

# Physically Based Atmosphere Rendering

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Advised by Norm Badler

## Summary

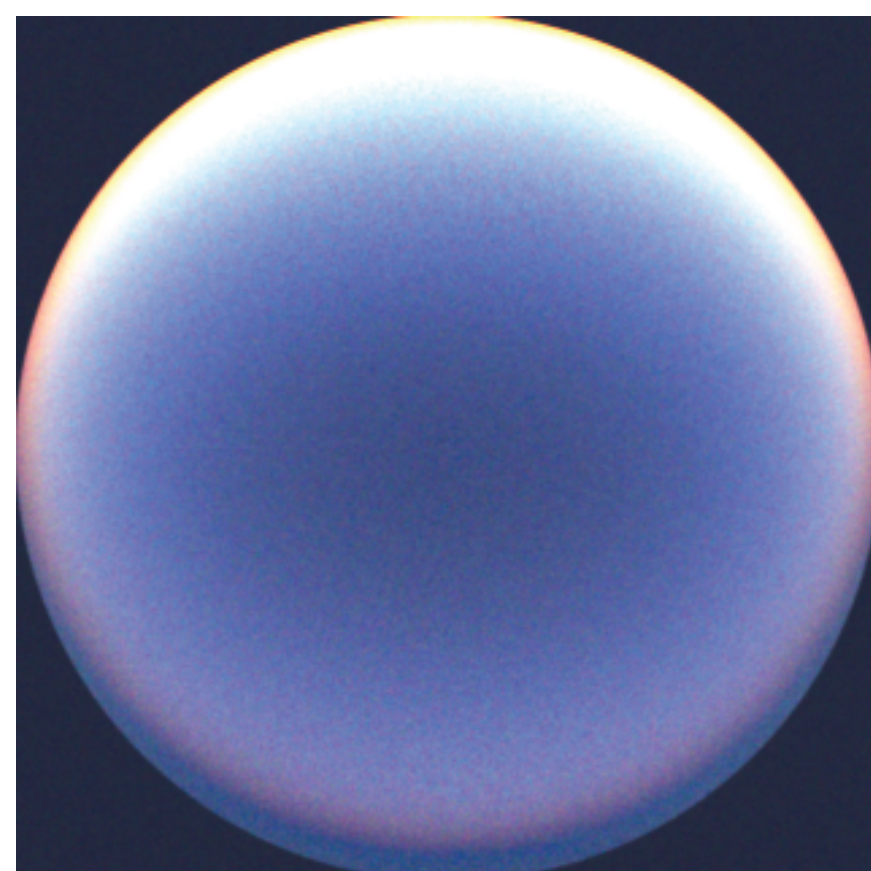
I programmed a renderer that simulates atmospheric light transport to produce realistic images of Earth's atmosphere.



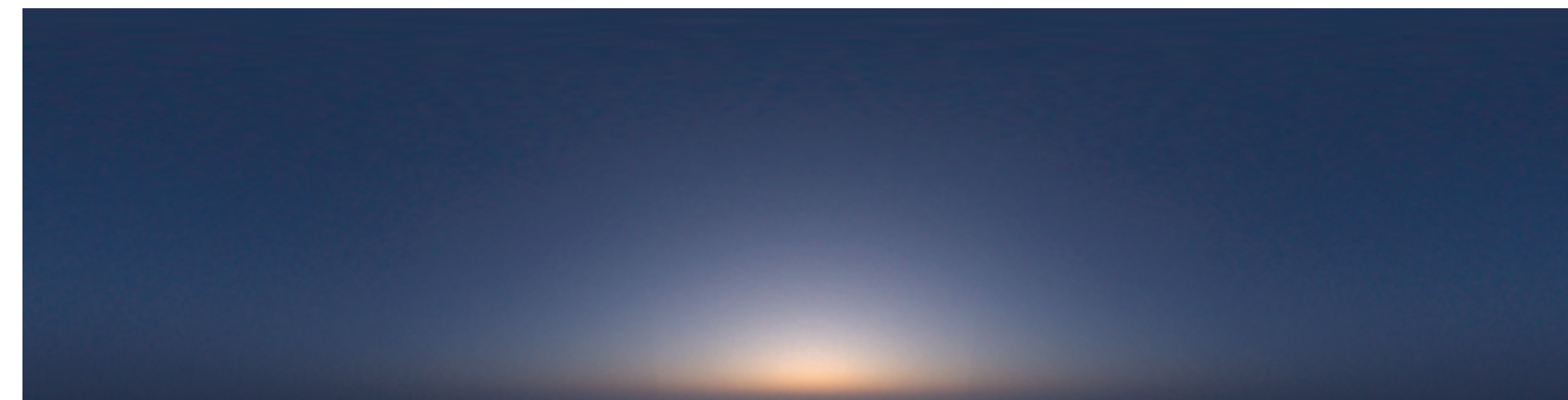
An image of the visible spectrum created using my spectral rendering system.

## Features

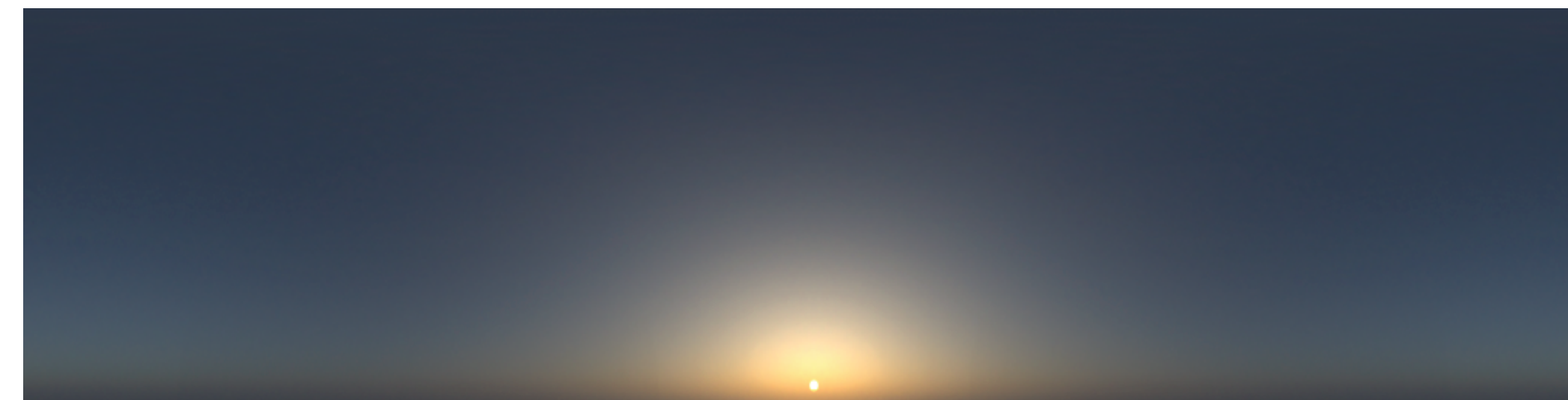
- Spectral rendering
- Realistic model of the Earth's atmosphere
- Monte Carlo path tracing
- Rayleigh and Mie scattering
- Ozone absorption
- Multiple scattering
- Unbiased distance sampling
- Reflective Earth surface
- Direct sun sampling
- Accurate solar spectrum
- SI units
- Panoramic cameras
- HDR environment map output



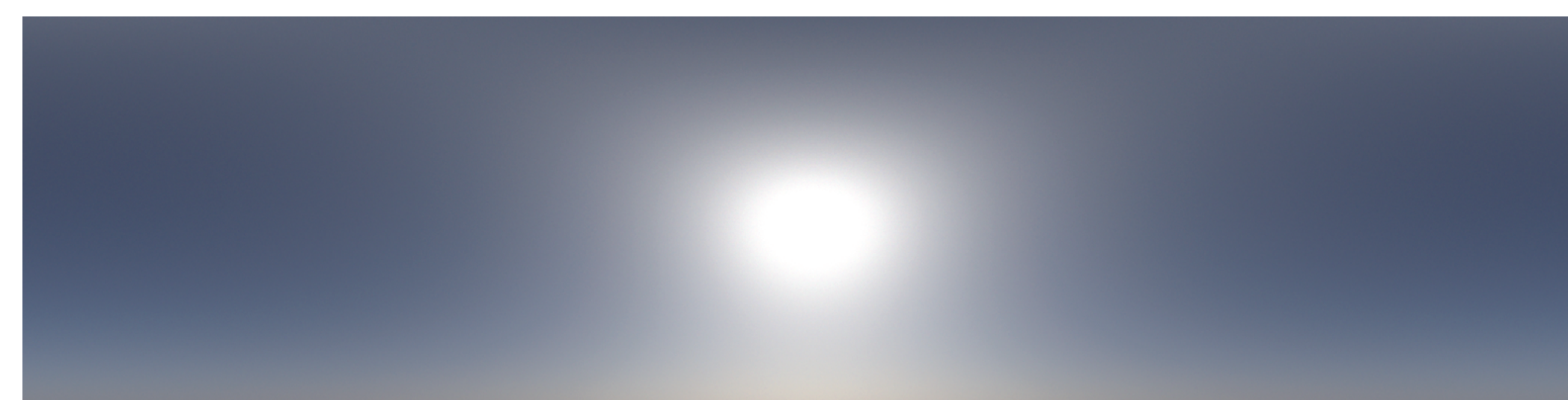
A fisheye render of twilight, clearly showing the the shadow of the Earth in the antisolar direction (along the bottom edge of the circular region).



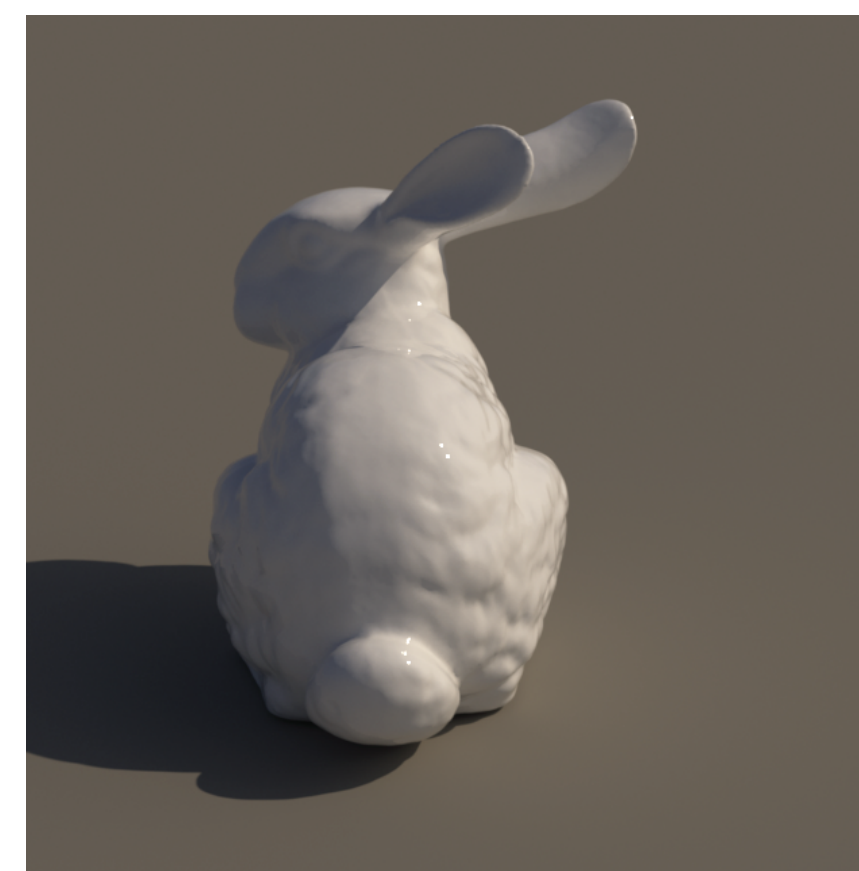
Above: Render of twilight. Below: Photoreализer\* render lit by the image above.



Above: Render of sunrise / sunset. Below: Photoreализer\* render lit by the image above.



Above: Render of midday. Below: Photoreализer\* render lit by the image above.



A render of the Earth's atmosphere as seen from space.



The same render except without any atmosphere.

## Results

- Accurately reproduces the color and brightness of the sun and sky under a variety of atmospheric conditions
- Able to render images from any viewpoint (e.g., ground or space)
- Accurately captures the deep blue color of the zenith sky during twilight (which would appear gray in the absence of ozone)
- Naturally reproduces phenomena such as the shadow of the Earth cast into the atmosphere during twilight
- Output can be used as a light source in other renderers

## Details

For much more information, check out my project blog at [skyrenderer.blogspot.com](http://skyrenderer.blogspot.com)

\* Photoreализer is a physically based 3D renderer that I wrote from scratch. See [photoreализer.com](http://photoreализer.com)

