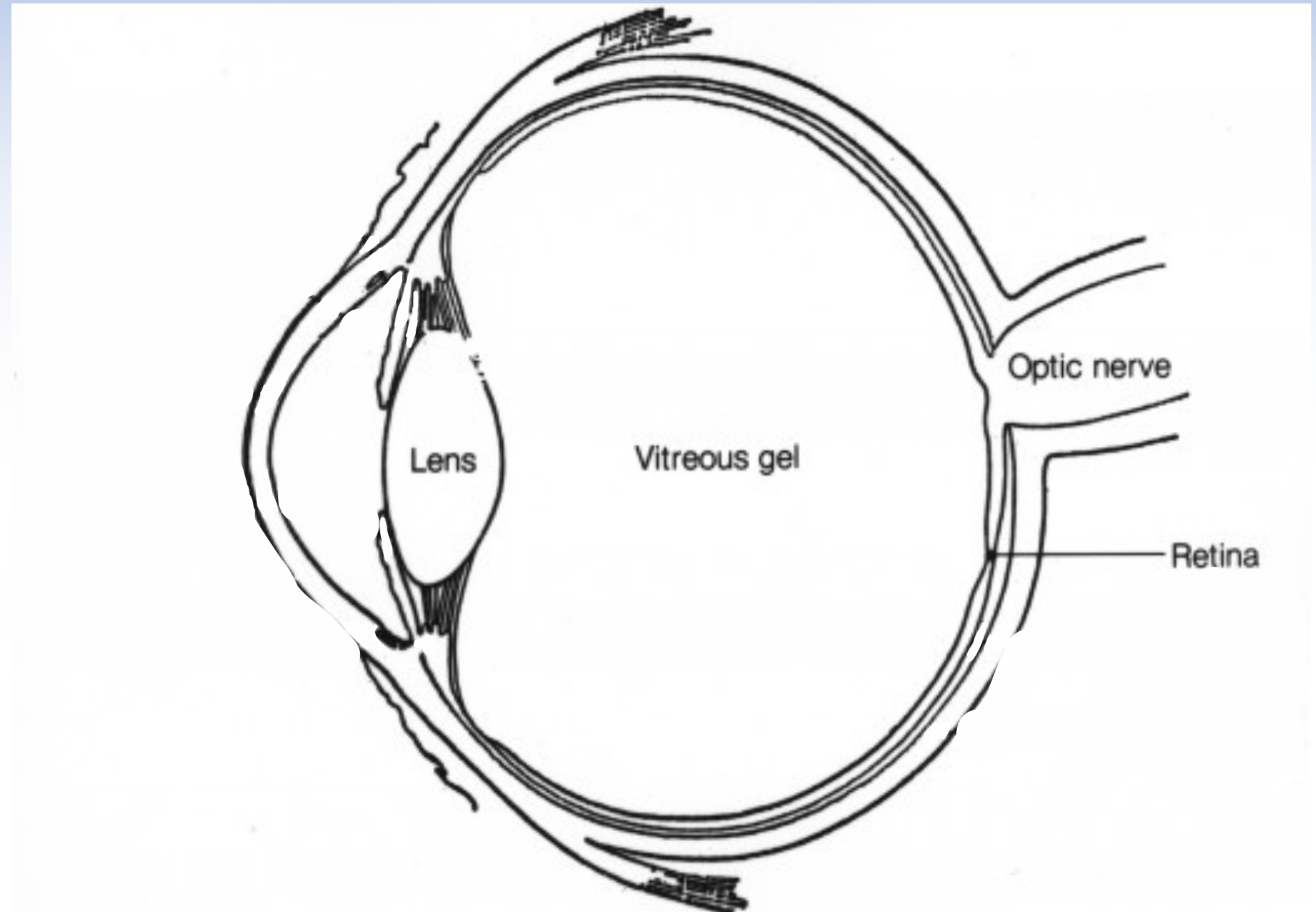
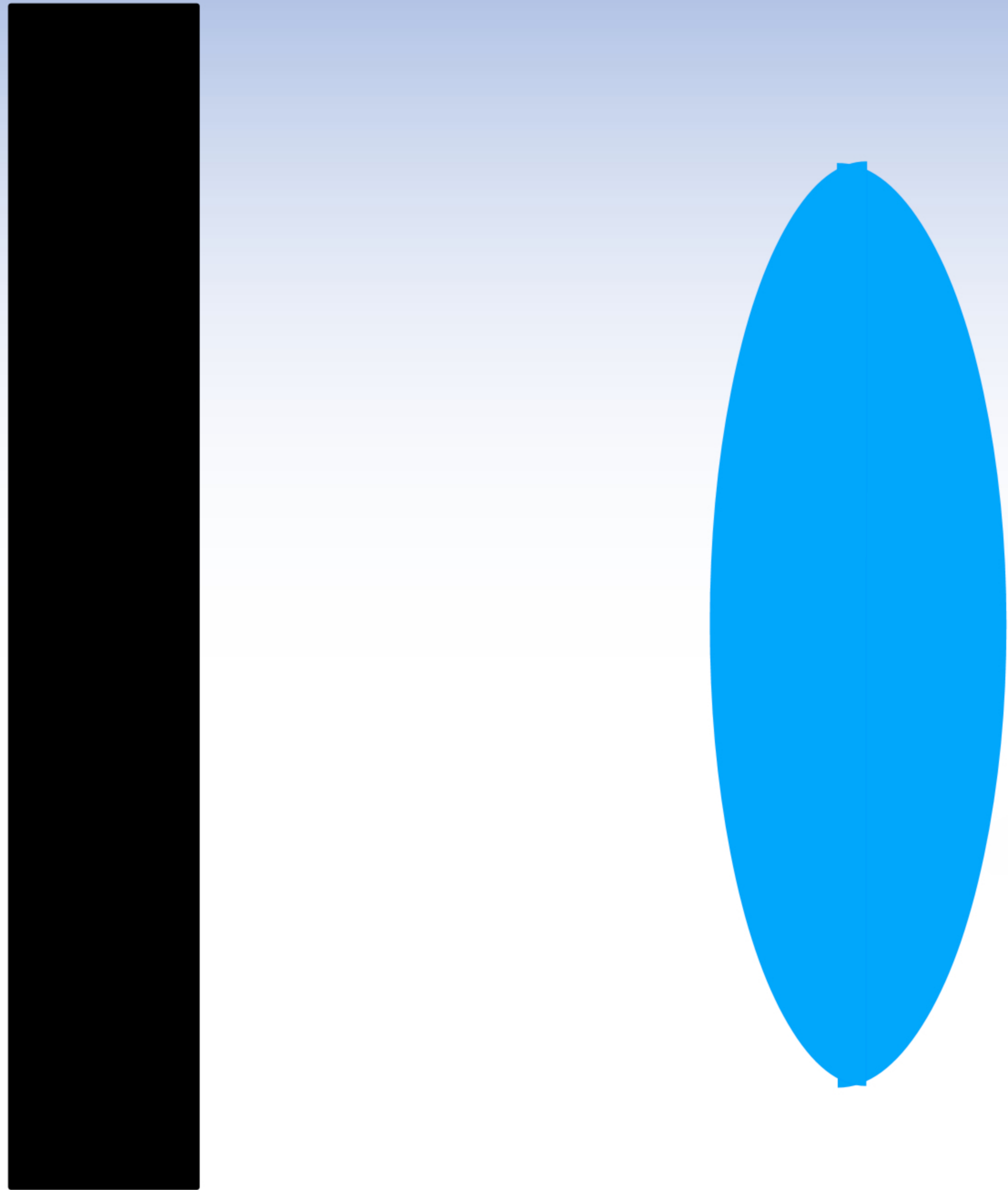


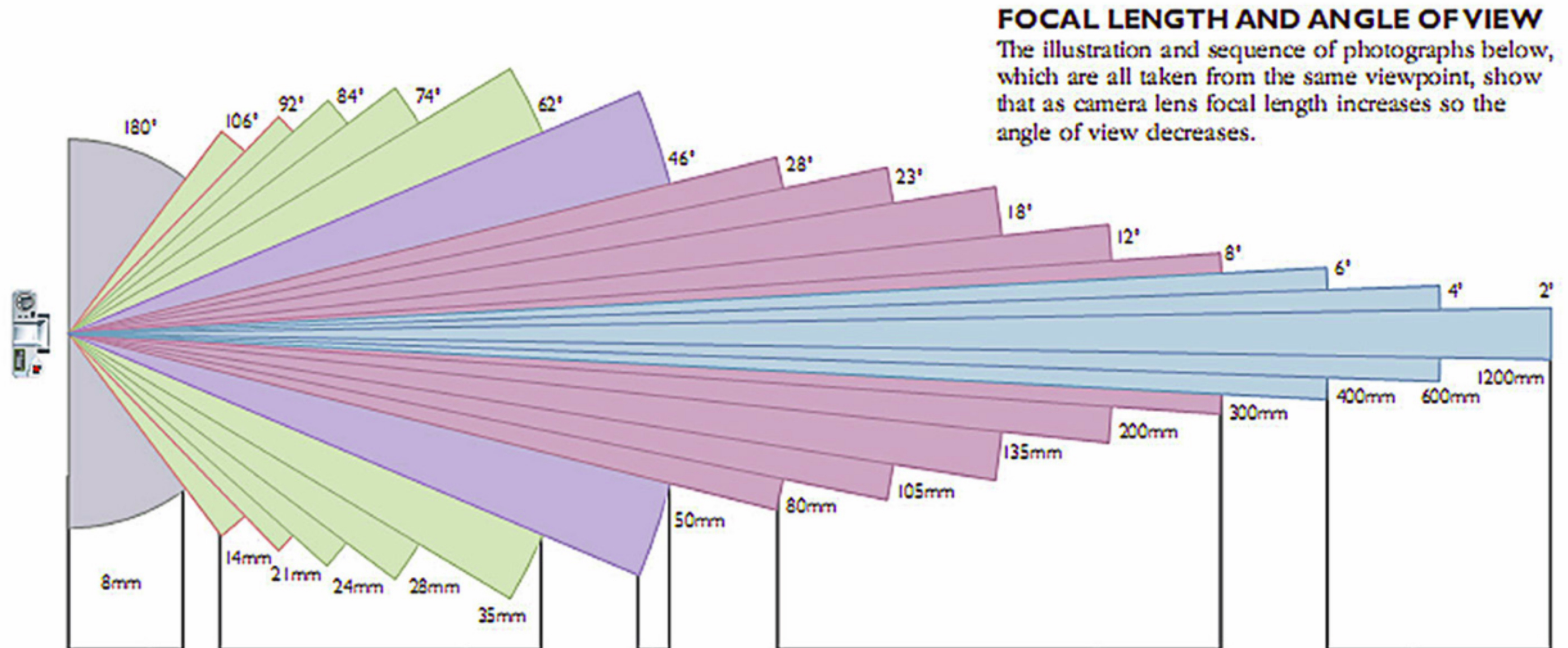
Announcements

- Project team and abstract due Oct 8, IN CLASS.
- MP3 will be out on Oct 8.

Imaging System Inside of a Human Eye



Lens Shapes and Focal Lengths



Fisheye lens



Wide-angle lens



Standard lens

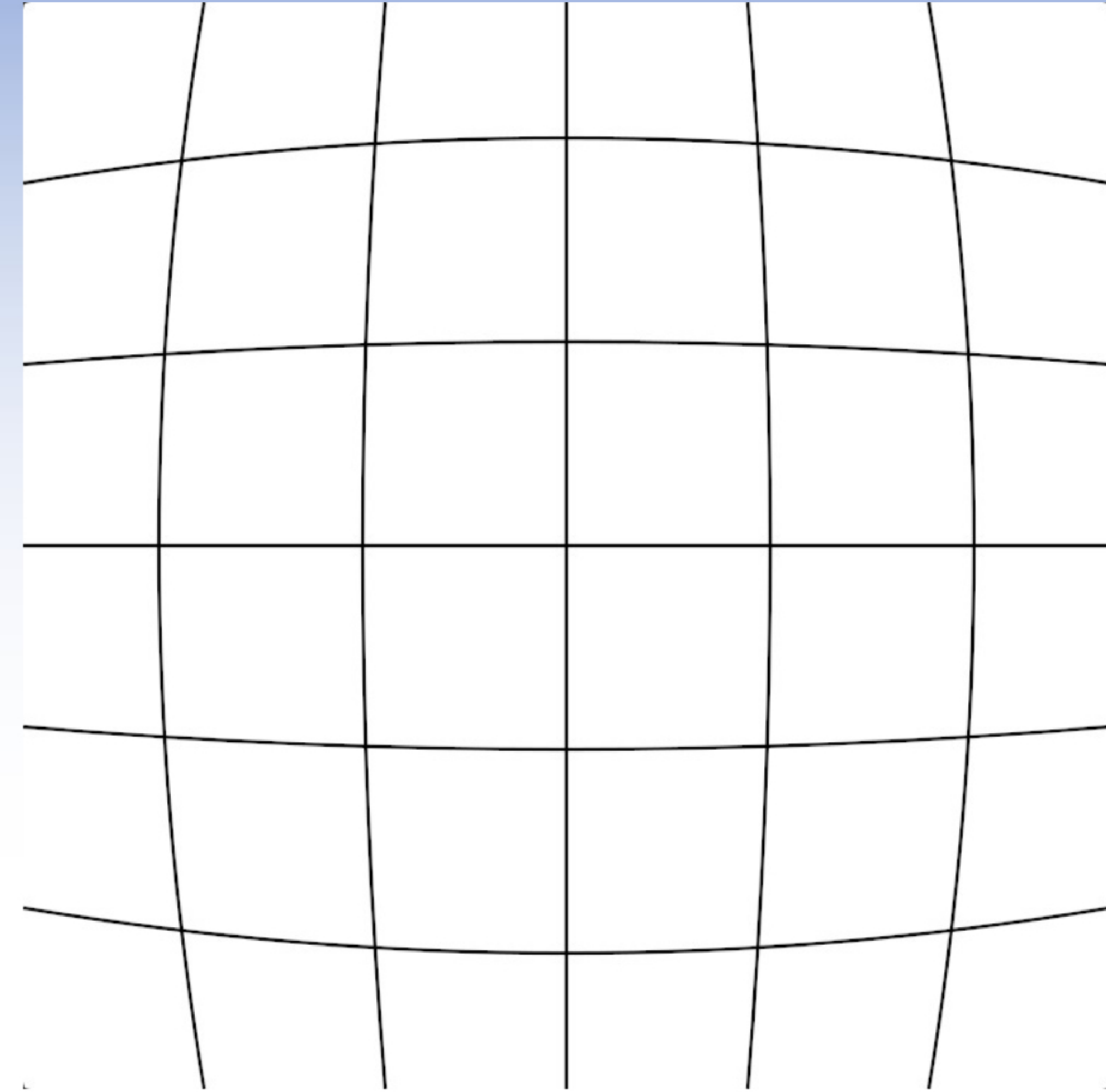
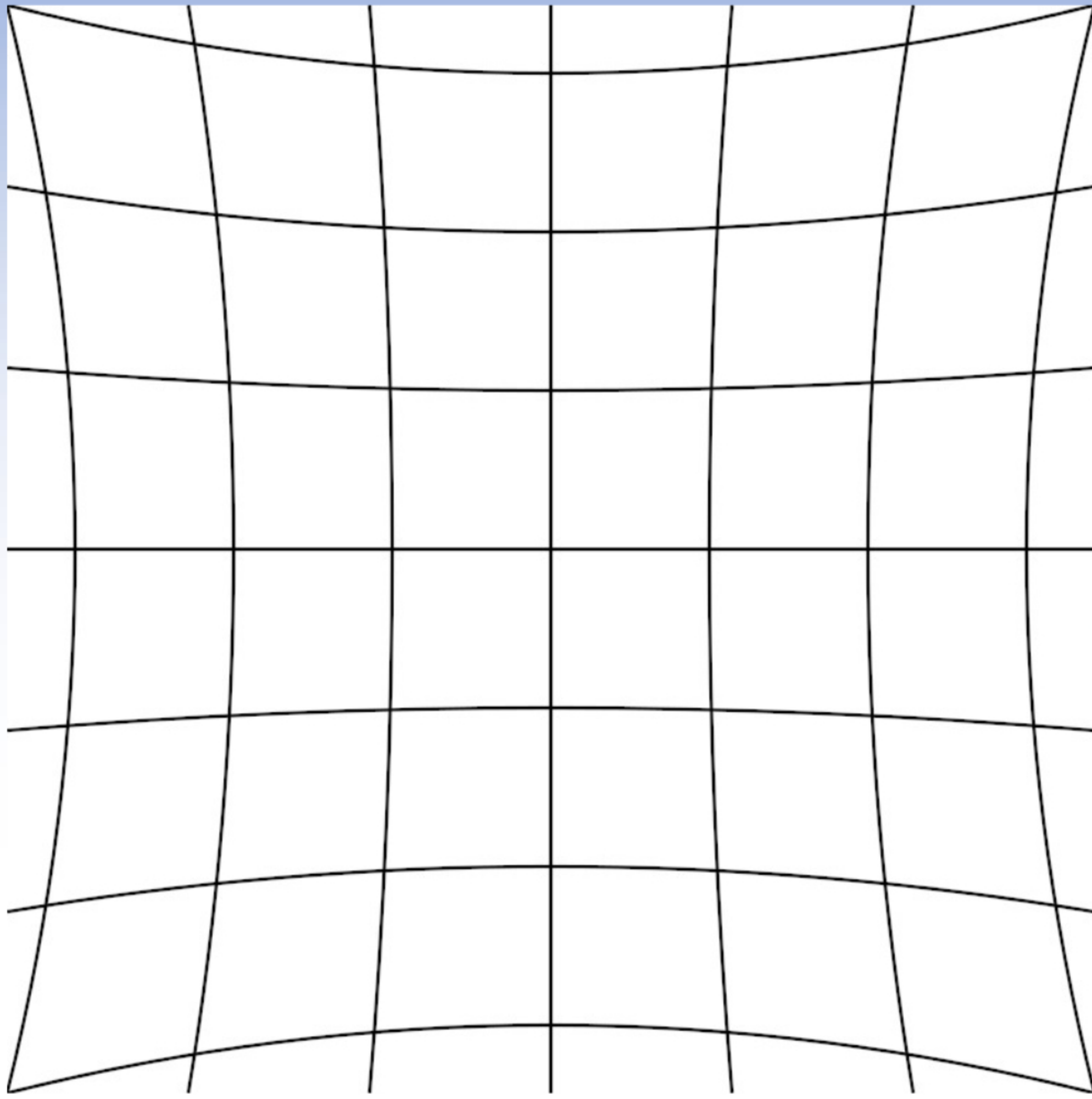


Long-focus lens

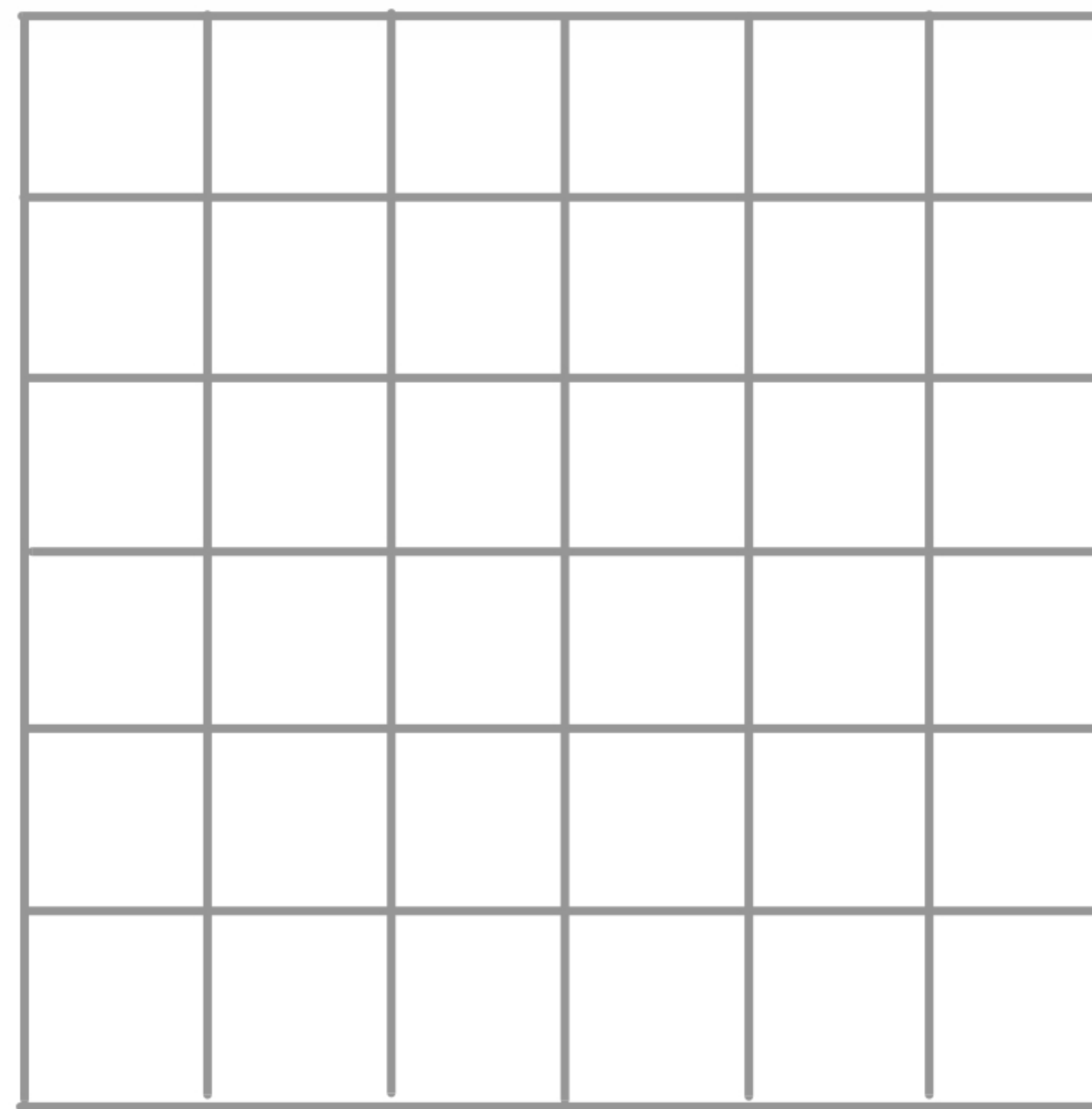
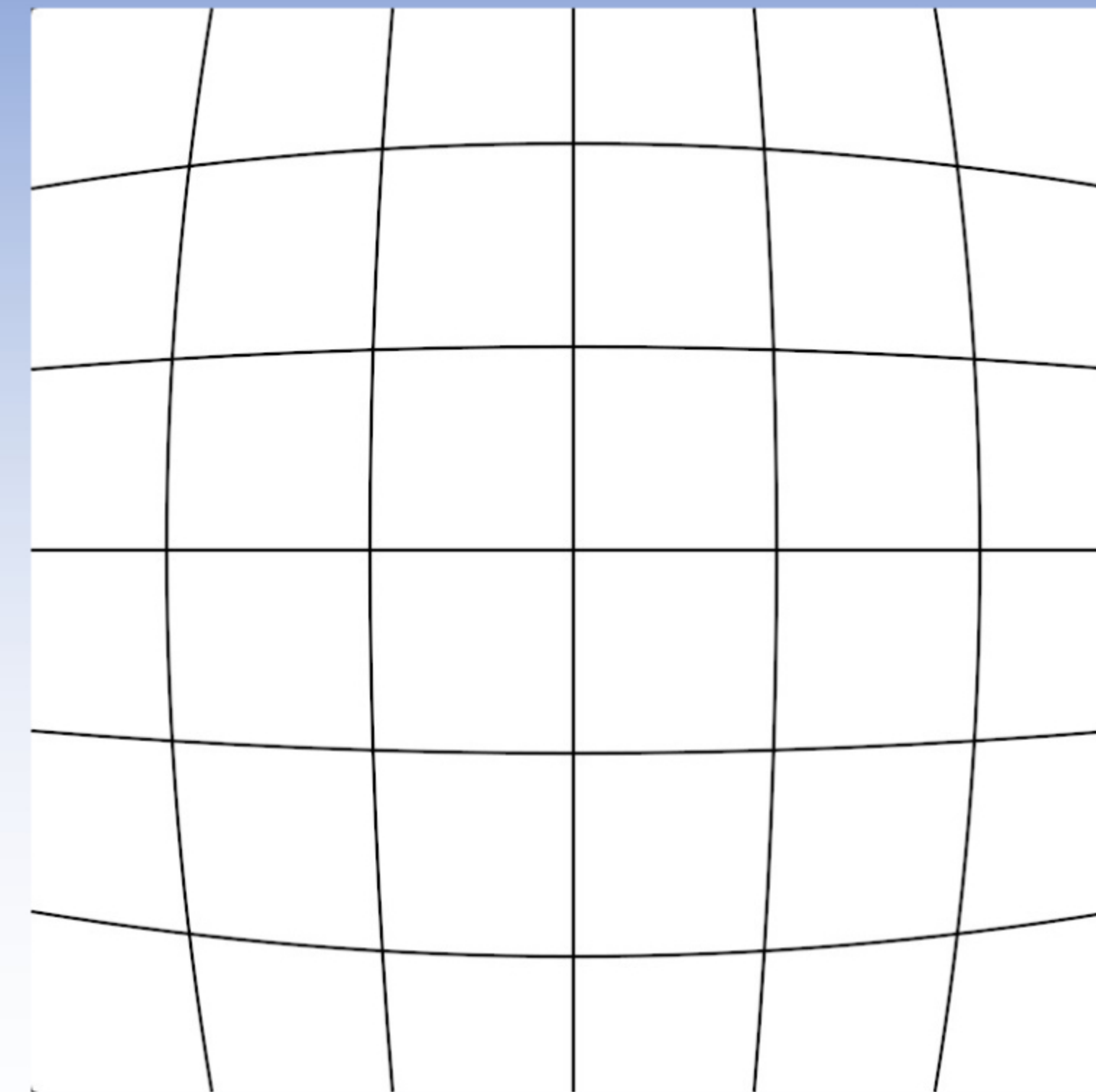
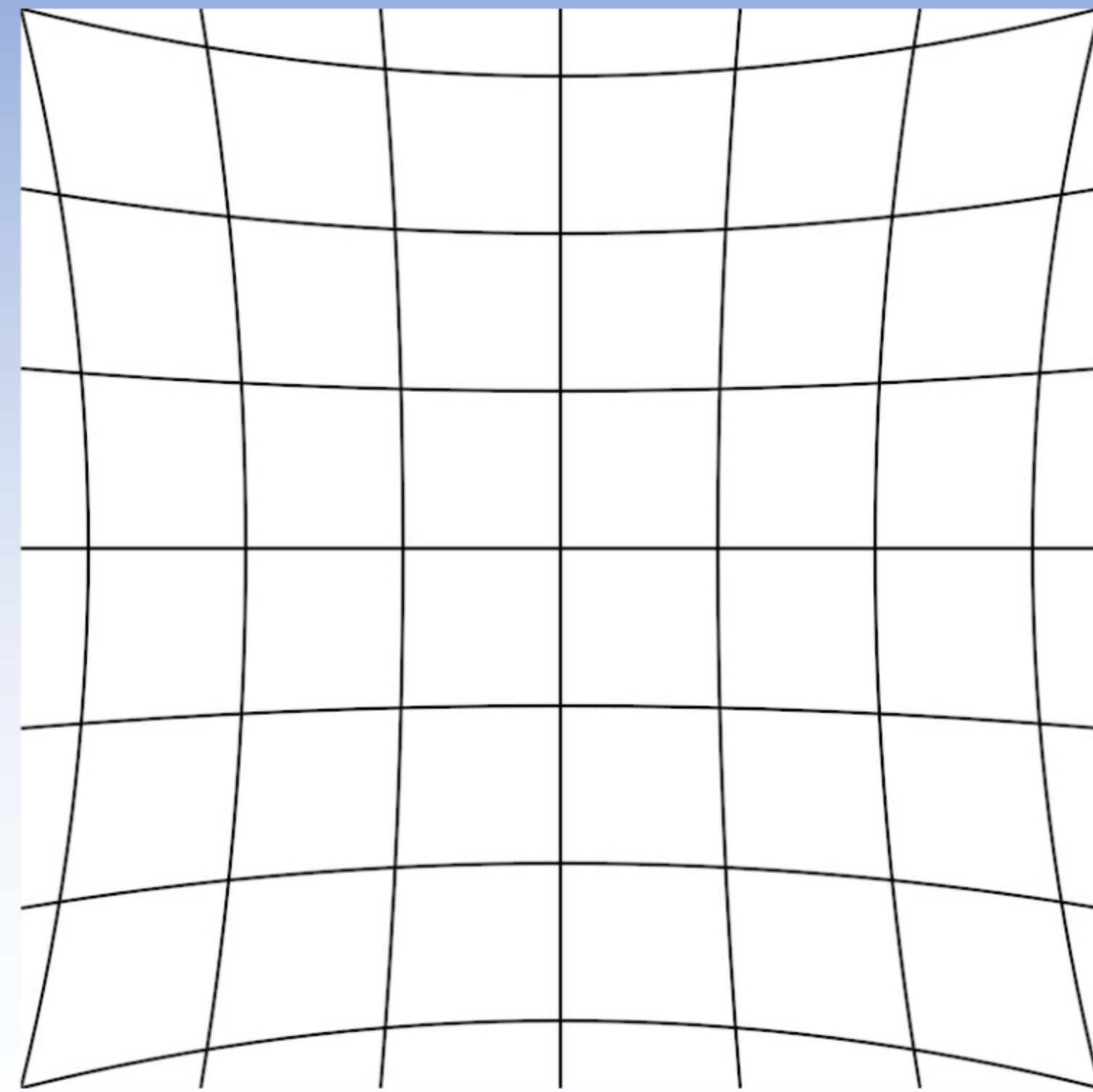


Extreme long-focus lens

Optical Distortion

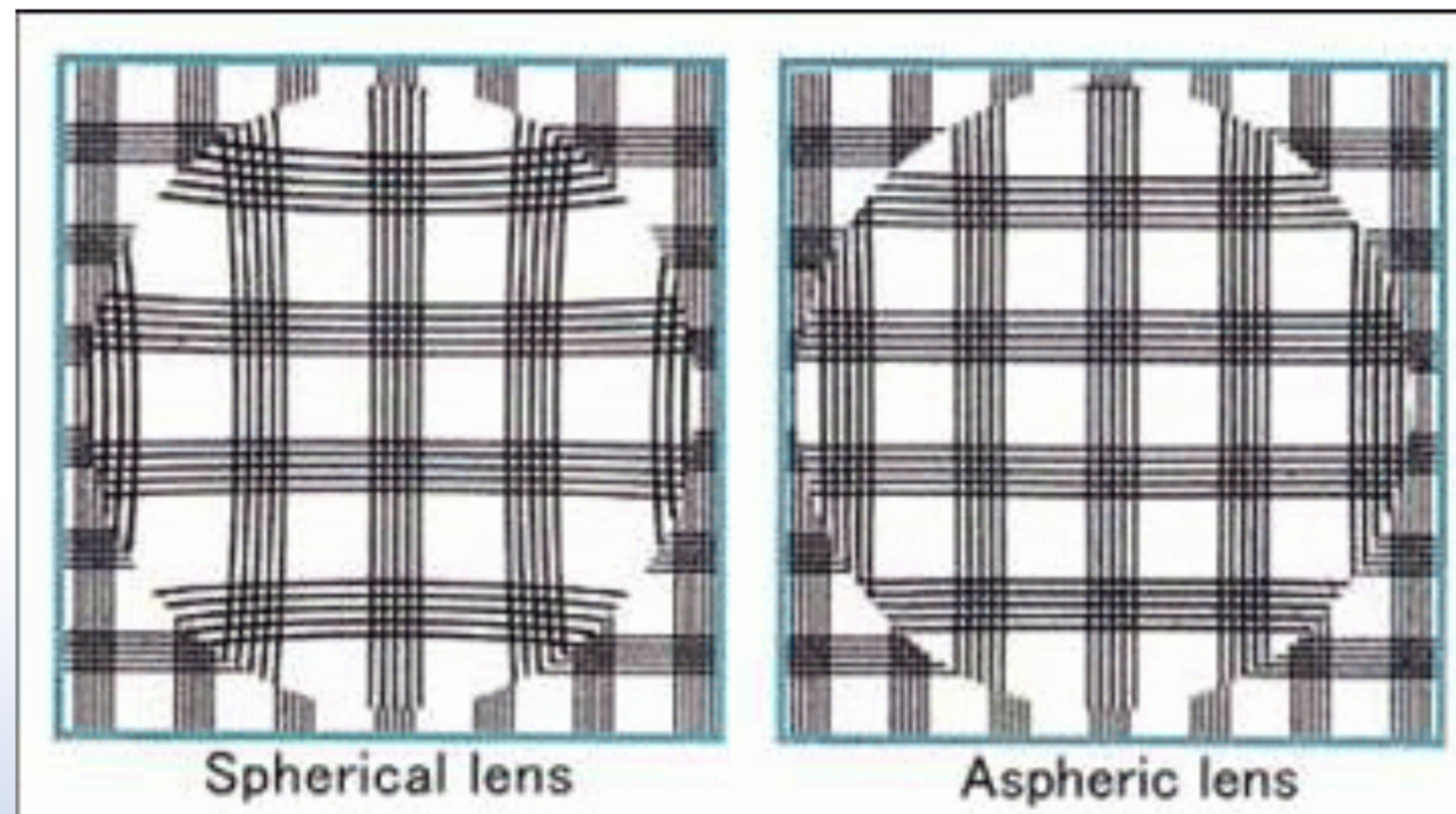


Optical Distortion

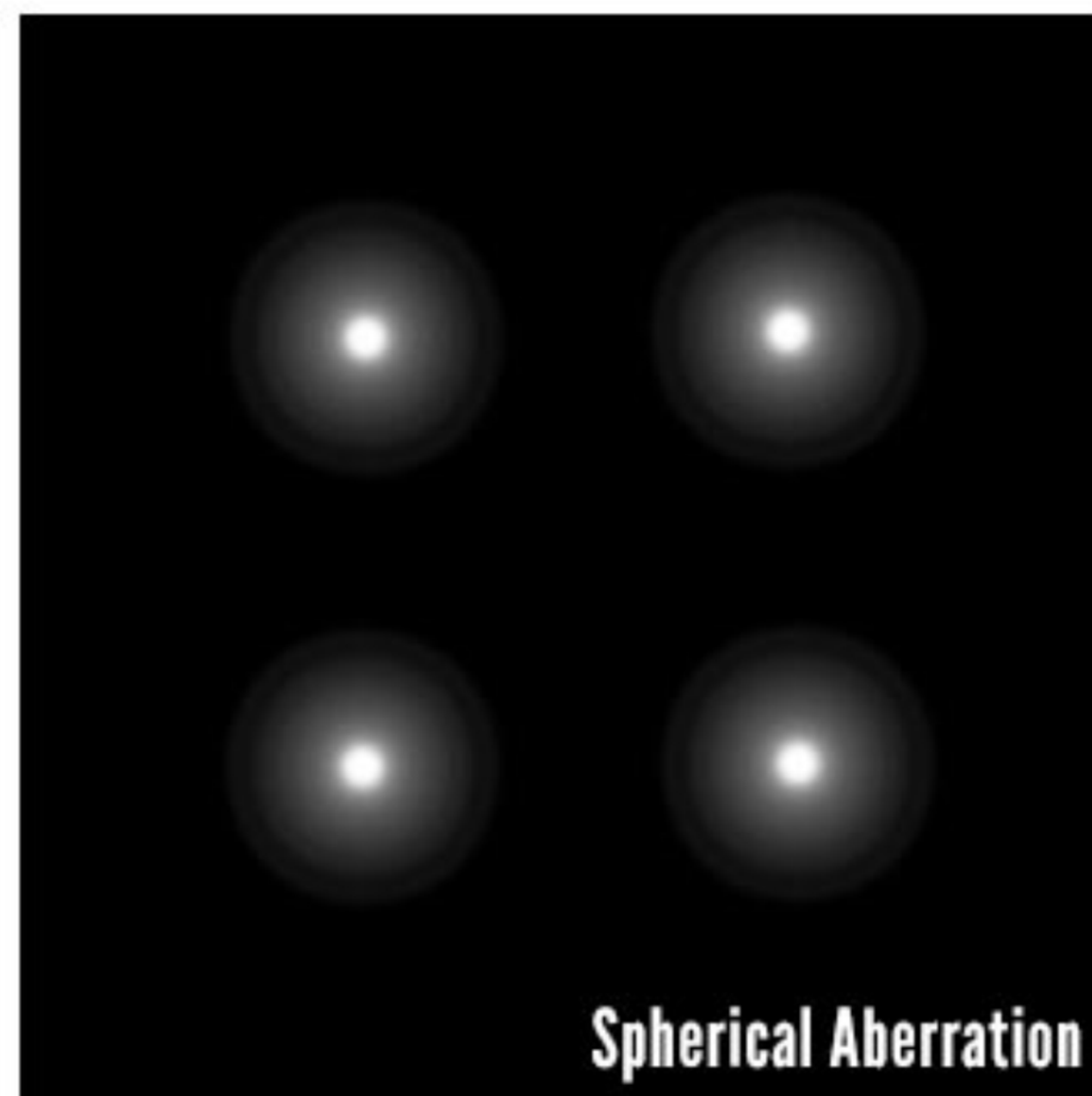
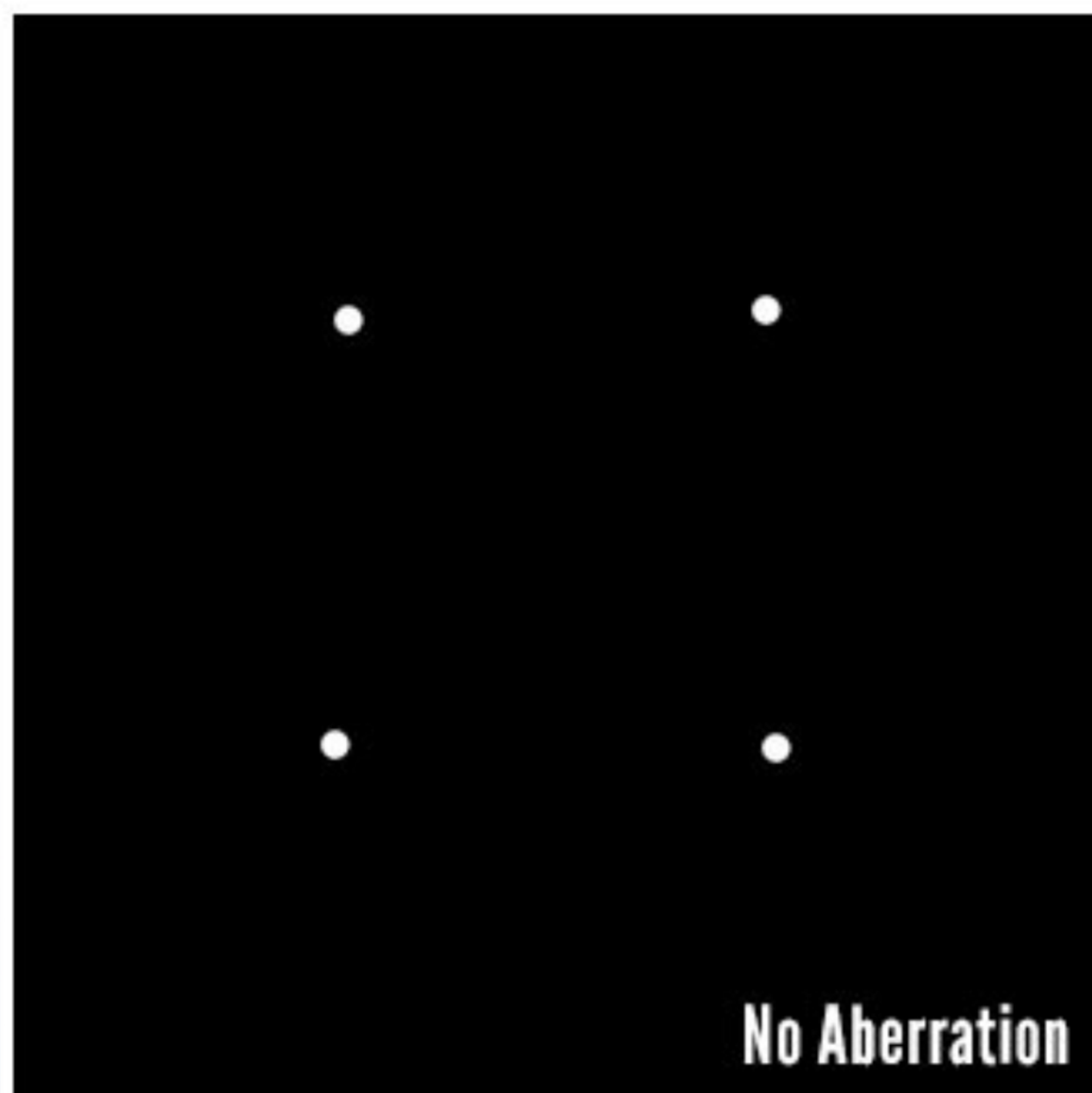
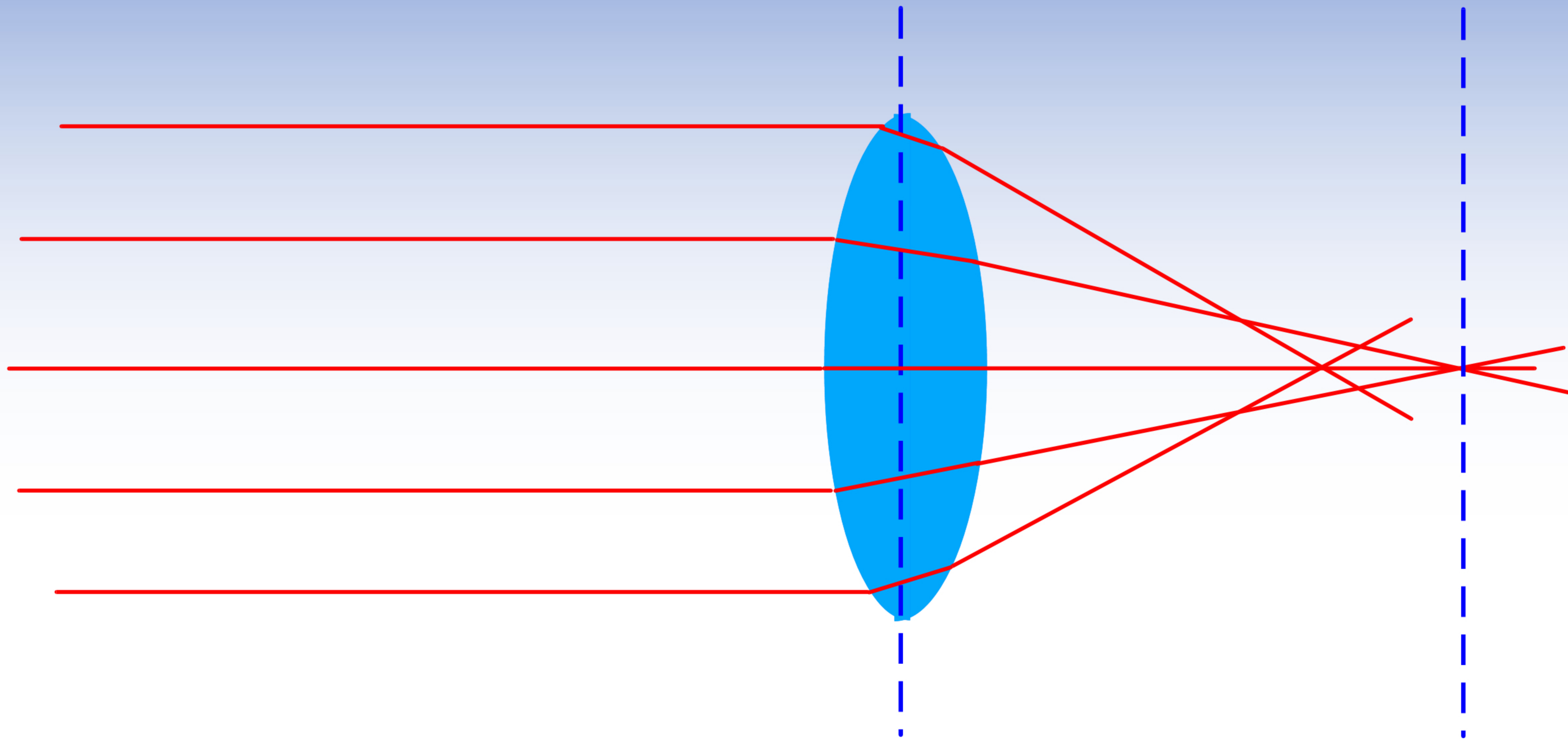


Put the Oculus Rift lens 40 mm away from the paper. Look through the lens and see which grid "appears" to be least distorted. Mark your result!

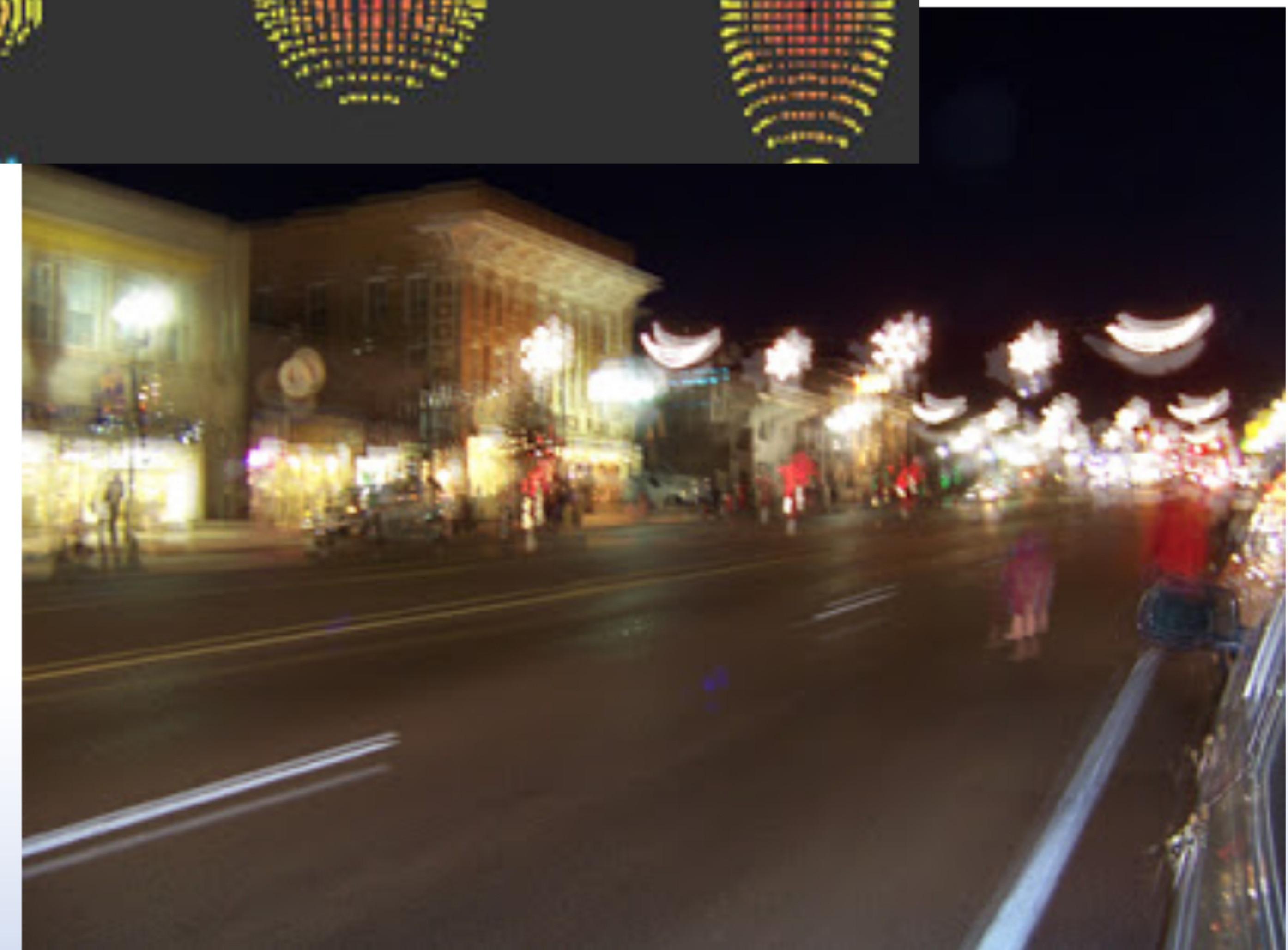
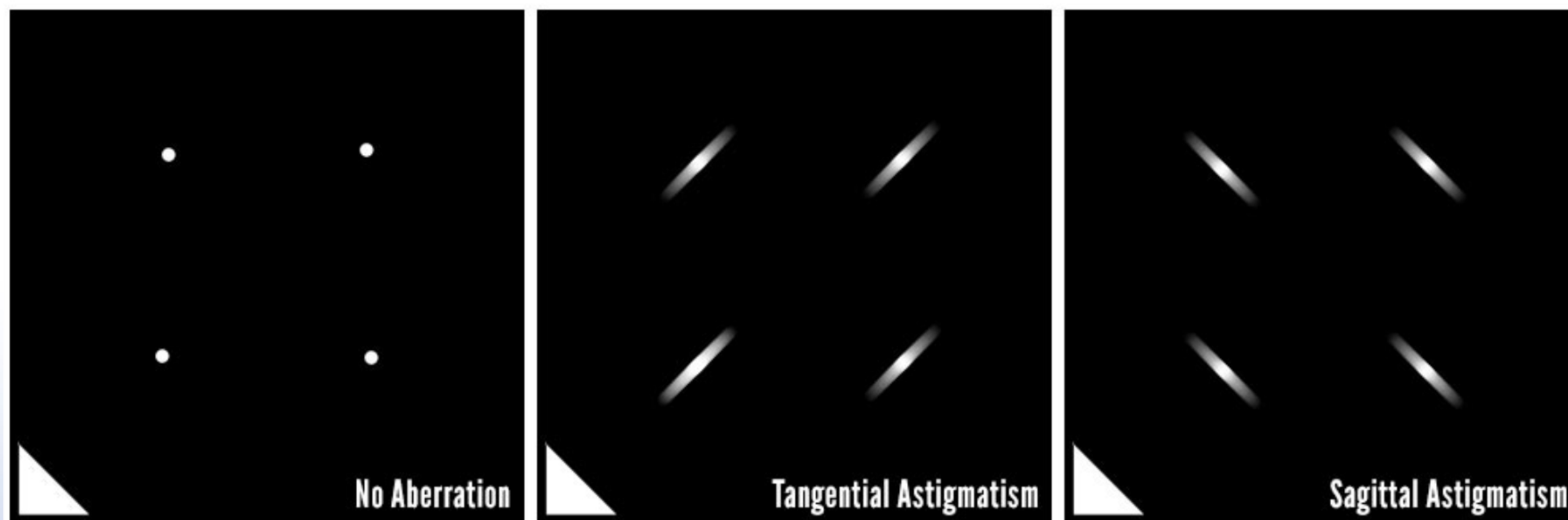
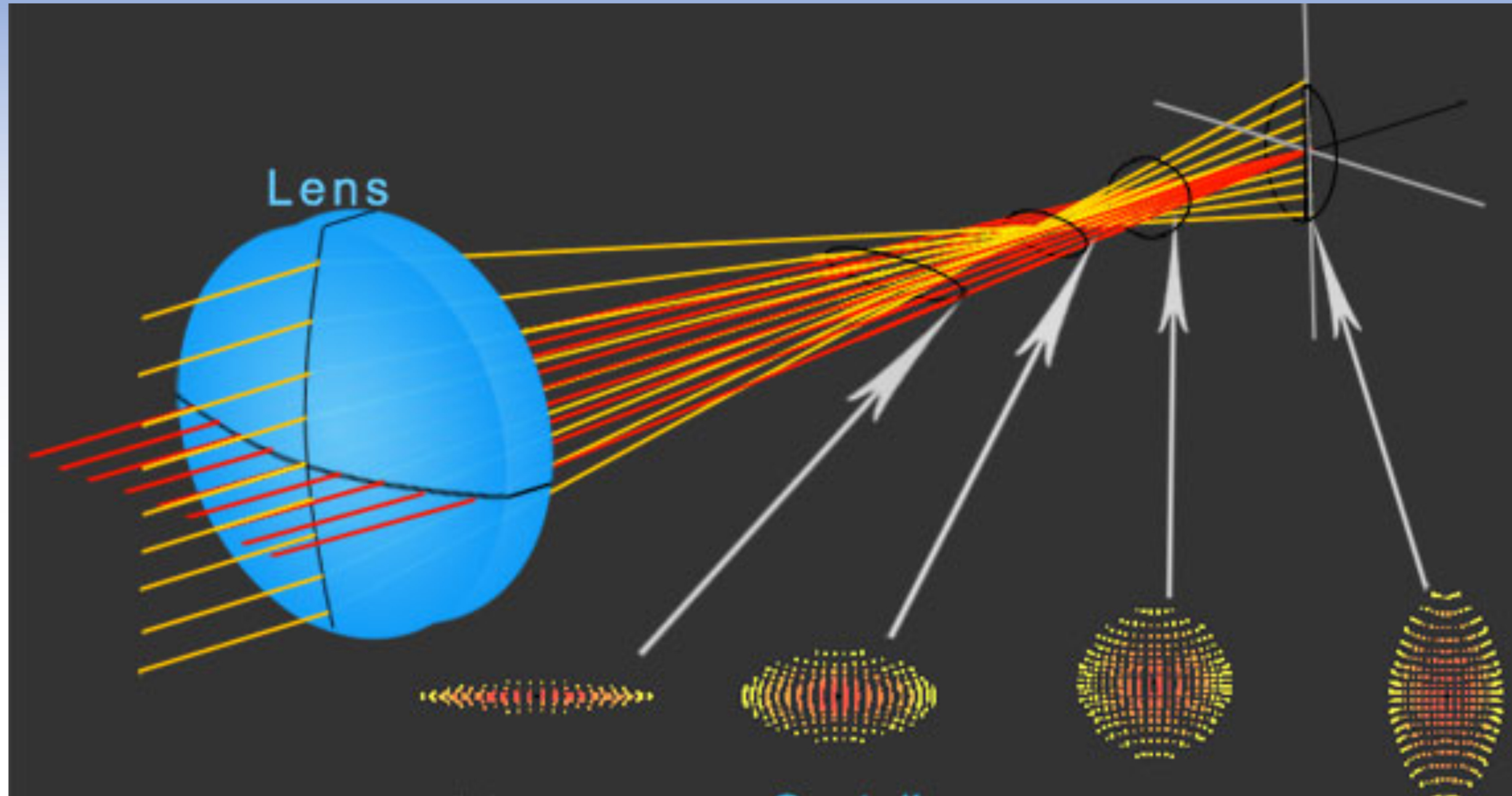
Optical Distortion: Solution



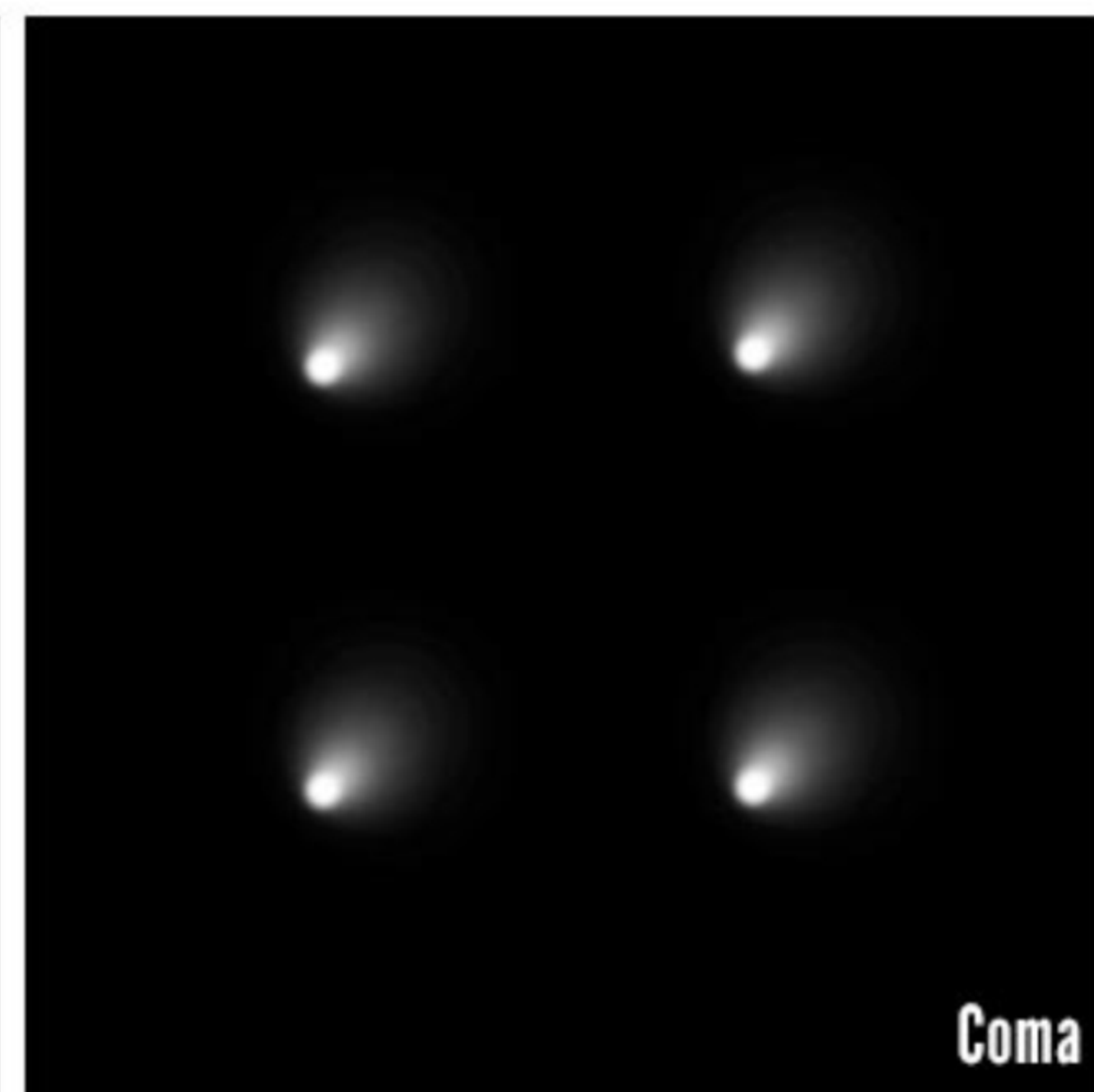
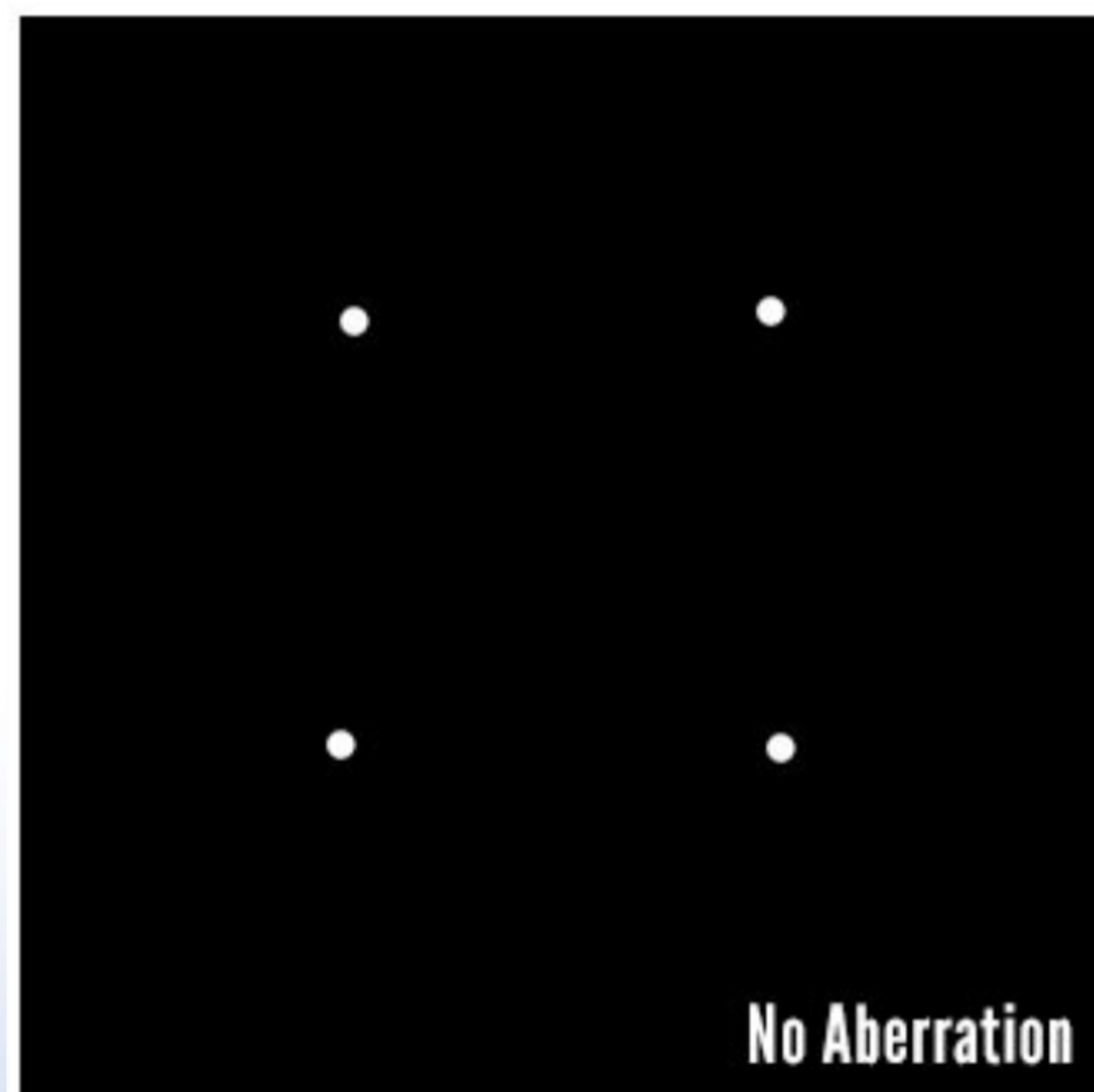
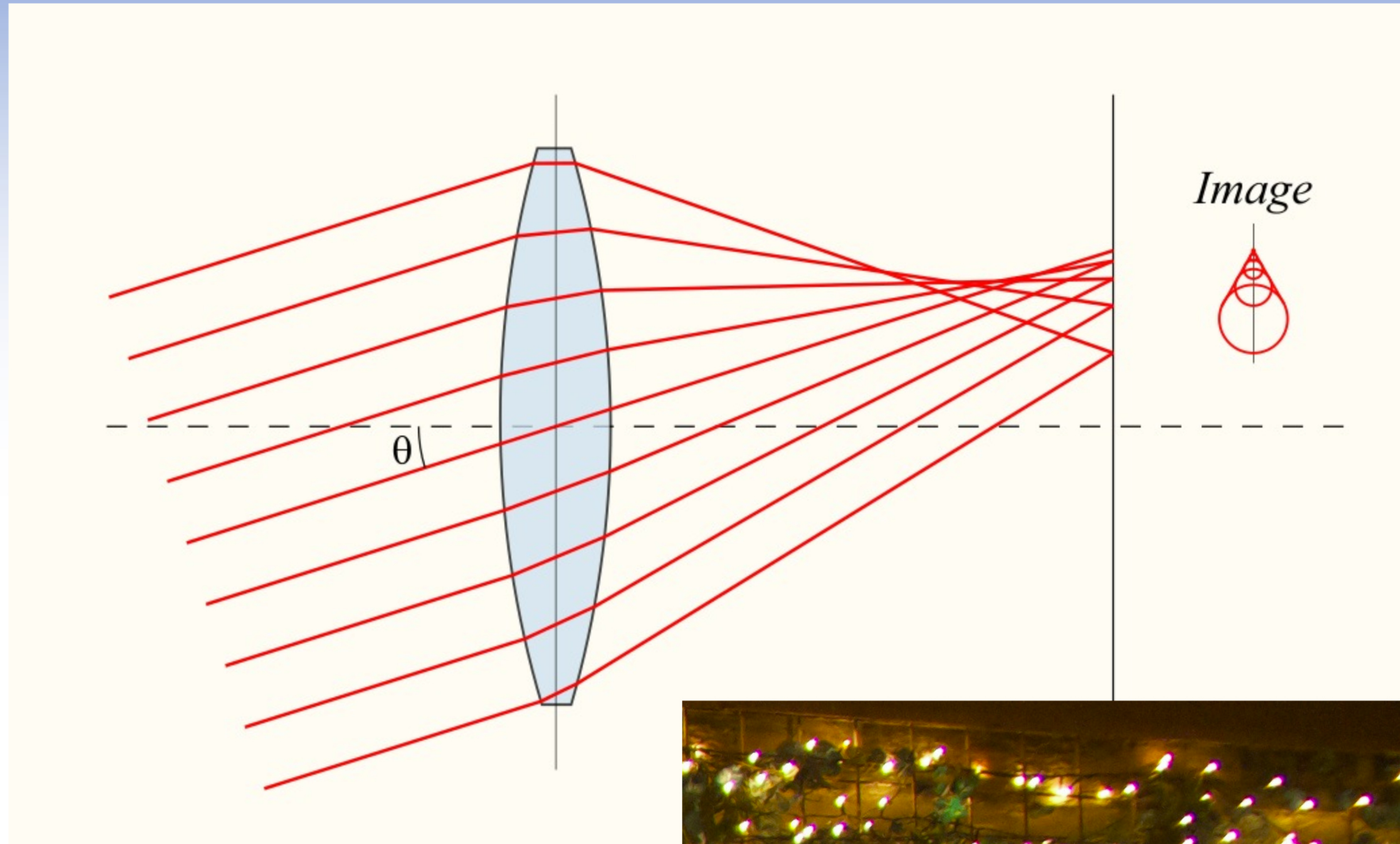
Spherical Aberrations



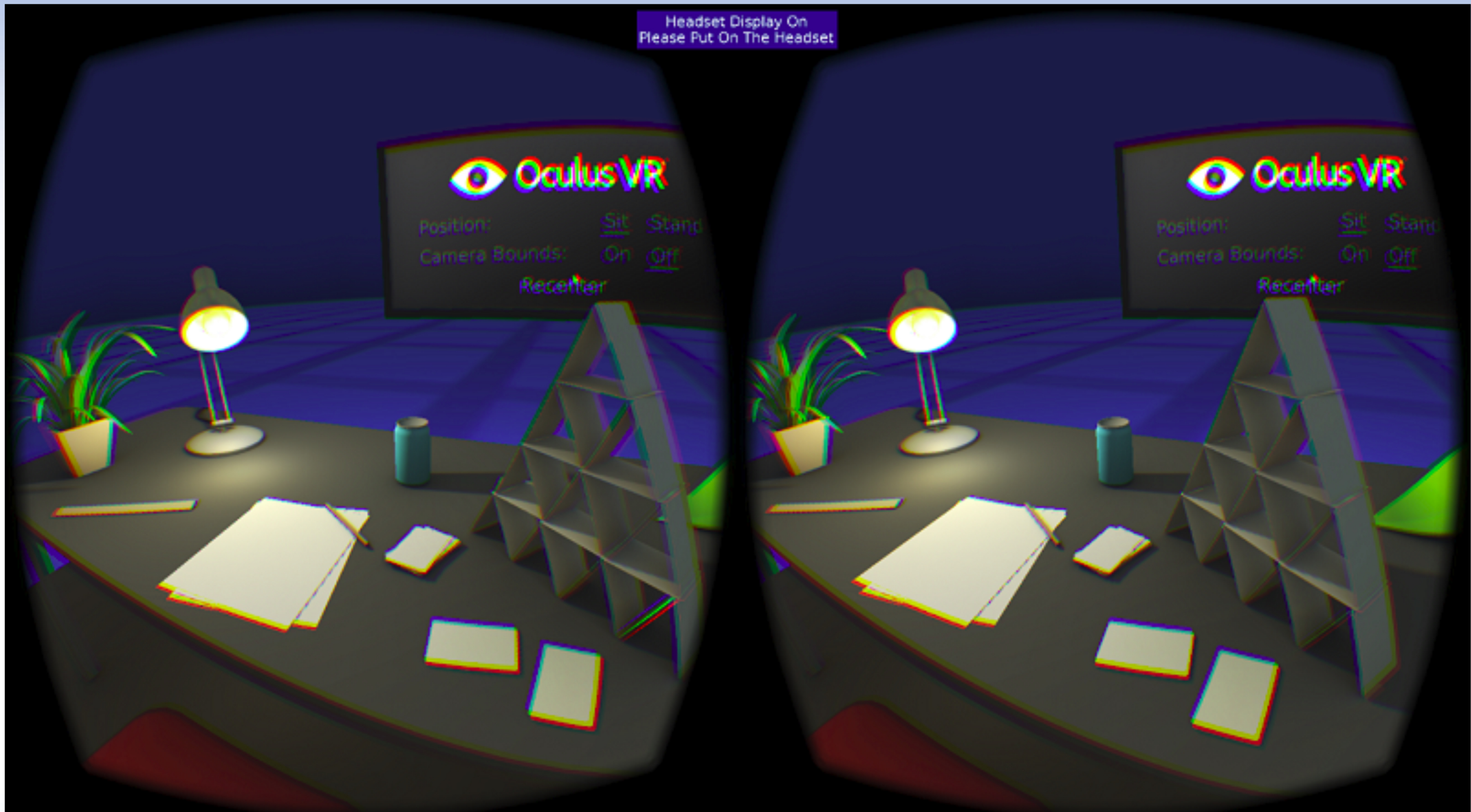
Astigmatism



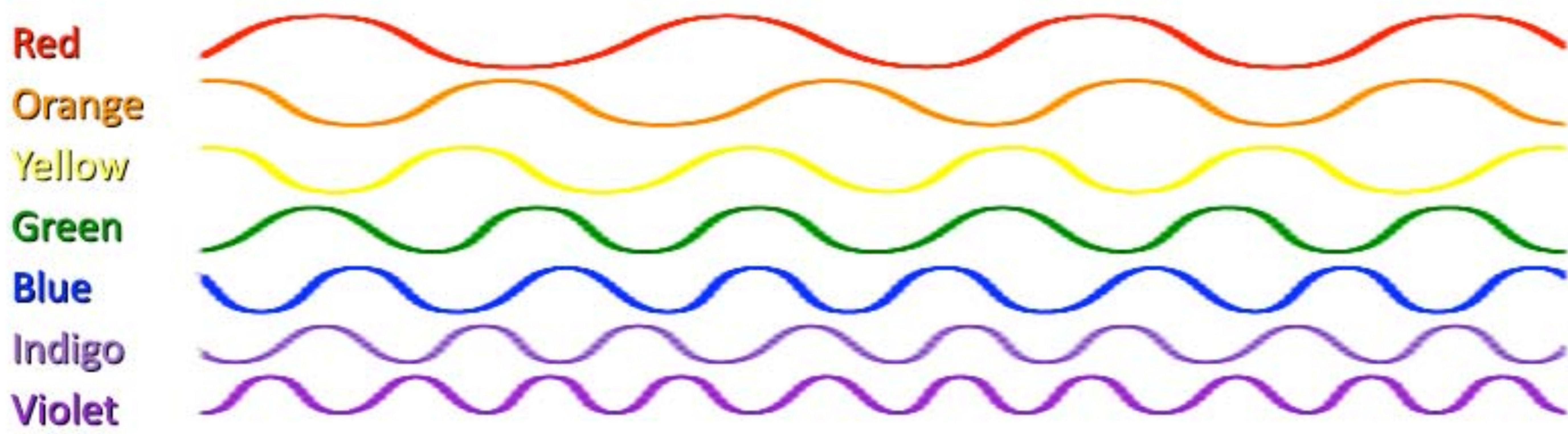
Coma



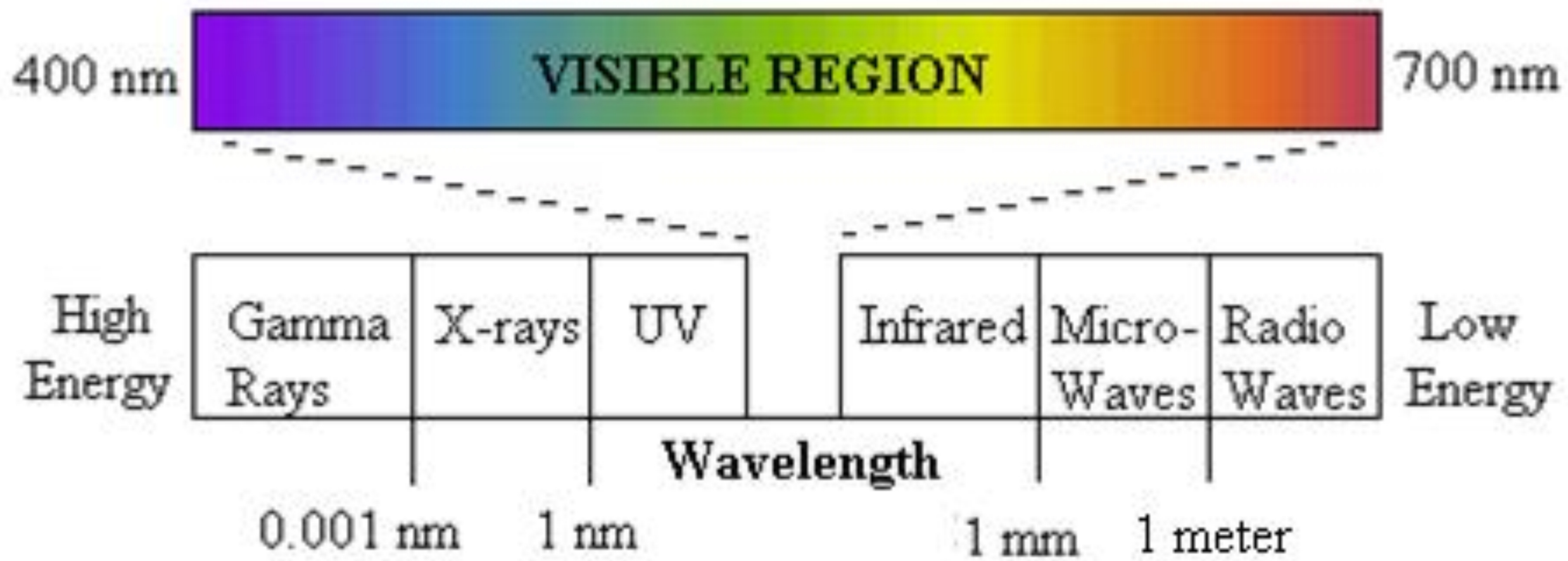
One More Issue



Electromagnetic vs Visible Spectrum

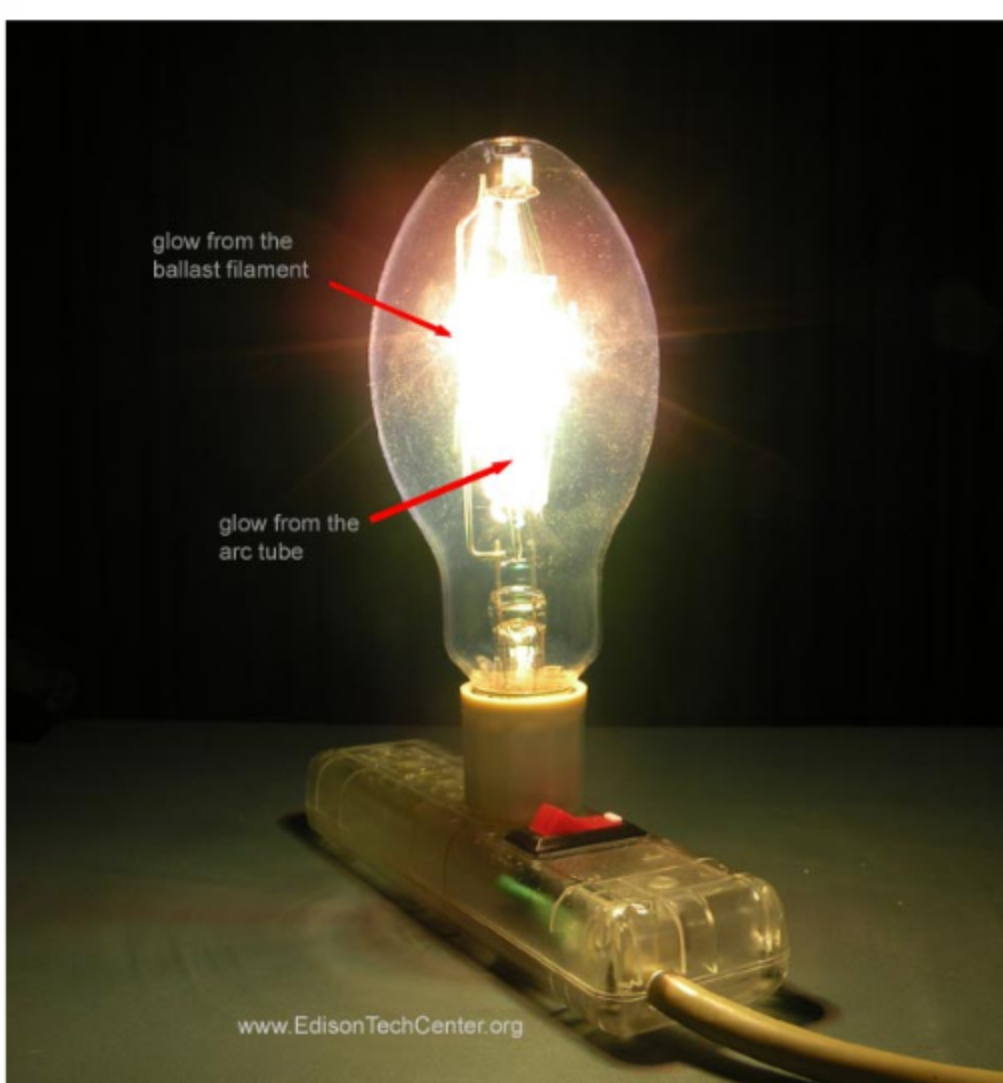
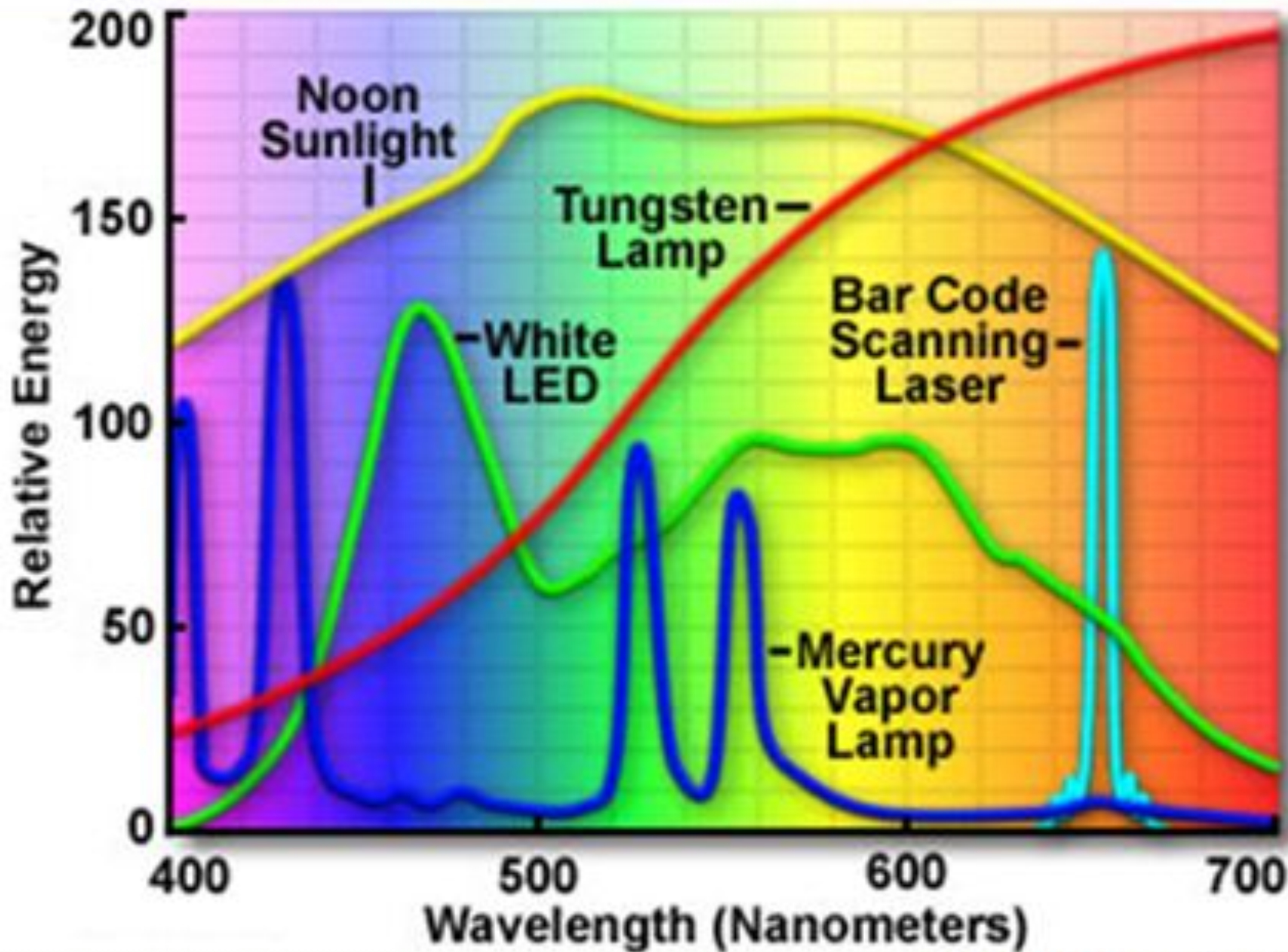


Electromagnetic Spectrum



Spectral Power of a Light Source

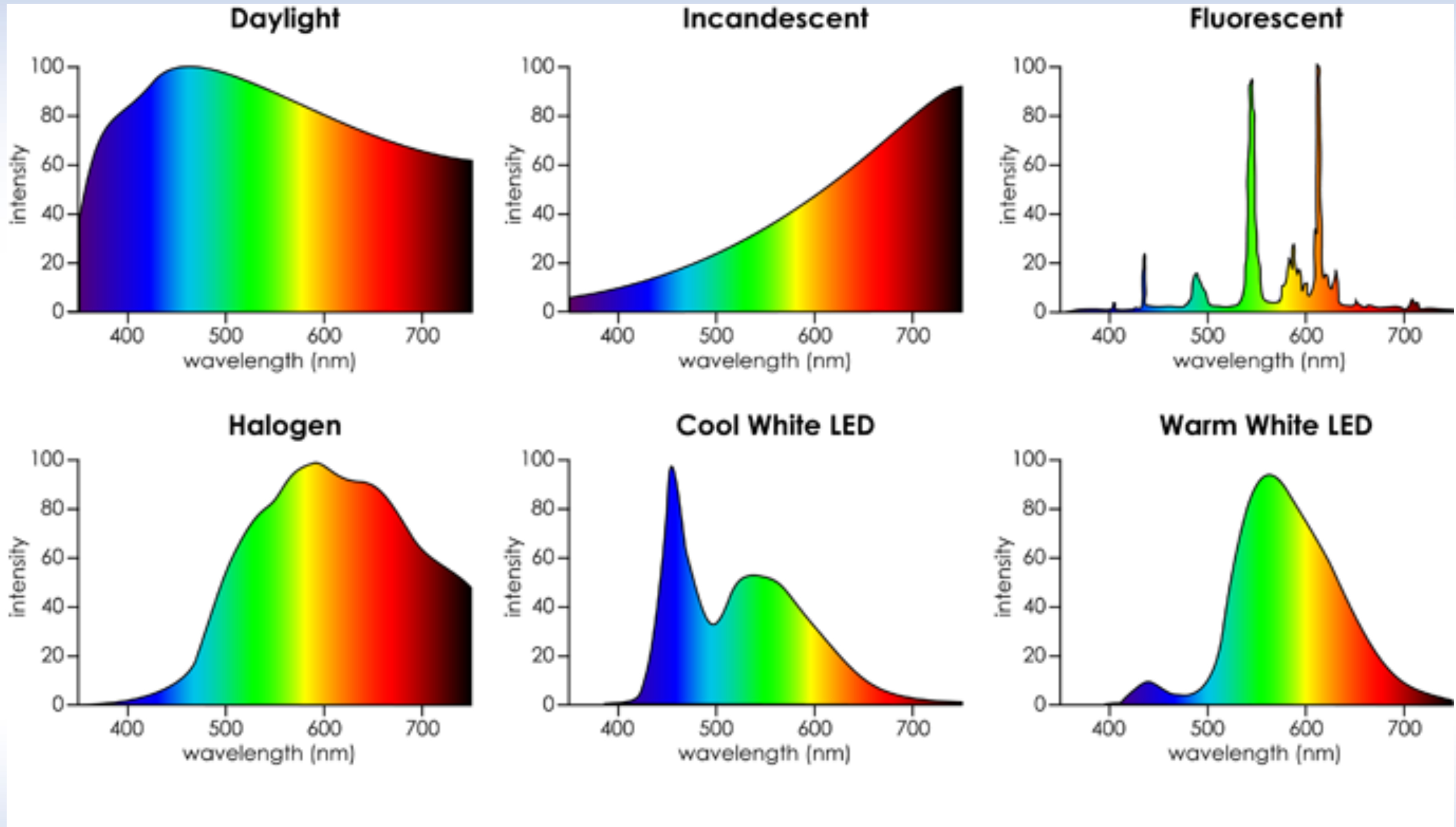
is like a histogram of _____



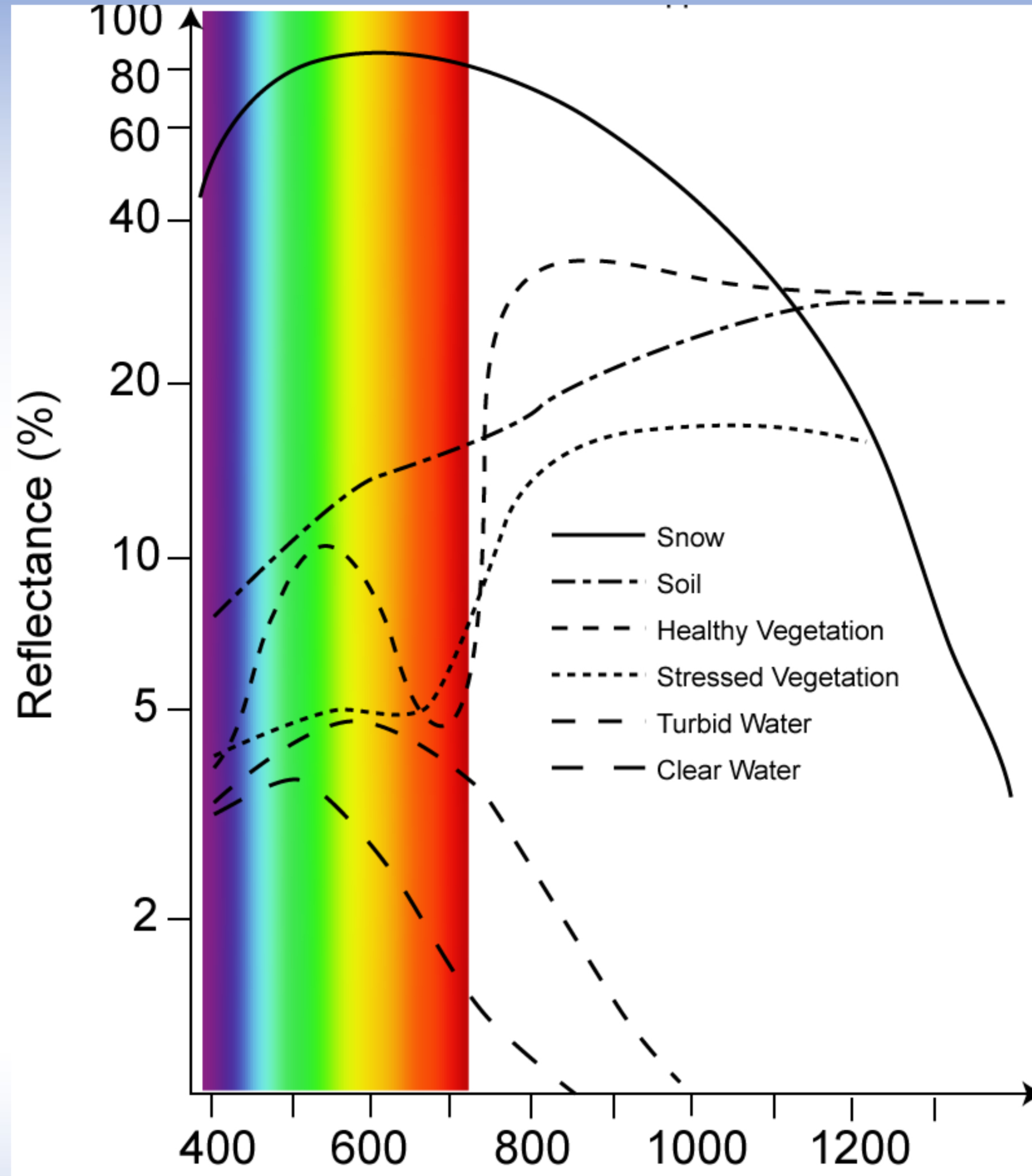
(Source: Olympus America)

Spectral Power of a Light Source

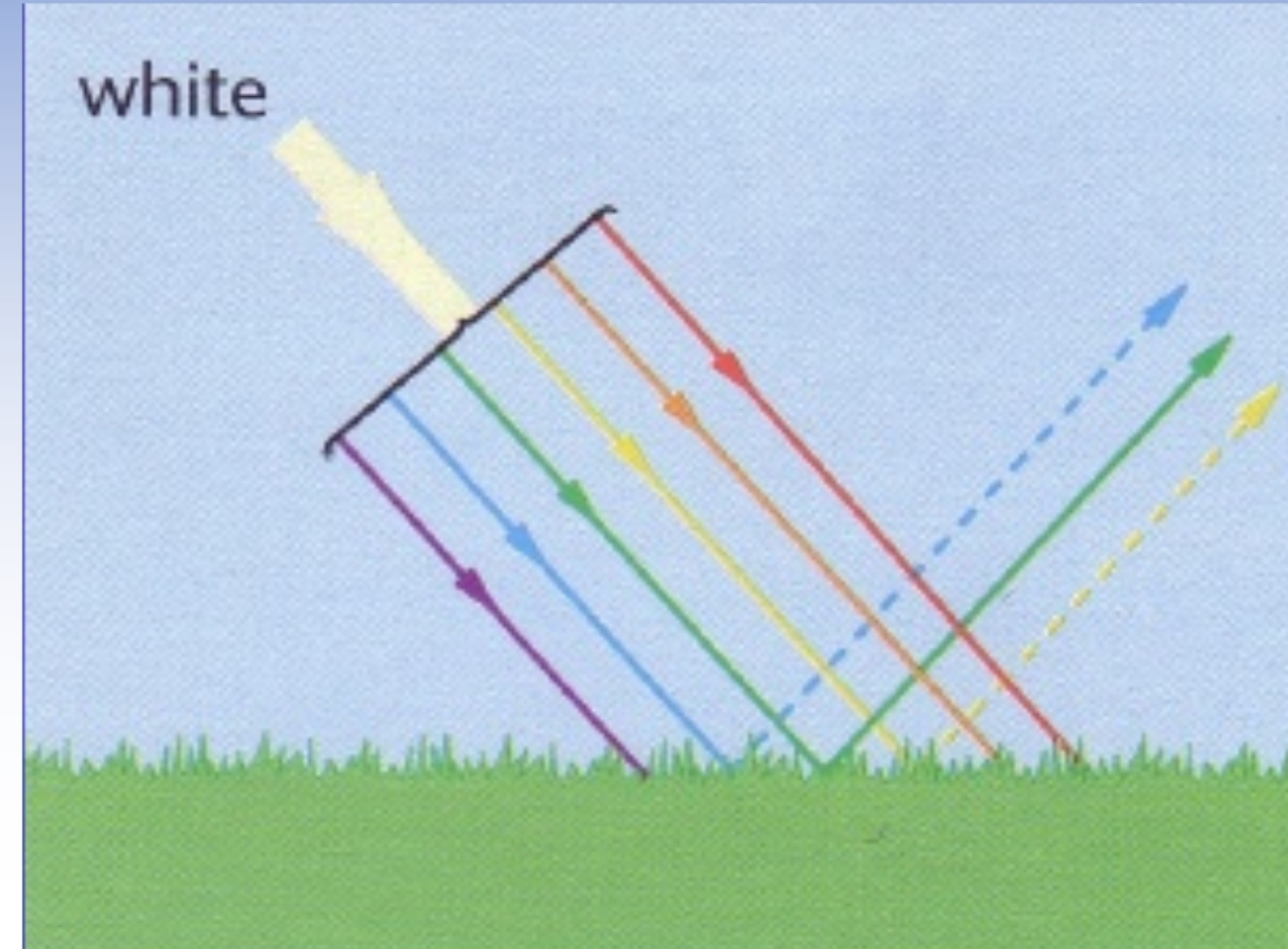
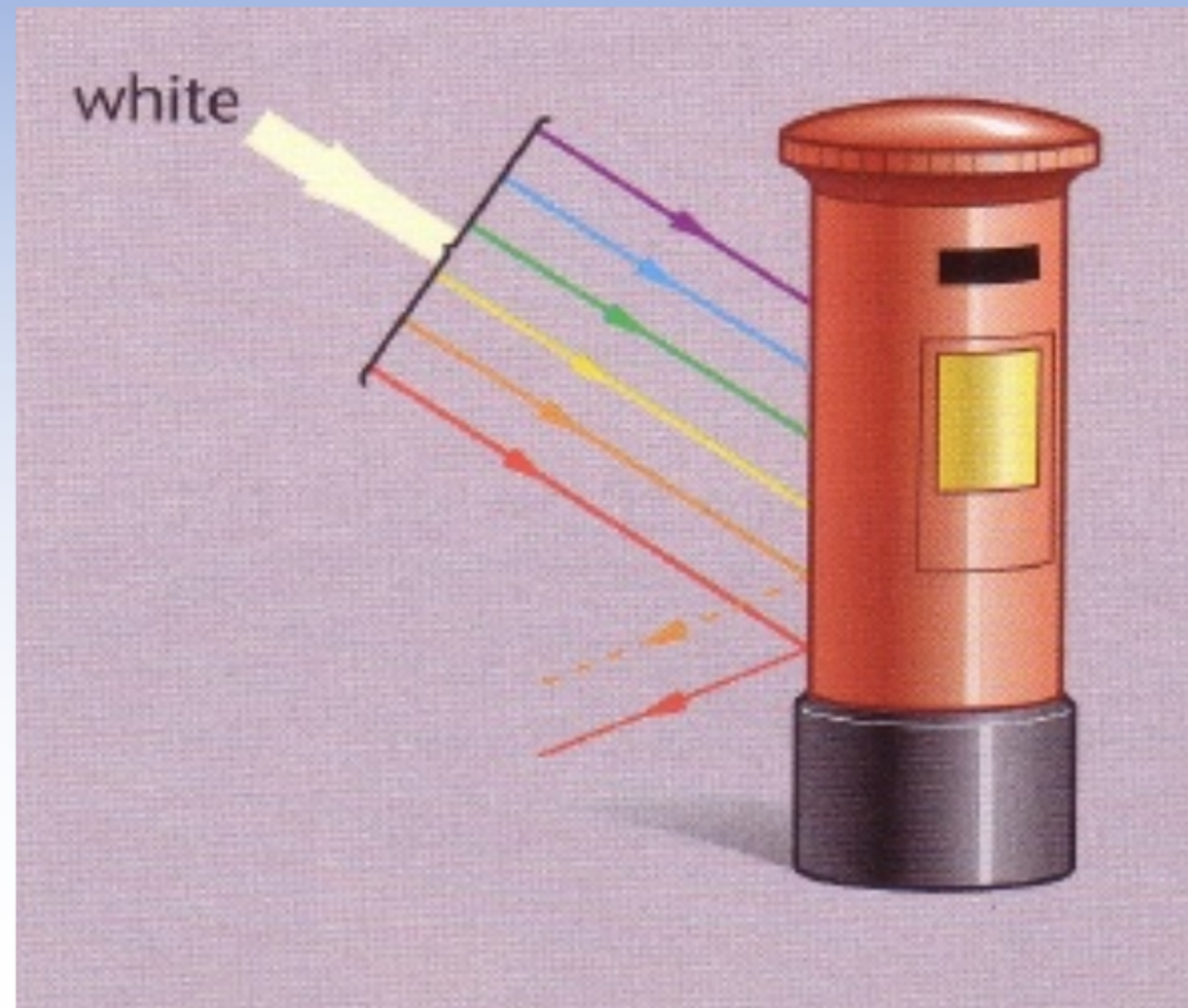
is like a histogram of _____



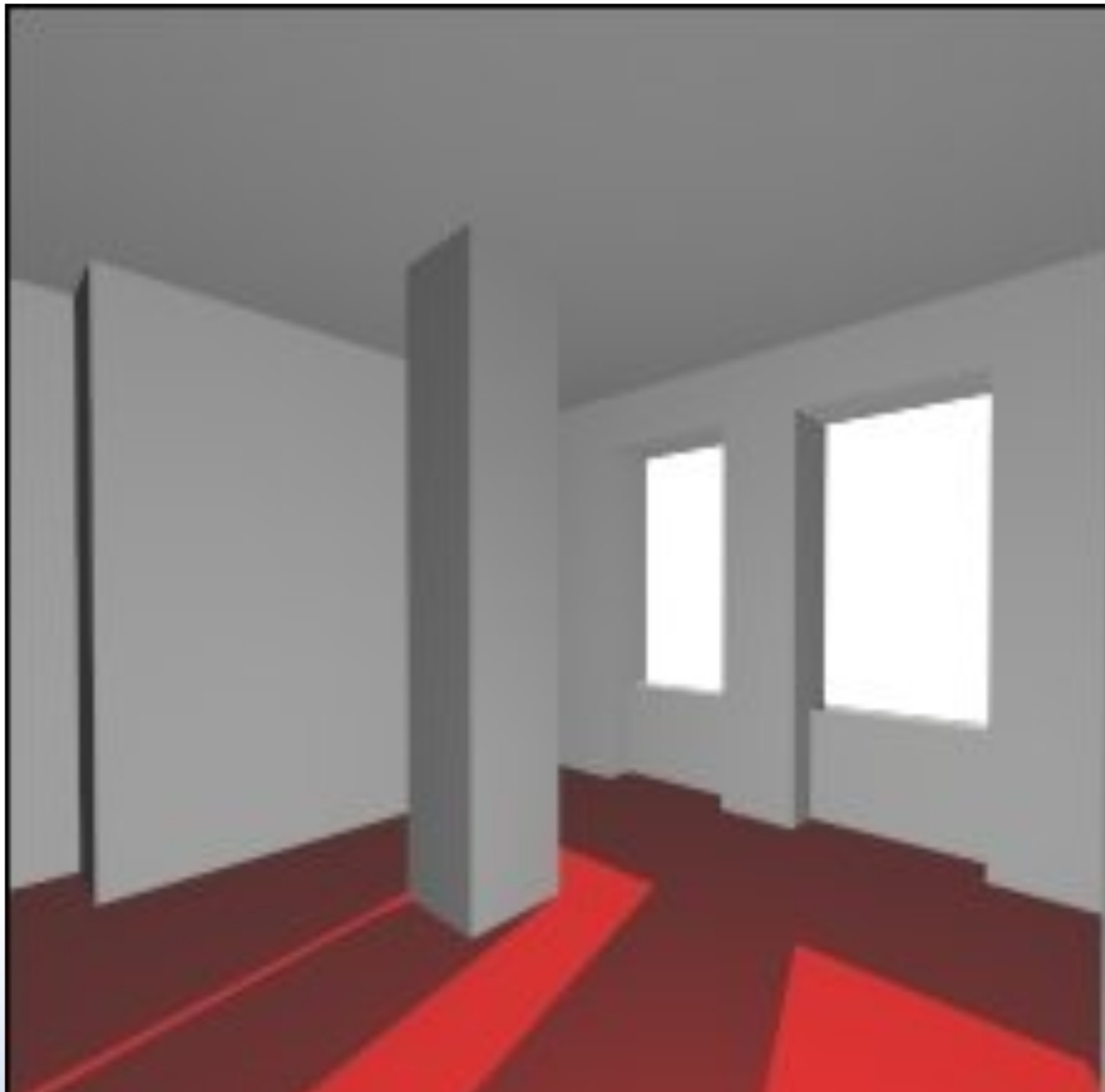
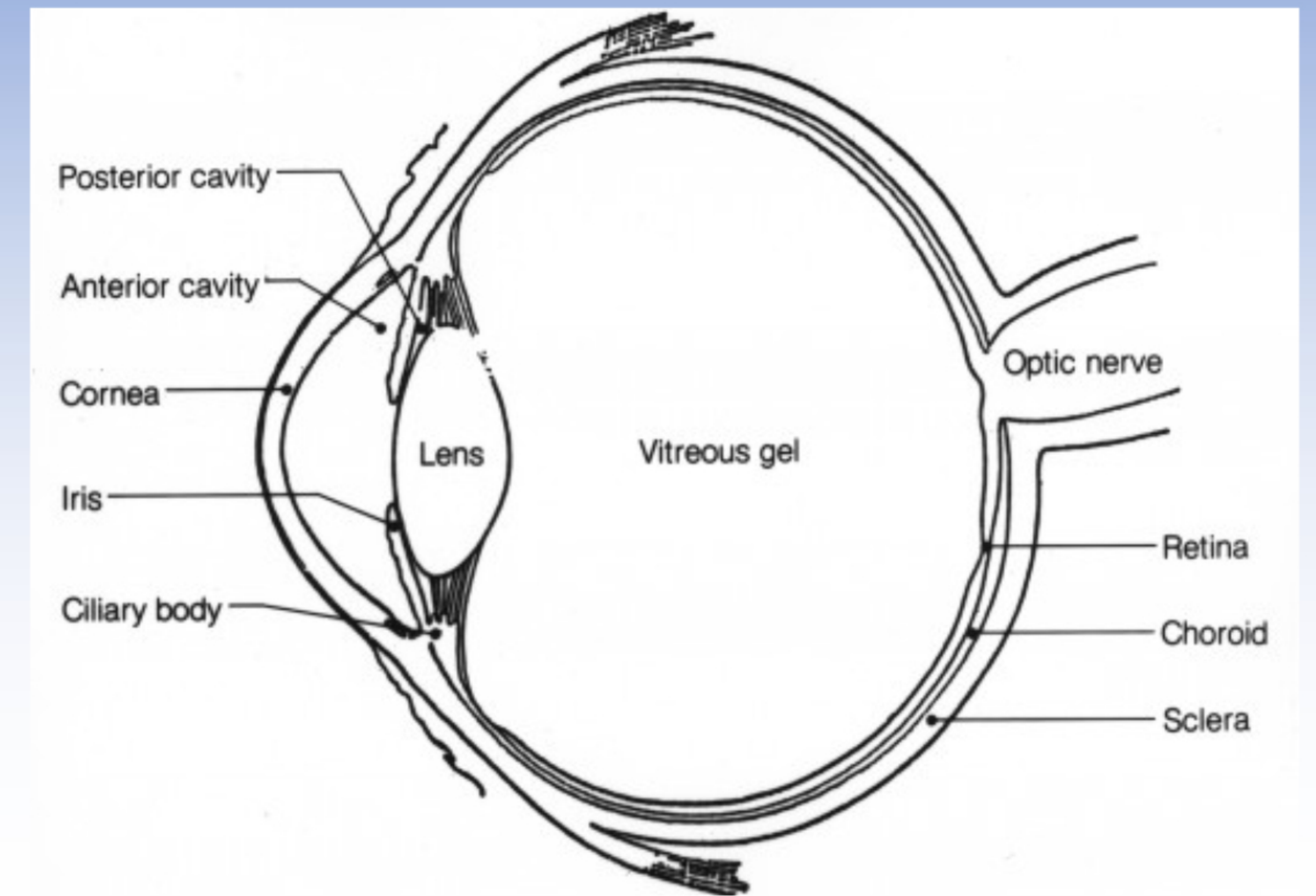
Spectral Reflectance of Material



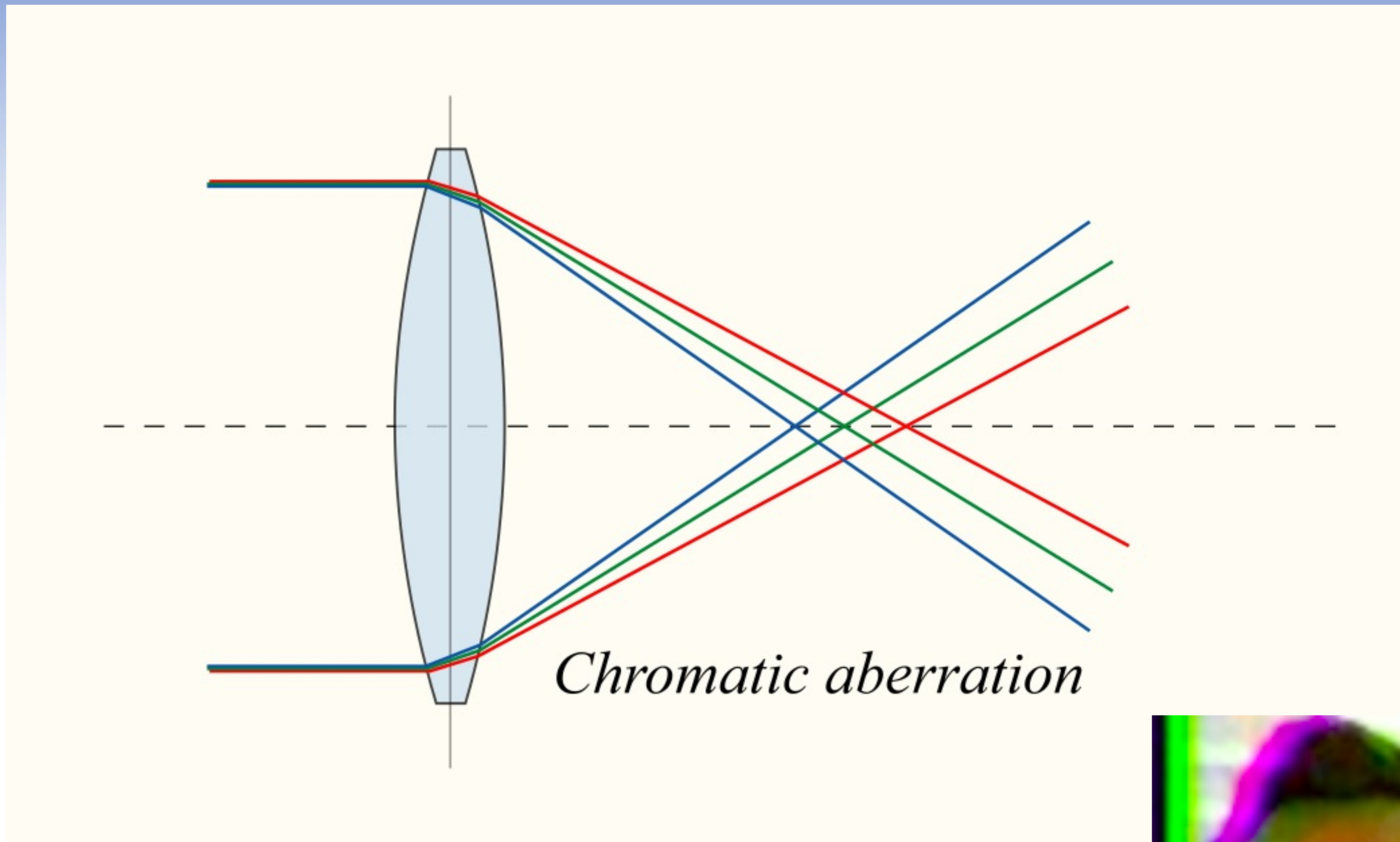
Perceiving Color of an Object



Spectral Power Models



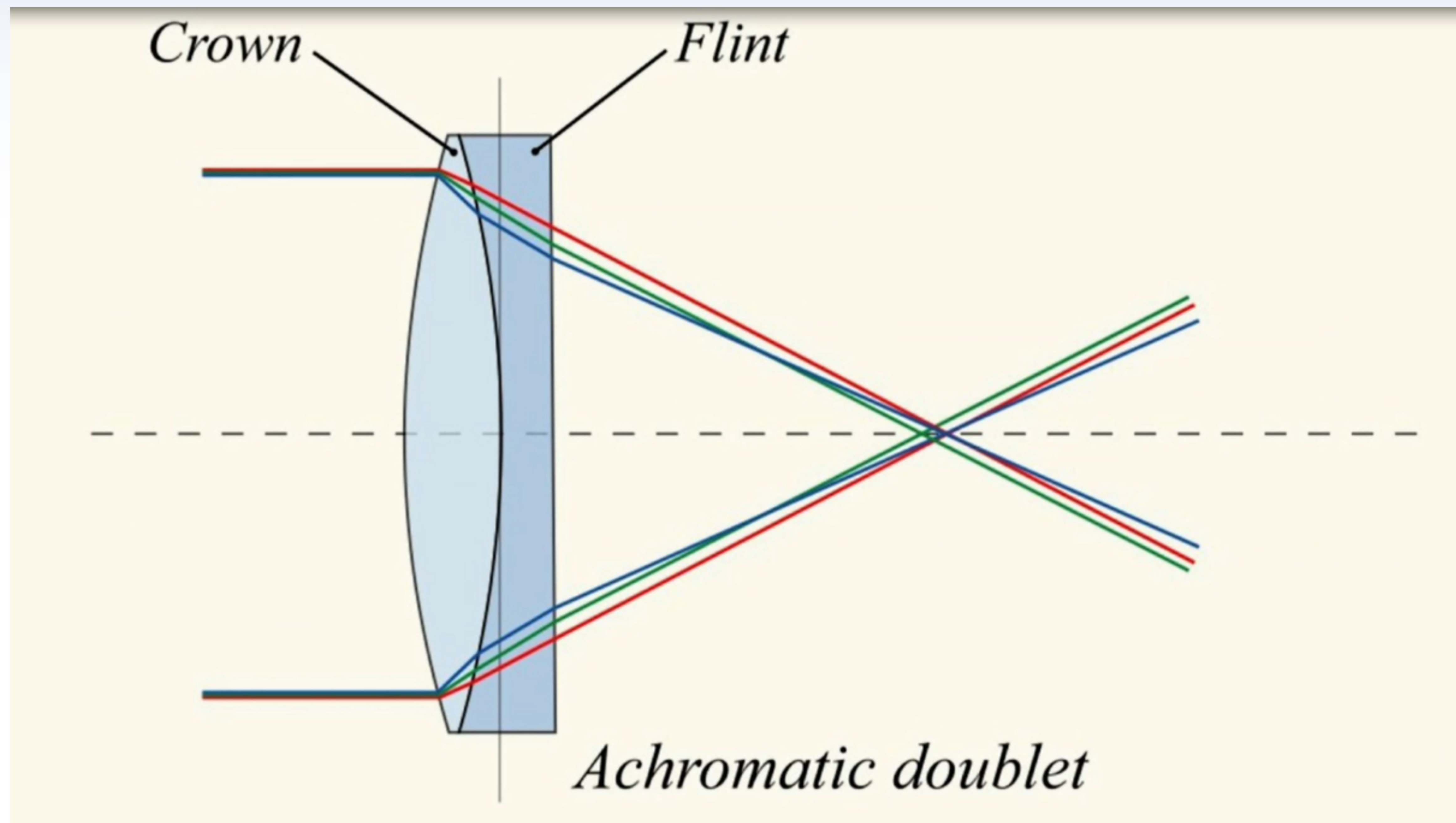
Chromatic Aberration



Chromatic Aberration Correction

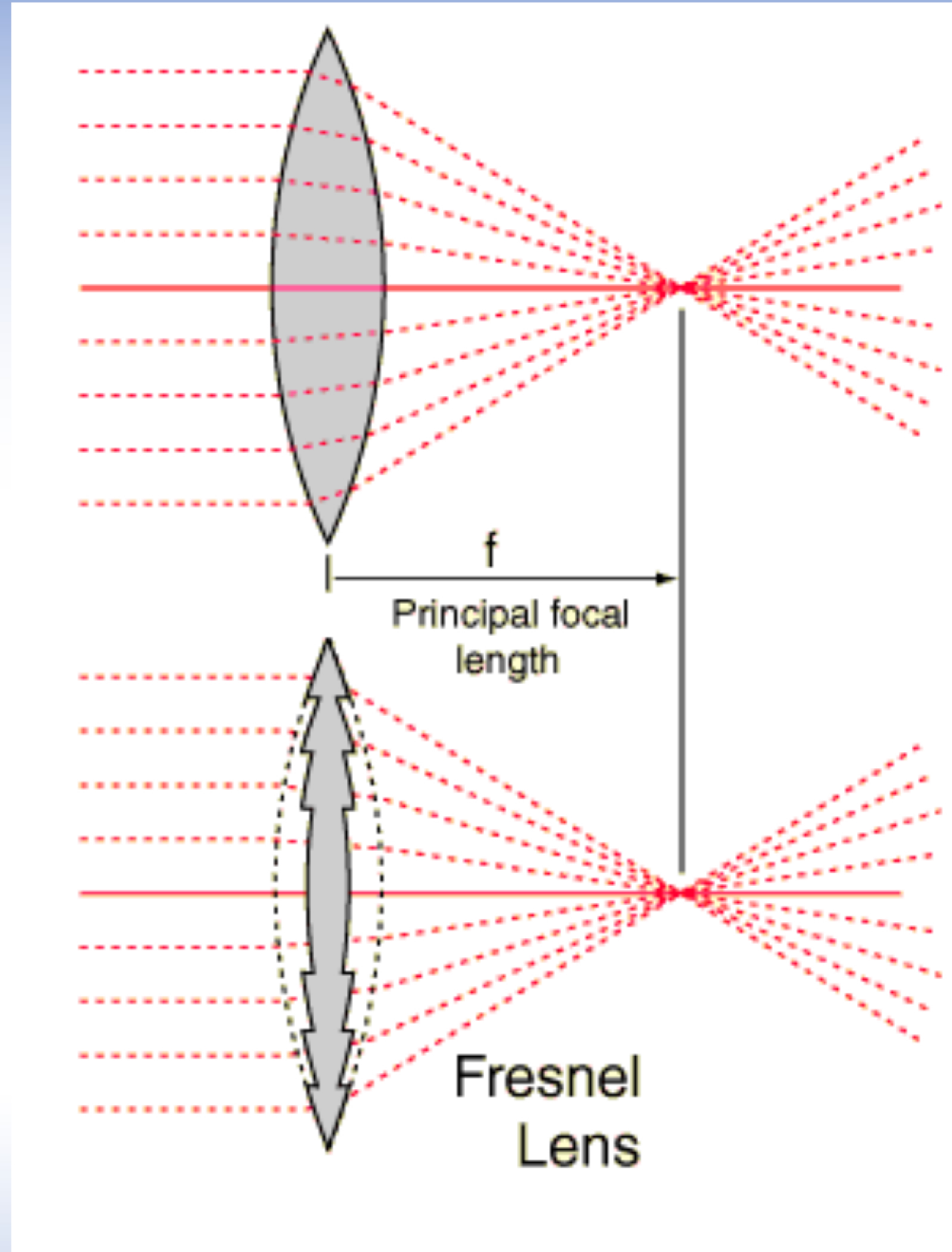
- Find and use material with a high Abbe number

-

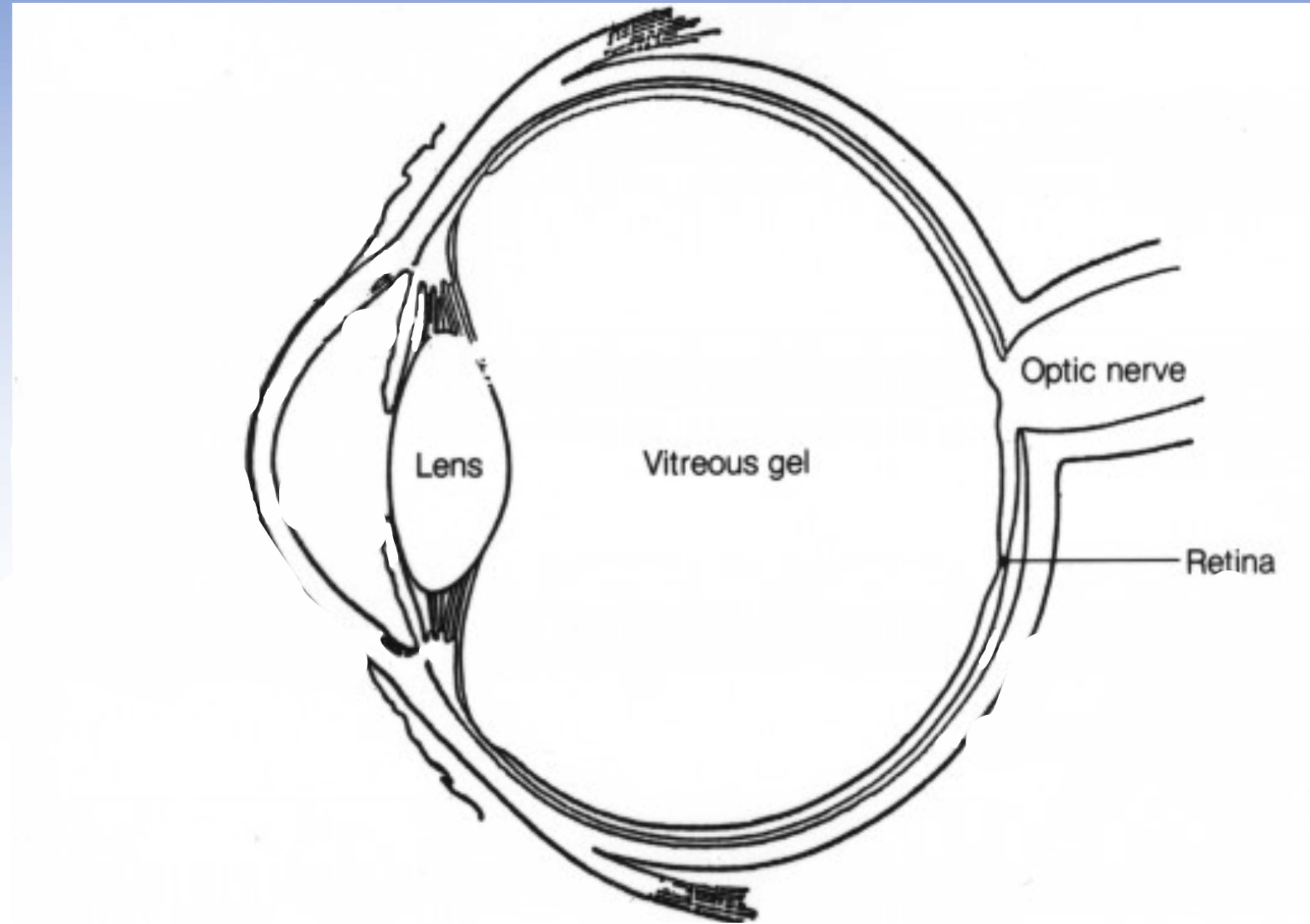


- <https://www.youtube.com/watch?t=6&v=-bcRYQKY4jc>

Reducing Weight and Cost: Fresnel Lens



Aberrations in Human Eye



2001: The detailed optical structure of the lens is still unknown, although we know that the surfaces are aspheric and the refractive index has a gradient form. Both of these have possibly a strong influence on the aberrations of the lens and hence eye as a whole. A knowledge of the ocular aberrations arising at the lens is important in understanding the effect of corneal aberrations on visual performance.

2009: Cornea, lens and eye models are analyzed and compared to experimental findings to assess properties and eventually unveil optical design principles involved in the structure and function of the optical system of the eye. Models and data often show good match but also some paradoxes.