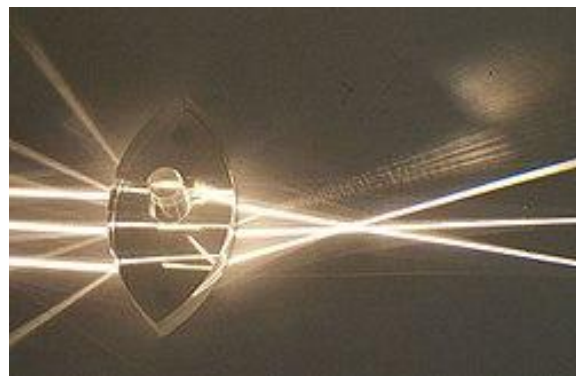
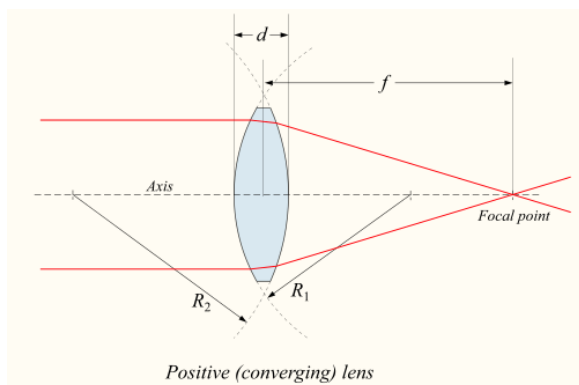


## Mysteries of Photography #18: Lenses

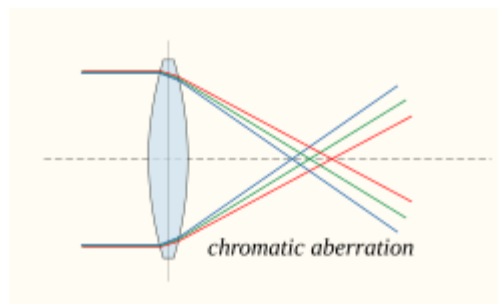
In the previous Mysteries, we discussed how light slows down when it enters a denser transparent medium such as glass or Perspex and why light hitting the interface at an angle causes light to bend at an angle. This is the method used to focus light selectively (i.e. with a lens). This probably found its original use as a way to start a fire using the sun.

This goes back quite a way. The ancient Greek playwright Aristophanes mentions a burning-glass in his play *The Clouds* (424 BCE). Also the use of curved transparent objects to correct sight is also nothing new. The Roman emperor Nero used an emerald to enable him to see the blood and gore at gladiatorial games. However it wasn't until the 13<sup>th</sup> century that an industry devoted to grinding and polishing lenses for spectacles arose in Venice and Florence and later in the Netherlands. Microscopes and telescopes came later in the 16<sup>th</sup> and 17<sup>th</sup> centuries. This started with the simple convex lens just like we see today in simple magnifying glasses.

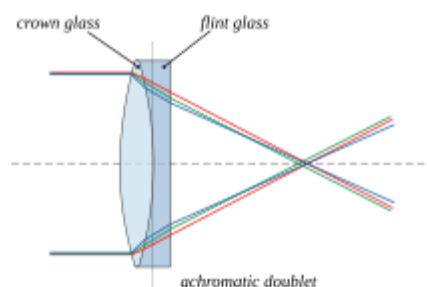


(images from Wikipedia)

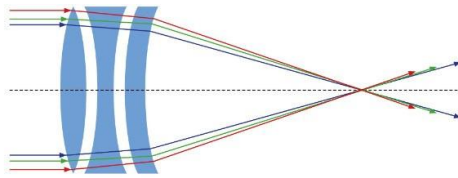
Lens makers soon found that they had a problem with colours separating as they passed through the lens. This is due to different wavelengths of light bending at slightly different angles as they pass through the glass-air interface.



I was surprised to learn that a solution to this was found as early as the 18<sup>th</sup> century with the development of compound achromatic lenses composed of two different types of glass.



This was improved further with the apochromatic lens design that added another element.



apochromat

The modern camera lens is even more complex. Not only are they focussing all the visible light wavelengths at the same point but doing so while projecting to a flat field (i.e. the camera sensor) but, in many cases, also providing internal focussing.



So when you price that next lens, don't wonder why it is so expensive but marvel that it is so cheap for what you are getting!

David Woodcock