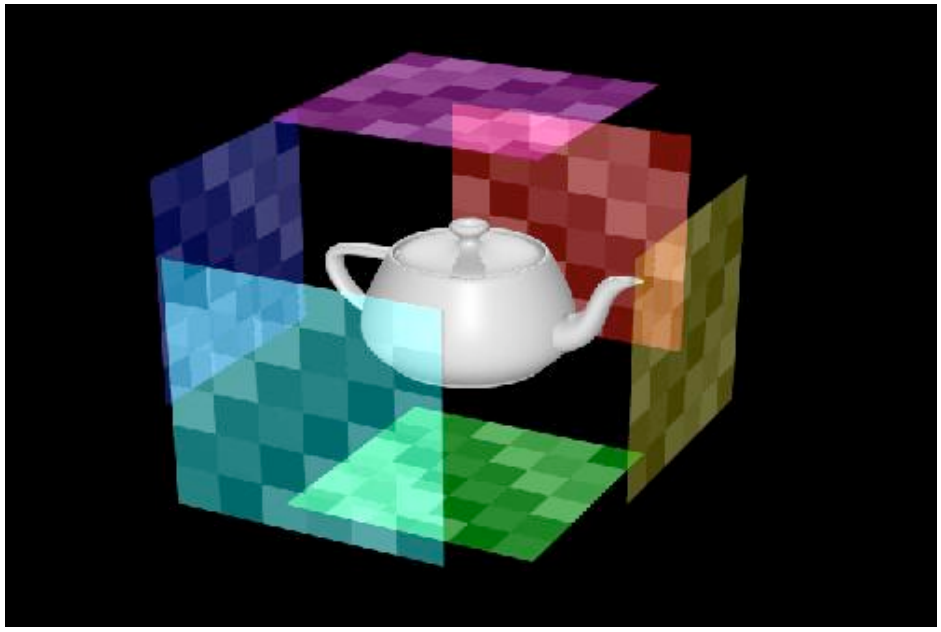
360° Env map

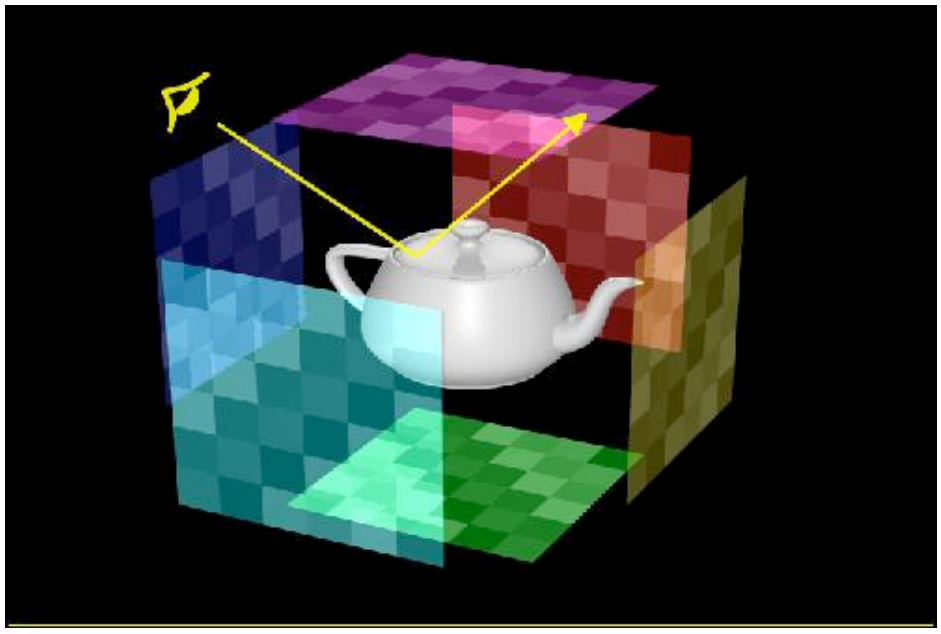
Images courtesy of Paul Haeberli

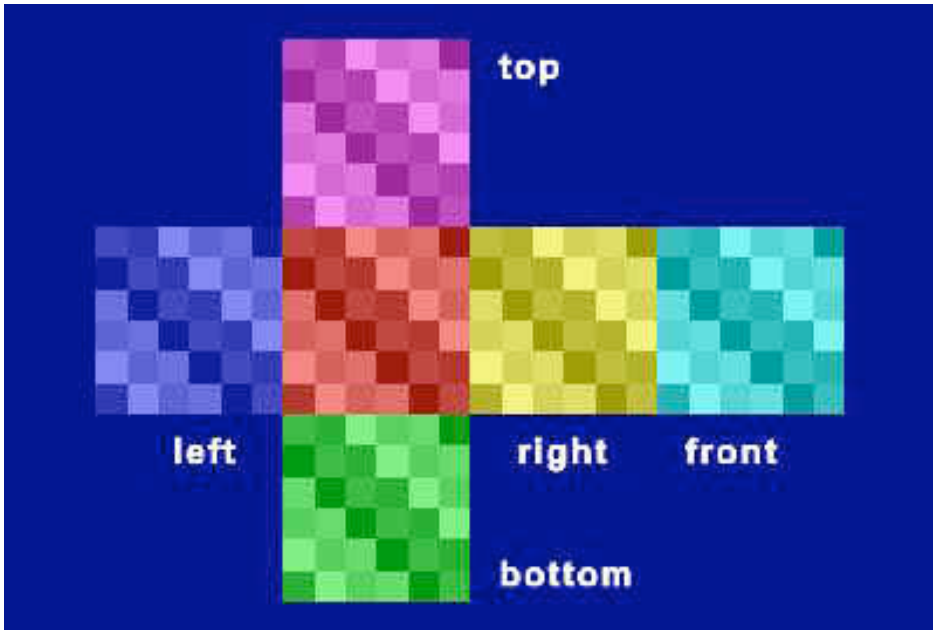
Cube Mapping

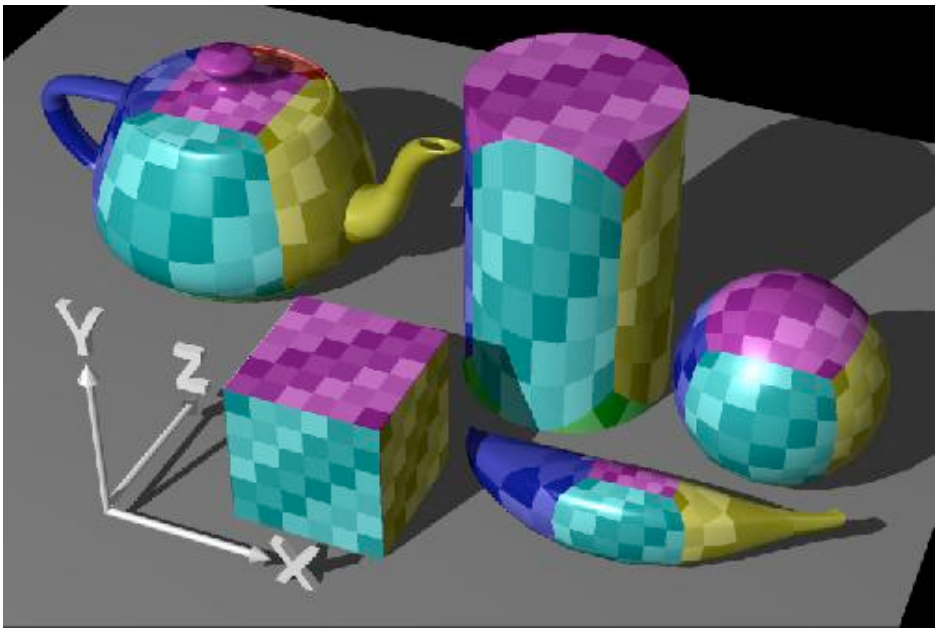


- Simple math:
  - Compute reflection vector *r*
  - Largest abs-value of component determines which cube face
    - Example: *r* = (5, -1, 2) give POS_X face
    - Divide *r* by 5 gives (u,v) =-1/5, 2/5)
  - Hardware often does all the work






top
left
right
front
bottom


Y
Z
X

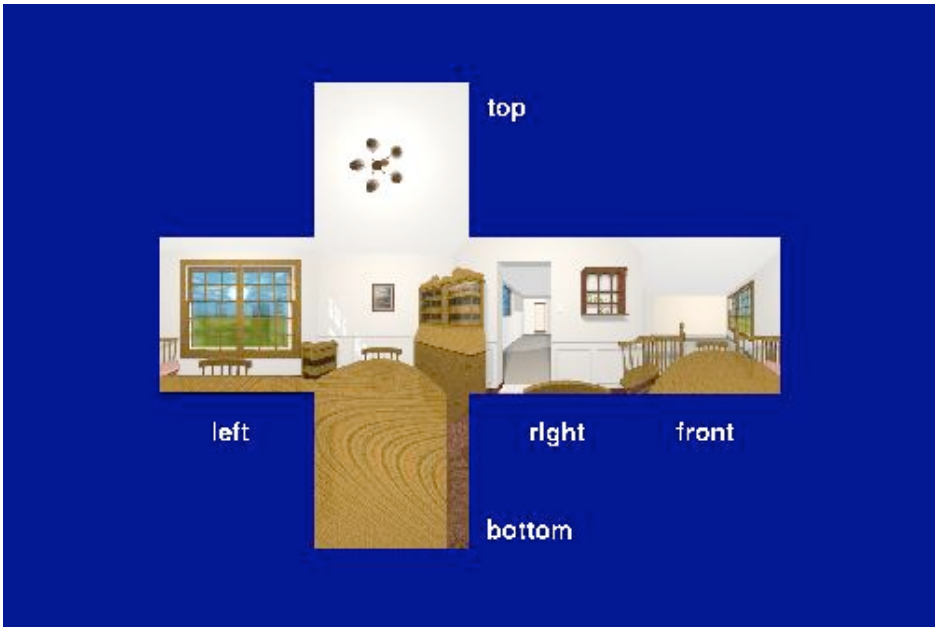

top
left
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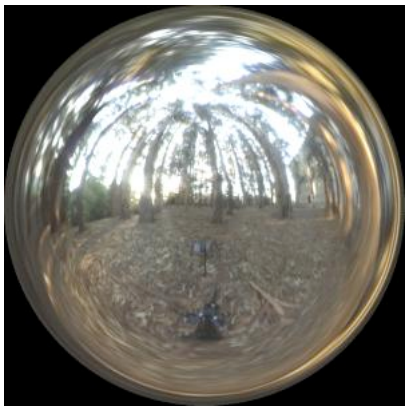
Image-based Illumination

- Paul Debevec. Rendering Synthetic Objects into Real Scenes: Bridging Traditional and Image-Based Graphics with Global Illumination and High Dynamic Range Photography. In SIGGRAPH 98, July 1998.



http://athens.ict.usc.edu/Probes/

Acquiring the Reflectance Field of a Human Face

Paul Debevec, Tim Hawkins, Chris Tchou, Haarm-Pieter Duiker,
Westley Sarokin, and Mark Sagar

SIGGRAPH 2000 Conference Proceedings

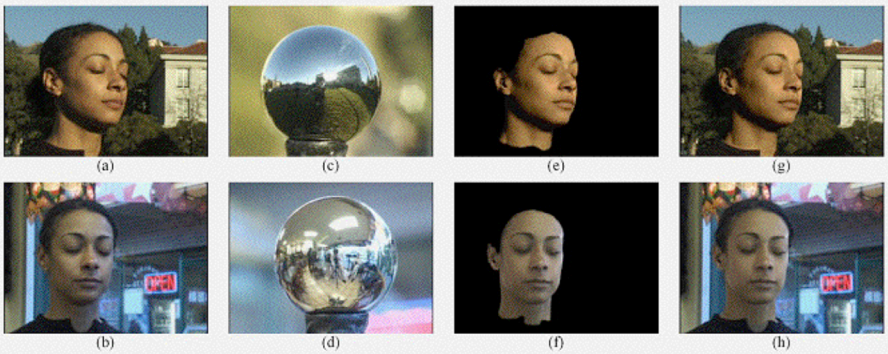


Figure 15: **Matching to Real-World Illumination** **(a,b)** Actual photographs of the subject in two different environments. **(c,d)** Images of a light probe placed in the position of the subject's head in the same environments. **(e,f)** Synthetic renderings of the face matched to the photographed viewpoints and illuminated by the captured lighting. **(g,h)** Renderings of the synthetic faces (e,f) composited over the original faces (a,b); the hair and shoulders come from the orginal photographs and are not produced using our techniques. The first environment is outdoors in sunlight; the second is indoors with mixed lighting coming from windows, incandescent lamps, and fluorescent ceiling fixtures.

http://www.debevec.org/Research/LS/

Credits

- http://www.debevec.org/
- http://www.debevec.org/ReflectionMapping
- Rosalee Wolfe