Catching Up with Barnard's Star. Dave Eagle

Within the constellation of Ophiuchus lies Barnard's Star. It is a fairly faint red dwarf star of magnitude 9.53, six light years from Earth, so is fairly close to us. Its luminosity is 1/2,500th that of the Sun and 16% its mass. The diameter is estimated at about 140,000 miles, so it's quite a small, faint star and well below naked eye visibility. So why is this star so well known? In 1916 Edward Barnard looked at a photographic plate of the area. When he compared this to a similar plate made in 1894, he noticed that one of the stars had moved between the time of the two plates being taken. Although all the stars in the sky in reality are all moving quite fast, from our remote vantage point on Earth most stars appear to appear virtually static during our lifetime as their apparent motion is extremely small. Barnard's star, being so close and moving so fast, is one of the stars that bucks this trend. So fast indeed that it will subtend the apparent diameter equivalent to the Moon or Sun in about 176 years. So compared to other stars it is really shifting. The star is travelling at 103 miles per second and is approaching us at about 87 miles per second. In about 8,000 years it will become the closest star to us, at just under 4 light years and will have brightened to magnitude 8.6. Peter van de Camp caused great excitement in the 1960's when he claimed to have discovered a planet (or more) around the star, due to wobbles superimposed on its movement. These claims have now been proven wrong.

Having read about this star many years ago and finding that it should be easily visible in my telescope, and its movement visible over a number of years, I was determined to have a go at finding and observing this myself. Of course, this was a project that would take a number of years to fulfil. Luckily my interest in astronomy has stood the test of time to allow me to do this.

The star is located due east-north-east of 3rd magnitude Beta Ophiuchi (Cebalrai). Locate Cebalrai in the centre of the field of view and pan slowly eastwards. You should see a triangle of 4th magnitude stars; 67, 68 and 70 Ophiuchi. Above those is 5th magnitude 66 Ophiuchi. From this star, head slightly north-west. You should see a triangular shaped pattern of 8th and 9th magnitude stars. Centre the star at the point of this triangle (HIP 87901) and look very slightly south. There will be another much smaller, but more distinct, triangle comprised of 11th and 12th magnitude stars. The field of view is really easy to remember once you familiarise yourself with it. The two "V" shaped arrow head patterns of stars really do help to point you in the right direction. Burnham's Celestial Handbook, (although now a bit outdated, should be on every astronomers bookshelf), has a fabulous finder chart for the area around this star. The smaller arrow-head of stars in that chart pointed almost directly to the position plotted for July 1960, but the star has moved a bit since then. Barnard's Star currently lies slightly east, almost midway between the two points of the arrows.

I first hunted down this runaway star on the 8th of April 1986. I remember being very doubtful about being able to find the correct star patterns as shown in the chart. Using a 10" Newtonian borrowed from a friend, I carefully star-hopped my way across to the stars position. I was gobsmacked when I could see both triangular patterns very easily. Once I

had found the right location, I plotted the position of the star onto a copy of the finder chart in Burnham's. As expected, the position of the star was now well away from the plotted location. To follow up this observation I re-visited this star ten years later on the 12th of June 1996, re-plotting its position on the same chart. Despite there being only 10 years difference between the two observations, the stars movement northwards during this time was really obvious.

So far I had not yet managed to image this star. So, on the 28th of June 2012, despite the awful weather we had that summer, I got a rare clear evening and was keen to rectify this. With everything set up and ready I was quickly focussed on a bright star even before the sky got dark. I slewed the scope round to the correct position, star-hopping across using bright stars using EQMOD and the planetarium program C2A. Once in position, I took a few test shots with my DSLR. Despite the sky still not being completely dark, I could clearly see both triangular patterns on my image. Game On! As I was only imaging stars, I decided to take a series of images right there and then stacking them together later. This I did, removing the bright background using imaging software.

On my image I have plotted the positions of the star as shown in Burnham's in July 1960, where I observed it in June 1996 and the location of the star on my image in June 2012. I have also included my image showing the wider field showing the V-Shaped "Arrow Heads" without annotation, to use as a finder chart.

I have produced everything in negative for easier printing.

Now all is set for my next project with this object. My aim is to take a series of images over a number of years. Once I have captured them I should then be able to create an animation of the stars movement over time.

So get out yourself and give it a go.
Please let me know if you do and how you get on.

KEEP LOOKING UP!

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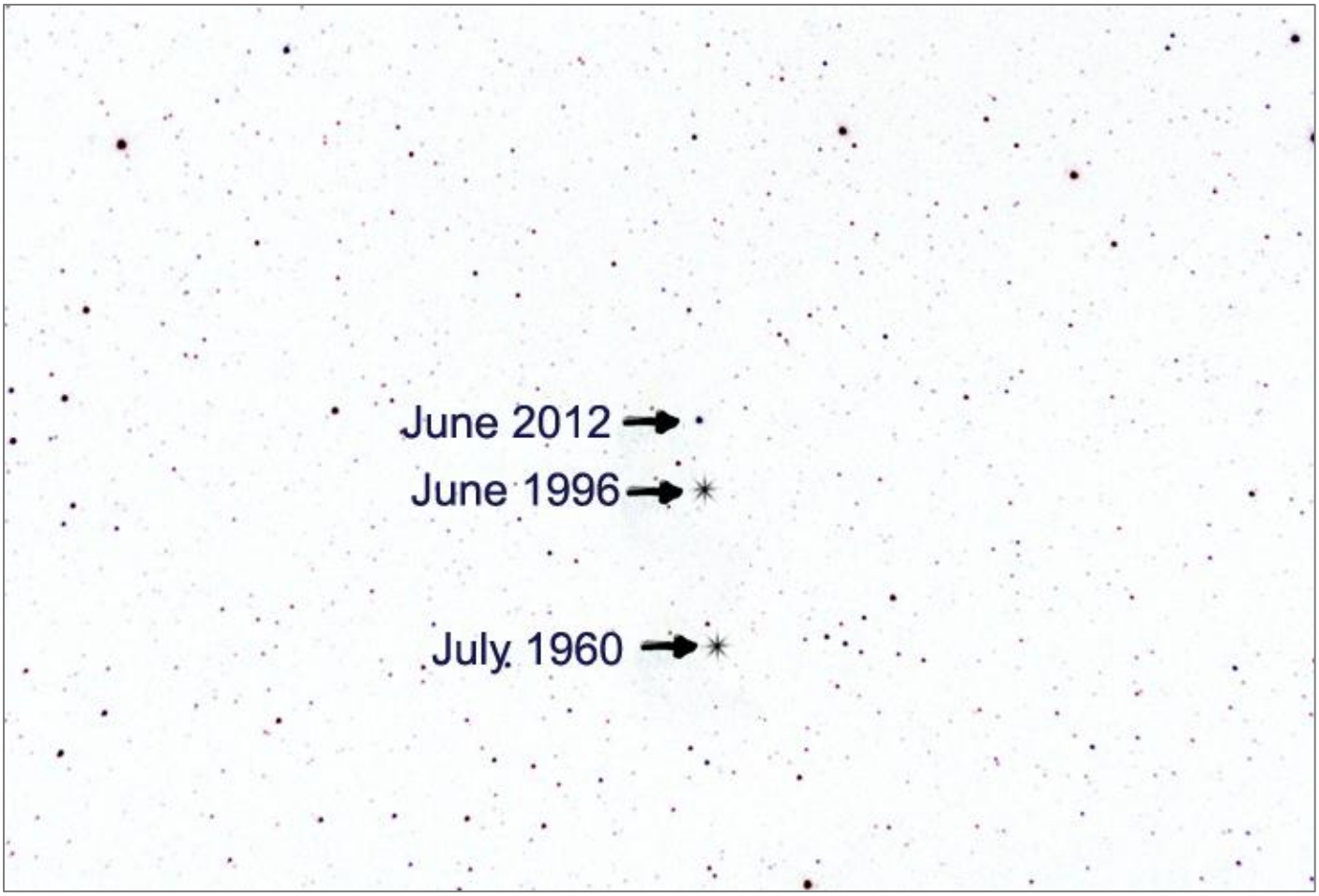

Figure 1. Barnard's Star's positions over time plotted on my image.

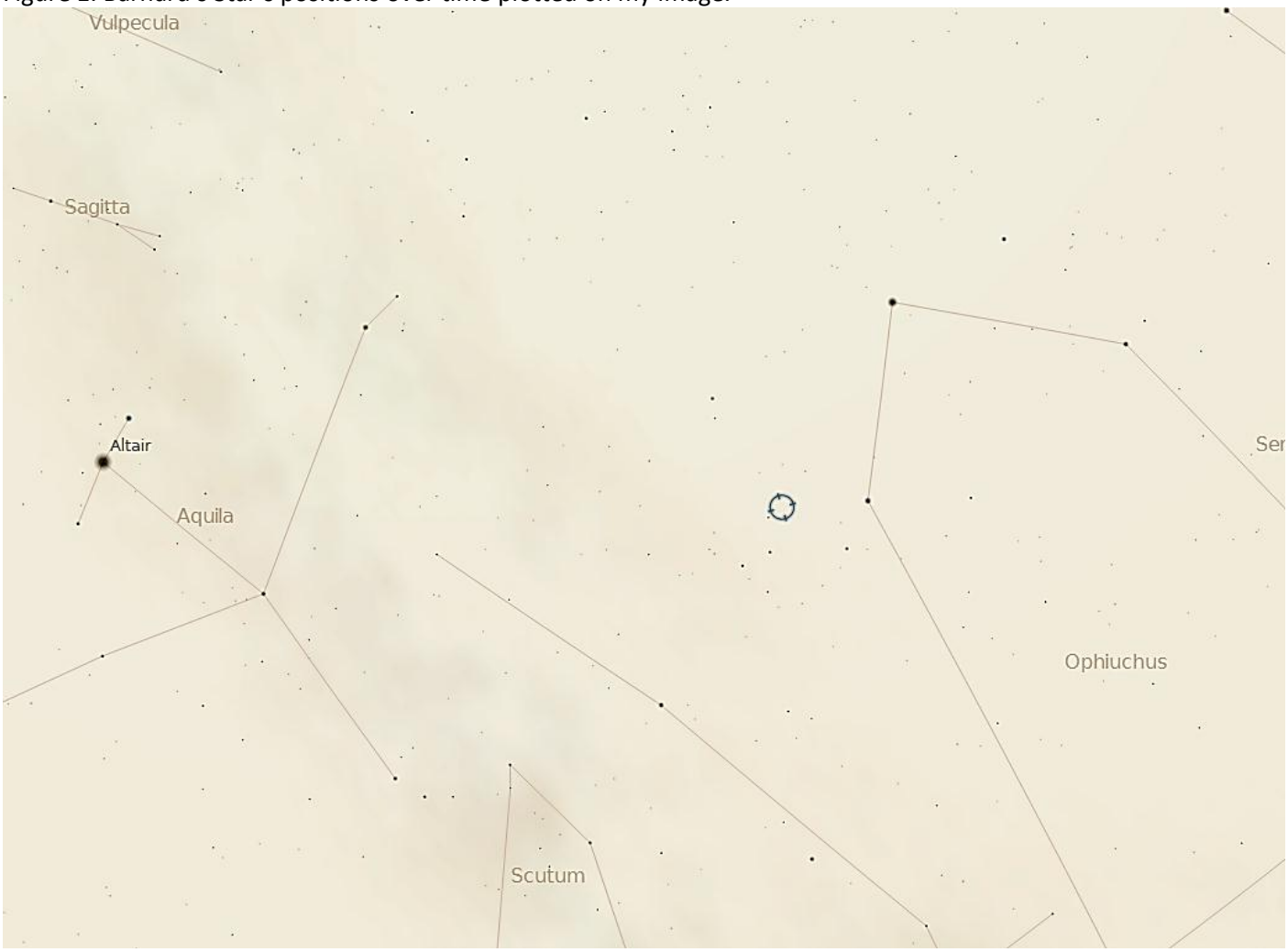

Figure 2. Location of Barnard's Star in Ophiuchus (Produced using Stellarium).

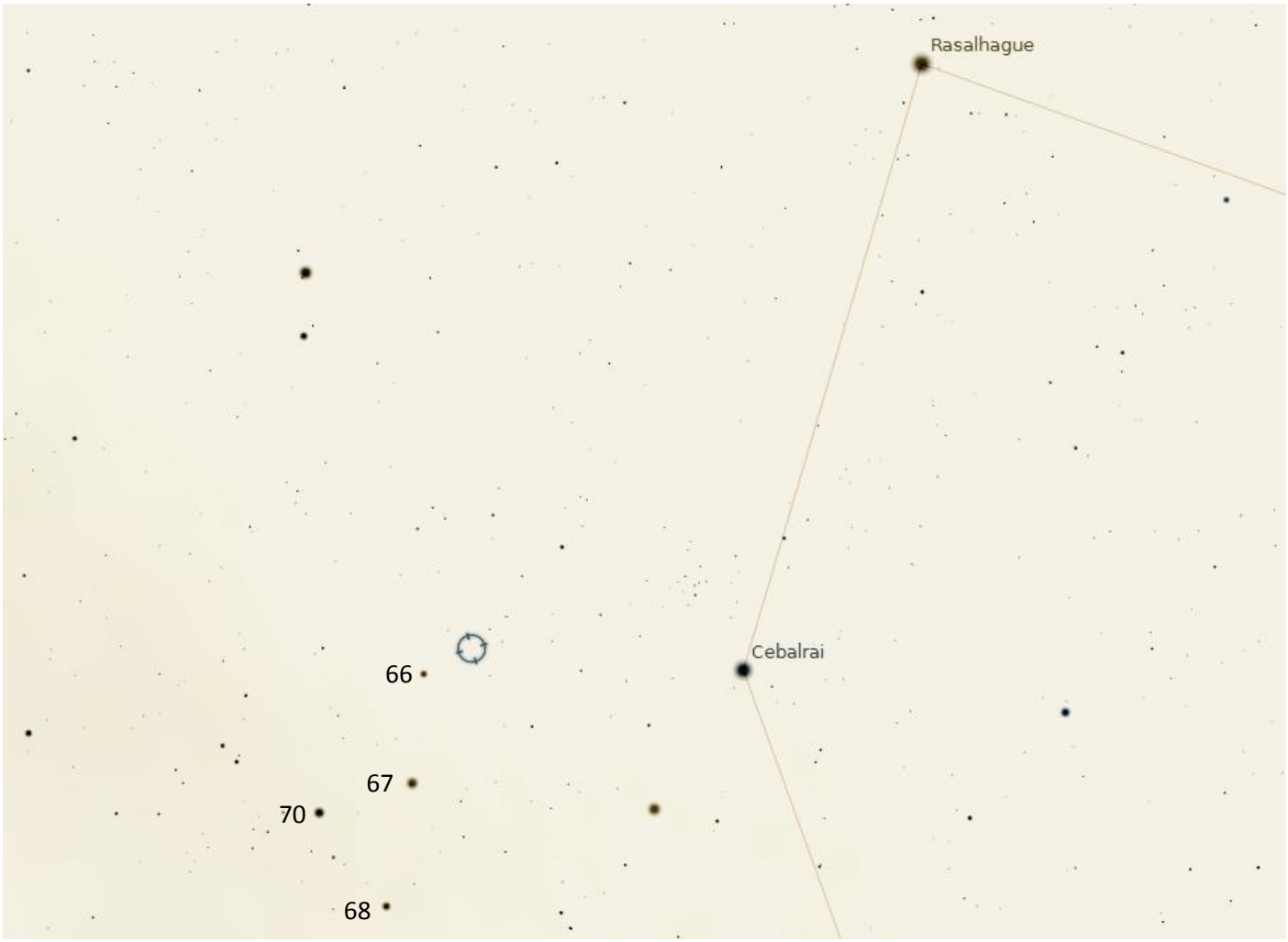

Figure 3. Location of Barnard's Star close to Cebalrai (Produced using Stellarium).

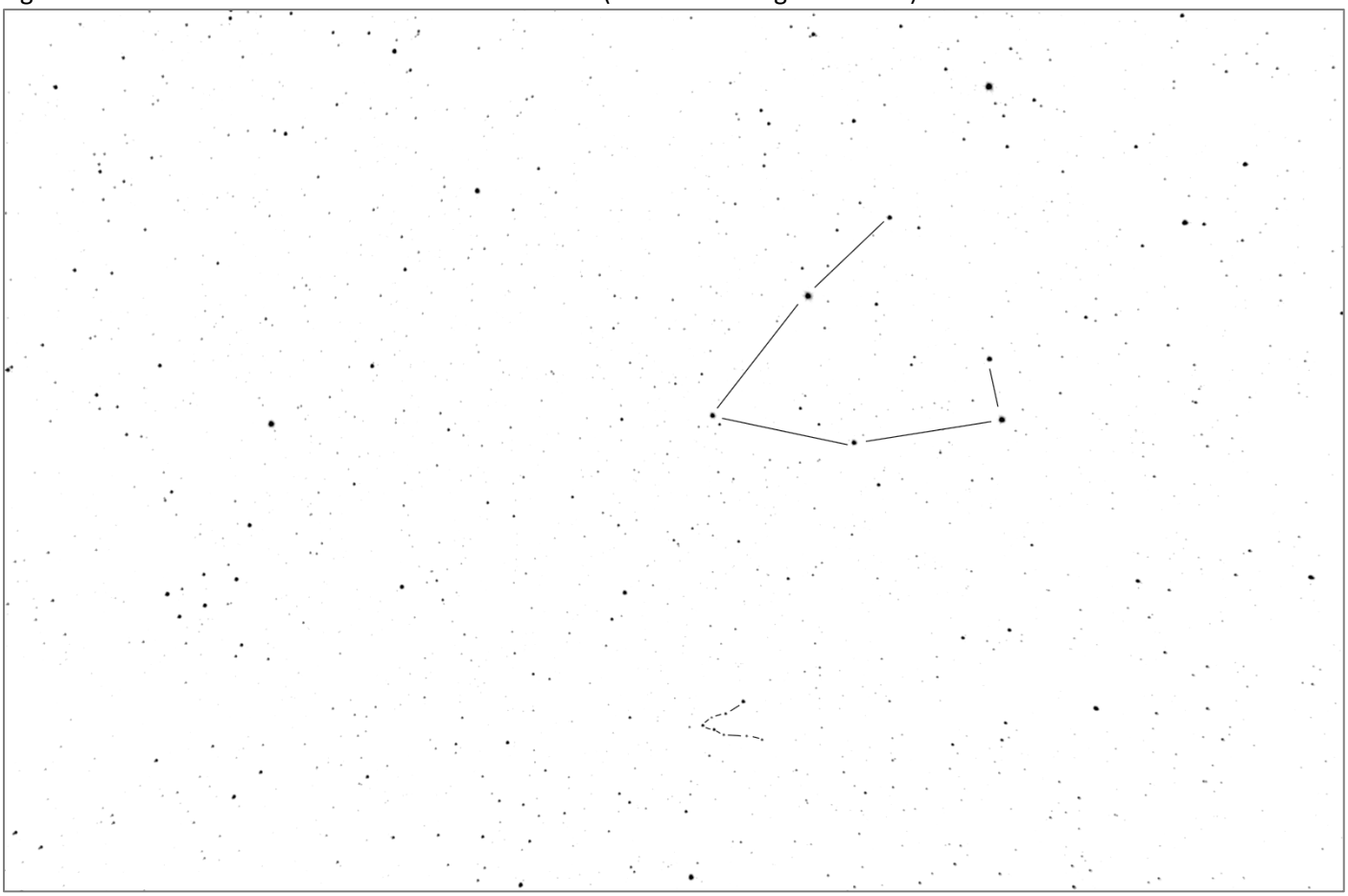
Figure 4. Slightly wider field of Barnard's Star field of view without annotation, showing V-shaped "Arrow Heads".