

OBSERVER



Composite photograph of the August 21st solar eclipse, as seen from Weiser, Idaho, with a 10" Newtonian. Image © Joe Gafford

OCTOBER SKIES

The Solar System

Keeping things simple to start, **Mercury** is lost in solar glare this month.

Venus is on the way to superior conjunction in early January—that is, it will swing around to line up on the far side of the Sun, from our point of view. Already, the planet is 87% illuminated and only 12° up an hour before dawn. It's still *very* noticeable, at magnitude -3.9, which will come in handy when you look for its tight pairing with Mars (see Mars, next). By Halloween, Venus is only 5° above the horizon an hour before sunrise, and even lower next month.

Mars is still a lousy target overall (mag. +1.8, and only 3.7" across), but it has an **impressive conjunction with Venus on the morning of the 5th, when the two planets**

by Zachary Singer

will be less than ¼° degree apart. Look for them due east, about 10° up, around 6 AM (an hour before dawn). The pair will also be quite close to each other on the 4th and 6th, too.

Jupiter now lies very low in the west; by midmonth, it will sink below the horizon just a half-hour after sunset. Superior conjunction is October 26th; when the planet eventually reappears from the solar glare, it will be as a pre-dawn object.

Saturn is sinking towards the west too, but at the beginning of October, it's still 20° above the horizon an hour after sunset, and you might still catch a (blurry) look at the rings. By Halloween, Saturn will *set* an hour after the sun does, so if you get to observe the planet at all, it will be low and in twilight.

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Sky Calendar

5	Full Moon
12	Last-Quarter Moon
19	New Moon
27	First-Quarter Moon

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PRESIDENT'S MESSAGE

by Ron Hranac

Looking Back on a Great Eclipse

wow (wou) *interject*. an exclamation of surprise, pleasure, etc. —vt. [Slang] to arouse enthusiasm in

The above is from my tattered copy of *Webster's New World Dictionary*, and it aptly describes the reaction of millions across the United States to the August 21, 2017 total solar eclipse. I've written about "wow factor" in these pages on at least two previous occasions (see my President's Message columns in the August 2016 *Observer* at http://www.denverastro.org/newsletters/august2016_denverobserver.pdf and in the October 2013 issue at <https://www.denverastro.org/newsletters/OCTOBER2013forweb.pdf>). It's difficult to express in words just how much wow factor there is in a total solar eclipse, but once someone sees one—especially for the first time—there is no question why it's at the top of the astronomical bucket list for many people.

I started making plans for this year's eclipse a little over four years ago. During a class reunion, my wife and I were enjoying a visit with a classmate and her husband (who happen to live in Casper, Wyoming), and

asked if they were excited that the centerline of the path of totality would be a few blocks from their house. At the time they didn't know anything about the eclipse, so I provided some background. I also offered to bring solar telescopes, eclipse glasses, and related activities for kids and grandkids in exchange for an overnight stay at their place. They eagerly agreed.

Fast forward to August of this year. My youngest daughter—who hadn't yet been born the last time a total solar eclipse was visible in the continental U.S.—flew in from southern California and joined my wife and me for the day-before-the-eclipse drive to Casper. Once past the usual traffic between Denver and Fort Collins, it was mostly smooth sailing the rest of the way. A Sunday night thunderstorm was unsettling (we managed to do a little nighttime observing of Saturn in between clouds), but we woke up to a clear sky Monday morning.

After breakfast, I set up four solar telescopes in our hosts' southeast-facing front yard. About 20 of us gathered to observe the pre-eclipse Sun and some dandy sunspots.

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DAS SCHEDULE

October 2017

- 7 DAS Auction—DU's Historic Chamberlin Observatory—Starts at 11:00 AM (**See p. 8**)
- 7 **E-Board Meeting—At DU's Historic Chamberlin Observatory, around 3:30 PM—right after the auction. All members welcome.
- 21 Dark Sky Weekend—EGK Dark Site & Brooks Observatory
- 28 Open House—DU's Historic Chamberlin Observatory—Starts at 6:00 PM
(November 2017)
- 3 DAS General Meeting—DU's Olin Hall, Rm. 105—Starts at 7:30 PM

During Open House, volunteer members of the DAS bring their telescopes to the Chamberlin Observatory's front (south) lawn, so the public can enjoy views of the stars and planets, try out different telescope designs, and get advice from DAS members. The Observatory is open, too (costs listed below), and its historic 20-inch telescope is open for observing with no reservations necessary.

Open House costs (non-members): If the skies are clear, \$2/person (\$5/family), \$1/person in inclement weather. DU students with ID, and DAS members free.

Public Nights feature a presentation on astronomical subjects and a small-group observing session on the historic 20-inch telescope (weather permitting), at Chamberlin Observatory on Tuesday and Thursday evenings (except holidays), beginning at the following times:

March 10 - September 30 at 8:30 PM

October 1 - March 9 at 7:30 PM

Public Night costs (non-members): \$4/adult, \$3/child and students with ID. DAS members and DU students with ID: free.

Members of the public (non-DAS/DU, as above), please make reservations via our website (www.denverastro.org) or call (303) 871-5172.

President's Message

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After first contact, kids and grownups alike had fun projecting images of the partially eclipsed Sun with homemade pinhole projectors and crossed fingers, looking at crescent shadows under trees and shrubs, and enjoying views through eclipse glasses and the filtered 'scopes.

During the partial phases between first and second contact, I urged folks to watch each other's reactions in addition to enjoying the eclipse (and shared details about eclipse-related phenomena to watch for), explaining that I have seen people shed tears, scream, and experience various other emotional reactions to totality.

As second contact approached, the temperature dropped; Denver TV station CBS4's mobile weather lab—in town for the eclipse—reported seven degrees, and the Casper airport nine degrees. Shadows got sharper, and streetlights came on. Totality and the beautiful corona (and some visible prominences) brought gasps of amazement and lots of oohs and aahs. There were more gasps and wows when the diamond ring appeared at third contact. Neighbors set off fireworks. My rarely-shows-her-emotions daughter choked up, and later told me she was very surprised at the reaction she had.

The weather cooperated nicely, with only a few thin cirrus

clouds appearing in parts of the sky (the Sun was in-between them). Indeed, the clouds more or less stayed out of the way until just before fourth contact, when they finally covered the almost-back-to-normal Sun.

We stayed one more night in Casper, avoiding the nasty traffic back to Colorado. It took many people 11 to 12 hours on Monday to make the southbound journey on I-25. Tuesday's trip was speed-limit-plus, until the usual traffic slowdowns from Fort Collins back to Denver.

No surprise: Nearly everyone in our group agreed that the roughly two-and-a-half minutes of totality went by much too quickly.

It might be nearly seven years away, but people are already making plans for the next total solar eclipse visible in the U.S., which takes place on Monday, April 8, 2024. The path of totality sweeps northeasterly from Texas to Maine. NASA has an interactive eclipse map on their web site at <https://eclipse.gsfc.nasa.gov/SEgoogle/SE-google2001/SE2024Apr08Tgoogle.html>.

Eclipse 2017 has come and gone, and for those of us fortunate to see it, it's an experience that we'll long remember.

Wow!



October Skies

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Uranus is at opposition late this month (it lies about 180° from the Sun in our sky), so it's visible all night. The planet is almost 30° up at 10 PM as October begins, and nearly 50° up at that hour by Halloween. Look for Uranus a little over 1° northwest of 4th-magnitude Omicron (o) Piscium at the beginning of the month, and about 2° due west by month's end.

Neptune was at opposition in early September, so it's up at a very convenient hour this month. It's also conveniently positioned, less than 2/3° from 4th-mag. Hydor, aka Lambda (λ) Aquarii—to the southeast of the star in early October and due south at Halloween.

Finally, **the Moon will occult Regulus in the wee hours of the 15th,**

but the duo will sit only 7° above the eastern horizon at entry (**about 3:30 AM, Denver time**), and just 16° up at exit, around 4:16 AM, Denver time. (Note that the exact time depends on your location, so start observing early.) Interestingly, the Moon will be a thin crescent, and Regulus will enter on a tapered edge of the lit area.

Stars and Deep Sky

Our first two targets this month are in the northern part of the constellation Cygnus, the Swan. The stars here are bright and easily identified, so finding your way won't be too tough if you're familiar with the area. If you're new, though, don't fret—we've got an article to get you up to speed—see "Getting Your Bearings," on page 4 of

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ABOUT THE DENVER ASTRONOMICAL SOCIETY

Membership in the Denver Astronomical Society is open to anyone wishing to join. The DAS provides trained volunteers who host educational and public outreach events at the University of Denver's Historic Chamberlin Observatory, which the DAS helped place on the National Register of Historic Places. First light at Chamberlin in 1894 was a public night of viewing, a tradition the DAS has helped maintain since its founding in 1952.

The DAS's mission is to provide its members a forum for increasing and sharing their knowledge of astronomy, to promote astronomical education to the public, and to preserve DU's Historic Chamberlin Observatory and its



telescope in cooperation with the University of Denver. The DAS is a long-time member in good standing of the Astronomical League and the International Dark Sky Association.

The DAS is a 501 (c)(3) tax-exempt corporation and has established three tax-deductible funds: the Van Nattan-Hansen Scholarship Fund, the DAS General Fund, and the Edmund G. Kline Dark Site Fund.

*****JOIN US!** More information about DAS activities and membership benefits is available on the DAS website at www.denverastro.org.



DAS NEWS

DASers Travel for the August '17 Total Solar Eclipse

This past August 21st, DAS members spread out far and wide to view the total eclipse of the Sun. Here is a sampling of the images (along with the photograph on the cover) that they sent back from Idaho, Wyoming, and Nebraska...

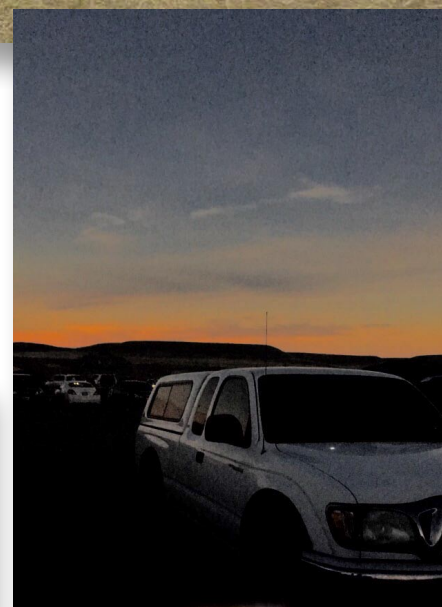


**Above: The DAS crew at Glendo, Wyoming.
Image courtesy David Shouldice.**



**Above: Ted Cox and Todd Hitch at Glendo.
Image © July Candia.**

**Below: Observing at the Sunrise campsite in Wyoming.
Image © Mehmet Unsoy.**



**Above: mid-eclipse twilight, Shoshone, Wyoming.
Image © Charles Habenicht.**

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(DASers at the Solar Eclipse, Cont'd)



Above: Observing as totality begins; Stapleton, Nebraska. Image by Marilyn Pearson; courtesy Ron Pearson.



Above—left and right: David Shouldice projects the eclipse at Glendo, Wyoming.

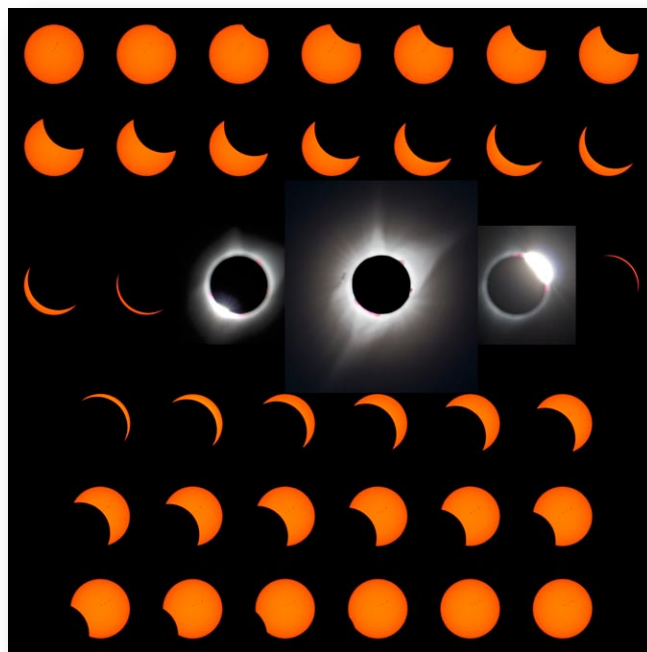


Left: Lindsey Shaw observes the Sun in Glendo.

(3) Images © July Candia.



Left: July Candia behind a projection of the solar eclipse at Glendo, Wyoming.



Right: "The Whole Eclipse in One Picture," as seen from Rigby, Idaho. Image © Don Lynn.



Left: Binoculars, filtered for the eclipse. Image © Charles Habenicht.

Volunteer Opportunities

Thursday, October 19, 2017, 8:00PM: Elizabeth High School, 34500 County Road 13, Elizabeth. Night observing (right after soccer game).

Friday, Oct 20, 2017, 5:30-8:00PM: Colorow Elementary Family Night, 6317 S. Estes St., Littleton, CO 8012. Night Observing.

To volunteer, please contact Julie Candia: external@denverastro.org —and thanks!

October In-Reach

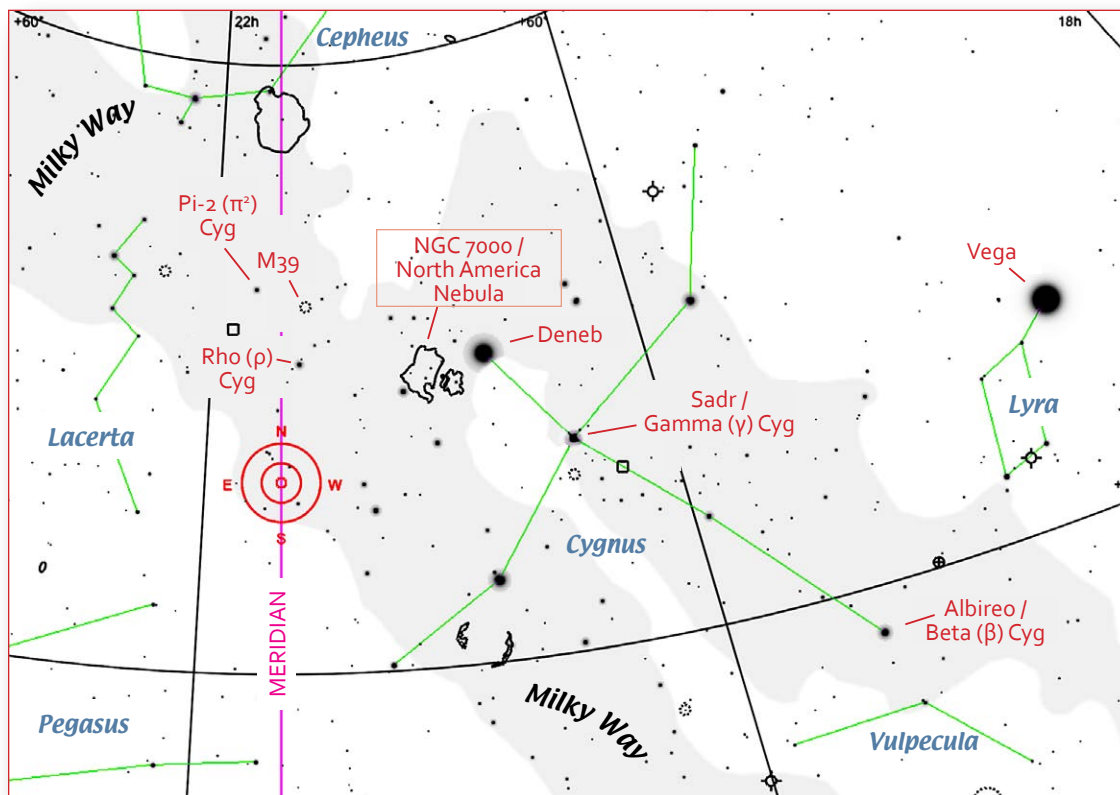
Come join us on **October 14th, from 7:00-9:00 PM**, for our monthly "In-Reach" activity at Chamberlin Observatory!

This month's subject will be "The Summer Triangle"—that bright and easy, three-star guide to a fascinating section of sky—it's high overhead at this time of year. After a lecture about what to look at, our more experienced members will be on hand to help with tips and tricks to find the targets presented.

This is a wonderful opportunity for those new to the hobby to get some practice at using telescopes, binoculars, or just learning some basic constellations in a members-only, hands-on setting. If you have equipment you'd like to learn more about, feel free to bring it; otherwise there's also some loaner equipment from the club to practice with.

Come join us!

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Left: View of the sky directly overhead in Denver at 9:00 PM in mid-October. Telrad circle included for scale; it also marks the zenith point (where you are looking straight up).

Users of Dobsonian-mount telescopes may find the sky near the zenith difficult to point to; if so, try observing these objects an hour later, when they've moved farther from the zenith.

Object positions, constellation and meridian lines charted in SkySafari, and then enhanced.

October Skies

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the September 2015 *Observer*, at http://www.denverastro.org/news-letters/september2015_denverobserver.pdf. (Our third target is in Delphinus, which is covered in that article, too.)

We'll start off with **NGC 7000**, or the **North America Nebula**, at **20h 59m, +44° 24'**. It lies a few degrees from the 1st-magnitude star Deneb, aka Alpha (α) Cygni or α Cyg. NGC 7000 is a huge cloud of ionized, glowing hydrogen gas, very much like the famous Orion Nebula, M42. Such clouds are star-birth regions, in which slightly denser pockets of gas slowly collapse under their own gravity; some of these clumps of material eventually heat up enough to begin fusion reactions and become stars. Like the Orion Nebula, NGC 7000 looks like it's isolated in space, but it's really part of a larger structure—the nearby Pelican Nebula is part of that larger cloud, too.

Under clear, dark skies, NGC 7000 (and the rest of its surrounding cloud) are quite visible to the naked eye—the area looks like a large, bright patch within the overall glow of the Milky Way. (The patch also shows up well in a 6x30 finderscope, though I wasn't able to separate out the “North America” shape.) With all of that, you'd think it would be an easy target in a telescope—and it can be. Ironically, though, telescopic views suffer from the sheer size of the nebula (it's the better part of 2° across) and the brightness of the Milky Way background (the nebula blends into it).

To deal with the latter problem, a good UHC filter will boost this nebula's contrast significantly, helping to go from “somewhat visible” to spectacular. (Such filters are a good tool for many other objects, too.)

But the size problem is another matter, since many telescopes have trouble showing a wide field. My 6-inch Newtonian's 2° field

worked wonderfully, but I found that when I went down to a normally ample, 1° field, it was easy to get lost inside the nebula's borders—instead of seeing a nebula, the impression I got was that I'd somehow lost contrast while looking at a fairly empty section of space.

A 1½° field would still work well, but if your 'scope and eye-pieces won't provide that, try this: Follow the nebula's edges. That is, with a narrow field, aim for an edge, and then *follow that around the nebula's perimeter*. The difference between the nebula, and the “not-a-nebula” background, will be much easier to see, and you can still get a good impression of the overall object by building it in your mind, a piece at a time, as you scan around it. On the plus side for this approach, you may well see details the low-power, wide-field views miss, especially in the “Central America” part of the nebula, towards the “Gulf Coast.” (If you're lost in the nebula's interior, or suspect you might be, try circling around until you pick up an edge.)

To get to the North America Nebula, imagine Deneb as the center of a clock face, and Gamma (γ) Cygni (aka Sadr) as the “6 o'clock” position. (Sadr is the star at the intersection of the “cross” in Cygnus.) With this arrangement in mind, look for the nebula's glow at about the “9:30” position, and about half the distance from Deneb, as Deneb is from Sadr. (If the nebula also has a “clock face,” and its hour-positions are aligned with the one we just used, then the nebula's interesting “Central America” section is at about the “7 o'clock” position on the nebula's face.)

In contrast to the splendor of NGC 7000, **M39 (21h 32m, +48° 31')**, is a “nice little object.” It's an open cluster; such objects are groups of stars that formed together in a nebula like NGC 7000. A similar cluster is indeed forming within NGC 7000,

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but we can't see it because of the nebula's intervening dust and gas; in clusters like M39, star-births are complete, and stellar radiation has since blown the gas and dust away. (In M39's case, the stars are thought to have formed some 200 million years ago.)

M39 isn't the biggest, or the brightest, or the "anything-est" open cluster. Rather, it's simply another noticeable naked-eye patch of light that may well attract your attention while sweeping across the Milky Way, away from Cygnus. In essence, "M39" is the answer to the inevitable "What's *that*?" when you scan the Milky Way under a dark sky; it's also a lovely "extra" after observing NGC 7000.

In my 6-inch, it made for a pleasant view, especially with its Milky Way background, and the cluster's $\frac{1}{2}^\circ$ width wasn't a problem (though folks with a typical 8-inch Schmidt-Cass telescope and a standard 25mm Plössl eyepiece might find it a tight fit). Viewing M39 from the city in my 12-inch Newtonian, the Milky Way background was noticeably missing, but I was struck by the cluster's blue tint. (Note, though, that finding it in the city probably isn't worth the difficulty it might entail.)

Under dark skies, look for M39's glow about as far from NGC 7000, as 7000 is from Sadr, and close to an imaginary line running through Sadr and NGC 7000. Using another "clock-face alignment," M39 is almost at 1 o'clock when the Sadr-NGC 7000 line runs from 6 o'clock to 12.

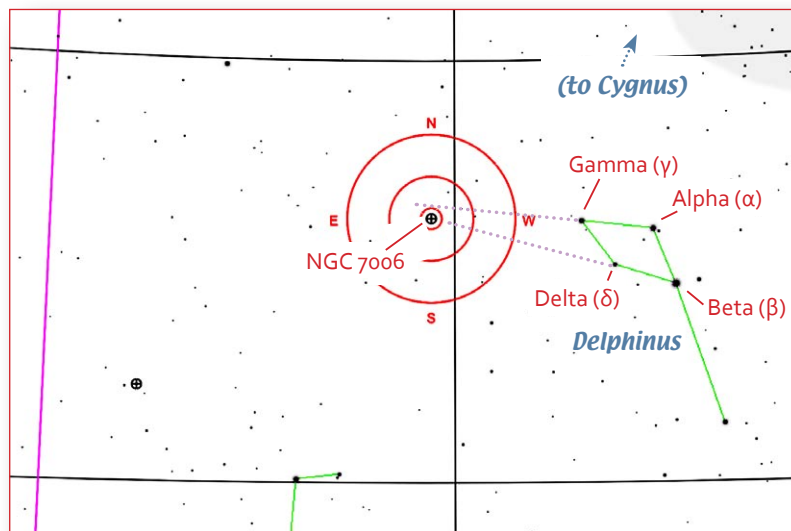
M39's glow is smaller than NGC 7000's, but it's still about the size of the Moon and quite noticeable amid the overall glow of the Milky Way. If you're looking at the right spot (naked-eye), you'll see two 4th-mag. stars making a right-angle with M39 at the vertex. Both stars are just under 3° from M39—Rho (ρ) Cygni lies to the south of the cluster; and Pi-2 (π^2) Cygni, to the east.

Our last target, NGC 7006, at 21h 02m, +16° 15', is for experienced observers (and stubborn, *curious* beginners who don't mind the risk of failing). If it were brighter, this globular cluster would be easy to find, just $3\frac{1}{2}^\circ$ degrees due east of Gamma (γ) Delphini, the bright star making up the "nose" of the constellation Delphinus, the Dolphin. At mag. +10.6, though, it probably won't show up in your 9x50 finderscope (and definitely not in a 6x30); you'll need great dead-reckoning with a Telrad, or good star-hopping skills, or computerized ("go-to") navigation. (Equatorial-mount folks are in luck, though—we'll discuss that below.)

This object isn't just hard to find, it's *dim* in a telescope, too! By now, you might be wondering why this object is worth a look—and the answer is, because of its 135,000 light-year distance from us, *among the farthest globular clusters that are orbiting our galaxy*. There are a few listings in the Palomar catalog that might be at a similar distance or a bit farther, but this one certainly is *wyyyy* out there, as far as globulars go—at the very least, it's the farthest Milky Way globular in the NGC catalog. (We do know of globular clusters that are indeed farther from us, like NGC 2419, the Intergalactic Wanderer, but they're not part of our galaxy.)

The cluster itself is about 140 light-years across, about the same diameter as the showpiece globular, M13. NGC 7006's internal makeup, though, must be somewhat different, as its absolute magnitude (its *intrinsic* brightness, after correcting for distance) is about a magnitude dimmer than M13's.

Many sources suggest that NGC 7006 should be visible in a 6-inch 'scope (though star-like at low power); but on a decent night at the dark sky site a few weeks back, I failed to detect it in mine. The cluster did appear, *very dimly* and *only with averted vision*, in an 8-inch instrument at 65x—not at all an easy object! In contrast, M13 and nearby M15 were as bright as usual, and very easy targets in my 6-inch. (Conditions were clear but windy.) Clearly, for most folks, a 10-inch or larger instrument would be a good idea—for what it's worth, let me remind DAS members that we do have a 14-inch 'scope at the dark sky site; it should be a big help with this challenging object.



NGC 7006, centered in Telrad circles. Dotted lines illustrate alignment with Beta (β) and Delta (δ) Delphini, to aid Telrad positioning. Also note how distance from the cluster to the Telrad's outer circle roughly matches distance to Delta (see text).
Object positions, constellation and meridian lines charted in SkySafari, and then enhanced.

To find NGC 7006, look for two stars in the "body" of Delphinus's "dolphin"—Delta (δ) and Beta (β) Delphini (the latter is listed as Rotanev on some charts). Imagine a line from Beta, extending through Delta; the line continues on to the cluster, and you'll find 7006 about $4\frac{1}{2}^\circ$ past Delta. Position your Telrad's center along this line, so that the outermost Telrad edge facing Delta is midway between that star and the Telrad's center. Then slide the Telrad $\frac{1}{2}^\circ$ away from Delta. You'll notice that you've wound up at a point that also lies *just below* a line from Alpha (α), aka Sualocin, through Gamma (γ).

As I mentioned earlier, equatorial-mount users are in luck—because the cluster is almost perfectly eastward of Gamma Delphini, you can just center your telescope on Gamma, and then slew the 'scope in Right Ascension (RA). If you have setting circles, try using them to move about 3° eastward, then slew with slow-motion controls while watching through your eyepiece. If you don't have setting circles, you can use a Telrad instead—slewing from Gamma until the Telrad's western edge is on that star will put you 2° eastward. (You can also slew farther, until the offset, or gap, between the Telrad's western edge matches the distance from the Telrad's outer circle to its mid-sized one, a distance of 1° .) The trick in all cases is to remember that the cluster is $3\frac{1}{2}^\circ$ from Gamma, and get reasonably close—without going too far—before watching in the eyepiece to slew the remaining distance. *Make sure your mount is properly polar-aligned, beforehand!*

—See you next month.



DAS News*Continued from Page 5***— DAS Auction —****Turn Your Old “Astro Stuff” into CASH & DAS DONATIONS**

Pick up some great gear at a bargain price while you’re supporting the DAS!

Haul your old ‘scopes, mounts, eyepieces, filters, CCDs, observing aids, and other astro-stuff to the annual DAS member auction by about **11 AM on the morning of Saturday, October 7th**.

We’ll review the loot for a few hours, break for a quick lunch, and then **the auction will start at 1 PM and last until 3 or 3:30 PM.**

Proceeds will go in varying amounts (10% minimum) to the DAS (specified before the bidding). The DAS portion is allocated to support of DAS activities. The rest goes to you!

ITEMS TO SELL OR BUY:

Eyepieces... CCDs... adapters... lenses... mirrors... secondaries... filters... telescopes... mounts... wedges... Crayfords... guide scopes... focusers... motors/drives... books... star atlases... observing guides... astronomical computer programs... astro-imaging software... MORE!!!

Please—no computers, and no computer programs, books or manuals that aren’t astro-related.

Several auction items have been donated to the society over the past year. All proceeds for these items will go to DAS outreach activities. Some of these are posted on the DAS website at: https://www.denverastro.org/das/event/das-auction-2/?instance_id=1178

