

Star Hopping in the Big City

By David Nakamoto

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On Nov 2nd 2016, I was at Garvey Ranch park observatory using the 8-inch refractor, and since that mount had no GOTO capability, I had to use my old star hopping techniques. I thought I'd share my experiences to help and encourage others under the ever perpetual sky glow.

General Guidelines

I assume you have properly aligned the mount, and the finder to the main scope. I also assume you know how to find out which direction is north from south, and east from west, in your finder and main scope.

To do star hops, you need good star charts, a good finder, a low power eyepiece in the main telescope, and patience.

I won't address GOTO scopes. What I will describe are old-fashion techniques you can use with any scope.

Your star charts should go down to 8th mag at least, since sometimes you might use the main scope to track down the object, or do slow sweeps through a region, hence the low power eyepiece on it.

The finder should be large enough to see stars too faint to pierce through the sky glow. The 50mm finder I used that night did well that night.

Setting up for the 1st Target:

My first target for the night was M13, the large globular cluster in Hercules. I started with the star Vega, because seeing the "keystone" asterism in Hercules was out of the question. In fact, I couldn't see any other stars around Vega !

The first step in star hopping is looking at the charts and finding bright stars, or groups of stars, that are either at the same RA (east/west), Dec (north/south), or FOV as your previous one, so you only have to move one axis at a time. So like navigating

to a destination through city streets, you move constantly, if not directly, to your target.

I started off by centering on Vega in the finder, the brightest star in the constellation of Lyra the Harp. The two stars to the northeast and southeast should also be visible in the finder. An 8x50mm finder usually has a field of view, or FOV, of around 6 degrees wide, 12 times the diameter of the full moon. Depending on your charts, the RA/Dec grid lines are about 10 degrees apart.

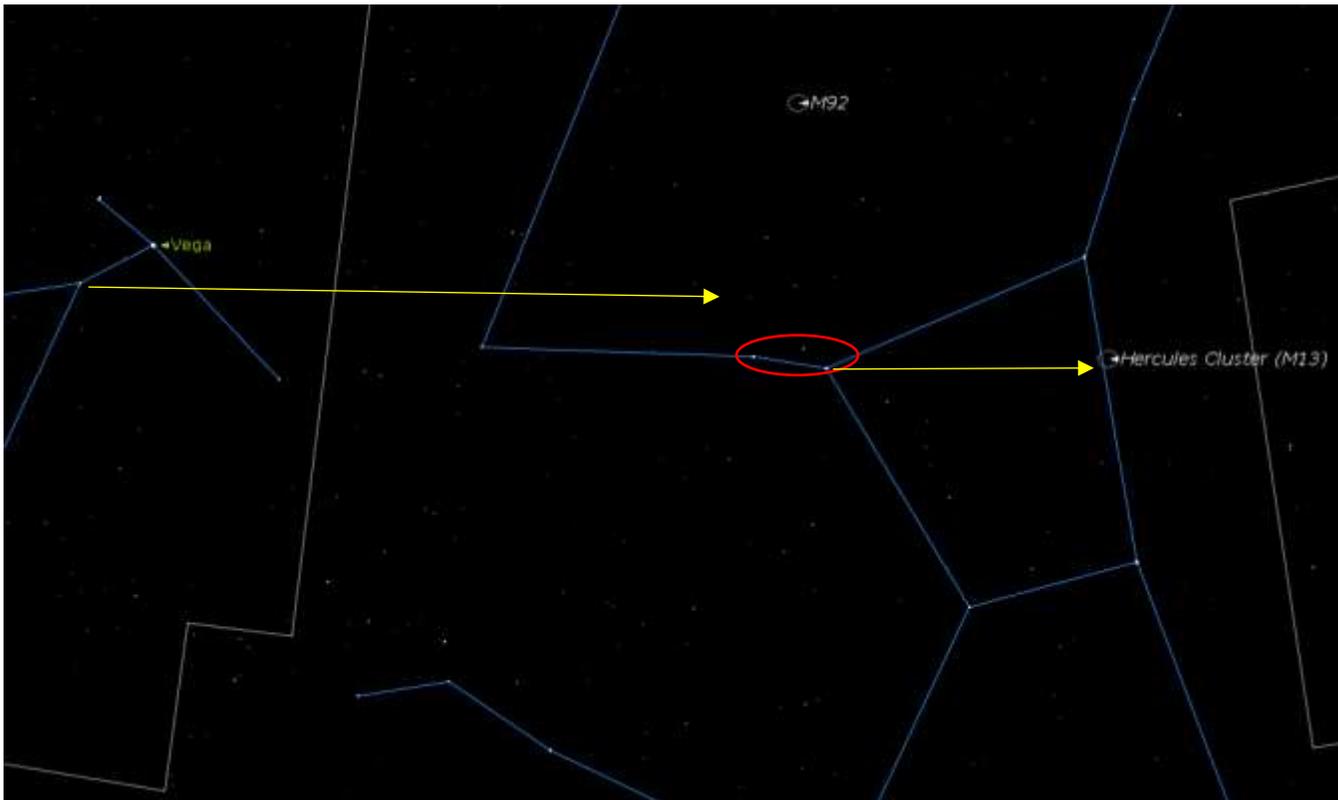
One thing you can do ahead of time is create a template out of cardboard or another durable material, which has a hole in it the size of a 6 degree FOV as measured on your charts.

Of course, with a smartphone app you just resize the FOV, but I like a large chart, which only printed charts can give you. Also, you need not worry about your batteries running out.

Star hopping consists of moving from one recognizable star, or better yet an easily recognizable pattern of stars, to another, until you are more or less centered on the object. This will be apparent with the rest of this article.

[M13, a No-Show:](#)

This charts shows my motions that night:



After centering on Vega in the finder, I then centered the finder on the star in the same FOV as Vega and southeast of it. This was to put the finder a bit further south, so that the scope was nearer to the Declination of the next group of stars, circled in red.

Then I went a long distance west (RA) until I came across a triangle, circled in red in the chart, with one star being noticeably red. I centered on that star so the scope was at about the same Declination (north-south) as M13.

Then I kept going west (RA) until I came across another relatively bright star at the northern part of the finder's FOV. M13 should have then be within a low power view through the main scope. Unfortunately, the bright lights from the athletic field made the sky too bright in the west to see ANYTHING.

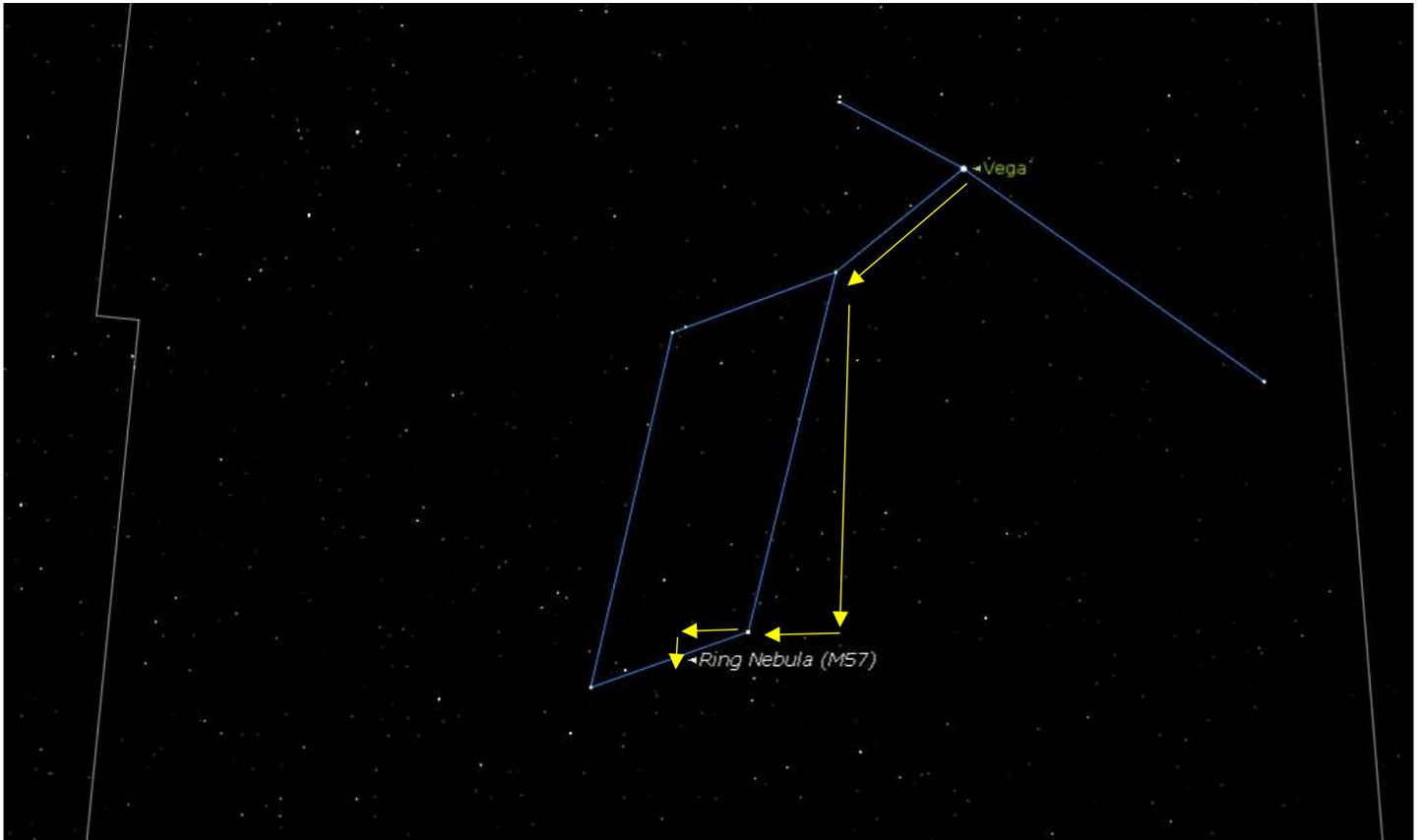
Oh well . . .

[M57, The 1st Success](#)

Next was M57, the Ring, a planetary nebula. The technique I used to find it was the same one I used when I was 10 years old to find it from my home in South San Gabriel, now Rosemead, using a 6x30mm finder and a 60mm refractor ! The good thing is

that there is a bright star nearby to start your journey; Vega ! Another good thing was that there was less sky glow back then than now.

The reference chart is below:



I re-centered the finder on Vega.

Then I centered on the same south-east star as before.

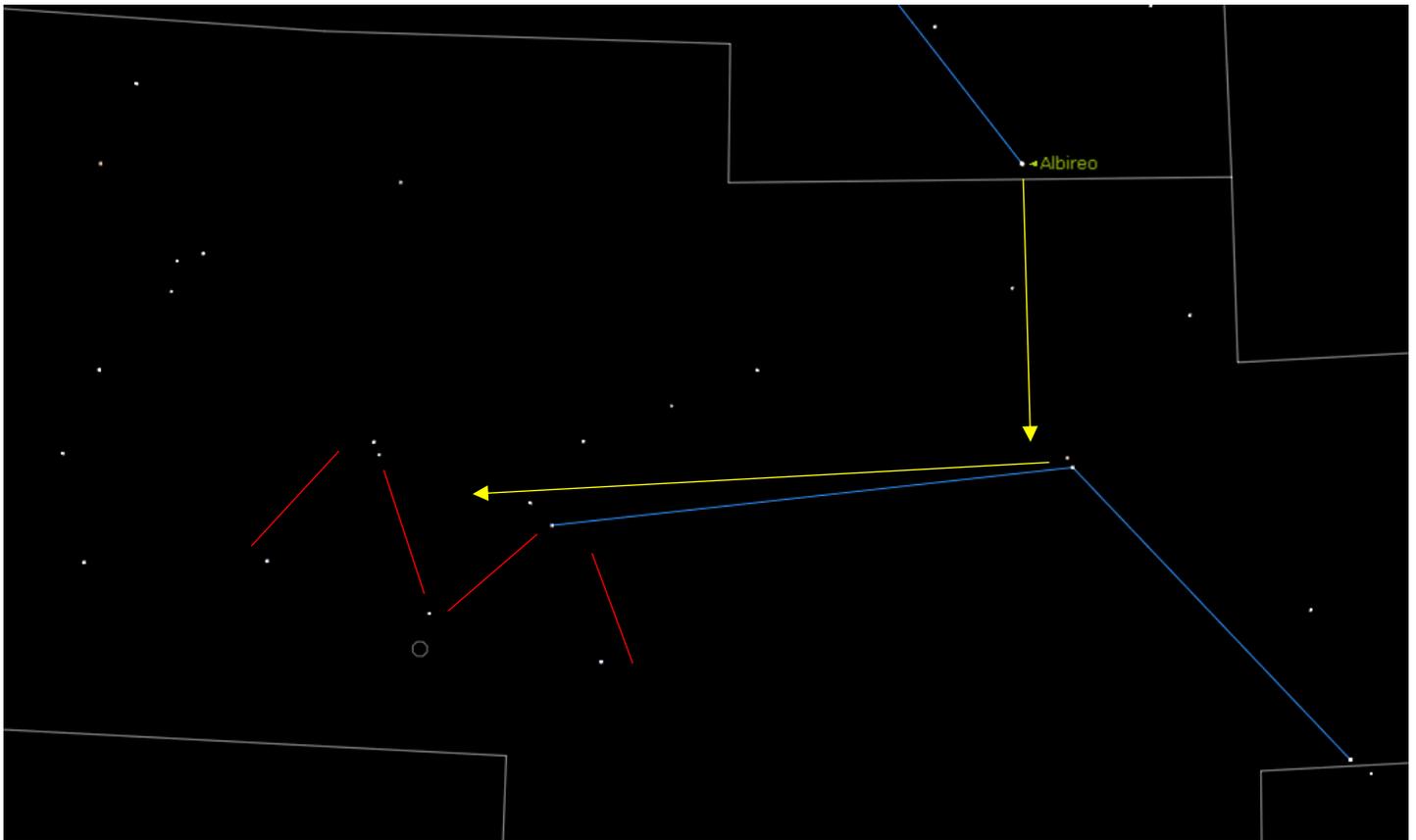
I then went south to one of the two stars at the south end of the parallelogram; refer to the chart. A slight move east centered that star. The second star forming the bottom of the harp should be visible in the finder.

Now I moved further east until I was halfway between the two stars in RA, and then dropped south until you're halfway between the two stars in Declination. And a little scanning and there it was in the main scope !

I tried a High Contrast or Light Pollution filter by flipping it between my eye and the eyepiece, and confirmed that on actual nebula, it does help lower the light pollution in the background but doesn't affect the planetary nebula as much.

M27: Using Patterns

Years ago, through that same 60mm refractor, I also found M27, the Dumbbell, a planetary nebula. This is a longer star hop, but there is an asterism of stars that helped me along the way.



I centered the finder on Alberio, not as easy as you might think, as sometimes it's barely visible in such heavily light polluted skies.

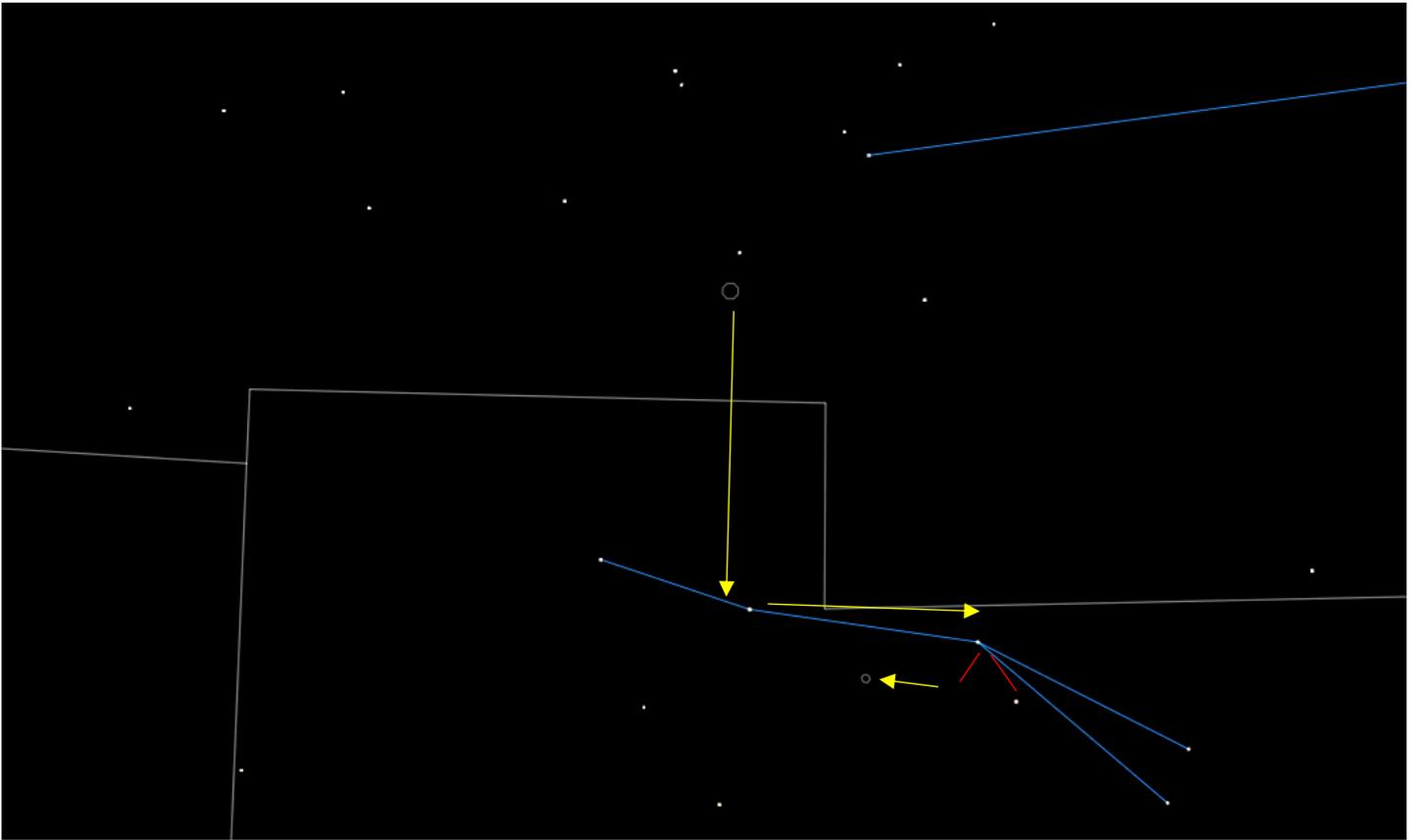
The first move was to the south (Dec) to a double star. I centered the finder on the pair.

Then east (RA) to get to the "M" with two binary stars at the two top angles. It's marked with red lines on the chart. M27 is just beyond the center star of the "M".

I tried the filter in and out of the FOV, and it was helped by the filter too.

M71: Another Miss in the Bright Skies

The next target that night was M71, a globular cluster, in nearby Sagitta the Arrow.



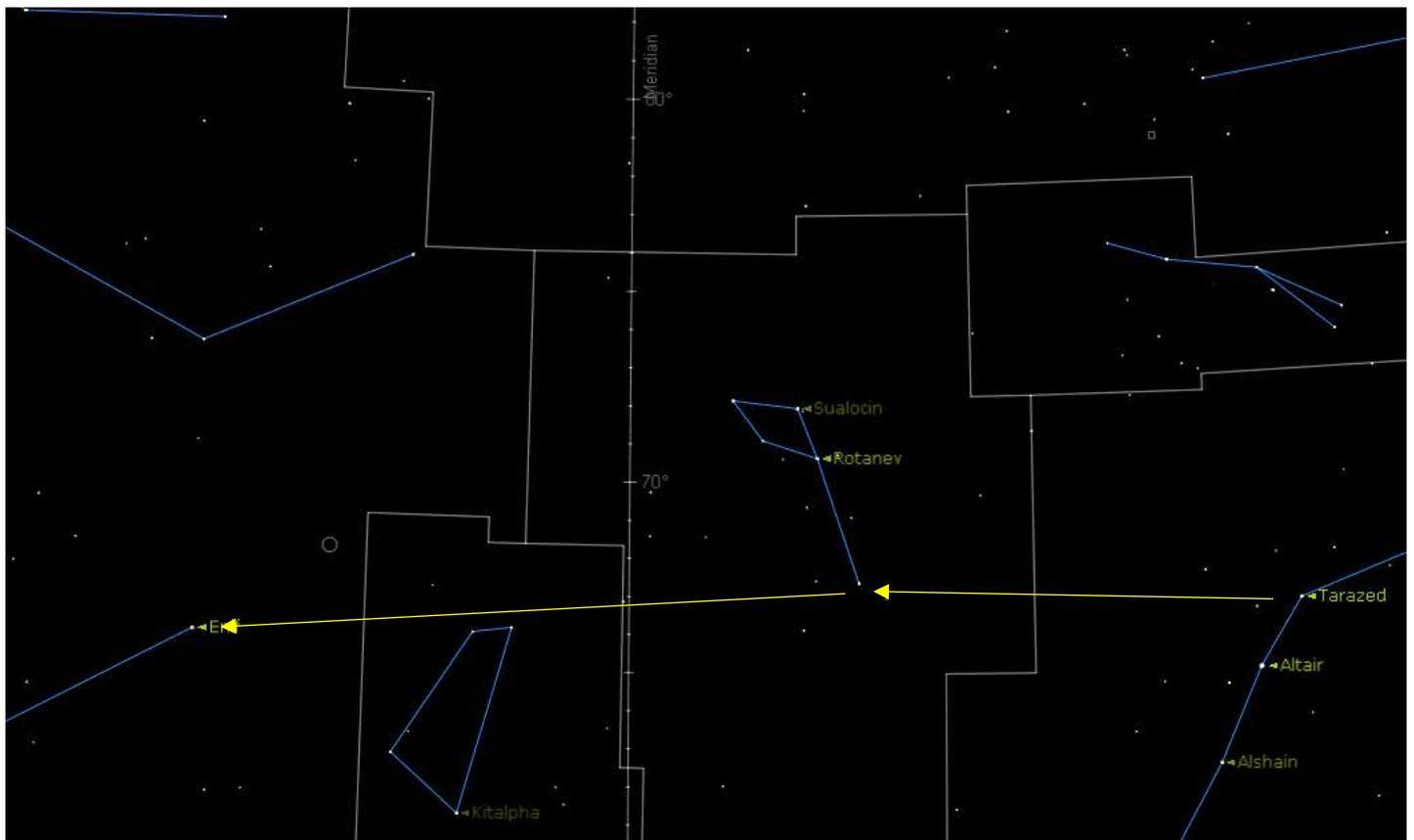
From M27 I went south (Dec) from M27 to a star along the “arrow”.

Then west (RA) to the trio of stars, although one was barely visible in the finder. I marked them with red lines. I centered the finder on that faint star. I then halfway back to the east (RA) to the first star.

But M71 is small and faint, and I didn't see it that night. Not all attempts are successful. You must learn to be patient, even to move on when things aren't working out.

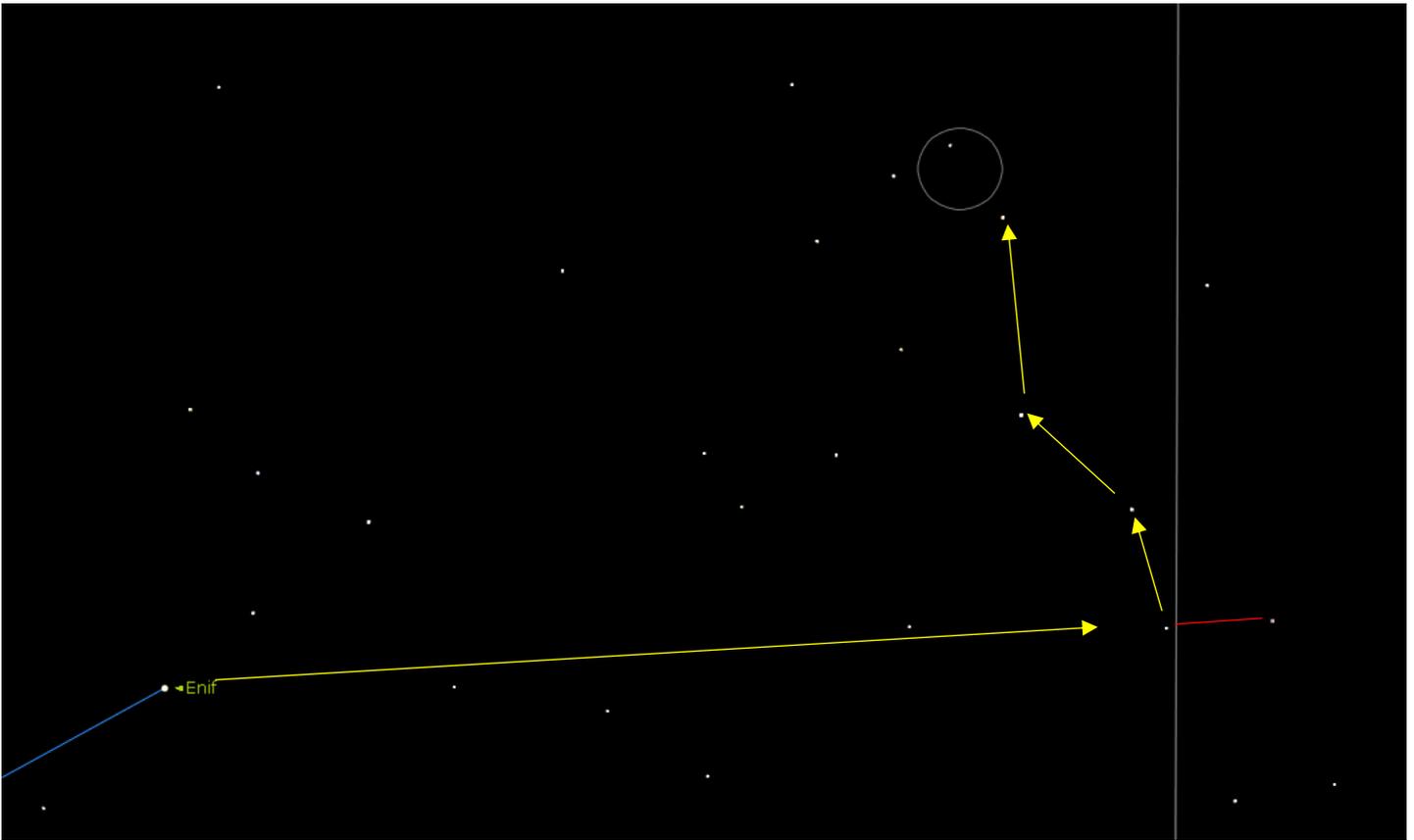
M15: FINALLY ! A Bright (well, relatively) Object

To find M15, I had to do a long star hop, but it wasn't hard as long as I just moved one axis at a time.



I found Altair first, visible to the unaided eye. Then I moved slightly north (Dec) of it to the relatively bright star Tarazed. Then east (RA) to the tail end of Delphinus. I checked to make sure I had the right star by moving north and slightly east to see the distinctive pattern of four stars forming the head of the “dolphin”.

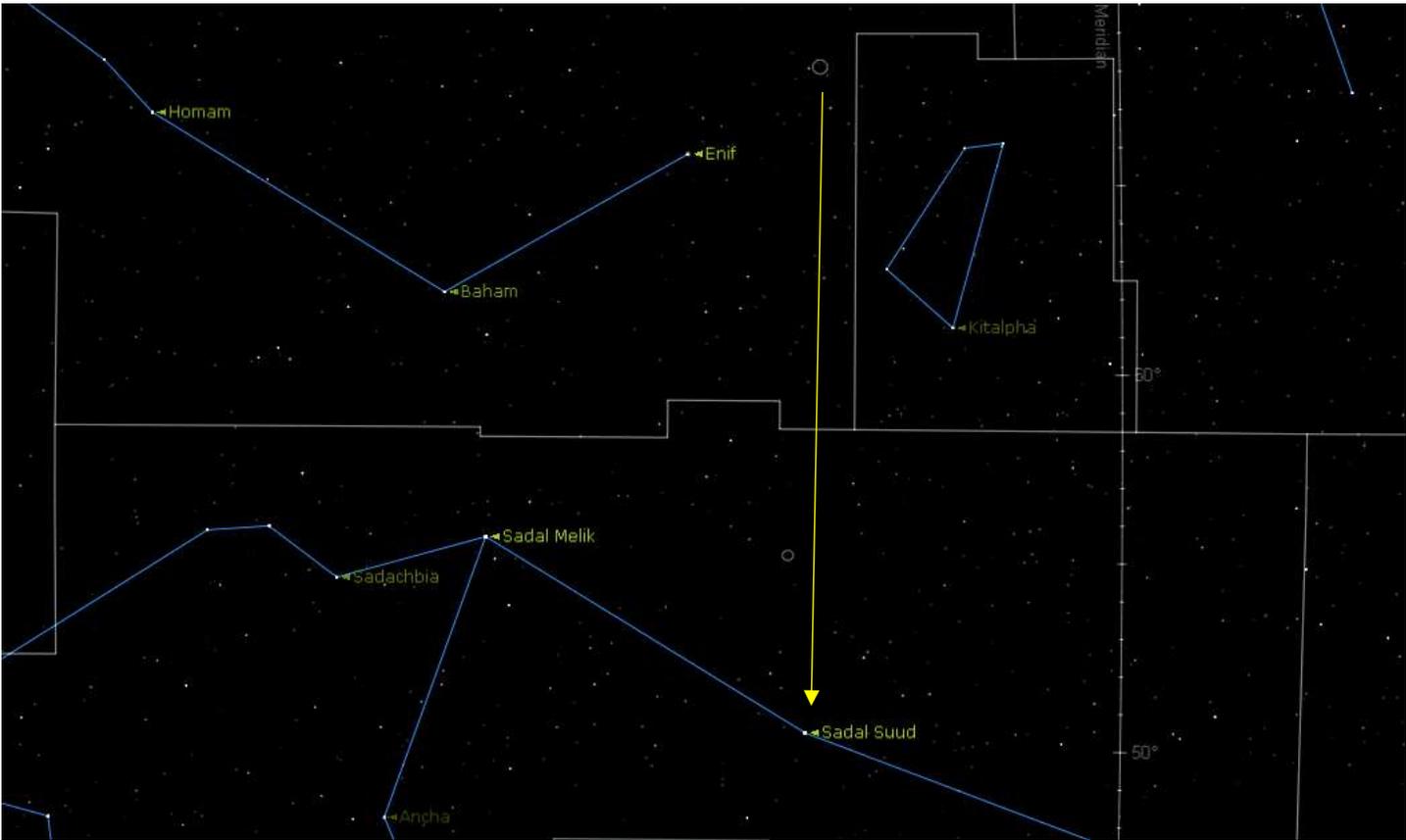
I then went east far enough to find Enif in western Pegasus. This is not as hit and miss as you might think. If you notice on the chart below, there ARE no bright stars between the tail of the Dolphin and Enif. Of course, if you can see Enif you can just start there, but on this night the sky was so bright that I couldn't positively identify any of the stars in Pegasus, and looking through a dome slit made it harder.



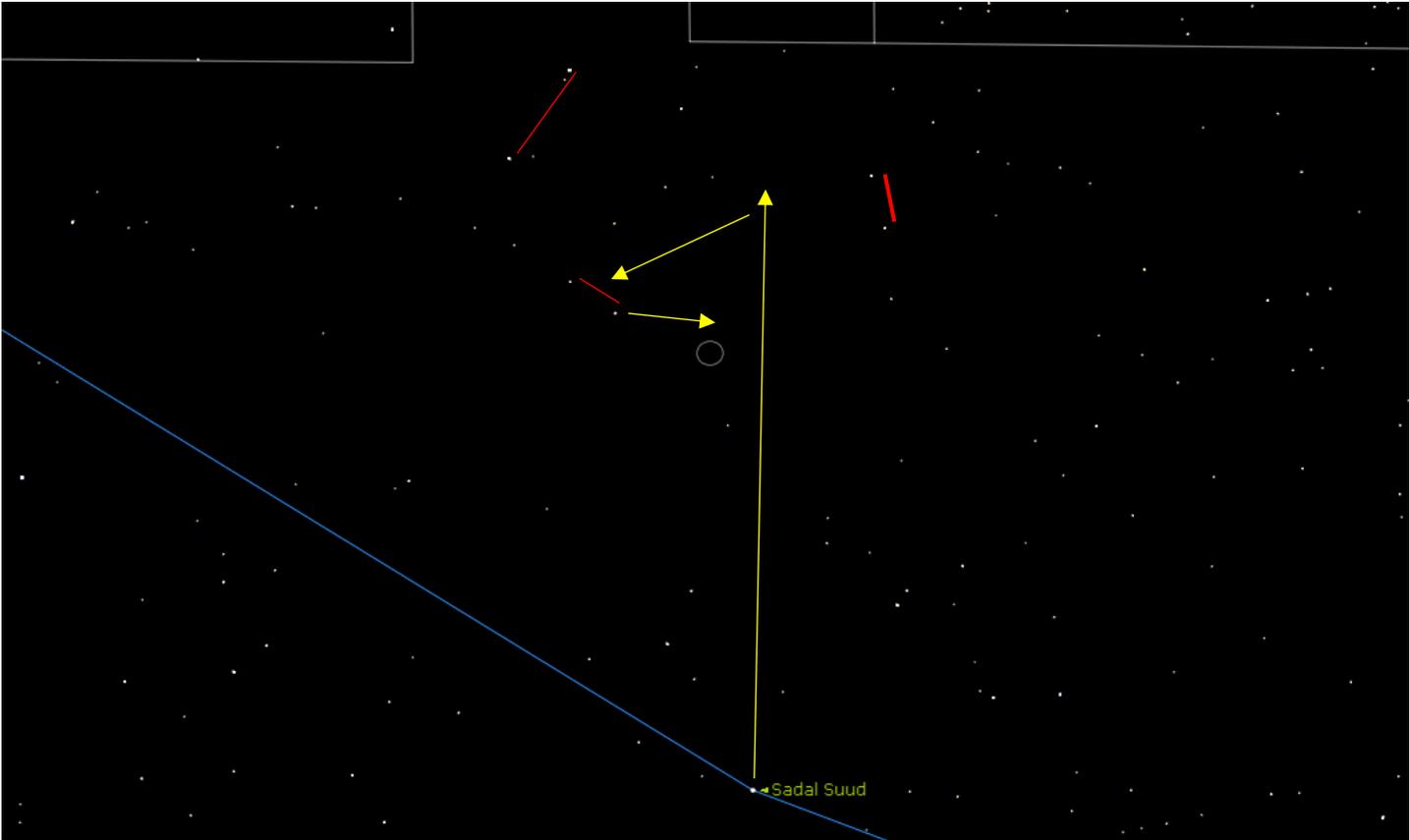
I then backtracked in RA $1/3^{\text{rd}}$ of the way back to Delphinus and found a pair of relatively bright stars lined up east-west, marked on the chart with a red line. I then went slowly north along three stars roughly north (Dec) from the pair. A little scanning in the main scope and there was M15 ! I tried the filters and didn't see any improvement. Stars emit light at all colors, not just a few like a real nebula like M57 or 27, so the filter works on the cluster to the same degree as the sly glow. Hence, no improvement.

M2. Getting a Little Lucky

South of M15 was M2 in Aquarius.



I went far south (Dec) to beta Aquarii, also known as Sadal Suud.



Then I backtracked north to two pairs of stars aligned roughly north–south to the west, and east–west to the east, marked by the red lines above. Northeast of them are two other bright stars, forming the pattern shown above. The reason I didn't go to this pattern first is that I always try for a bright reference star near to the object. I centered on the western–most of the eastern pair of stars. This would hopefully put M2 within the FOV of the main scope, although a little north of it.

I then went west about the distance equal to the separation between the stars. M2 should be within the lowest power FOV of the main scope, although I had to scan gently and slowly before I could see it, but I did see it !

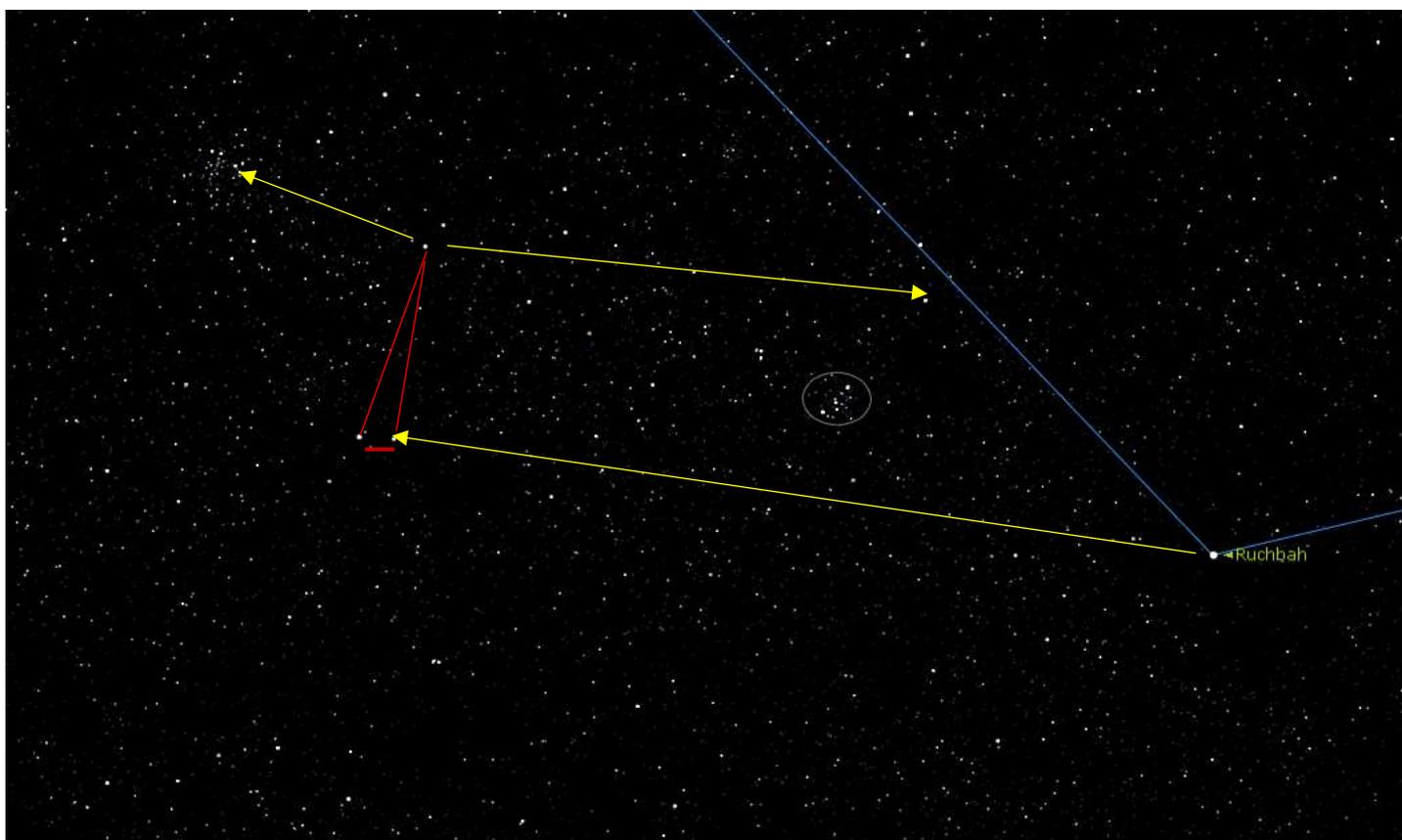
M103 and Two Unknowns (You Win Some, and You Lose Some)

The next target was M103 way to in Cassiopeia, specifically in the eastern part of Cassiopeia. However, I either got confused or the star charts I was using got the position slightly wrong, because I never found it, but this example shows the Principle of Serendipity, of stumbling on things other than the one you wanted.



I found Ruchbah without too much difficulty, it just being visible to the unaided eye, but for some reason I couldn't find it with a simple move to the east (RA). I tried through the finder, then the main scope.

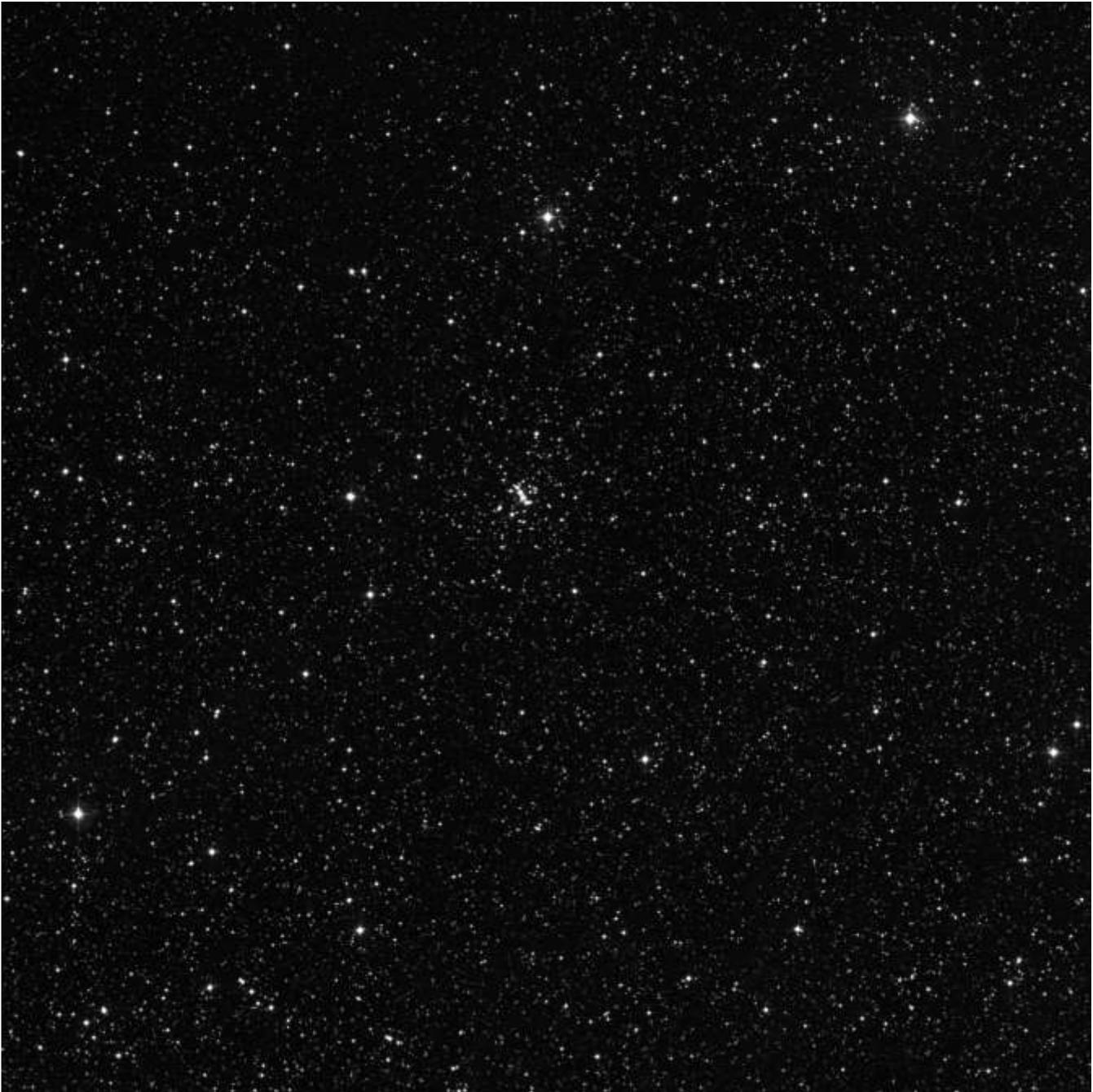
This is a good example of trying a different set of hops if for some reason your earlier attempt didn't work. After this failure, I noticed a thin triangle of stars east (RA) of Ruchbah and M103, marked with red lines below, and managed to find it without difficulty. I then tried to move back west (RA) to M103, but the chart I was using indicated it a bit further north than it was, hence I started my final move from the top of the triangle, not the bottom. I still didn't see it.



But two surprises. The 1st was a SMALL group of 4 stars in a line and spaced out evenly. One was a bit brighter than the others, with one star on one side and two on the other. Its approximate location is indicated in the chart above with the yellow arrow pointing back towards Ruchbah. That position is RA = 1h 37.3m, Dec = +61° 1.6', but I can't locate it on DSS images.

An additional discovery was made while scanning the DSS image below centered at RA=1h 37.3m, Dec=+61° 1.6'. 30' northwest of that position is a possible cluster that is not in the NGC/IC lists. Its location is RA = 1h 35m 42s, Dec = 61° 17' 30". Our own Dana Patchick identified it as Trumpler-1. Thanks Dana !

Below is a DSS image, 30 arc-minutes on each side. Can anyone try and spot this and report to the group? Thanks !

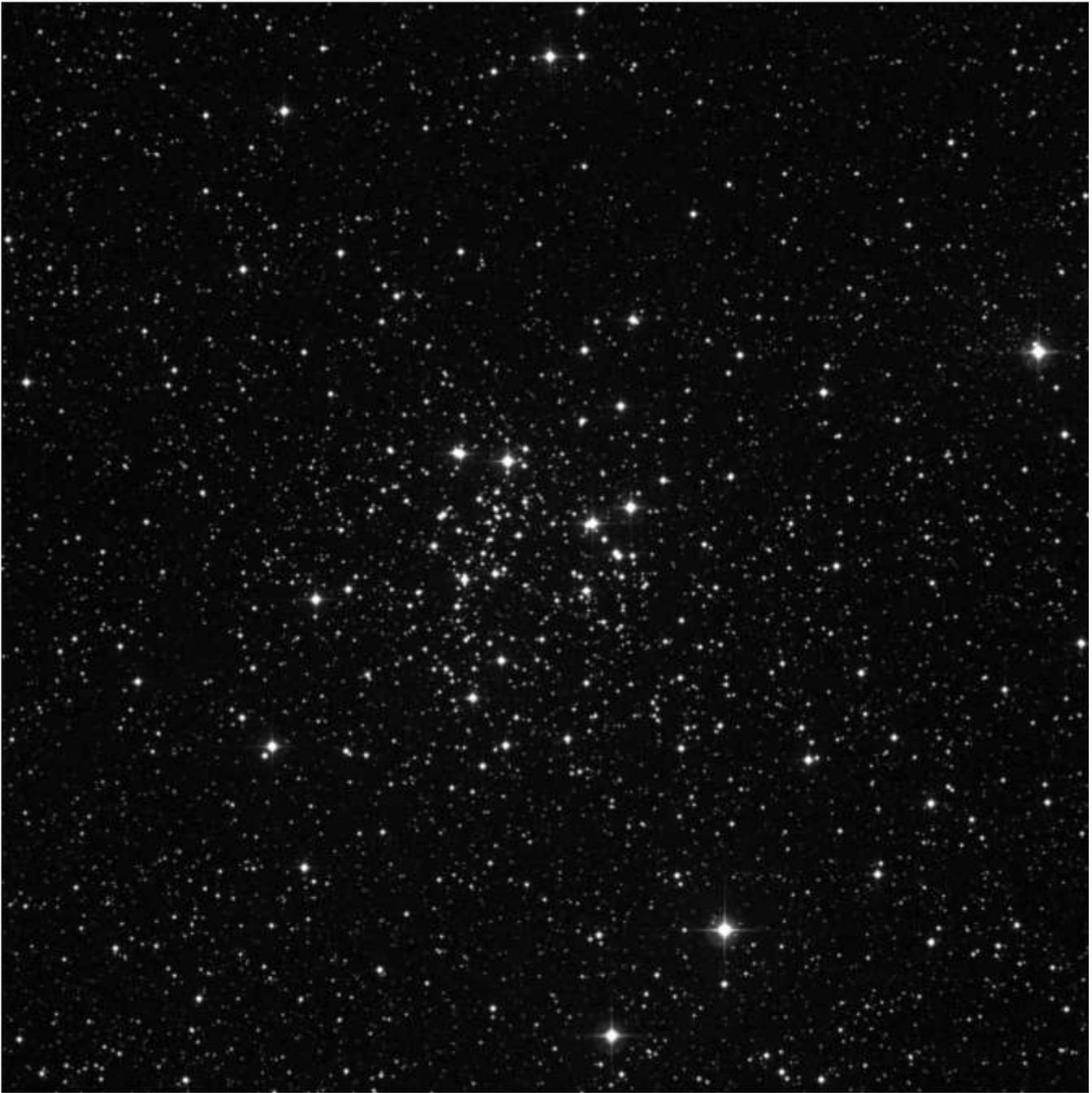


And this my own image taken on Nov 19th from Azusa, an 18' x 14' image:



Then there was what looked like an open cluster, which at the time I thought was M103. It looks to be NGC-663. Referencing to the previous chart, go to the top of the triangle, then slowly move eastward. This might be visible in the finder, but probably you'll need to scan east using the main scope at lowest power.

The image below seems to confirm this is NGC-663. This is a 30' X 30' FOV, similar to the view through the 8-inch refractor with a 50mm eyepiece $(50\text{mm})(1''/25\text{mm})=2.8 \times 10/2 = 40\times$.



And here is my own image, taken on Nov 19th from Azusa, an 18' x 14' FOV:



I hope this little article will give some idea of how to star hop. Remember, practice makes perfect, and the more you use your scope and finder, the easier it is to find objects . . . mostly.

Clear and Steady Nights !

David Nakamoto