

In and Around Orion : Determining the “resolution” of my telescope.

I've just started developing a structured observing programme & I'm currently concentrating on the area of sky encompassed by Orion. I'm taking the time to investigate the nebulae, measure the separation of the double / multi star systems and attempt to estimate the magnitudes of the variable stars.

Having calibrated my eyepieces I'm fairly confident of visually estimating the separation of stars. But this is where my troubles have started; in particular, Rigel. The separation of Rigel A and B is 9.5 arc-seconds. Patrick Moore has split Rigel and found it to be “by no means difficult, and [has] often seen it with a modest 3-inch refractor” (*Brilliant Stars*). Yet I have been unable to see Rigel B.

The Rayleigh Criterion gives the best resolution of a telescope as :

$$\alpha = 1.22 \lambda / d \text{ radians, where } \alpha \text{ is the best resolution, } \lambda \text{ is the wavelength of light being observed and } d \text{ is the aperture of the telescope.}$$

We can take  $\lambda$  as 550nm (which corresponds to yellow-green visible light). For my 6" (15.2 cm) reflector, the best resolution would be :

$$\begin{aligned} \alpha &= 1.22 \times (550 \times 100 \times 10^{-9}) / 15.2 \text{ radians} \\ &= 4.4 \times 10^{-6} \text{ radians} \end{aligned}$$

There are (as good as) 206265 arc-seconds per radian. Therefore the best resolution for my telescope would be 0.9 arc-seconds.

I have double-checked this by calculating the “Dawes Limit” for my telescope ( $dl = 12 / d$  arc-seconds,  $d$  is the aperture in cm). This comes out at 0.8 arc-seconds.

If I allow 1 arc-second for the seeing, my best resolution would be about 2 arc-seconds. So it should be possible for me to split Rigel.

I have also been unable to split Alnitak (separation 2.4 arc-seconds) but have seen the faint companion about 1.5 arc-minutes to the North (TY1 4771-1207). I have managed to split Mintaka (separation 53 arc-seconds), but this is an easy challenge.

So far all of this is quite frustrating. In the coming months I will be honing my observing skills, tightening up on my scope's collimation and waiting for the very best transparent skies to try again. Surely I can repeat Patrick Moore's success from light-polluted Thanet ?

Lee Russell  
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