MONTHLY OBSERVER'S CHALLENGE

Las Vegas Astronomical Society

Compiled by:

Roger Ivester, Boiling Springs, North Carolina

&

Fred Rayworth, Las Vegas, Nevada

With special assistance from:

Rob Lambert, Alabama

JULY 2017

M14 (NGC-6402) Globular Cluster in Ophiuchus

Introduction

The purpose of the Observer's Challenge is to encourage the pursuit of visual observing. It's open to everyone that's interested, and if you're able to contribute notes, and/or drawings, we'll be happy to include them in our monthly summary. We also accept digital imaging. Visual astronomy depends on what's seen through the eyepiece. Not only does it satisfy an innate curiosity, but it allows the visual observer to discover the beauty and the wonderment of the night sky. Before photography, all observations depended on what the astronomer saw in the eyepiece, and how they recorded their observations. This was done through notes and drawings, and that's the tradition we're stressing in the Observers Challenge. We're not excluding those with an interest in astrophotography, either. Your images and notes are just as welcome. The hope is that you'll read through these reports and become inspired to take more time at the eyepiece, study each object, and look for those subtle details that you might never have noticed before.

M14 (NGC-6402) Globular Cluster in Ophiuchus

Messier 14, also known as NGC-6402, is a globular cluster discovered by Charles Messier in 1764. It lies about 30,000 light-years away in the constellation of Ophiuchus. It contains several hundred-thousand stars, which give it an accumulative mag. of approximately 7.6+, depending on the source. The brightest individual stars in the cluster shine at a relatively dim mag. 14, so it takes a fairly decent sized scope to resolve individual stars. However, you might be surprised what you can see with good optics and on a good night. There are seventy known variable stars within the cluster of the W Virginis variety, common to globular clusters, as well as a nova discovered in 1938 through photographic plates. There's no indication, as of this writing, of a visible planetary remnant.

Observations/Drawings/Photos

John Bishop: Observer from Massachusetts

NOTE: We'd like to welcome new participant, John Bishop from the ATMoB (Amateur Telescope Makers of Boston) club.

On July 20, 2017 at 10:45 pm, I used 10X42 image-stabilized binoculars to observe M14 from the deck of a cottage in Wellfleet, Massachusetts (on Cape Cod), located about a half mile from the ocean. This is one of the less built up areas of Cape Cod, located partly within the National Seashore. It can, at times, provide excellent "dark" sky conditions.

Sky conditions: Cloud cover: 0. Transparency: Excellent. Seeing: Excellent. As an indicator of the excellent conditions, all seven primary stars in the Little Dipper were visible without using averted vision.

After locating the proper field in a clear, dark sky bristling with stars, I observed M14 with little difficulty. It was a small, round, well-defined object, definitely non-stellar. I saw no sign of a "halo." I wasn't able to resolve any stars.

On July 21, 2017, at 11:00 pm, using an 8.25-inch Dall-Kirkham reflector, I again observed M14 from the cottage deck in Wellfleet, Massachusetts. Observing conditions were not as favorable as the prior night.

Sky Conditions: Cloud cover: 0 becoming intermittent clouds and thin haze during the viewing session. Transparency: Good becoming fair to poor. Seeing: Good becoming fair to poor. Conditions initially were good, but deteriorated as I was observing other nearby Messier objects (M107, M10, and M12).

I observed M14 at 48X, 100X, and 192X. The lower powers gave more pleasing views. Seen through the telescope after viewing it through binoculars the prior night, M14 was obviously larger, but it didn't show the level of detail or star resolution seen with other globulars such as M13. This lack of resolution has been reported by other observers, but it may have been exacerbated by the deteriorating transparency during observation. The halo surrounding the core, as noted by other observers, was prominent, however.

Chris Elledge: Observer from Massachusetts

On July 15th, 2017, @10:50pm, EDT, I used a 10-inch f/5 reflector to observe M14 from the ATMoB (Amateur Telescope Makers of Boston) Clubhouse. Sky conditions were: Bortle Scale: 6. NELM: 5.5. Transparency: Good. Seeing: Excellent.

The sky that night was causing a mixture of excitement and frustration. Clouds were spontaneously appearing and disappearing as they saw fit, with no wind pushing them by once they appeared. Between the clouds, though, the sky was completely still and beautiful. The seeing conditions were excellent. Unfortunately, within an hour of starting my observing session, the night turned into a raging battle against the dew.

Finding M14 was challenging, given the lack of bright stars nearby. I attempted to star-hop from Cebalrai via HR 6575 (double star), HD 160438, and HR 6578. The hardest jump for me was from HR 6575 to HD 160438 since my 1.9° FOV 35mm eyepiece still left quite a bit of space between them for me to get lost. Once HR6578 was in view, M14 was visible without any trouble.

With a 35mm (1.9° FOV) eyepiece and M14 centered, there was a hook of five mag. 7 to mag. 9 stars from the NW curving around the N side of M14 and heading toward it from the N (HD 159307, HD 159545, HD 159860, HD 159891, & HD 159928). Many satellites passed through the view while observing. M14 itself appeared as an almost perfectly round cloud. In a 25mm (1.4° FOV) eyepiece, the cloud had a concentrated center that evenly faded out with the distance from the center.

A 10mm (0.9° FOV) eyepiece brought out the best view of M14. The cluster was framed by a ring of mag. 9 and mag. 10 stars: HD 159837 and its companion to the SW, HD 159928 to the N, HD 160120 to the NE, and a few mag. 11 stars to the S and SE. The cluster itself

appeared as a fairly dim round cloud in the center of the view. While carefully watching the view, a few stars seemed to very briefly resolve with averted vision. The most prominent one I saw was on the SSW side.

James Mullaney: Observer from Deleware

Most beautiful & delicate of the finest star dust….excessively rich. M14 lacked a sharp central condensation with the distribution of light being very smooth across the disc, and a gradual tapering off at the outer edges. Easily visible in a 3-inch. Mottled look, partly resolved in an 8-inch. Conspicuously oval.

Paraphrased from James Mullaney, *Celestial Harvest*

David Eicher: Editor – *Astronomy Magazine* and Observer From Wisconsin

Due east of the M10/M12 area is another bright globular, M14 (NGC 6402). This group of stars is a fainter, dimmer version of M10 and M12, but still quite impressive in any telescope. At mag. 7.5 and 11.7' diameter, the group is a fuzzy spot in binoculars and shows up well in a 4-inch reflector. A 16-inch telescope at high power resolves M14 across its face, leaving a misty grainy light suspended behind a curtain of glistening mag. 15 stars. Paraphrased David Eicher, *Astronomy Magazine*

Richard Nugent: Observer from Massachusetts

I observed M14 in early July, 2017 using my 20-inch f/5 Dob under mediocre skies. I could just barely see 61 Cygnus (mag. 4.8) by naked eye. The overall sky conditions are generally quite poor here in Framingham. As my eyes adapted to the dark, the sky took on a milky gray appearance due to the LED lighting in town. Of course, under these conditions, contrast suffered greatly!

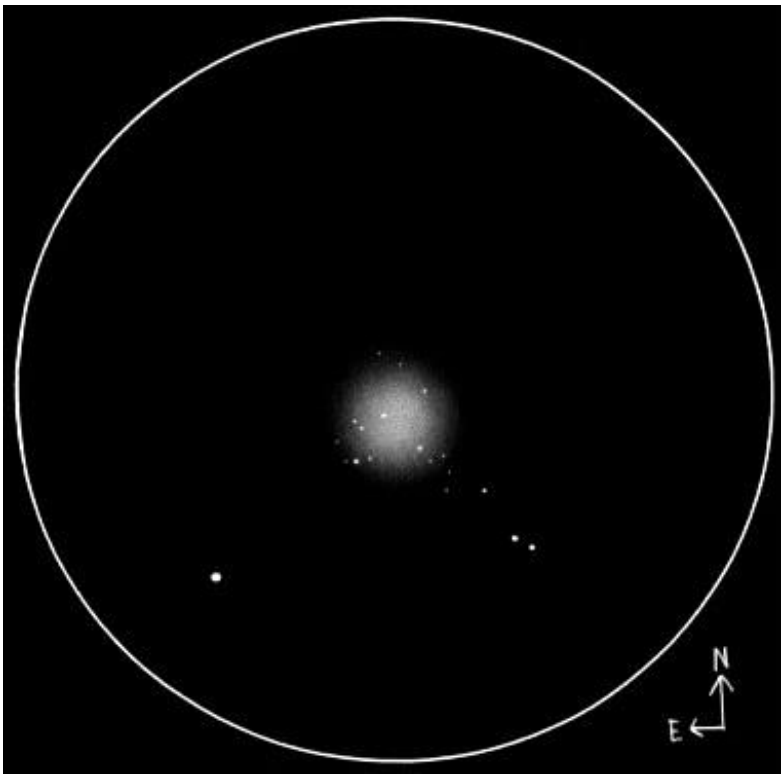
The cluster was visible in the 70mm finder scope as a diffuse patch of light. At lower powers, the 20" showed the cluster as a glow with several of the cluster's brighter members visible as a sprinkling of faint stars. I'd like to mention an interesting effect I noticed. I increased magnification to 388X, and with direct vision, I could see many of the cluster's brighter stars superimposed on the now-faint, diffuse glow. Upon averting my gaze, most of the stars disappeared and the diffuse glow dominated the view! This was very reminiscent of the effect seen in the "blinking planetary", NGC-6826. Maybe the effect is only visible in larger aperture scopes. I'll test it using my 10-inch scope on the next clear night. I'm going to refer to M14 as the "blinking globular." Have any other observers seen this while observing M14?

I observed it again on July 31, 2017. This time, I used my 10-inch f/5 Dob. Sky conditions were very poor. I just glimpsed 61 Cygni. The temperature was 70°F with a dew point of 60°F. The haziness was illuminated by the town's LED lighting and a 64% illuminated moon hanging 12° above the SW horizon. I couldn't see M14 in the 80mm finder. With the telescope, the cluster nearly melted into the sky background and, had I been sweeping across the area, would've easily missed it. I could see no stars at any magnifications. I didn't observe the blinking effect. This observing session provided a stark reminder of the importance of dark skies!

Again, thanks so much to your dedication and hard work with these monthly challenge reports! They're much appreciated!

Jaakko Saloranta: Observer from Finland

Using 8-inch reflector, I described this fine globular as follows: Faint, with no obviously brighter core. A few very faint mag. 14 resolved stars, mostly from the edges. I noted no dark markings at any magnification. Altitude of the object ~17°.

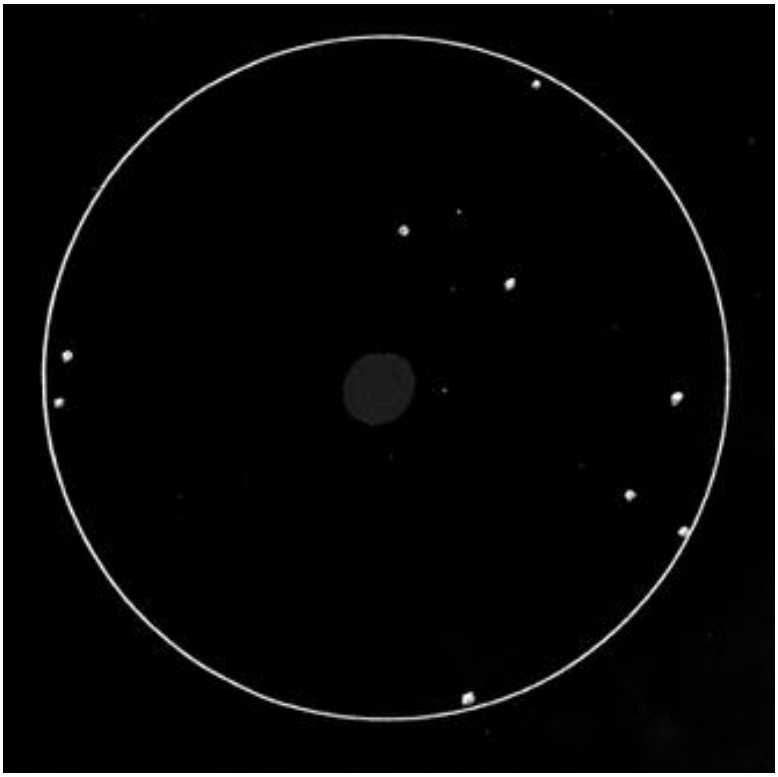


Mike McCabe: Observer from Massachusetts

The weather this year has been as unpredictable as ever, so I figured that if I had the opportunity, I might as well tackle the LVAS July challenge sooner rather than later. That opportunity presented itself on the evening of June 28, 2017. The sky was cloud-free, but the transparency was somewhat hampered by a high haze and the seeing was bottom of the barrel stuff. Also, the waxing crescent moon sat about 10° above the western horizon during this observation.

The LVAS Challenge object for July was M14, a globular cluster in Ophiuchus. Now, I know that doesn't sound like much of a challenge, and in some ways it isn't, but then again, in some ways it is. Ophiuchus is a sprawling constellation that occupies many degrees on the sky, and its asterism looks like a giant tent set up high in the southern sky. You'll find M14 lying about 5° south of Beta and Gamma Oph, and it's not an exceptionally difficult star hop down to it. I found M14 to be barely visible in a 9X50 finder, and that's a definite precursor to what you'll find in the eyepiece.

M14 is dim. It's listed at mag. 8.32, but its surface brightness is much lower. It's a tightly packed gathering of stars, none of which I was able to resolve in the eyepiece. In fact, in some ways it looked very galaxy-like. I was working with an 8-inch reflector and I looked at powers of 50 to 200X. About the best I could do was a slight brightening on the NW limb of the structure. Now I see why it was put it up as a "Challenge" object. I need to go back with more horsepower and see if I can resolve any stars in it. This ain't no M13!

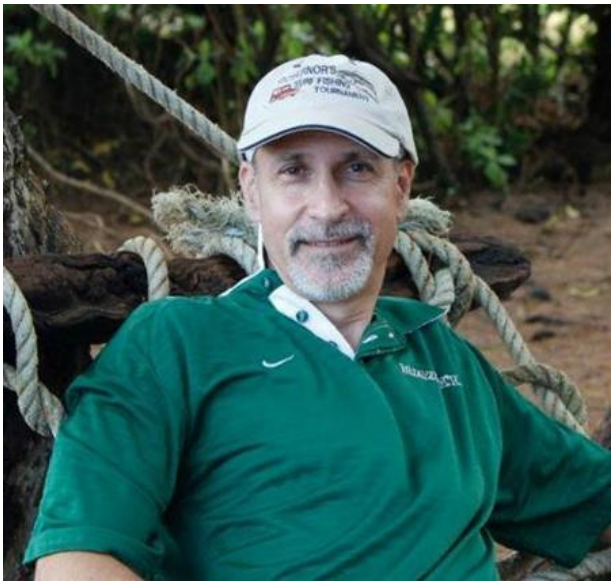


Sue French: Observer from New York

Globular cluster Messier 14 (M14) perches 4.9° due north of Mu Ophiuchi. Through 15X45 binoculars, it's simply a soft round glow. My refractor at 47X displays a very faint 5 ½' halo enfolding a bright 4' core that grows more intense toward the center. At 153X, a few extremely faint stars are visible. The core is mottled, and the halo is slightly oval northeast-southwest.

In my 10-inch reflector at 43X, M14 bears a bright 3' inner core, a fairly bright 5' outer core, and a faint halo that fades outward to 8'. At 115X, many stars bead the halo and are netted in the haze at the core. The cluster is quite pretty at 213X. It's richly populated with very faint stars, while several brighter ones spangle its countenance. Paraphrased Sue French, *Deep-Sky Wonders*

Dr. James Dire: Observer From Hawaii



M14 is a beautiful mag. 7.6 globular star cluster in the constellation Ophiuchus. To find M14, find the point halfway between the stars Rasalhague (Alpha Ophiuchi) and Sabik (Eta Ophiuchi), both second mag. stars, and then move 2.5° east. With 21 globular clusters, Ophiuchus has more globular star clusters than any other constellation, except Sagittarius, which also has 21. M14 is the third brightest globular cluster in Ophiuchus after M10 and M12. All three are visible in binoculars.

M14 is approximately 30,000 light years away and around 100 light years in diameter. Its absolute brightness is the equivalent of 400,000 suns, but is thought to have only 150,000 stars.

In a 60mm (2.4-inch) refractor, the cluster appeared as a faint, round glow. It's difficult to resolve stars in that instrument, similar to what Charles Messier saw in 1764 when he cataloged the unresolved cluster. In my 7.5-inch Mak-Newt at 111X, the cluster resolved into countless stars. The view in my image herein approximates the splendor of the cluster I saw in my 14-inch f/6 Dob.

My image of M14 was taken through a 10-inch f/6 Newtonian with a coma corrector using an SBIG ST-2000XCM CCD camera. The exposure was 40 minutes. This 1/2°-wide cluster barely fits into the field of view of the CCD camera. The image shows clearly how the density of stars drops off exponentially with distance from the center of the cluster.

Gus Johnson: Observer from Maryland

In August, 1982, I observed M14 with an 8-inch reflector @116X. It had a mostly round shape, and I was able to resolve a few stars. It was much dimmer than globulars M10 and M12. I could also see it with my 8X50 finder. It was easy with a 60mm (2.4-inch) refractor at 21X, appearing only as a faint glow. It had a wide, uneven double in the same field of view toward the SW in that scope as well.

Joseph Rothchild: Observer from Massachusetts

I had hoped to observe M14 at Stellafane, but was clouded out the one night I was there. I then observed it on July 25, 2017 with a 10-inch reflector in hazy suburban skies in Newton, Mass. At 42X, the cluster was faint, but I found it easily. I couldn't resolve it and it looked like a faint cotton ball. At 82X, it was more clearly defined. It was much less visible than the nearby globulars M10 and M12, also in Ophiuchus.

On July 30, 2017, I observed it in Newton again with a 6-inch reflector. At 28X, it was at the limit of visibility, but similar in overall appearance to the view in the 10-inch. M14 was again more visible with higher contrast at higher power (54X).

Jay and Liz Thompson: LVAS member and observer from Nevada

We visually observed M14 with three telescopes from our backyard in Henderson, NV. It was just visible through a 60mm (2.4-inch) f/5.8 refractor at 28X. At lower powers, such as 10X and 13X, it tended to blend in with the background skyglow, though once located at 28X, it could just be detected at the lower powers. At 28X, M14 was an unresolved soft glow. It was noticeably fainter than M10 and M12.

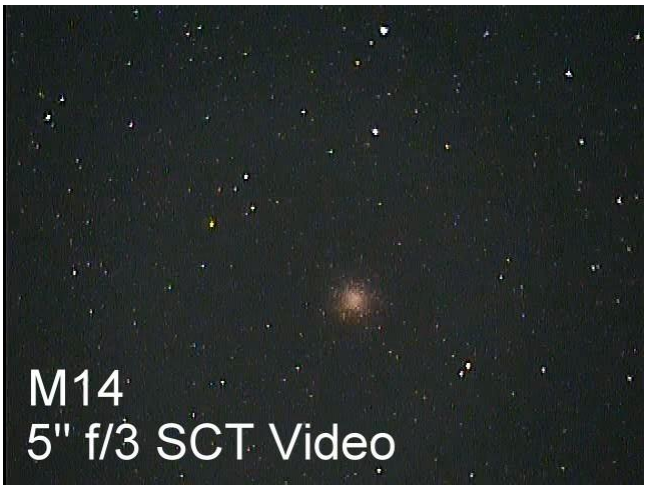
We then looked at M14 through a 90mm (3-inch) f/13.8 Maksutov, which gathers more than double the light of the 60mm (2.4-inch) refractor. With averted vision, M14 was slightly resolved at 101X. It appeared as a milky glow with hints of very dim stars when using averted vision.

For our final observation that night from our backyard, we unleashed a 16-inch f/10 SCT on it. At 102X, it showed up as a hazy glow that we could resolve with averted vision. At 156X, it was slightly easier to resolve. At 203X, we could resolve it even with direct vision. At 271X, two faint stars to the south that are aligned roughly north and south just outside the core became more evident. At 406X, the two stars to the south were still fairly evident. With averted vision and with direct vision, we could resolve the main part of the cluster. The best view was at 271X, followed closely by the view at 203X.

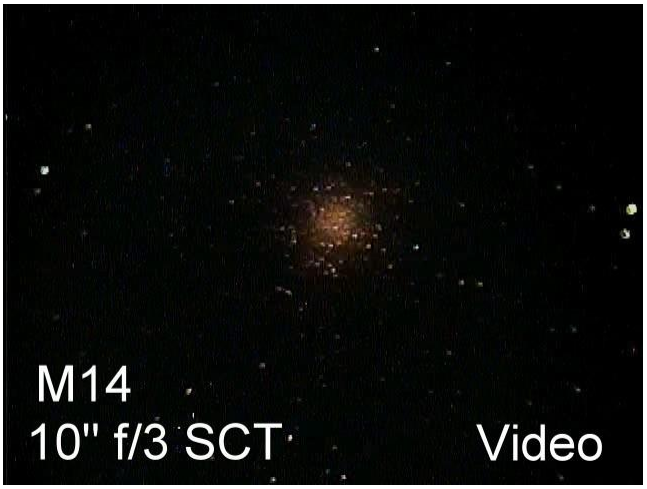
M14 was a real treat under dark desert skies with larger telescopes. With the 17-inch under the dark skies of Meadview, AZ, it was noticeably fainter than M10 and M12, but still nice and resolved at 125X, and awesome at 227X.

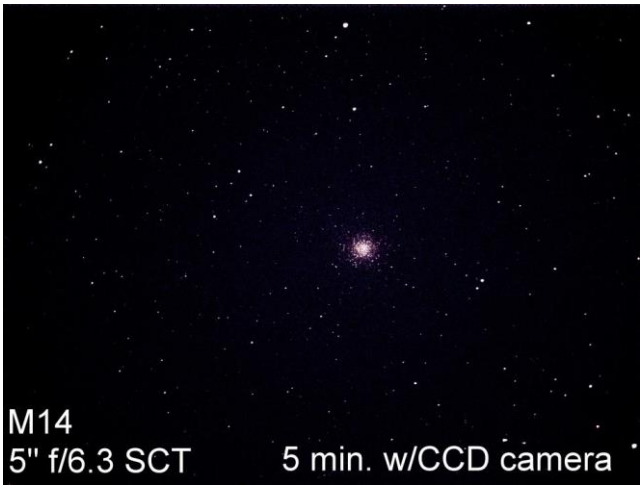
We viewed the cluster from Cathedral Gorge, Ash Meadows, and Meadview with the LVAS 24-inch. It appeared as a nice large globular cluster. At 116X, we resolved the cluster into a fine mist of stars. At 277X, it took up about a third of the field of view and we resolved it easily with direct vision into thousands of stars. M14 has uniformly fainter stars than M10 and M12.

We recently tried out a friend's entry-level astronomical video camera and used M14 as one of the comparison objects. Screen grabs from the video camera representing about 30 seconds of exposure time each are shown below. For comparison, images obtained with a one-shot color CCD camera are included. Minimal processing was done on the video images and represent a range of telescopes, focal lengths, and experience. For the CCD images, dark frames were subtracted and some adjustments of the backgrounds were done, as well as reducing the sizes by 25% or so to get the file sizes down for emailing. Compared to the eyeball, these cameras give a gain in sensitivity of at least a couple of mags. (with a lot less eyestrain when using the small scopes under non-ideal skies).




M14
4" f/5 SCT
Video

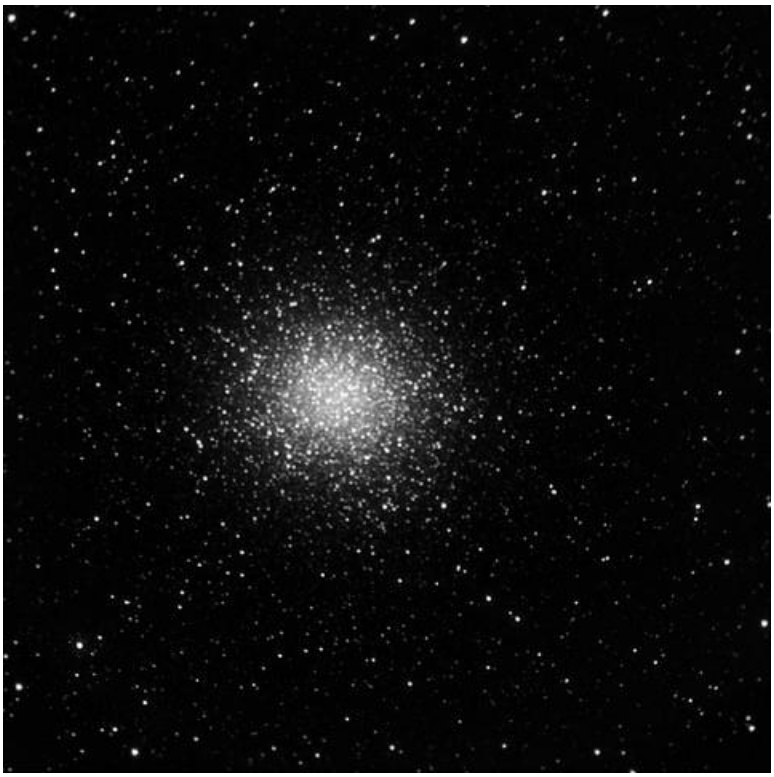

M14
10" f/3 SCT
Video


M14
5" f/6.3 SCT
5 min. w/CCD camera


M14
14" f/5.5 SCT
5 min w/CCD camera

Mario Motta: Observer from Massachusetts

Done with a 32-inch reflector.



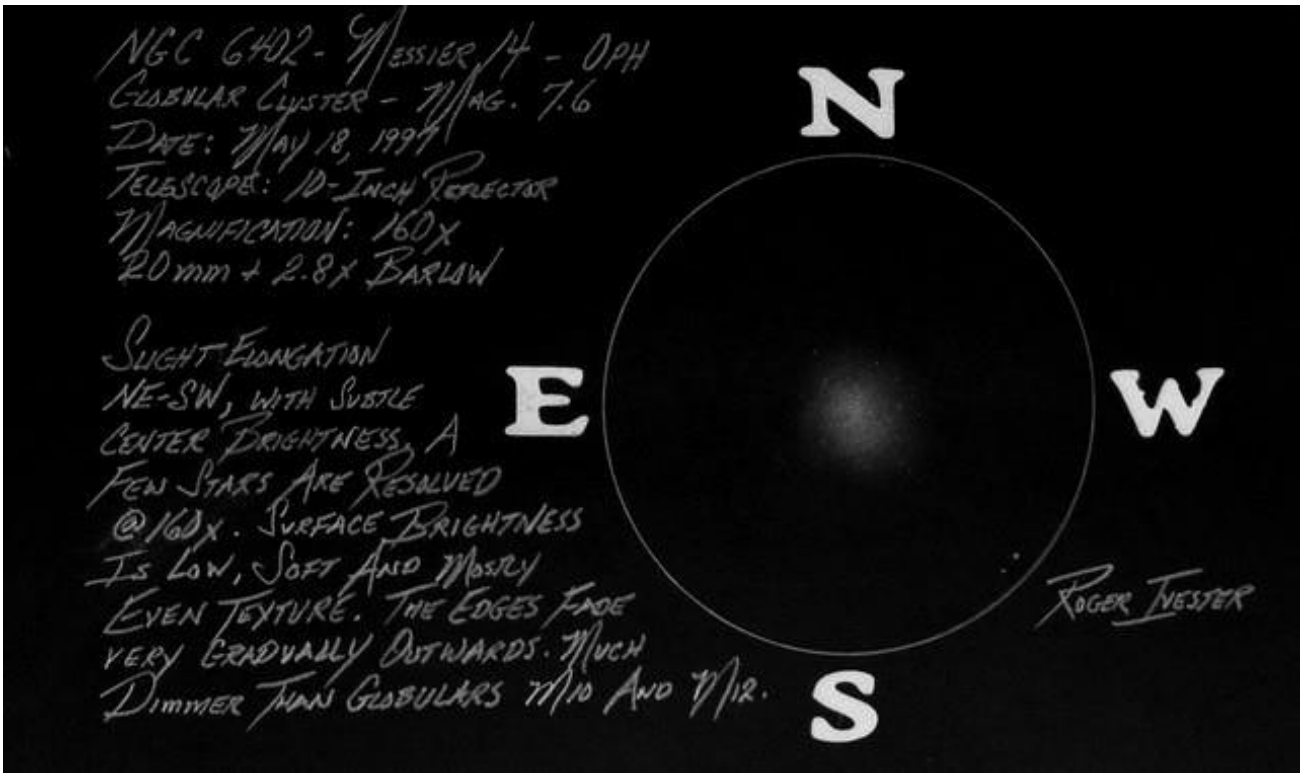
Roger Ivester: LVAS Observer from North Carolina

In a 10-inch reflector, M14 was a large cluster, mostly round, but with a slight elongation, oriented northeast-southwest.

At 160X, I could resolve very few stars, but only with averted vision. The surface brightness was overall fairly low with a mostly even texture, but with a subtle brightening in the central region. The edges faded very gradually outward.

M14, at mag. 7.6, is quite a bit fainter than globulars M10 and M12, also located in Ophiuchus.

In a 3.5-inch Maksutov-Cassegrain, the cluster was mostly round, with a faint, brighter concentrated middle. I couldn't resolve any stars.


NGC 6402 - Messier 14 - Oph
Globular Cluster - Mag. 7.6
Date: May 18, 1994
Telescope: 10-Inch Reflector
Magnification: 160x
20mm + 2.8x Barlow
Slight Elongation
NE-SW, with Subtle
Center Brightness, A
Few Stars Are Resolved
@160x. Surface Brightness
Is Low, Soft And Mostly
Even Texture. The Edges Fade
Very Gradually Outwards. Much
Dimmer Than Globulars M10 And M12.
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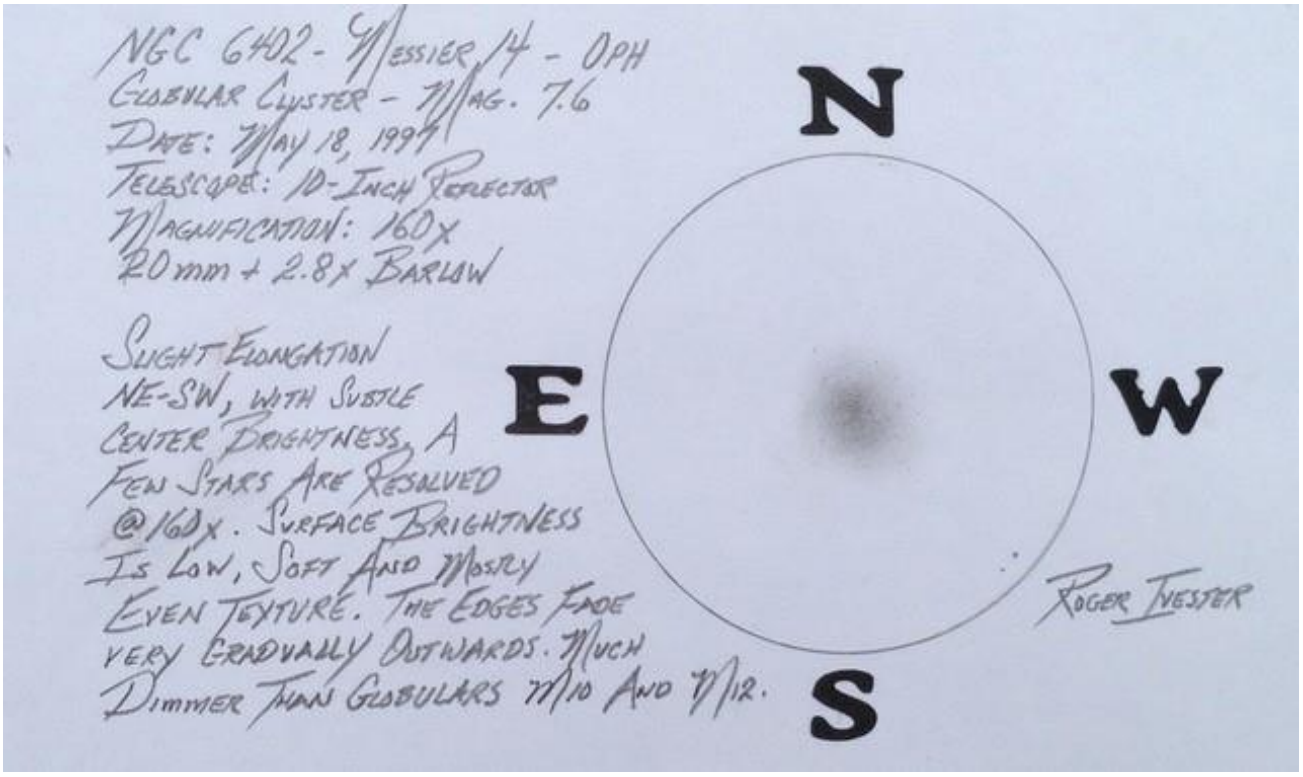
Roger Ivester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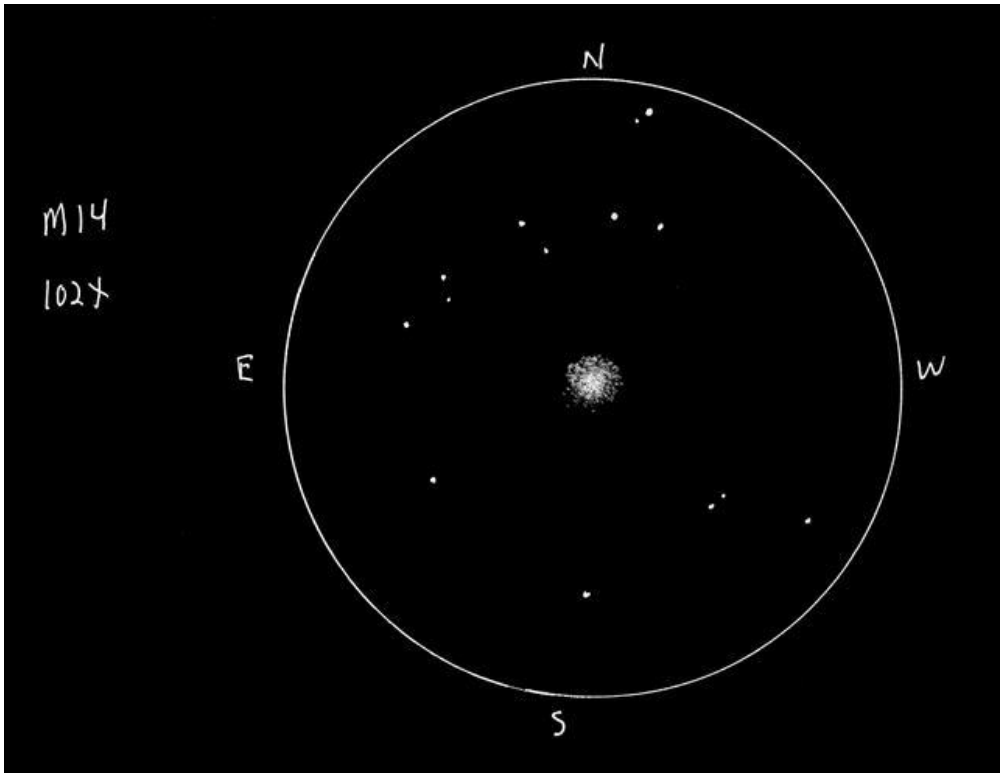
Fred Rayworth: LVAS AL Coordinator and Observer from Nevada

I've viewed this dense globular multiple times, but the most recent one, and the observation I used for the Challenge was on May 20, 2017 from Cathedral Gorge State Park in East-Central Nevada. At 4,800 feet, the weather was not near as good as the previous evening. It was warmer and calm, with occasional air movement. Puffy clouds moved through like the night before and I was hopeful they'd stay away. Unfortunately, though conditions were similar to the night before at first, by 11PM, the clouds moved in in waves and never left. I packed up for the evening instead of chasing holes. In the morning, I woke up to basically overcast skies, so it was a good call to not wait it out the night before.

Even low in the muck, M14 looked impressive at 102X with my 16-inch f/4.5 Dob. It sort of looked like M13, but without the spider arms. It was very intense and concentrated. I could make out a few individual stars, though I can imagine if it were higher in the sky, I could've seen even more. I didn't detect any particular color, maybe due to the altitude in the sky, which was just above the horizon. Overall, it had a grainy appearance, more milky at the center, but occasionally resolving into individual stars, especially at the edges. I never saw the "halo" others have mentioned. That might be because my scope is larger and it probably blended in with the background.


M14
102X
N
E
W
S