MONTHLY OBSERVER'S CHALLENGE

Compiled by:

Roger Ivester, North Carolina

&

Sue French, New York

December 2022

Report #167

Iota Cassiopeia, Multiple Star

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 who's interested, and if you're able to contribute notes and/or drawings, we'll be happy to include them in our monthly summary. 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 astronomers 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 Observer's Challenge. And for folks with an interest in astrophotography, your digital 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.

This month's target:

Iota (ι) Cassiopeia offers us a lovely multiple star system whose A, B, and C components can be seen through most telescopes. The colors perceived differ according to the observer and sometimes the telescope used, which is not uncommon when it comes to multiple stars. Contrast illusions often play havoc with an observer's perception of color, especially with tightly grouped stars such as these. In his 1844 Bedford Catalogue, Admiral William Henry Smyth described the A, B, and C components as pale yellow, lilac, and fine blue, respectively. Swedish astronomer Nils Christoffer Dunér saw the C component as pink. Try detecting the hues of these stars for yourself using two tricks that can help you discern colors better. Slightly defocus the stars to give them a little dimension, and increase the apparent separation of the stars with high powers to lessen color-contrast effects.

If you missed this fetching triple, be sure to give a try. The images and sketches in this report will help you recognize the triplet more easily. At the start of 2023 the A and B are only 3.051 arcseconds apart, so good seeing conditions assist the hunt. You'll see the B component close southwest of its primary, while the much dimmer C component lies considerably farther from A toward the east-southeast.

Mircea Pteancu: Observer from Arad, Romania

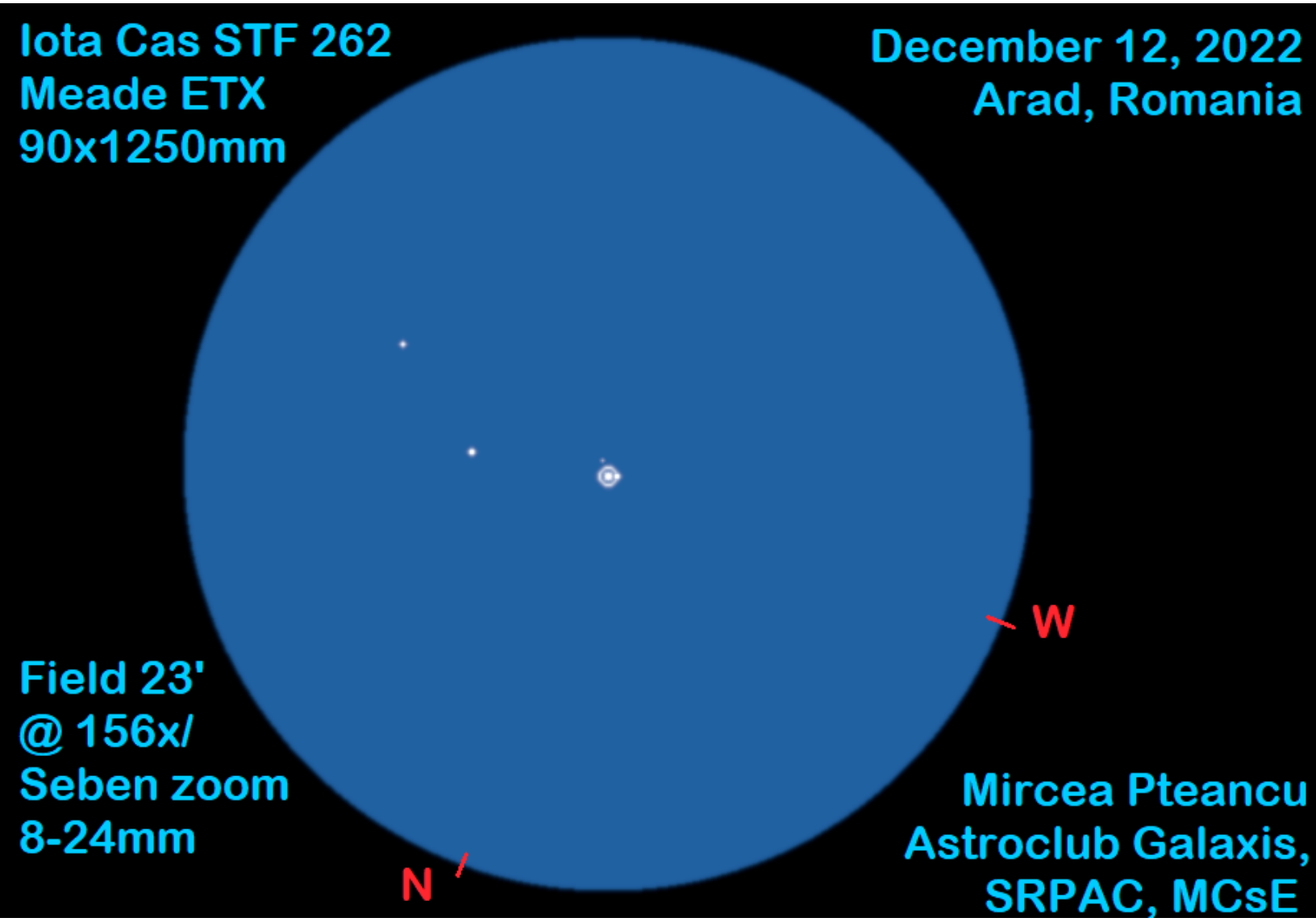
Mircea Pteancu of Arad, Romania
affiliated to Hungarian Astronomical Assoc., Romanian Society for Cultural Astronomy,
''Galaxis'' Astronomy Club, moderator on *astronomy.ro* forum.
https://observoergosum.blogspot.com/
https://www.astronomy.ro/forum

I looked for the triple star Iota Cas by using the distance of stars Delta Cas- Epsilon Cas as a gauge. Iota Cas is about one such distance from Epsilon Cas. It is located in a ''check mark'' asterism of stars, being the brightest of them.

I observed Iota Cas on December 12, in a pretty hazy sky. The telescope used was a Meade ETX 90mm F/13.9 Maksutov on my home-built ''Penelopa'' pipe-mount. The eyepiece used was a Seben 8-24mm zoom.

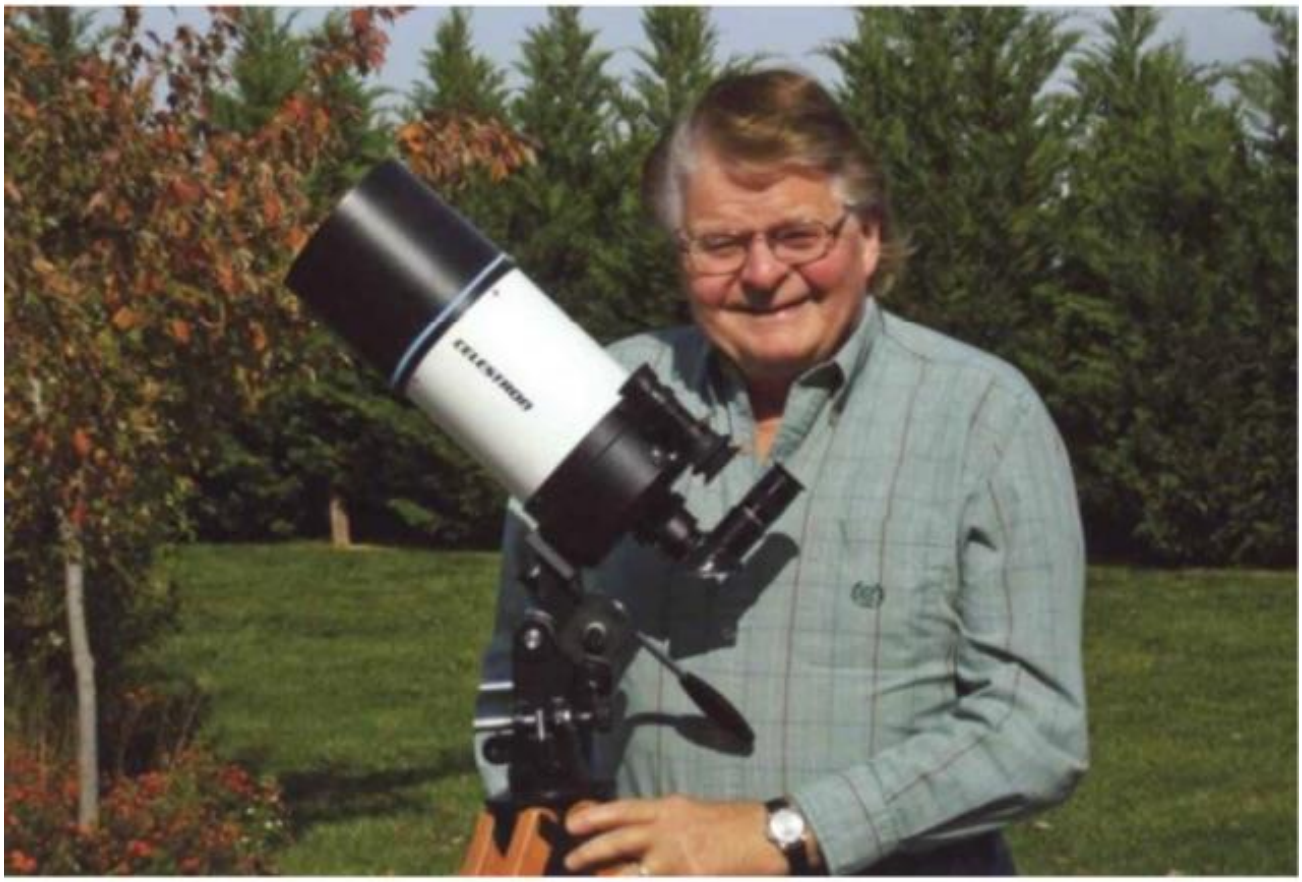
Star C was already discernable at 52×, at the lowest setting of 24mm of the zoom. Using 156×/ 8mm focus of the zoom eyepiece, five stars were visible in the eyepiece. The brightest was the primary star A of Iota Cas, followed by companion B, located on the first diffraction ring of the primary, at SW. Companion B was the second as brightness. Two field stars were visible to the East, both dimmer than AB. The dimmest star of the field was companion C, visible at E-SE, at twice the separation of AB.

Sketch Follows



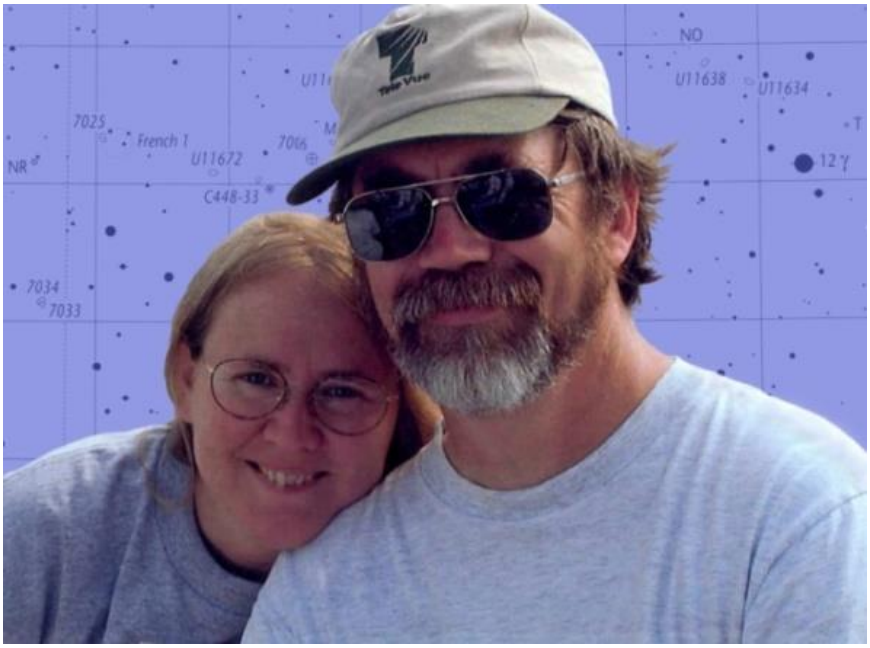
All the stars visible in the field were white. According to my logbook, my smallest telescopes able to resolve Iota Cas are the 60mm refractors. The first time I succeeded was on November 3, 2014 when I split Iota Cas with my 60×700mm Frankenscope at 93× obtained with an ‘’orange’’ 7.5mm Celestron Plössl eyepiece.

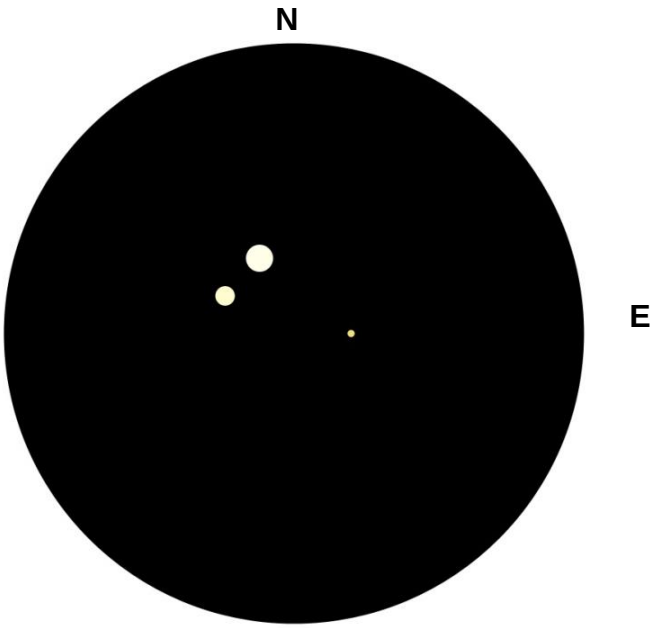
James Mullaney: Observer from Delaware



Iota CAS is a lovely triple star as seen in the Allegheny Observatory 13-inch refractor at 145× but can be a bit difficult in apertures under 6-inches. Definitely needs good seeing to appreciate its beauty. Yellowish-white primary and bluish-white companions.

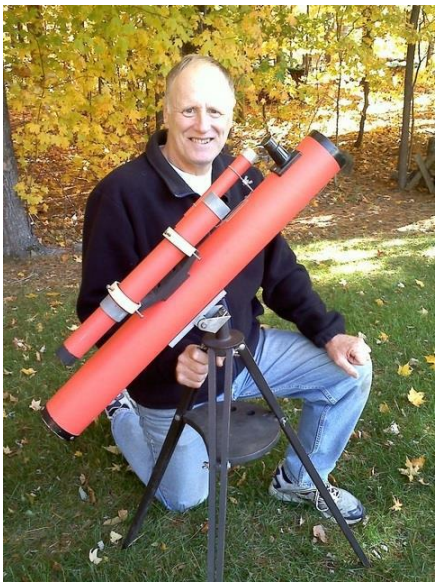
Sue French: Observer from New York





Shining at magnitude 4.6, ι Cas is visible to the unaided eye in a moderately dark sky. Iota is quite easy to locate, since the stars Delta(δ) and Epsilon (ε) in Cassiopeia's landmark W or M shape point straight to it. What draws our attention, however, is the view through a telescope, which reveals a beautiful triplet. Observed through my 130-mm refractor at 63×, the bright primary (A) appears white, and there's a much dimmer, orange companion (C) to its east-southeast. Boosting the magnification to 117×, a brighter, yellow-white companion (B) pops out close southwest of the primary. These colors correspond fairly well with their spectral types of *A*5 (A), *F*5 (B), and *K*3 (C).

Glenn Chaple: Observer from Massachusetts



iota Cassiopeiae Triple Star (AB Magnitudes 4.6+6.9, Separation 2.9″, Position Angle 230^{o}; AC Mags 4.6+9.1, Sep 6.7″, PA 117^{o})

Backyard astronomers who favor gossamer deep sky targets like galaxies and nebulae eagerly await the dark, ultra-clear nights that bring these "faint fuzzies" to light. The same can't be said for the double, triple, and multiple star aficionado, as such evenings are also marred by poor seeing conditions which render the splitting of close stellar partnerships all but impossible.

Such is the case with this month's Observer's Challenge, the triple star iota Cassiopeiae. The separations of its three members aren't the problem. Components A and B are about 3 arc-seconds apart, while a little under 7 arc-seconds separate A and C - separations well within reach of a common 60mm (2.4-inch) refractor. The difficulty lies in the magnitude differences between these stars. The main component, Iota Cassiopeia A (magnitude 4.6), is 8 times brighter than B (magnitude 6.9) and over 60 times brighter than C (magnitude 9.1). You'll need steady seeing and a reasonably high magnification to bring all three to light.

Locating iota Cassiopeia is no problem at all. A 5th-magnitude star to the unaided eye, it's found by tracing an imaginary line from delta through epsilon – both part of the Cassiopeia "W" – and extending it an equal distance beyond.

My first observation of iota Cassiopeiae was on the evening of October 18, 1971. Encouraged by the fact that I had already split several reasonably close, unequal pairs with my 3-inch f/10 reflector, I decided to give it a try. Despite its faintness, the C component was glimpsed at 60×, but B remained elusive, even at higher magnifications.

It was the Observer's Challenge that brought me back to iota Cassiopeiae early this past November. On successive evenings, first with the trusty 3-inch and then with a 4.5-inch f/8 reflector, I looked for the B component without success. Skies were clear but slightly turbulent on both occasions. On the third evening, there was the slight haze that often comes with nights of good seeing. Taking no chances, I pulled out a 6-inch f/8 reflector. The one-degree field of my 43× "search" eyepiece showed iota and two 8th-magnitude stars to its east – an attractive sight. A switch to 133× did the trick – all three of iota's component stars were visible. I boosted the magnification to 200× and made an eyepiece sketch. The C component seemed slightly reddish to me, an impression later borne out when I learned that it's an extremely close binary pair comprised

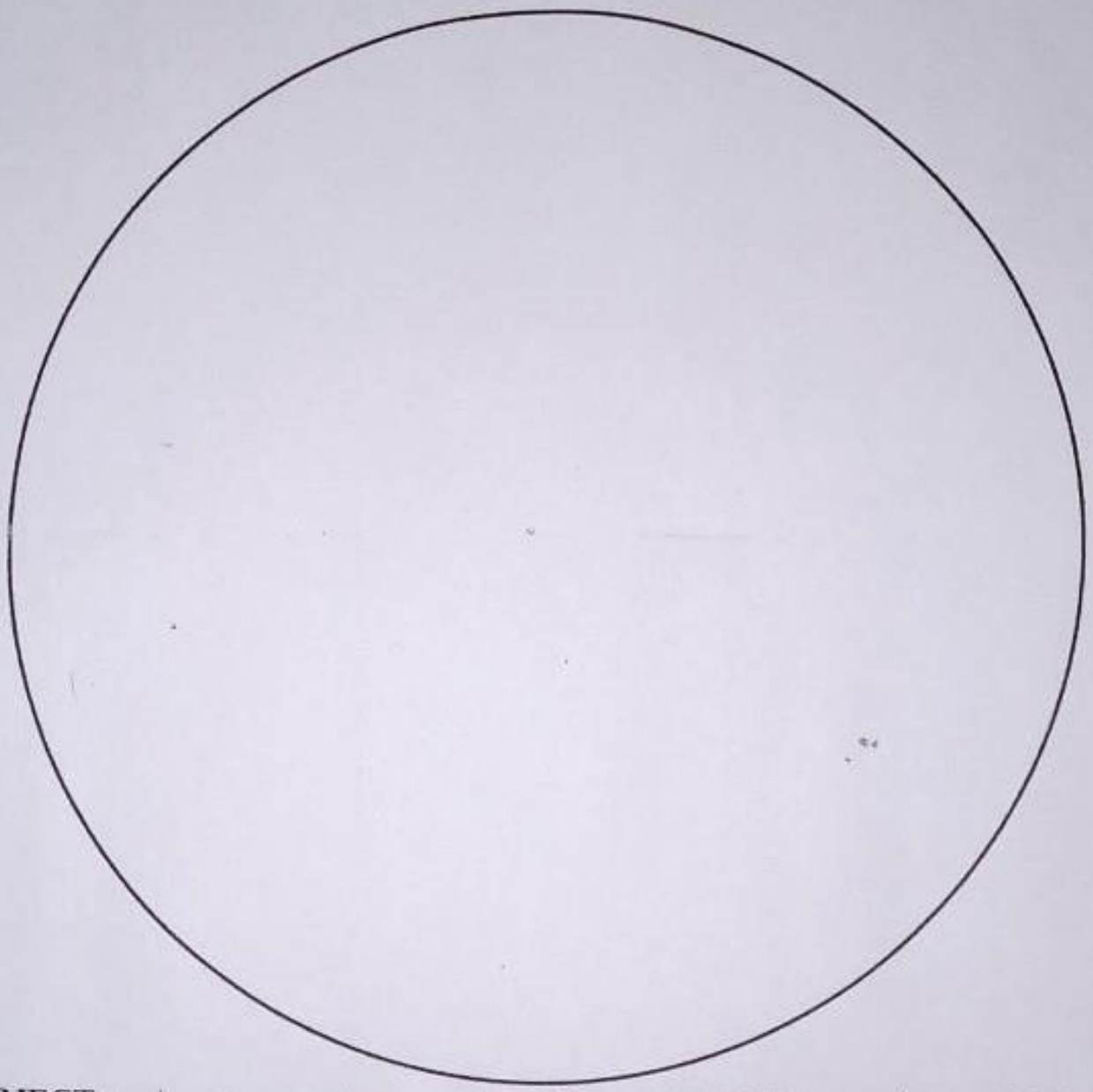
of a K spectral class star and a K or M class companion.

Not only is iota Cassiopeiae C a tight binary pair, but so is iota Cassiopeiae A. Each of these sub-arc-second duos was discovered through the magic of modern-day adaptive optics. This remarkable system lies some 140 light-years away.

iota Cassiopeiae Finder Chart

Sketch follows

N



SUBJECT: Iota Cassiopeiae **DATE/TIME:** 23 November, 2022

TELESCOPE/EYEPIECE: 6-inch f/8 reflector / 6mm orthoscopic eyepiece

MAGNIFYING POWER: 200X **FIELD OF VIEW:** 0.2°

NOTES:

Attractive grouping with two 8th or 9th magnitude stars to its east. All 3 components resolved with 133X. C component seems reddish. Nice triple!

Mario Motta: Observer from Massachusetts

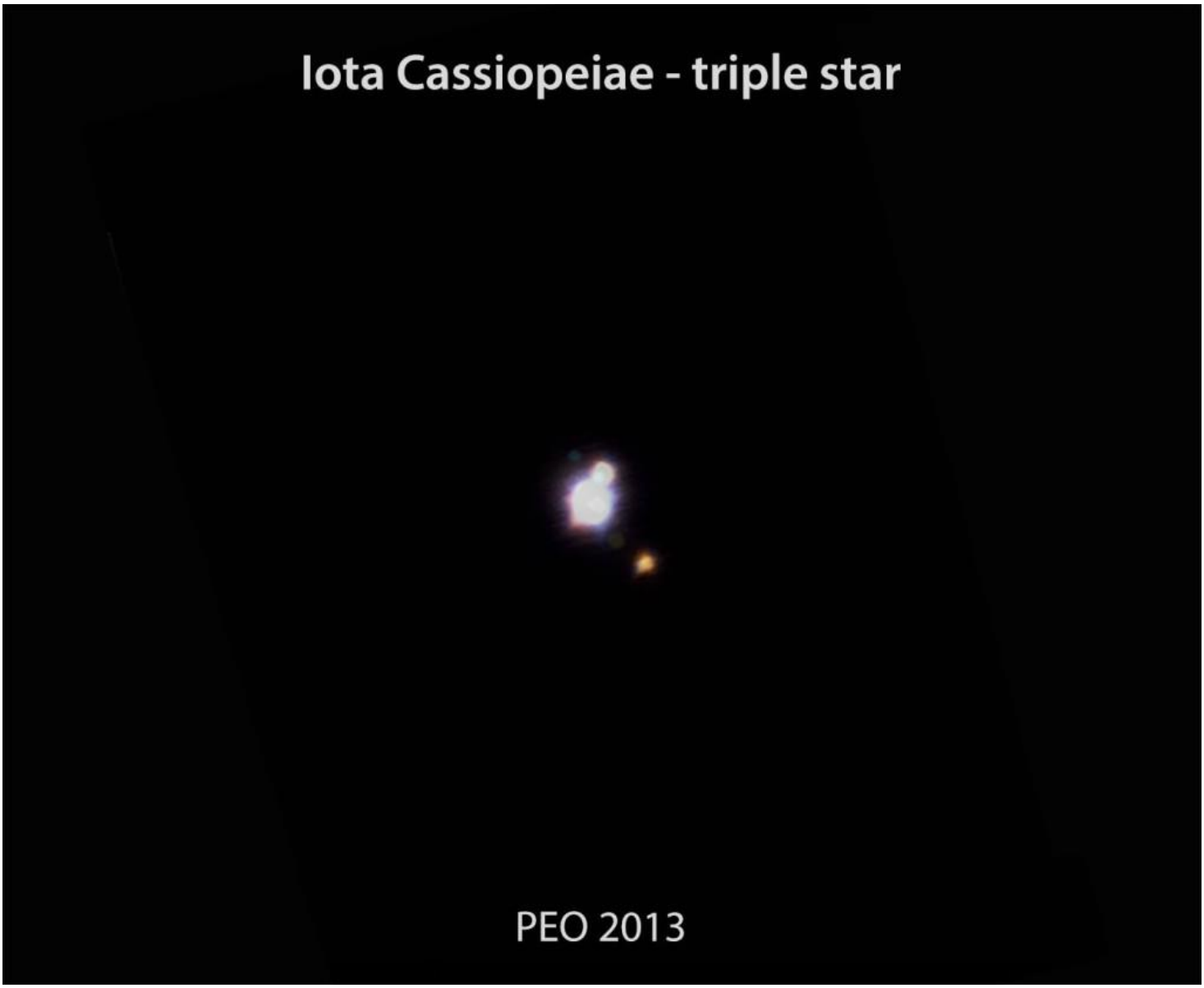
This image of Iota Cass was difficult for me with a large scope.

The star would bloat and overexpose even with my shortest exposure. So, I did it with NB filters, and 10 images of the star system with an O3 filter, stacked and processed.

Even with that…overexposed.

Then along came BlurXterminator which I tried, and cleanly separated the stars.

Phil Orbanes: Observer from Massachusetts



Here is my image of Iota Cassiopeiae. This one is a "twist" for me.

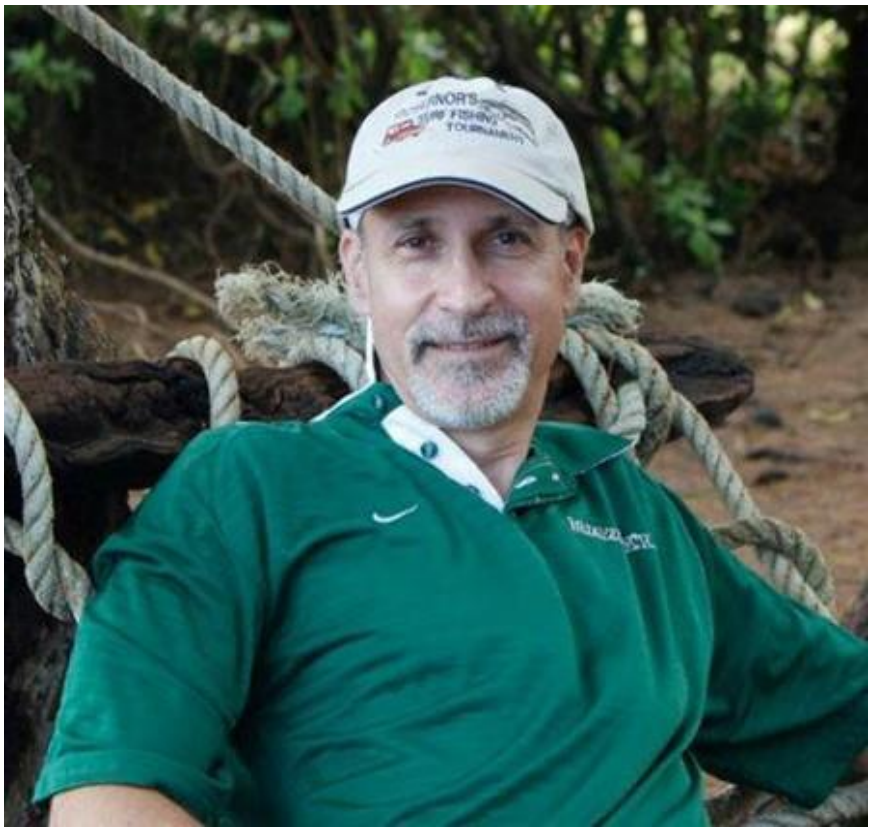
It is actually one of the very first astro-photographs I took when I re-entered amateur astronomy in 2013. My scope back then was a 11-inch Celestron and my camera was a Bayer modified Canon.

I had to set-up the scope on a concrete platform each time, and then perform the best polar alignment I could, despite the fact that Polaris was obscured by my neighbor's tree. I then replaced my eyepiece with the camera and hoped for the best. So the following image was a humble beginning to be sure.

Nevertheless, I did resolve Iota into its three stars. My submitted image was a combination of the five best subs, and these were hand-aligned and weighted in Photoshop (there being no PixInsight yet).

Iota Cassiopeiae is visible to the naked eye as a mag. 4.5 star. The three component stars are 5^{th}, 7^{th}, and 9^{th} magnitudes. My perceived colors are a white primary, with the fainter companions being yellow-orange, and white. This multiple star system is about 133 light years from earth.

James Dire: Observer from Illinois

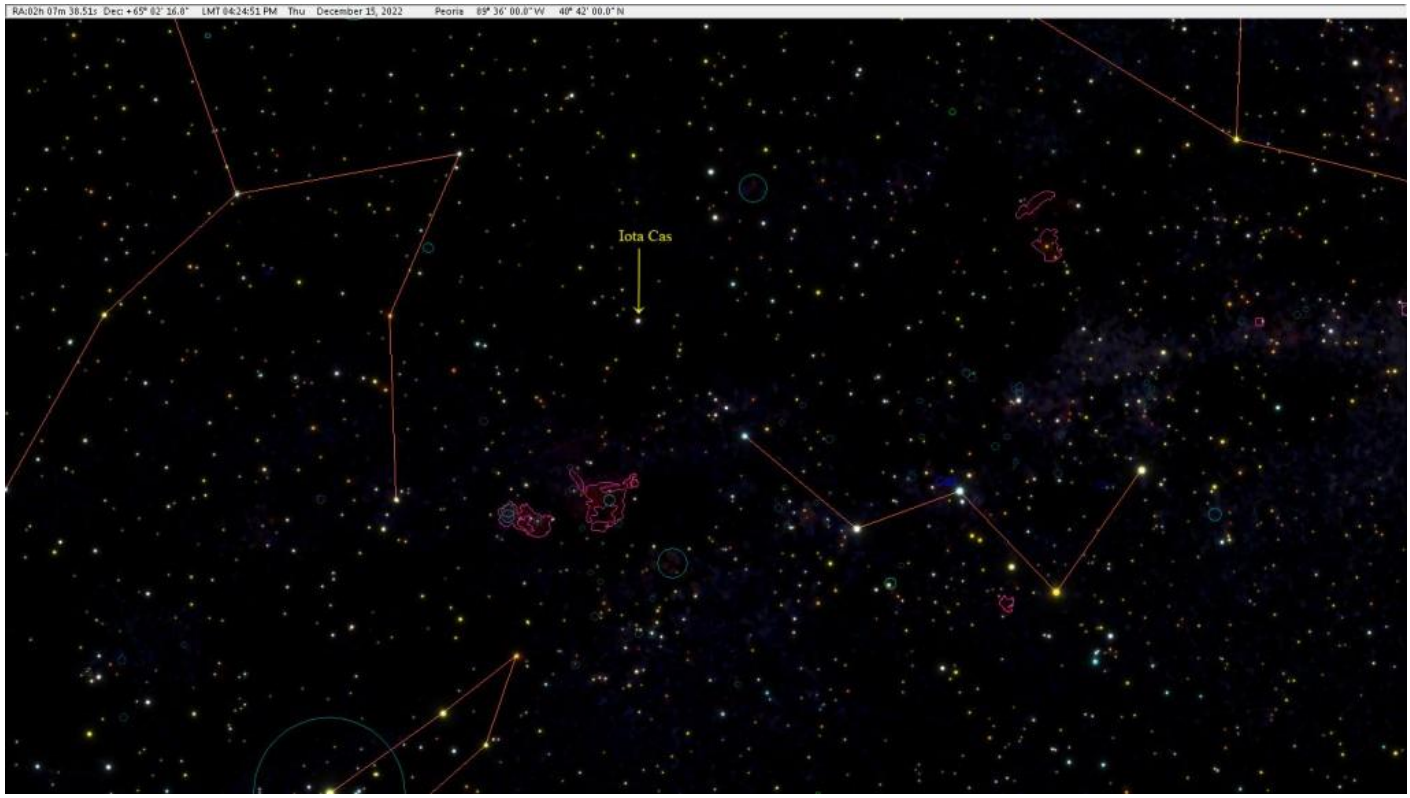


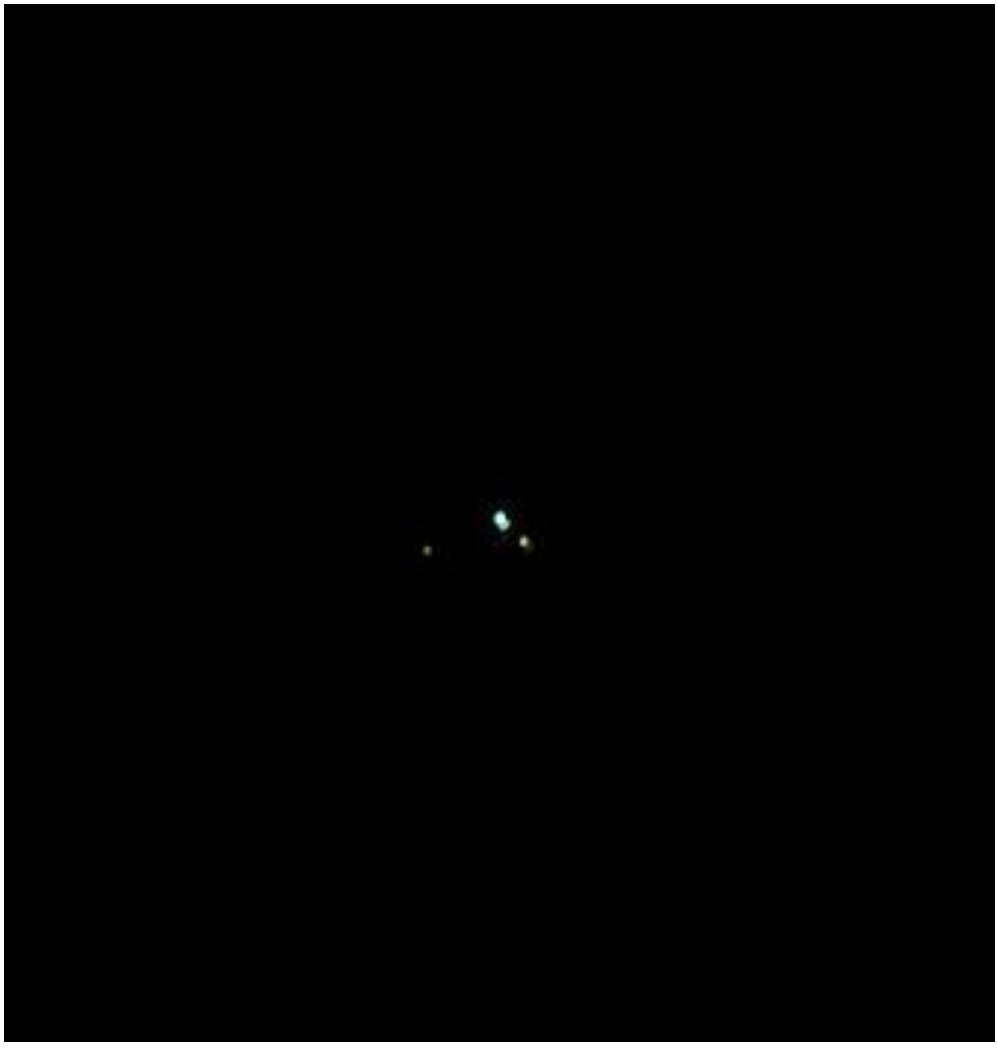
Iota Cassiopeiae is a beautiful triple star system. A finder chart for it is in **Image 1**. I imaged the star system with a 10-inch f/12 Cassegrain using a ZWO ASI120MC camera (see **Image 2**). This is a video camera. So, Image 2 is a combination of 336 frames each exposed for 10ms. There are four stars in the image. The two closest are barely resolved.

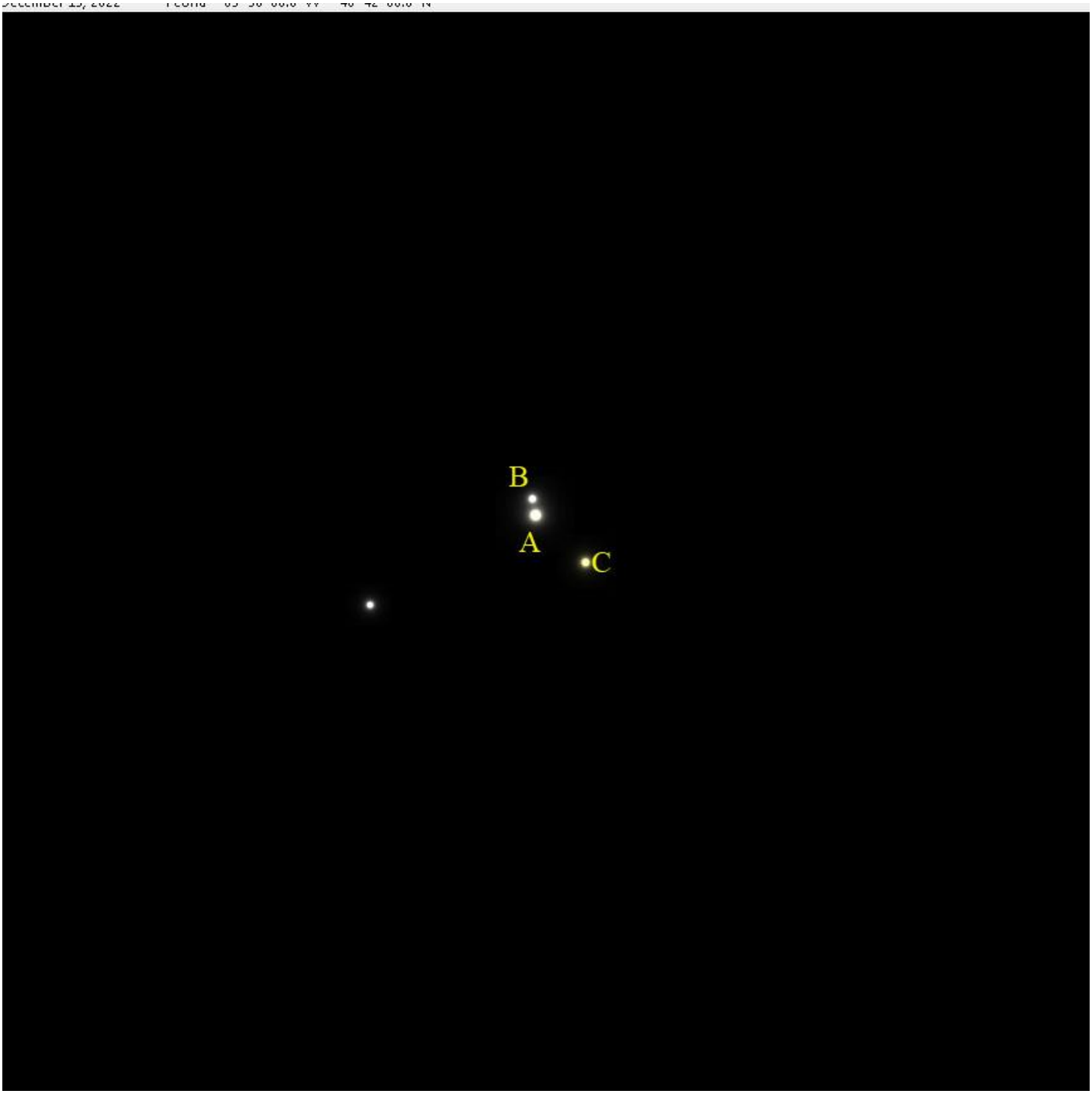
Image 3 shows what the star system should look like, taken from a desktop planetarium program. North is up and east to the left. The three stars in Iota Cassiopeiae are labeled A, B and C. The A star is the brightest and most massive. It is a magnitude 4.64 main sequence spectral class A3 star. The star is variable with a 0.08 magnitude brightness variation with a period of 1.74 days. The A star is also a binary star. The two stars are separated by around 5 AU and have an orbital period of 52.4 years. In 2005, they were separated by 0.5 arcsec. The companion star is magnitude 8.5.

The B star is a magnitude 6.89 yellow-white F5 main sequence star. The AB separation is 2.27 arcsec. The B star is around 100 AU from the A star and orbits it every 840 years.

The C star is a yellow F5 main sequence star 7.3 arcsec from the A star. The C star is part of the system, but no orbital period has been determined. So either the period is extremely long or the A and C stars are just floating around the galaxy together without orbiting one another. The separation of the two stars is at least 300 AU. The C star is magnitude 9. The C star is also binary. Its secondary component was 0.4 arcsec away from the primary in 2005. I could find no information on the magnitude of the secondary component.


RA:02h 07m 38.51s Dec: +65° 02' 16.0" LMT 04:24:51 PM Thu December 15, 2022 Peoria 89° 36' 00.0" W 40° 42' 00.0" N
Iota Cas




B
A
C

Mike McCabe: Observer from Massachusetts

OBSERVATION LOG - OBJECT: Iota Cassiopeia

DATE 12-20-22 /z TIME 18:40 /z EST LOCAL OBSERVING LOCATION 42°N 71°W

SCOPE/APERTURE 6" F/8 Acnro Refractor

EYEPIECE 4.4mm MAGNIFICATION 275x

FILTER — SEEING 2/5 TRANSPARENCY 2/5

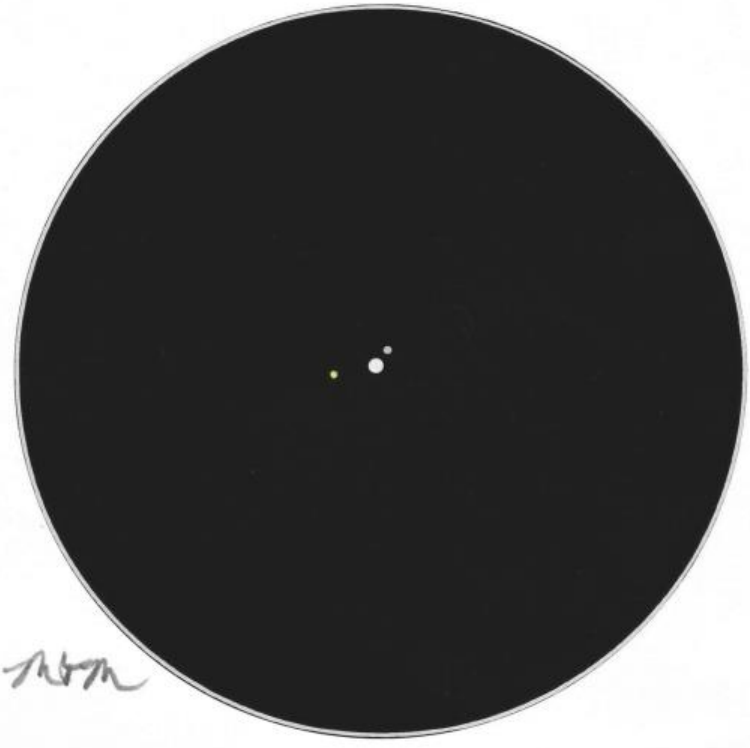
TEMP 30°F BARO PRES. — WIND —

COMMENTS:

Very pretty triple star system that was highly pleasurable to observe on this first night before winter.

Orientation as seen in a diagonal equipped refractor on alt/az mount.

ORIENTATION AND/OR ROTATION



What a nice way to wrap up the 2022 Observer's Challenge Series!

In a year that saw a significant number of challenging objects make the list, it was nice to conclude the season with a multiple star system as pretty as Iota Cassiopeia. Very well placed for northern hemisphere observers around this time, the object presented little difficulty from an accessibility perspective. Finding it via star hopping was a straightforward affair from Segin (ε Cas) and it was in the eyepiece in short order with little fanfare.

My first observation for the challenge happened on the evening of the 20th, when I used a 6-inch f/8 achromatic refractor to view it. Upon finding the star at low power, I wasted no time going straight to high power. To do so I used an 8.8mm/82° eyepiece with the employ of a 2× Barlow. The resulting magnification was about 275×, a power at which the eyepiece offered an 18 arc minute TFoV.

The view was simply splendid!

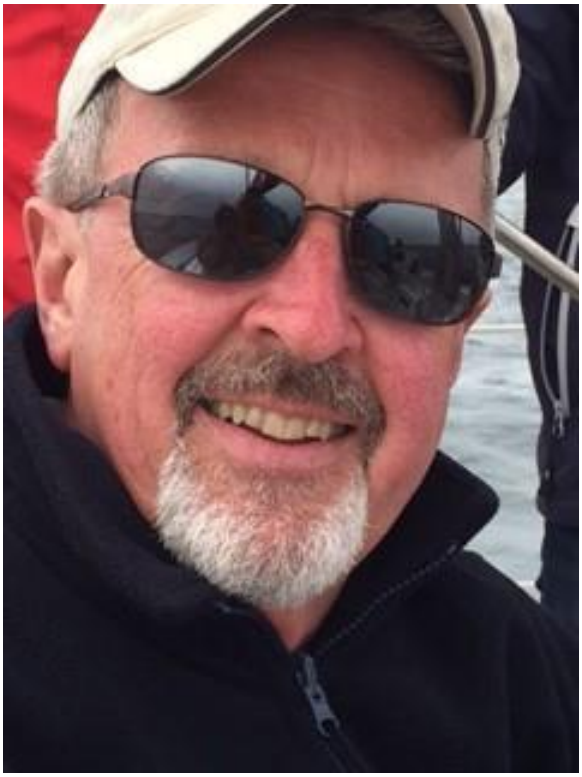
The primary shone pure white, while the 'B' component appeared to cast a light bluish hue. The more distant 'C' component exhibited a distinct yellow shade. All three components were finely separated at the high magnification of 275×.

My second observation came on the following night, just about an hour after the winter solstice. The transparency was slightly worse than the first observation, but I was still curious if my little ETX 90 (Maksutov-Cassegrain) could resolve the system. After dealing with the silly little 8×25 finder for a bit longer than I'd have liked, I finally landed on the system.

As I did the evening before, I went straight up to higher magnification. I pulled a Harry Siebert 4.9mm Star Splitter eyepiece out of my case, and in the ETX's 1,250mm focal length optics that equates to 255×. At that magnification the 'A' and nearby 'B' components were readily visible, but an extended examination saw no sign of the dimmer and more distant 'C' component.

Pulling out a 4.9mm eyepiece and sliding in a 9mm Celestron Ex-Cel LX eyepiece that I had handy dropped the power down to 140×. I wasn't expecting much, which made the sight I saw in the eyepiece all that much more pleasurable. There, tightly grouped but very clearly defined were all three components as sharp as could be. It was a surprise for sure, and a very welcome one.

John Bishop: Observer from Massachusetts



On December 27, 2022, I observed triple star Iota Cassiopeiae. I used an 8.25-inch f/11.5 Dall-Kirkham reflector. It is a portable setup, with a motor driven equatorial mount, without go-to. I observed from the ATMoB Clubhouse in Westford, Massachusetts. The sky was generally clear, with occasional thin clouds passing through. The air at ground level was calm, but seeing was unsteady. Transparency was fair. There was humidity in the air at ground level. At 7:00 p.m. the temperature was 26º F.

Locating Iota Cas should have been a simple matter of direct viewing with a Telrad or finder. On this evening, however, Iota was barely visible, if at all, with averted vision, even though it was well-placed in the sky. The four day old Moon, combined with local light pollution, contributed to this, I assume. So I starhopped from Epsilon Cas, which was plainly visible. A string of three stars near Epsilon pointed to Iota.

It was not difficult to separate the components of Iota Cas. At 48×, Iota looked "fat", but was not split. At 100×, the three components were just split at steady moments. At 133×, the triple was definitely split. With a Barlow at 266×, the triple was well split, but the atmospheric turbulence was obvious. Iota A, the brightest component (and itself a double, reportedly), was bright white to me. It also looked "fat", but that may have been a collimation issue. Iota B looked white to me. Iota C (also a double, reportedly) was faint, with a dull "brown" color. I assume this was the orange color other observers have reported.

Iota Cass reminded me of another triple, Beta Monocerotis. Iota has a much greater brightness differential among its components. As I recall, the Beta Mon stars are white with a bluish tint.

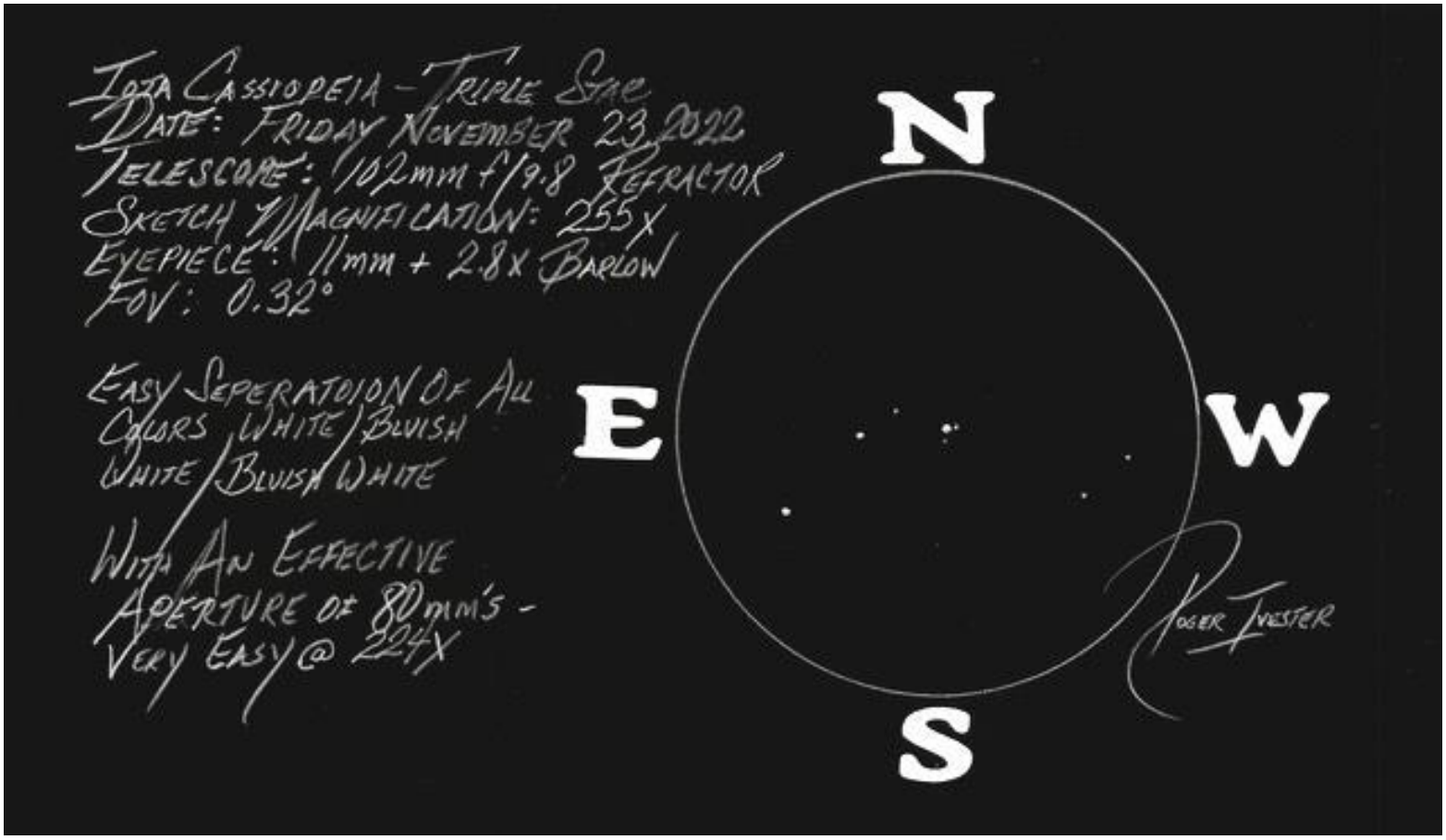
I have visited Cassiopeia many times over the years. This was my first time observing Iota Cas. It was a pleasant surprise to come across this interesting object, which had been lying in "plain view" all the while.

Joseph Rothchild: Observer from Massachusetts

The December 2022 Challenge object is Iota Cas. It is a triple star system with separations of 2.7 and 7.4 arc seconds (A, B, and C). There are also additional stars Aa and Cc which are only seen with adaptive optics and have separations of 0.5 and 0.4 arc seconds respectively.

I had hoped to have multiple observations this month, but only observed Iota Cass once because of poor weather conditions. I observed with my 10″ Dobsonian in Newton, Mass. under poor seeing. Iota Cas was not visible naked eye so I star hopped from Epsilon Cass. There were 3 stars that pointed past 55 Cas to Iota Cas. The triple star was easily split as a small triangle at 179×. A appears significantly brighter than B and C which are 2 and 3 magnitudes fainter.

Roger Ivester: Observer from North Carolina



Text follows

Date: November 23, 2022

Telescope: 102mm f/9.8 Refractor

Sketch Magnification: 255×

Eyepiece: 11mm + 2.8× Barlow

FOV: 0.32º

Excellent separation of all components with the 102mm refractor. I reduced the aperture to 80mm's and still had an excellent view of all, using 224×. After many years of observing this triple, using both refractors and reflectors, my perception of the primary is white with both of the fainter components appearing bluish-white.

The following is the complete listing of all Observer's Challenge reports to-date.

https://rogerivester.com/category/observers-challenge-reports-complete/