MONTHLY OBSERVER'S CHALLENGE

Las Vegas Astronomical Society

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&

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AUGUST 2013

NGC-6791 Open Cluster In Lyra

Introduction

The purpose of the observer's challenge is to encourage the pursuit of visual observing. It is open to everyone that is interested, and if you are able to contribute notes, drawings, or photographs, we will be happy to include them in our monthly summary. Observing is not only a pleasure, but an art. With the main focus of amateur astronomy on astrophotography, many times people tend to forget how it was in the days before cameras, clock drives, and GOTO. Astronomy depended on what was seen through the eyepiece. Not only did it satisfy an innate curiosity, but it allowed the first astronomers 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 is the tradition we are stressing in the observers challenge. By combining our visual observations with our drawings, and sometimes, astrophotography (from those with the equipment and talent to do so), we get a unique understanding of what it is like to look through an eyepiece, and to see what is really there. The hope is that you will read through these notes and become inspired to take more time at the eyepiece studying each object, and looking for those subtle details that you might never have noticed before. Each new discovery increases one's appreciation of the skies above us. It is our firm belief that careful observing can improve your visual acuity to a much higher level that just might allow you to add inches to your telescope. Please consider this at your next observing session, as you can learn to make details jump out. It is also a thrill to point out details a new observer wouldn't even know to look for in that very faint galaxy, star cluster, nebula, or planet.

NGC-6791 Open Cluster In Lyra

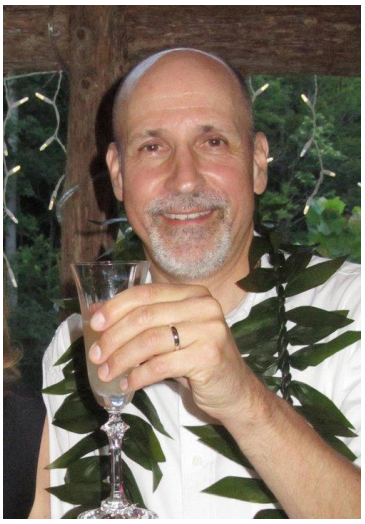
NGC-6791 really puts the *challenge* in the Observer's Challenge. It's one of the more difficult open clusters to observe. In fact, it was obscure enough to be left out of the first editions of the NGC-2000 catalog.

Discovered by Frederich August Theodor Winnecke in 1853, it's roughly eight billion years old. A very metal-rich cluster with a high concentration of iron and hydrogen, the cluster contains stars that are four, six and eight billion years old which has led to plenty of controversy. This makes it one of the most studied star clusters in the sky.

NGC-6791 shines at a moderate mag. 9.5, but the low surface brightness makes that number a lot less depending on actual seeing conditions. The cluster tends to sneak up on the observer, and requires dark and transparent skies to spot. Small scopes are as likely to see it as large ones if conditions are right, but if not, even large scopes can miss it. Good luck!

Observations/Drawings/Photos

James Dire: Observer from Hawaii



NGC-6791 is the only open star cluster of note in the constellation Lyra. The cluster is mag. 9.5 and is around 10 arcminutes in diameter. It is thought to contain 300 stars mag. 13 and fainter. I observed the cluster in my 14 inch, f/6, Dobsonian at 82X, and it appeared very similar to the accompanying image.

NGC-6791 can be found 1° southeast of the mag. 4 yellow star Theta Lyrae, which itself is 7 3/4° east and slightly south of Vega. Don't confuse Theta Lyra with mag. 4 Eta Lyrae, a blue star that lies 1.2° northwest of Theta. While observing, I recommend looking at both Theta and Eta to compare their colors.

My image of NGC-6791 was taken July 3, 2013 from the Kauai Community College Barking Sands Observatory on Kauai using a 102mm (4-inch) f/6.3 apochromatic refractor. The exposure was 40 minutes. The brightest star in the image is mag. 6.25 SAO68129, located at the bottom right hand corner of the image. This is a very white star of spectral type A0. The next brightest star is mag. 6.6 SOA68225, a K0 orange, which can be used to judge the diameter of the star cluster visually and on my image. The faintest stars in this image are dimmer than mag. 18!

The bright red star just to the upper right of the cluster is a pulsating variable red giant star whose mag. varies from 8.3 to 13.5 every 452 days. At the time of this exposure, the star was near maximum brightness.

Sue French: Observer from New York

On June 27, 1997, at 12:10 AM EDT, I used a 10-inch f/6 Newtonian with a 9 mm eyepiece. Seeing was fair and transparency was good.

This neat open cluster was trying to hide in a rich star field. It was a very rich group of extremely faint stars about 15' across. The group was brighter in the middle, glowing with the light of many unresolved stars. Many faint points of light, stars just visible to the scope, were peppered across the entire cluster.

On June 28, 1997, at 11:00 PM EDT, I used a 14.5-inch f/6 Newtonian with a 24 mm eyepiece. Seeing was poor and transparency was good.

Very rich cluster of very faint stars. About 15' across with concentration increasing markedly toward the center. Hiding behind a rich field of brighter foreground stars.

On July 30, 1997 at 10:05 PM EDT, I used a 4.1-inch f/6 apochromatic refractor with a 9mm eyepiece. Seeing was fair and transparency was excellent (faintest naked eye mag. = 6.3).

Ten faint to very faint stars (probably foreground) scattered across a dim hazy patch 12' across.

On October 1, 2010 at 9:30 PM EDT, I used a 130mm apochromatic refractor with a 22mm eyepiece. Seeing and transparency were good.

Very pretty. An arc of three stars ran through the NE part of the cluster and several faint to extremely faint stars sparkled across the haze.

Jaakko Saloranta: Observer from Finland

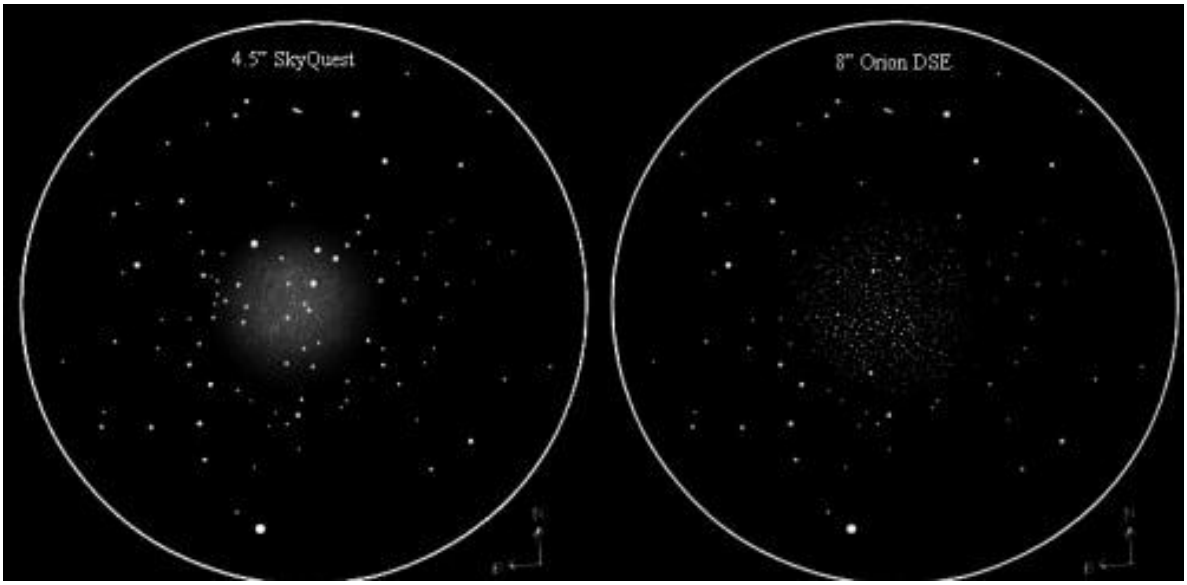
NGC-6791 one of the biggest clusters in our galaxy, as well as one of the oldest known. The cluster is 7-8 billion years old! Our readers get a better perspective when you compare this to some of the showpiece open clusters in the fall sky. The Pleiades, (M-45) is roughly 70 million years old and nearby Melotte 20 (the Hyades) is older at about 625 million years. However, they're nowhere near the age of NGC-6791. It is nearly old enough to beat young globular clusters such as M-71 in Sagitta, estimated to be 8-9 billion years old.

The cluster was found by Friedrich Winnecke using only a 3-inch telescope in 1853. The brightest individual stars in the group shine at the respectable mag. of 15, and it contains over 380 stars according to the 2003 book *Star Clusters*, by Brent Archinal & Steven Hynes. A new paper published in 2011 (Platais et al), counted a staggering 4,800 cluster members down to mag. 22 within 15'. The brightest individual member is listed roughly at mag. 14.5 in the same paper.

A huge number of extremely faint anonymous galaxies can be seen in deep photographs taken of NGC-6791. The brightest of these galaxies are Anon 192007+375112.8 and Anon 192033+375401.9 on the NW side of the cluster. The very faint galaxy E of the cluster is known as DSH J1921.5+3745, after Deep Sky Hunters. I noted this faint galaxy several years ago and it was added to the DSH-database and later published. As with the galaxies, several faint wisps of galactic cirrus swirl surround our cluster. Brightest of these is an arc-like reflection nebula Saloranta GN J1921.3+3743 and it's located just 7' away from the center of the cluster. Two other concentrations of nebulosity are at 19 22 38 +37 39 53 and the one surrounding the star TYC 3134-975-1.

Despite my best efforts to see the object with a larger pair of binoculars (15 X 70), I've never been able to do so. With a 3-inch refractor, the view is quite typical for an unresolved cluster: a soft, round glow without detail. Under dark skies and with slightly more aperture, I described the cluster as follows with a 4.5-inch Newtoniant: "A ghostly haze visible @ 76X in a rich Milky Way star field. A multitude of extremely faint stars flickered in the background haze with extreme averted vision. Several mag. 13 and 14 stars resolved across the face. No central concentration. Size 4'." With an 8-inch Dobsonian, I called the view "staggering" with "tens and hundreds of golden yellow individual stars glimmering within the cluster's glow. The big, older brother of NGC-7789."

The sketch on the left represents the view of NGC-6791 using a 4.5-inch Newtonian @ 203X. The sketch on the right shows an old, quick and crude impression of the cluster using an 8-inch Dobsonian @ 200X simply pasted over the newer sketch in Photoshop to demonstrate the difference.



Gus Johnson: Observer from Maryland

In December, 1984, I used a 5-inch f/4.8 reflector at 48X. On that very cold winter night, this cluster appeared very faint with several bright foreground stars. No resolution of the much fainter members, but only a subtle brightening. This is a very dim object.

In September, 1990 using my 8-inch reflector at 58X, the cluster presented a faint glow with some brighter stars in front of the cluster. I'm not sure if these stars are members of the cluster or not. When increasing the magnification to 87X, many of the faint stars began to glisten like tiny diamonds.

Glenn Chaple: Observer from Massachusetts

On September 5, 2013, I observed NGC-6791 from Townsend, MA using a 4.5-inch f/7.9 reflector with a magnification of 56X (also used a 10-inch later). Seeing on the Antoniadi scale was IV and the limiting magnitude was 5.5.

I saw a "ghostly presence" when viewed with the 4.5-inch. No resolution. Surprisingly difficult even in a 10-inch. Just a sprinkle of faint stars (about mag. 13) seen. See the drawing from my log below.

OBSERVING LOG

(please print)

OBSERVER: Glenn Chaple **EXPERIENCE** (circle one): B I (A)

DATE (M/D/Y): 9 / 5 / 2013 **TIME:** start 10 : 00pm end: 10 : 23pm Time Zone EDT

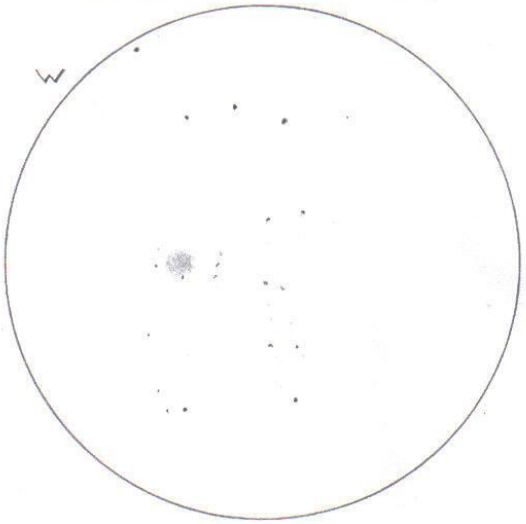
LOCATION: Townsend MA

city/town | state/province | country

SKY CONDITIONS: **SEEING** (Antoniadi Scale) IV **LIMITING MAGNITUDE** 5.5

OBJECT: NGC 6791 **TYPE:** OC **CONSTELLATION:** Lyr

SKETCH (note direction of west)



NOTES:

A ghostly "presence" when viewed with 4.5-inch. No resolution. Surprisingly difficult even in 10-inch. Just a sprinkle of faint stars (~mag 13) seen.

OBSERVING EQUIPMENT

Binoculars

Size: ____ X ____

Telescope

Telescope Type: 4.5-inch f/7.9 reflector

Eyepiece Type: 16 mm Nagler

Magnification: ____ X Field Diameter: ____ °

Filter (if any): none

Jay Thompson: Observer from Nevada

On the nights of June 7-8, 2013, I observed from Meadview, NV with a17.5-inch f/4.5 Newtonian.

With the 16mm (125X), NGC-6791 appeared as a faint condensation of the Milky Way background. Size was approximately that of NGC-5466 (Challenge object for June 2013). Fewer stars were resolved in NGC-6791 than in NGC-5466 when viewing with an 8.8mm eyepiece (227X).

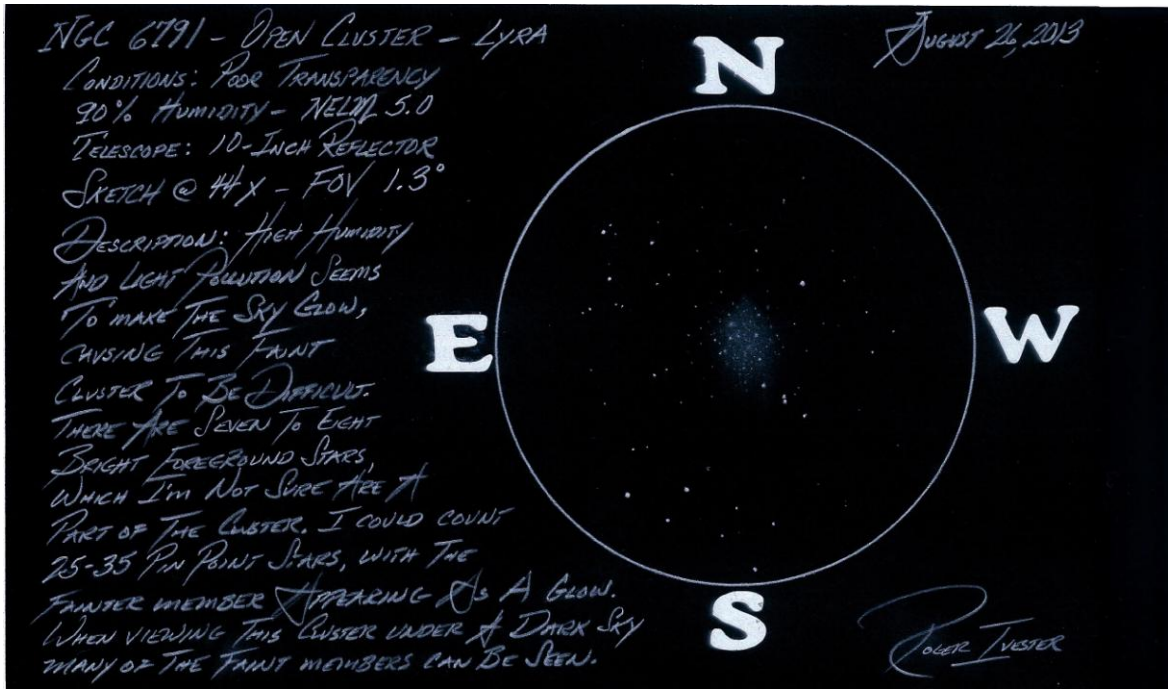
Roger Ivester: Observer from North Carolina

On August 26, 2013, at 11:00 PM EDT, I observed NGC-6791 from the foothills of North Carolina. The Naked Eye Limiting Magnitude (NELM) was 5.0, the temperature in the 60's, humidity 90%. Seeing and transparency were fair. I used a 10-inch f/4.5 Newtonian at a magnification of 44X with a field of view of 1.3º.

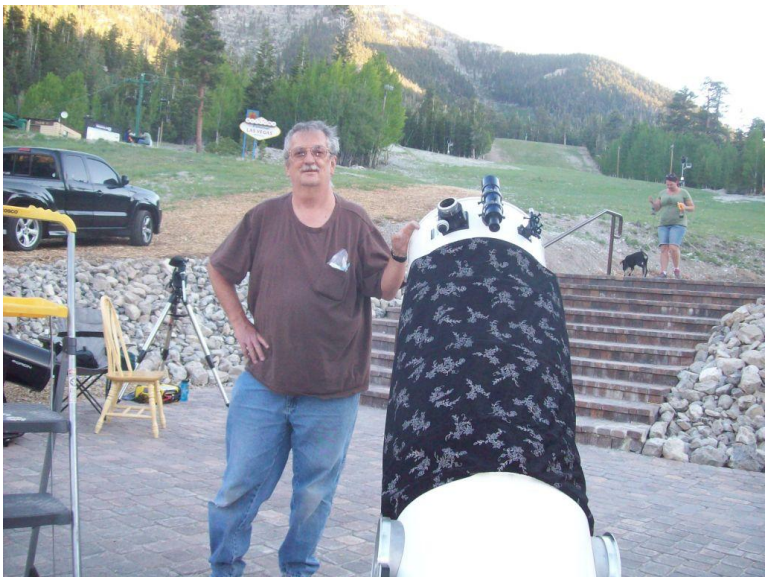
The cluster was a faint and difficult object from my moderately light-polluted backyard. I first became interested in it over twenty years ago, after reading *1000 + The Amateur Astronomer's Field Guide To Deep-Sky Observing* by Tomm Lorenzin. His description read: "11M; 20' diameter; large faint and rich; a glorious sprinkle of over three hundred stars! <1º ESE of 4.5M Theta LYR." I had also read other observing reports describing this cluster. I pointed my scope, using a magnification of 57X, looking carefully, but couldn't see anything. I increased the magnification to 114X, but still no luck. Conditions were fair, but the North Carolina haze during this time of the year can make observing pretty difficult. I changed back to the lower magnification and carefully started my search again, and then I spotted a very faint haze, which required a bit of field motion to confirm (field motion is tapping the telescope tube ever so slightly which causes a faint deep-sky object to stand out a bit more). I was excited to have seen this elusive cluster, but couldn't resolve any of the stars. However, I did note some brighter stars superimposed over the cluster.

Almost twenty one years later, to the day, on the night of August 26, 2013, I was able to get a better look at this cluster. Using my 10-inch reflector with a magnification of 44X, I was able to see a faint haze, which I had seen twenty-one years earlier, but there was more. My description of NGC- 6791 is as follows:

A relatively faint glow with a somewhat elongated shape, oriented N-S. I could count about eight fairly bright foreground stars, but in the darkness behind them a sprinkling of maybe 35 very faint stars. I used averted vision, and the faint stars of the cluster seemed to sparkle. What a beautiful sight! The fainter stars seemed to be far in the distance behind what I perceived as foreground stars. The most noticeable feature was a chain of three brighter stars on the SW edge of the cluster. The middle star in the chain had a fainter companion, which made a total of four stars, but this additional star required at least 100X to see. I can now easily locate the cluster by looking for this small star chain. The following sketch was made using a blank 5 X 8 note card, and a No. 2 pencil. The colors were inverted using my scanner.



Fred Rayworth: Observer from Nevada



This sneaky little devil has given me a challenge for several years. I became interested in it when I spotted it on my Tirion one time and decided to try it. No dice. I tried again another time and the same thing.

I finally found it the first time on August 20, 2011 from the Lee Canyon Weather Station on Lee Canyon Road (State Rte. 156) near Las Vegas, Nevada. At an elevation of 6,500 feet, it was clear and calm, with just an occasional slight breeze gusting up, but it never became a problem all night. However, the sky was thick with dust and possibly smoke from an Arizona fire. It never really got completely dark. Could never find any mag. 13 galaxies though I thought I spotted a mag. 14.8 or just a hint of one, but I have my doubts. Not ideal, but still a decent night compared to the rest of the year, so far.

Wow! No wonder this thing didn't make the NGC-2000 catalogue. Extremely obscure open cluster. Would never find it in a sweep. Almost invisible without a careful look. The detailed chart and garnet star were the only keys to finding this thing. Just a haze in the background against a busy star field. Nothing to write home about.

The second time I found it was on September 3, 2011 from Corn Creek Station, just north of Las Vegas, Nevada. With an altitude of 2,814 feet, it was warm with a slight breeze that never became a problem. A lot of haze. Couldn't see Mt. Charleston clearly. Same as last two times we came to this site. Was cloudy all day and just cleared out. A front from California was moving in supposedly the next day. Moon was almost 1/2 phase. As the night progressed, sky brightened and it became obvious, even as the moon set, that the limiting magnitude was not going to be that great. Still, it could've been worse.

A dim haze behind a bright star field. Still nothing to write home about. I had to sweep to make sure I was on the right spot and definitely spotted it. Despite being in the Dobson hole, it was not very prominent. The transparency and bright background didn't help. I need a really dark sky to bring this one out. I had a witness look at it and verify that it was there so it wasn't just my imagination, but when I have to have someone else do that, it wasn't something that blew me away. The listed mag. 9.5 is not very accurate.

For this Challenge and drawing, I obtained another observation (also based on a lot more of what to expect!) on September 5, 2013 from Cathedral Gorge State Park, Nevada at an altitude of 4,800 feet. It was warm with dying winds but high bands of humidity moving over the area. Also, thunderstorms on the horizon, at least the clouds, but haven't seen any activity yet. An occasional gust comes up, just enough to be annoying. Not sure if I'll be able to see much tonight. As it turned out, I didn't see much. Though the sky darkened quite a bit toward midnight, I stayed at it from 10 through midnight and only found a dozen objects. I couldn't break the mag. 14 barrier at all. The transparency just wasn't there. That high humidity was still lingering up there. I gave up in frustration at 00:15 am.

As it turned out, I had my best observation of the cluster yet. It was straight up, in the Dobson hole, but it was worth it. I must've hit a clear hole in the humidity because the cluster just opened up for me as my notes show. Finally! It was right there! That orange, garnet star was just at the edge of the field and the cluster itself was a subtle glow against the black, velvety background. Looked more like a faint globular. Could barely resolve a few stars as grainy sand behind a few foreground stars. The mail sprinkling was framed by a trapezoid of four bright stars with a fifth one just to the edge. The right side pair almost formed a line with the fifth star. Note that the cardinal directions are probably way off. I was craning my neck with not only my green laser pointer, but my 50mm optical finder, trying to spot this thing, and I forgot to get proper directions so I probably, most assuredly got the directions wrong so disregard them in my drawing. However, the drawing is accurate as to what I saw in the eyepiece, regardless of what the directions are.

NGC-6791

102 X