MONTHLY OBSERVER'S CHALLENGE

Las Vegas Astronomical Society

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&

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JULY 2018

M4 (NGC-6121) Globular Cluster in Scorpius

"Sharing Observations and Bringing Amateur Astronomers Together"

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.

M4 (NGC-6121) Globular Cluster in Scorpius

M4, also known as NGC-6121, is a loose globular cluster in Scorpius discovered by Philippe Loys de Chéseaux in 1745. It was then catalogued by Charles Messier in 1764 as another one of his non-comets.

It's about 75 light-years across and 7,200 light-years distant. It shines at an apparent mag. 5.9, or thereabouts, but that mag. can be deceiving as it's often quite hard to pick up initially, especially from northern latitudes where it's often buried in the muck. On the other hand, it makes a fine binocular fuzz ball and displays quite well in even small telescopes as a distinct fuzzball, once the skies darken and the atmosphere is clear.

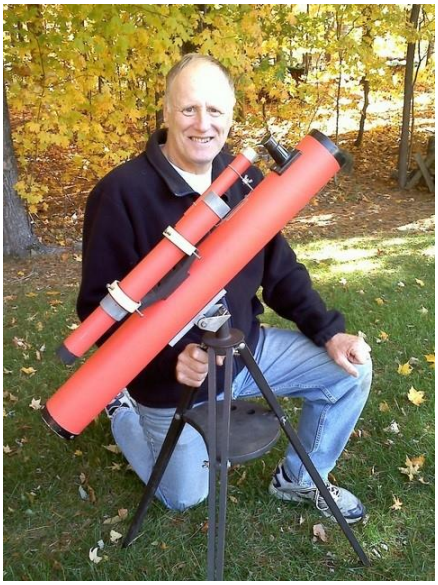
It's one of the closest globulars in the sky, along with NGC-6397, and is loosely put assembled by globular standards. Because of this, there are several patterns visible, especially in smaller telescopes, including a bar structure that stands out in moderate sized telescopes. However, this feature is often washed out in larger scopes due to their better resolution of more

background stars within the cluster. The cluster is known to be the home of many white dwarf stars and is quite old.

In even modest telescopes, stars can be resolved quite easily.

Observations/Drawings/Photos

Glenn Chaple: Observer from Massachusetts



I first viewed M4 from Columbus, Georgia, on May 26, 1971, using a 3-inch f/10 reflector and 30X. I used the same set-up to view the globular clusters Omega Centauri, M13, M3, M92, and M80 that night. It was a great opportunity to make comparisons. I found M4 to be large, dim, and unresolved. On July 25, 1998, I re-observed M4 from the Stellafane campground, this time with a 4-inch RFT (rich-field telescope) at 74X, and a 4.5-inch f/8 reflector at 152X. With the RFT, M4 seemed large and odd-shaped (my notes: "doesn't seem 'globular'"), while I detected some resolution with the 4.5-inch. A month ago, I had the opportunity to view M4 with several telescopes at the Amateur Telescope Makers of Boston clubhouse. I resolved it well with an 8-inch reflector, and was surprisingly sparse — visually underwhelming when compared to globulars like M3 and M13. The bisecting N-S row of stars was obvious and striking. At the most recent Stellafane Convention, M4 was one of 20 deep-sky objects on their binocular challenge list. Being close to Antares, M4 was one of the easiest targets and was visible in my 7X50s, even before the skies were completely dark.

Keith Caceres: Observer from Nevada

Messier 4 is a globular star cluster in the constellation Scorpius, just 1.3° west of Antares. At 7,200 light-years distant, it's thought to be one of closest globulars to Earth, and was the first to have its individual stars resolved in a telescope.

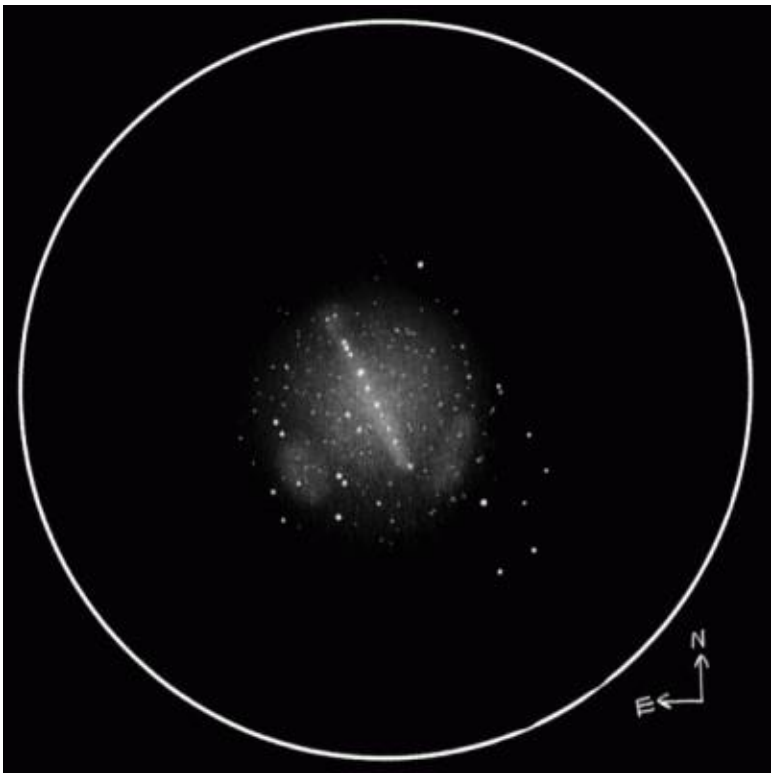
I imaged M4 at our monthly Astronomy in the Park event at Red Rock Canyon Visitor Center on August 4, 2018. Transparency was extremely poor that evening due to all the smoke and haze in the atmosphere from the wildfires raging in California. The photo was taken using an f/6 80mm APO refractor with a Canon 70D DSLR camera. Exposure was set to 60 seconds at ISO 3,200. Despite this fairly deep exposure, and there being no moon, the visibility of the cluster was fairly diminished by the smoke particulates in the sky.

The original image had a reddish, washed-out background hue due to light pollution and smoke. Plate solving indicates the original is 2.68 X 1.78° at a pixel scale of 1.76 arc-sec/pixel. The included image is a crop of the center containing M4, with the histogram stretched to make the background black. Despite the poor sky conditions, the central north/south bar of stars that this globular is known for is still visible, as well as various other knots and chains of stars. The cluster is about 36 arc-minutes in diameter, corresponding to an actual width of about 140 light-years, given its distance.

Jaakko Saloranta: Observer from Finland

Even from Southern Finland, Messier 4 rises only roughly 3° above the horizon, and mostly only during nautical twilight. I've seen it only a few times from Finland. Once, with 3-1 night vision binoculars from the coast of the Gulf of Finland, and second time with a pair of 15X70 binoculars from a top of a building. Both times, the task was far from easy.

From Southern Europe, M4 is easy to spot, even with the smallest of binoculars. Seeing it with the naked eye can be somewhat difficult, at least due to interference from the brilliant star Antares. My sketch represents the view of M4 using a 3-inch travelling scope with medium aperture. The notable features include the central "bar," several brightenings within the halo, and a fairly well resolved surface.


N
E

Chris Elledge: Observer from Massachusetts

On June 11, 2018, @11:00pm EDT, I used a 10-inch f/5 reflector and a 102mm f/7 refractor to observe M4 from the ATMoB Clubhouse in Westford, MA. Sky conditions were: Bortle Scale 6. NELM: 5.0 overhead. NELM: 4.0 near M4. Transparency: Good. Seeing: Good.

M4 is trivial to locate since it sits a little more than 1° from Antares. Just point the telescope at Antares, move Antares to the east side of the view, and M4 slides in.

At 36X in the reflector (35mm, 1.9° FOV), both M4 and Antares can share the same view with Antares directly to the east of M4. There was a chain of mag. 11 to 9 stars heading north from the cluster. Two mag. 8 stars were located to the E and SE (HD147955 & HD147743). There was another group of mag. 10 and 11 stars arcing from the S to SW. M4 itself was slightly washed out in the light pollution in the Southern sky, but it was still easily viewable. There was some visible speckling of the stars resolving in the cluster.

At 51X in the reflector (25mm, 1.4° FOV), there were a few resolved stars around the less dense perimeter of the cluster. The dense core itself seemed slightly elongated in the SE to NW direction.

At 270X in the reflector (4.7mm, 0.3° FOV), many stars in the cluster resolved. There was a chain of 7 stars resolved in the center, running from N to S. There was a lane of darkness directly to the E of these stars and running parallel to them, which made them stand out even further. There were two other brighter resolved stars to the SE of the core that were also parallel to this line of stars.

At 152X in the refractor (4.7mm, 0.5° FOV), the N to S lanes were still visible, but were much less noticeable. Very few stars resolved with this aperture. At lower powers, the cluster was just a round fuzzy.

Richard Nugent: Observer from Massachusetts

Living on the east coast of the U.S. makes nearly every deep sky object a challenge. During the summer months, hazy, hot, and humid conditions that extend into the nighttime hours make observing somewhat uncomfortable. The mosquitoes seem to love it, and feast upon us relentlessly. Add the effects of light pollution and it's a wonder anyone here ever develops an interest in amateur astronomy! However, we do, and we make the best of things!

From Massachusetts, M4 culminates with an altitude of only about 20°. At this altitude, an observer is peering through about 3 air masses of atmosphere. We look through only 1 air mass when we observe at the zenith. Depending on sky conditions, there's a significant loss of light due to atmospheric extinction and scattering. Tony Flanders and Phillip Creed published a nice piece on this on *Sky & Telescope* Magazine's web site:

https://www.skyandtelescope.com/astronomy-resources/transparency-and-atmospheric-extinction/

When I look back on my earliest observing notes (from 1970), I note M4 only twice. Once to report finding it using my 8-inch reflector ("Very nice.") and again to note that "…cluster appears as a diffuse glow. No stars resolved." Observing it only twice suggests I wasn't impressed by it. Perhaps this was because of the effects described above.

Last month, I used a variety of instruments to observe the cluster. Reports suggest that, from a dark sky, the cluster can be glimpsed with the naked eye, but I have never seen it that way. I have, in the past, seen it through 7X50 binoculars, but during July, I could not see any trace of the cluster in my 80mm (3-inch) finder scope. Fortunately, it lies just a bit over 1° west of Antares, making it easy to locate.

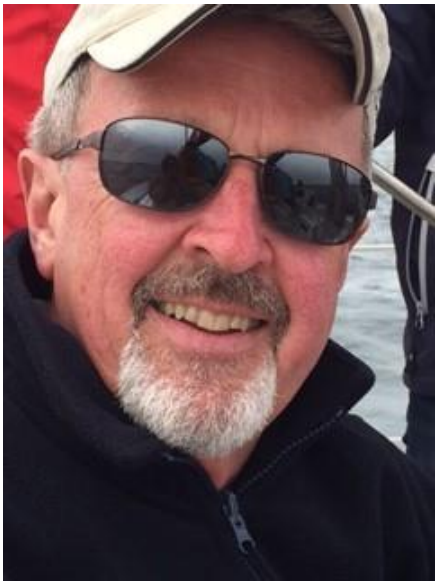
Using my 60mm (2.4-inch) refractor, with magnifications ranging from 28X to 128X, the cluster appeared as a diffuse glow, barely standing out against the light pollution. I could resolve no stars and noticed no brightening of the center (from the bar of stars).

From the Amateur Telescope Makers of Boston's observing site, using Phil Rounseville's superb 6-inch Maksutov-Newtonian scope, the cluster was beautifully resolved into a wide splash of stars. The individual stars that made up the central bar were clearly visible. Using Steve Clougherty's 18-inch scope, there were several hundred stars across the eyepiece field of view. It was an exceptional view! I didn't see any of the red color reported by Herschel. The club's 25-inch scope cannot be pointed low enough to observe this cluster.

Using my own 20-inch scope, the views were amazing! Again, no star color was visible, but the stars were too numerous to count or sketch! Despite the murky, grayish background, the cluster was quite impressive.

I've been exploring the use of a bino-viewer with my 10-inch scope. The views through this scope are delightful. Using both eyes truly enhances the observing experience. I'll talk more about this in a future report! The eyepiece pairs I own provide magnifications of 52X, 67X, 84X, 112X, 240X, and 350X. At 52X, the central bar was an unsolved feature, clearly standing out against the diffuse glow of the cluster. The most pleasing view of the cluster came at 112X (using 15mm eyepieces – providing a 0.6° true field of view with a 3.2mm exit pupil). While the cluster remained a diffuse glow, the central bar sparkled with several stars. Very pretty!

John Bishop: Observer from Massachusetts



I managed to get out last night, although conditions were not ideal to observe M4.

On August 9, 2018, I observed M4 from the ATMoB Clubhouse in Westford, Massachusetts. I used an 8.25-inch reflector at 48X, 100X, 133X, and 192X. I did not use any filters.

The sky was clear. Transparency and seeing were fair, at best. There was noticeable moisture in the air and on my equipment. The atmosphere was turbulent, producing "boiling" images of Jupiter and Mars. To compound matters, M4 was located relatively low in the southern sky, which has noticeable glow from artificial light at the horizon. Contrast at the eyepiece was only fair.

I located M4 easily enough. At 48X, it was a distinct round glow, somewhat washed out in the haze and skyglow. At that low power, the shape was more like that of a conventional globular cluster than at higher powers. I saw no detail or structure, and I could not resolve any stars.

At 100X and 133X, I saw some detail and structure. However, the object no longer appeared as a sphere. Instead, it was more irregularly shaped and spread out. There were dark areas or lanes that added to the irregularity. There was a line of brighter stars running through the center of the cluster, which seemed almost to resolve, unlike the rest of the cluster. In fact, these brighter stars were so conspicuous that I questioned whether they were actually part of the cluster, or were foreground objects. These brighter stars also tended to draw the eye's attention, and make the cluster look long, rather than round. I found that I could get a better sense of the structure of the whole cluster by looking away from the string of bright stars. Still, there was

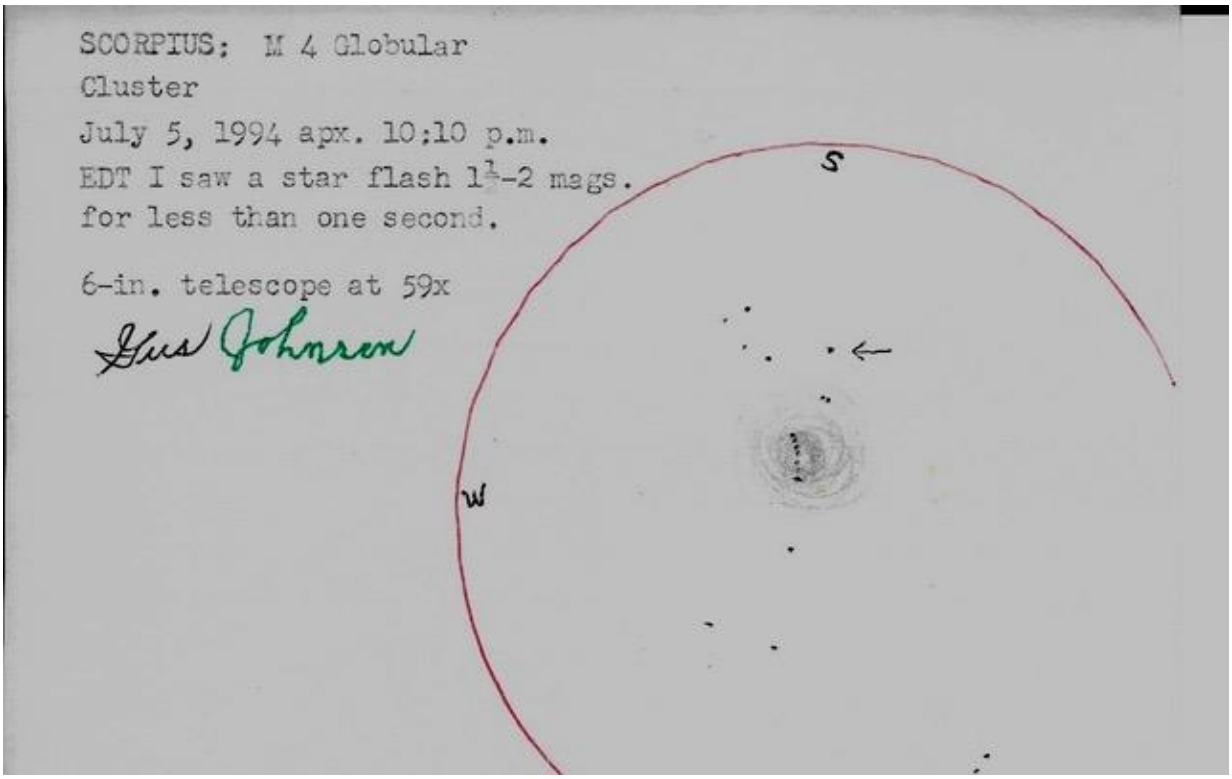
little resolution of individual stars, such as seen in conventional showpiece globulars like M13 (which I observed for comparison).

Moving to 192X didn't produce a pleasing image. The added magnification mainly seemed to amplify the atmospheric turbulence, producing an unsteady image.

Gus Johnson: Observer from Maryland

In May, 1967, I used a 6-inch reflector to view M4. It showed a N-S line of stars in the central region, and resolved many cluster members.

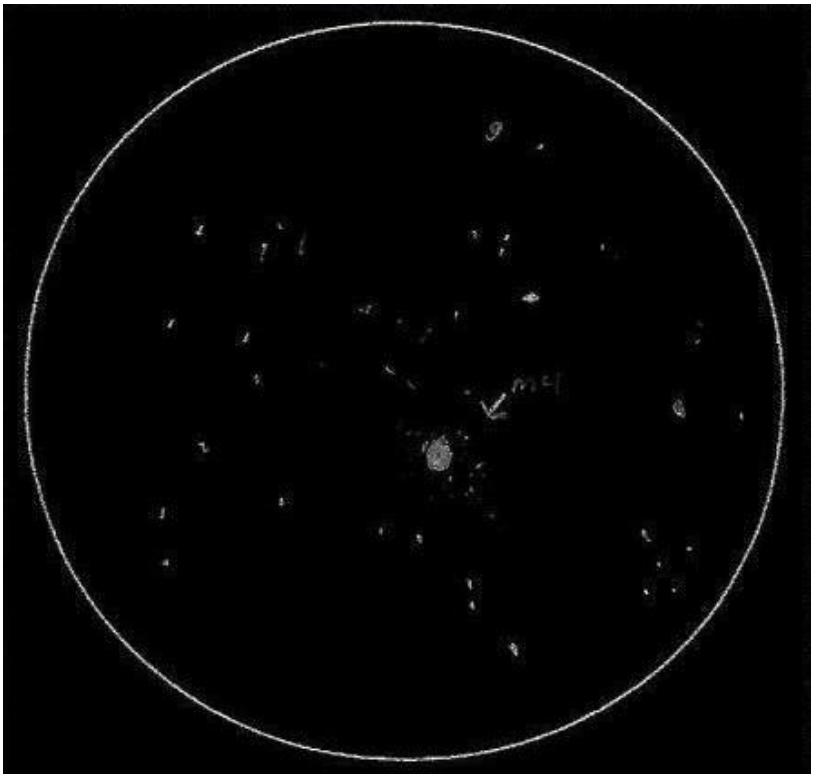
In May, 1983, I used an 8-inch reflector. I saw the N-S chain of stars, and it was an excellent view, resolving the cluster @ 94X.



Francisco Silva: Observer from Nevada

I observed M4 on July 28, 2018 from Caliente, NV using an 8-inch reflector @37.5X. The transparency was 4 out of 5 and seeing was 1 out of 5.

This cluster was not difficult to find using the bright star Antares as a guide. I could see the core and distinguish individual stars in the outermost areas. One of the reasons I like this cluster is because it's very likely that it is one of the closest to earth at only 7,200 light-years away.


M4

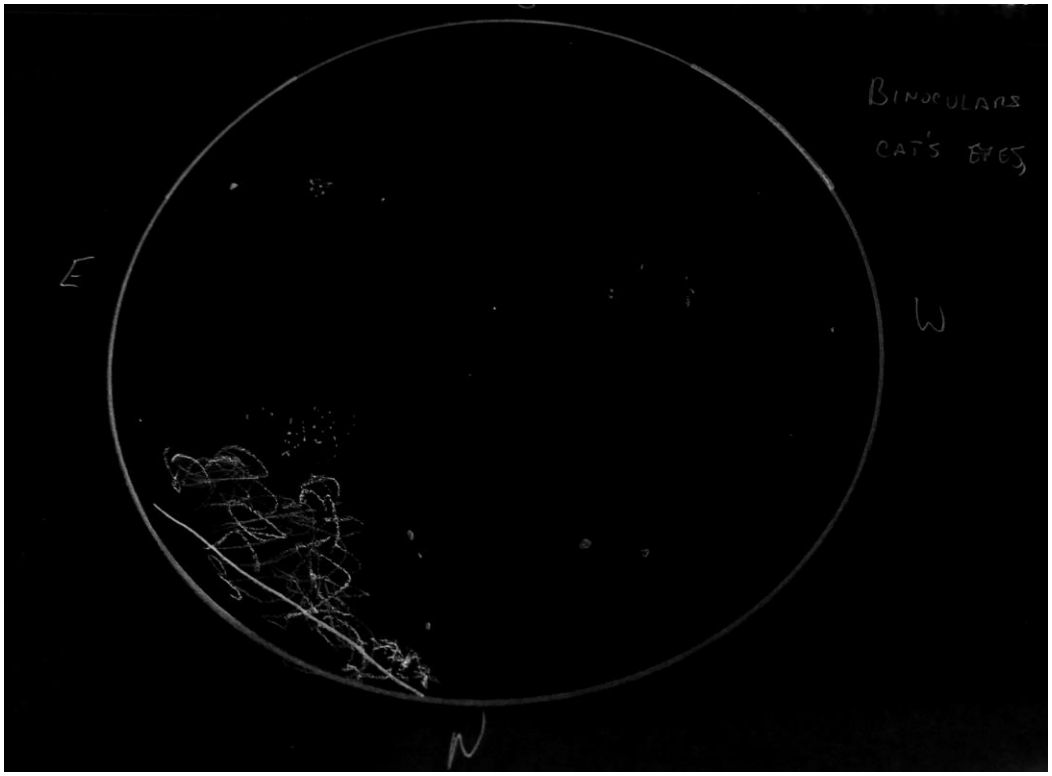
Ed Fraini: Observer from Texas

Changing your magnification will reveal many different aspects of many of the objects we observe. This certainly applies to globular clusters. The observation of M4 took place on July 13, 2018 under the best conditions we've had in a long time. A defocused star disk was sharp, and long arc diffraction rings evident. I obtained the object easily at 113X and it appeared as a distinctive smudge in the field of view. With each increase in power, more stars resolved, and when increasing the magnification to 213X, I could see the loose nature of the core. Several clear star patterns became apparent and the core had an "A" form. I noted many yellow stars which seemed easier to resolve.

My estimate of classification for this globular would be 8, possibly higher. M4 is a favorite, and an excellent object to point out the different nature of globular clusters.

Craig Sandler: Observer from Massachusetts

This is my first binocular sketch of M4! I REALLY enjoyed doing it. Could be a lot better, I know, but I love it. The Butterfly Cluster, Ptolemy Cluster, and the Cat's Eyes cluster's are included. SUCH a good moment.



Joseph Rothchild: Observer from Massachusetts

I was finally able to observe M4 under dark skies in Cape Cod. The transparency was fair. I observed with 10X50 binoculars, an 80mm (3-inch) refractor and 10-inch reflector. In the binoculars and refractor at 22X, the cluster appeared uniform and round. In the 10-inch, however, the cluster was irregular with a line of 5-6 brighter stars in the midline. I saw it best at 178X, but it also looked good at 46X. The view was most pleasing at 89X, with numerous individual stars showing across the cluster. I've observed this object numerous times in the past, but never tried the higher powers.

Mike McCabe: Observer from Massachusetts

The LVAS Observer's Challenge object for July, 2018 was the classic summer globular cluster, Messier 4. Located in Scorpius, M4 rides pretty low in our northern hemisphere sky. In fact, from where I am at 42° N latitude, it barely cracks 21° above the horizon at the meridian. Otherwise, it's always lower. It's also difficult to observe from my yard, due to a row of tall trees that I have along the southern perimeter, so I have to back up into what I refer to as the 'streetlight zone'. Observing low southern objects, such as M4, can be very difficult from Massachusetts.

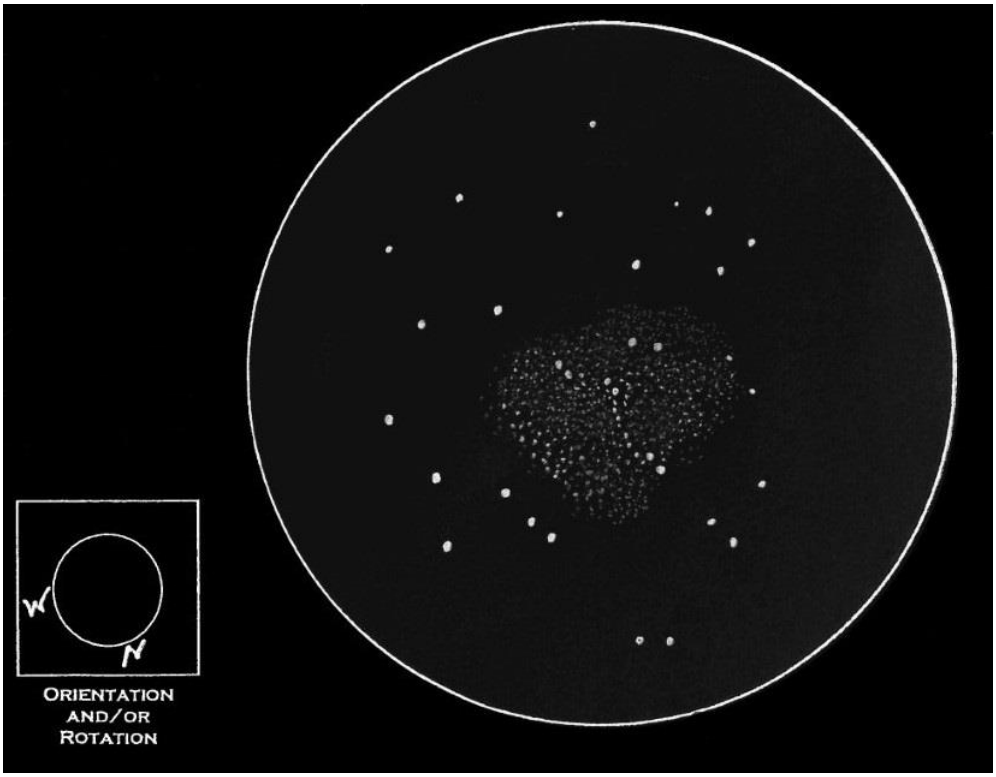
On the evening that I sat down to observe M4 for my challenge sketch, the skies were clear of outright clouds but the transparency was poor, and the southerly declination didn't enhance the seeing any. I know M4 is a spectacular object, but I've yet to experience that 'wow' moment that I'm sure it can induce under good conditions. There's one definite good thing about it though. At just over 1° WSW of Antares, it's really easy to find.

I was kind of hoping to make a sketch of M4 and Antares in the same FOV, and I had the setup to do it – barely. Using a 10-inch f/5 reflector and a 30mm/82° eyepiece, I was able to get both objects framed, but they were in the outer ranges of the FOV, and there was some discernible coma in that area, so it wasn't entirely pretty. I could've used another scope with smaller aperture and shorter focal length to get a better wide field, but then I couldn't see the globular that well. So, I took the opposite approach and used high magnification to darken the sky some and bring out the stars in the glob. It was the first time I really did this with M4, and it was interesting.

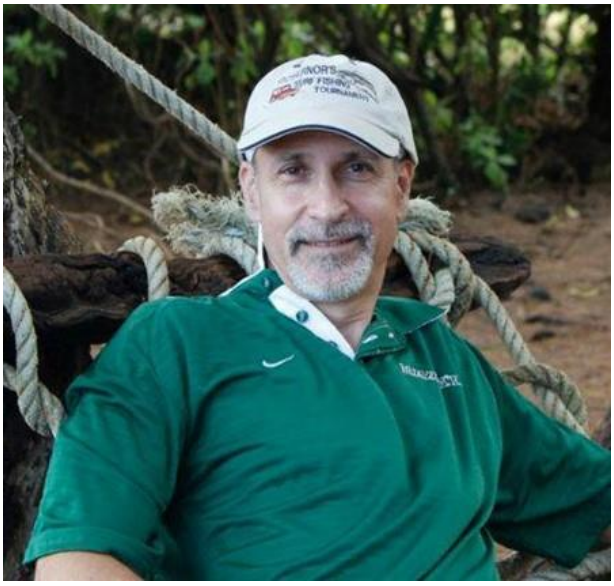
I found M4 to be a difficult object to sketch. There were several brighter stars dotting the FOV, and a line of them coursed right through the middle of the cluster, but otherwise it was a non-spherical haze of semi-resolved and unresolved stars. It was difficult to render the haze in

an accurate manner. The resolution of the stars in the eyepiece kept coming and going, and it seemed like every time I went from eyepiece to paper and back to the eyepiece again the view had subtly changed. My globular rendition skills need practice.

However, they won't get it on M4. I'll practice on higher targets first, then someday when I'm traveling in a location much south of here, I'll go back there with a pencil again. In the meantime I'll just enjoy the occasional low-power view of Antares and M4 in the eyepiece together on a clear, dark night. That's a view that's hard to replicate anywhere else in our sky.



Dr. James Dire: Observer from Hawaii



M4 is a mag. 5.9 globular star cluster in the constellation Scorpius. The cluster is 35 arcminutes in diameter and lies 7,200 light years away. It's the easiest globular cluster to find since it lies 1.25° west of the bright star Antares. A wide field telescopes can capture both M4 and Antares in the same eyepiece. There's another globular cluster, NGC-6144, 2/3° northwest of Antares that can be seen in the same field of view. However, NGC-6144 is three mags. fainter than M4, and is more difficult to see that close to Antares.

The Swiss astronomer and mathematician Philippe Loys de Chéseaux discovered M4 in 1746. Charles Messier was the first to resolve the cluster in 1764. M4 was the only globular cluster Messier ever resolved into stars! It's one of the nearest globular clusters to Earth. The cluster is 75 light-years in diameter.

M4 is a loosely populated globular cluster with a luminosity of 44,000 suns. The cluster is thought to be 12.8 billion years old, one of the oldest known. The age was determined by estimating the age of its oldest white dwarf stars, which are thought to be the oldest white dwarf stars in the Milky Way.

I have viewed M4 in every size telescope from three inches to twenty inches in diameter. In the smaller scopes, it's a faint fuzzy patch, barely resolved into stars. In my 14-inch Dob, the cluster is magnificently resolved into countless stars.

I imaged M4 using a 102mm (4 -inch) f/7.9 apochromatic refractor and an SBIG ST-2000XCM CCD camera. The exposure was 30 minutes. The field of view on the image is about 50 arcminutes from left to right.

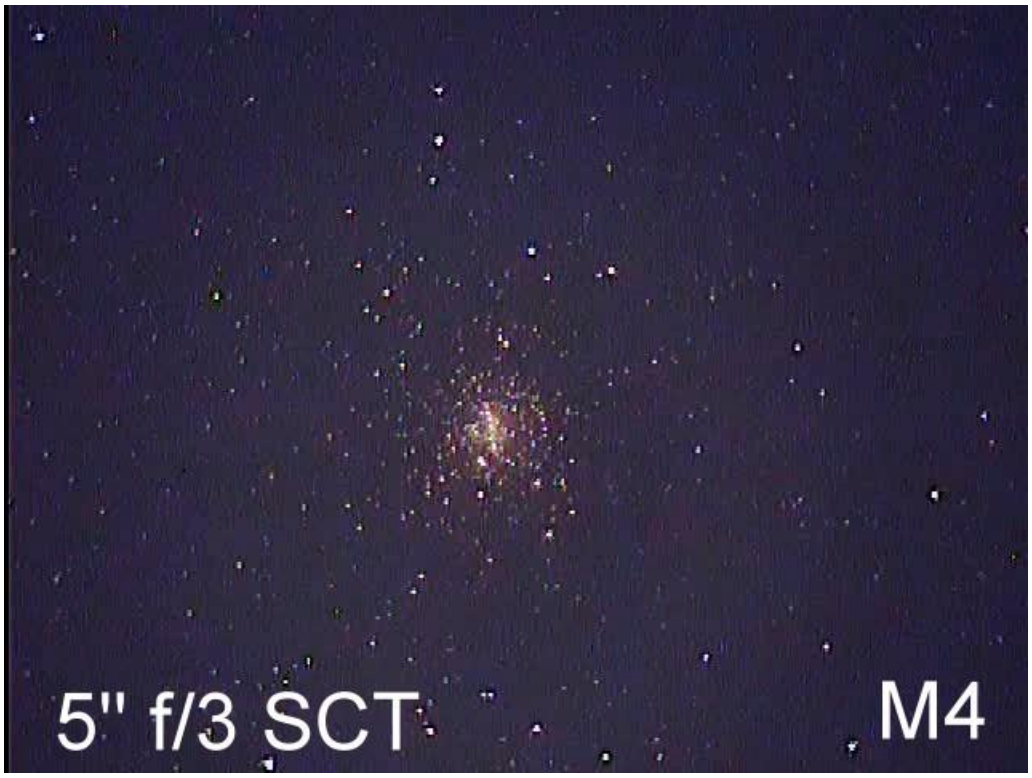
Jay and Liz Thompson: LVAS members and observers from Nevada

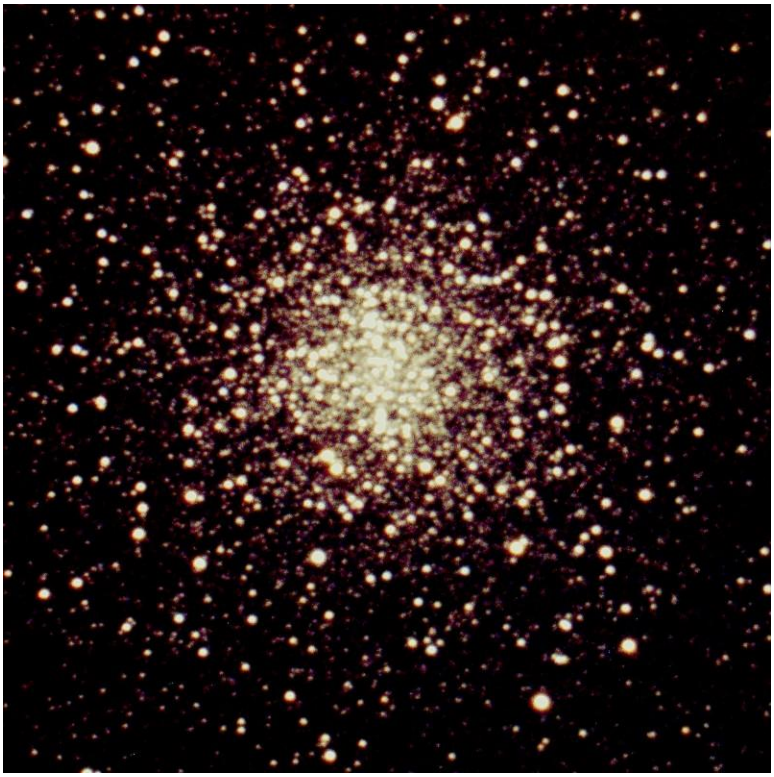
Through a 24-inch at Meadview, AZ, M4 was big, relatively sparse, and loose. At 119X, we noticed a brighter core with averted vision, subtly increasing in intensity near the center. At 283X, it took up the whole field of view. The background glow of the core was evident, with streams of brighter stars superimposed in front of the glow.

The view through a 16-inch SCT from our backyard was respectable at 203X, resolving the cluster well and taking up most of the field of view.

M4 is bright and easy to find, so it has been a frequent subject of imaging and a useful test subject when comparing detectors and telescopes. The first image was taken with a DSLR through a 210mm f/4 telephoto lens and shows M4 west of Antares. The next image was

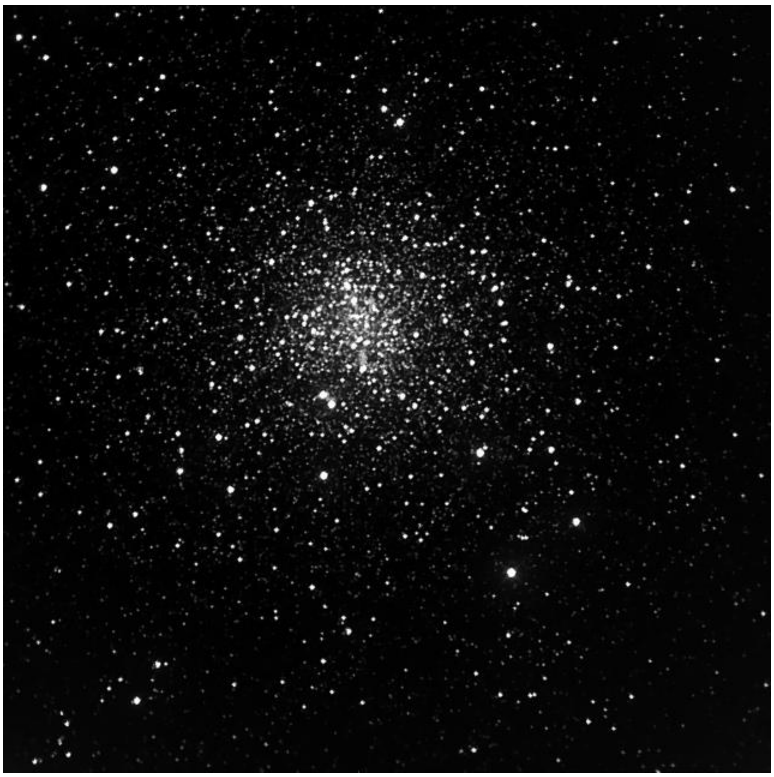
through a 5-inch SCT working at f/3, coupled to an entry-level video camera. The third image was taken with a color CCD camera through a 14-inch f/5.4 SCT. All images were taken from our backyard in Henderson, NV.


5" f/3 SCT
M4



Mario Motta: Observer from Massachusetts

This is an old image. I don't recall all the details, but likely 30 minutes from 5 min subs with my SBIG STL 1001E camera, through my 32-inch F/6 scope.



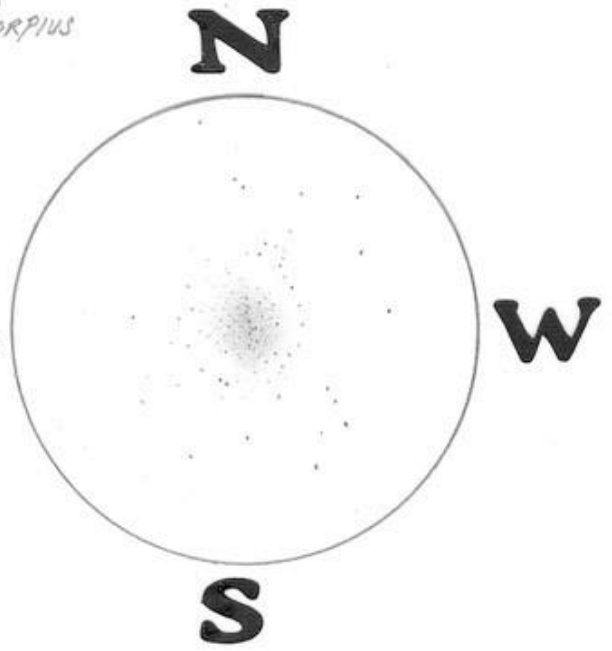
Roger Ivester: LVAS Observer from North Carolina

Globular cluster, M4 is easy to see with a 60mm (2.4-inch) refractor, appearing as a faint circular glow at low magnification. When using a 3.5-inch Maksutov-Cassegrain at 78X, I was able to resolve some of the brighter members. The cluster had a subtle, elongated shape, with a faint chain of stars in the central region, oriented N-S. With a 102mm (4-inch) refractor, I could resolve a greater number of stars within the cluster, and see a much greater concentration of stars, elongated and with more stars in the central chain. A fairly bright double star was located on the SE edge.

My 10-inch reflector at 140X, did an excellent job resolving the cluster. The center chain of stars was very bright, and I counted many stars, both in the central region and around the outer edges. A chain of stars made an arc, the entire length of the cluster, on the NW side. The elongated shape became much more apparent with the larger aperture.

Messier 4 - Globular Cluster - Scorpius
Date: July 9, 2018
NELM: 4.8
Telescope: 102 mm Refractor
Magnification: 140x

Irregular Shape, Subtle N-S Elongation. Chain of Stars In The Central Region. A Chain of Stars Envelope The Cluster of The N-W Side, Extending The Length of The Cluster. A Prominent Double Star on The S-E Edge.



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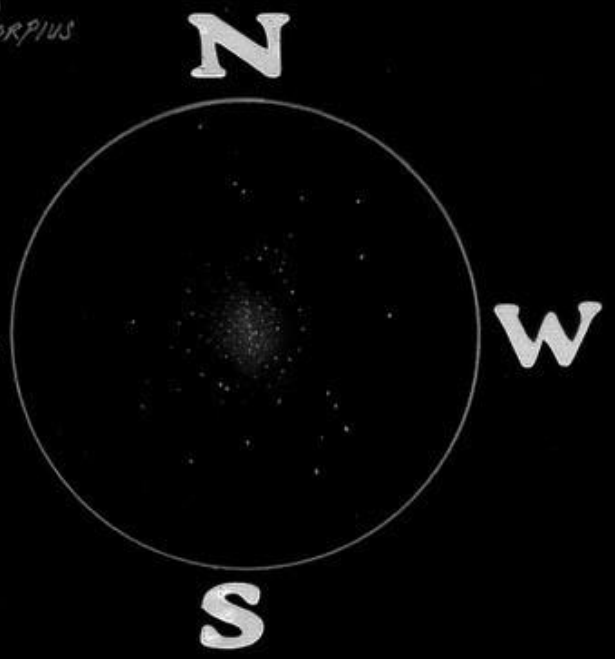

Fred Rayworth: LVAS AL Coordinator and Observer from Nevada

I've literally observed M4 hundreds of times over the decades and have bothered to record those observations 45 times in my database.

For the Challenge, I did an observation on Jun 6, 2018 from the "undisclosed location" at Lake Mead, Nevada and one last night (as I'm writing this) on August 4, 2018 from Red Rocks Visitor Center west of Las Vegas. I'll start first with the undisclosed location observation.

On June 6, 2018 at 2,100 feet, it started mostly clear, with a few clouds hovering on the western horizon. It was warm, with gusty breezes that were gradually calming down, but never really went away. The winds were actually calmer when we first set up, but got gradually worse as the night progressed. It would be dead calm for a few minutes, then gusty and annoying the next. I could've lived with that, except the sky gradually closed in from the west, first in patches, but then in masse, when it became almost completely opaque. I chased holes for about an hour of real observing and gave up. It was basically a bust except for a few cool objects.

As for my description, it wasn't much at first. With the scope bobbing and weaving, I had to give it a lot of patience. When it finally settled down, the cluster was rich and grainy, a lot better than on most nights. In fact, it was so rich, most of the details blended in. I barely saw the bar through the middle, but saw plenty of odd patterns mixed in with reddish-yellow stars. I'm not sure how much of the color was the actual stars or just how high or low it was on the horizon. However, it did seen high enough and clear enough, especially considering I hardly ever see it so rich. It still doesn't compare to M22 or M13 or M5, but at least tonight, it looked more like a globular than just a dense open cluster, which is the way I usually see it. I added what details I could to the sketch below.

At 3,790 feet, Red Rocks visitor center is not ideal, despite the apparent altitude. Nestled in the foothills next to Las Vegas, it gets all the skyglow from the city and little darkness. Not only that, but on this evening, the sky was filled with an orange haze from the nearby California fires. Though mostly up north, that didn't seem to stop the smoke from drifting south and engulfing the Las Vegas Valley. On the one hand, the smoke made a great filter for gazing at planets Venus, Jupiter, Saturn and Mars. However, for deep sky objects like our Challenge object, which was already at a disadvantage with the inherent light pollution, the smoke just made it much worse. While I was using a 16-inch scope, it made the image look like what one would expect to see through a 3-inch aperture.

The advantage of this apparent hindrance was that I was able to see the distinct line of stars through the middle of the cluster that's normally blended in when the skies are darker. Up at my dark sky locations, I usually see a lot more background stars, which are much brighter and thus, these patterns seen in smaller scopes blend in. This night, I saw a line of stars crossing up and down through the cluster. I've only seen hints of that when sky conditions were not so good (not as bad as this), or rightly so, actually noticed it!

It took a lot of strain and averted vision to pick out the grainy haze of the rest of the cluster this night.

The drawing is a composite of both nights at 102X.