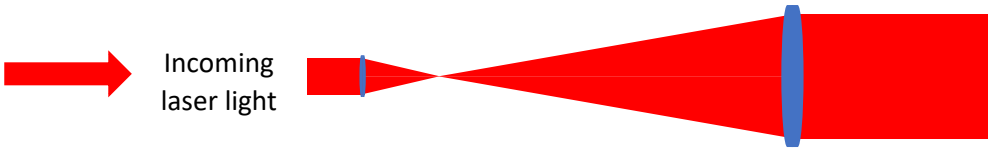
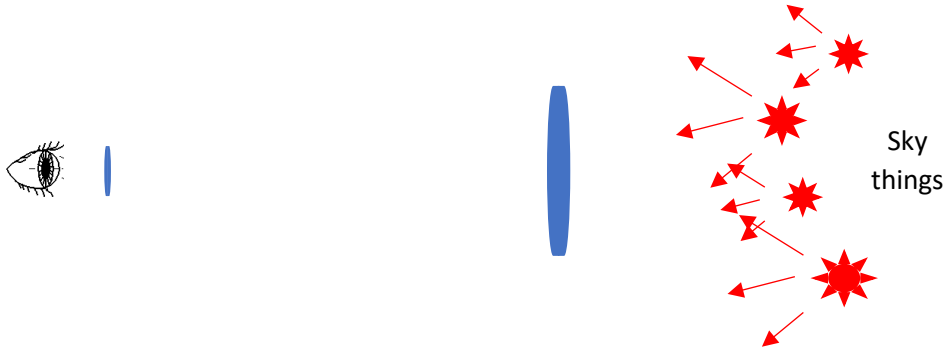
Magnification – how to understand it (hopefully). A commentary on the optics lab experience

The optics lab experiment took a narrow laser beam, put it through a diverging lens to spread it out, and then a converging lens to create a broader column of light. The same thing can be accomplished with two converging lenses as shown here:



This is a telescope in reverse (and so is the diverging-converging arrangement). For telescopes, the light source (the sky) enters through the large converging lens, and the small eyepiece lens collimates the light into a smaller beam. This causes the original image of the sky to be ***magnified***. At first thought, this seems incorrect – how does reducing a large column of light to a small column of light result in magnification? The confusion is the result of the fact that while the optical arrangement above is correct, the incoming light from the sky is **not collimated**; it enters from various points and enters the large objective lens at various angles. This affects how the light is bent before reaching your eye and that affects what your eye perceives.



The sketch below attempts to explain how telescope optics magnify the image. The image your eye sees (the *virtual image*) is an inverted magnified image of an object. In effect, the telescope is taking a small area of sky and optically stretching it to look bigger.

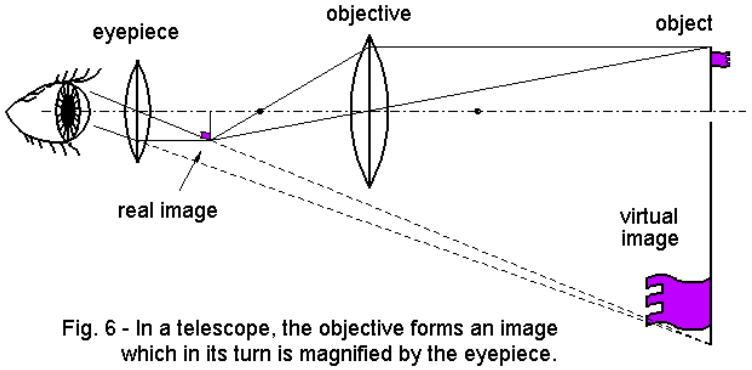


Fig. 6 - In a telescope, the objective forms an image which in its turn is magnified by the eyepiece.

http://www.funsci.com/fun3_en/lens/lens.htm