

# OBSERVER



Aurora photographed in Evergreen, Colorado, on June 23, 2015. Strong solar storms brought aurorae unusually far south.

Image © Ron Pearson

## AUGUST SKIES

by Zachary Singer

Compared to June and July, when Venus and Jupiter put on a show, August promises to be relatively laid-back for planets... The two just mentioned are deep in solar glare, and will reemerge as morning objects this fall. **Saturn**, though, can be found right where we left it last month—almost exactly, in fact, since its slowing retrograde motion kept it from shifting very far. Our distance from Saturn has been increasing since opposition a few months ago, but the planet is only a little smaller in the eyepiece, and good views can still be had. Keep in mind that by September, Saturn will be both smaller and lower in the sky, so enjoy the views while you can.

will be more and more of a fixture in the sky as it approaches opposition next spring. **Uranus**, too—it rises around 11 p.m. at the beginning of the month, and two hours earlier at month’s end. Look for the tiny blue orb in Pisces (at 1h 16m, +7° 20’ mid-month), about ½° from Zeta (ζ) Piscium.

As always in August, there’s the **Perseid meteor shower**, and we’ll have favorable conditions: During the shower’s peak, after midnight on the 13<sup>th</sup>, the moon will be absent; when the pencil-thin crescent finally clears the horizon at 5:22 a.m., it will hardly matter. (If you’re still up by then, though, the moon will be worth a look.)

Before we start on deep-sky targets, there is our galaxy itself—at 10 p.m. on a mid-August night, the very center of the **Milky Way** glows brightly in the south—an unmistakable landmark in dark skies, and an amazing sight on its own. Let your eyes dark-adapt properly, away from city lights, and they’ll show you a detailed, yet panoramic view of a galaxy (*ours!*) that no actual telescope can match with any deep-sky galactic competitor. Right in front of you, as you face south, is the central

### Sky Calendar

- 6 Last-Quarter Moon
- 13 Perseid Meteor Shower Peak
- 14 New Moon
- 22 First-Quarter Moon
- 29 Full Moon

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Then again, “lose a planet, gain a planet”—if you’re up early on the morning of the 20<sup>th</sup>, look for **Mars in M44, the Beehive**. The spectacle will occur low in the brightening pre-dawn sky, with the still-faraway planet just 4° above our eastern horizon at 5 a.m., rising to almost 6° by 5:10. If that all seems a bit marginal, well... Mars is definitely coming, and

# PRESIDENT'S MESSAGE

by Ron Hranac

## Benefits of DAS Membership

How much do you know about the benefits of membership in Denver Astronomical Society? If you were to put together a list of those benefits, what would be on that list? Most DAS members are familiar with our monthly general meetings and lectures at the University of Denver's Olin Hall, access to the Edmund G. Kline Dark Site near Deer Trail, Colo., and the outreach we do during twice-weekly Public Nights and monthly Open Houses at DU's historic Chamberlin Observatory. Did you know that as a member, you don't have to pay admission to attend Public Nights and Open Houses? (You don't need a reservation for Public Nights, either.)

You might be surprised to learn that our combined outreach activities allow DAS to share astronomy with something like 5,000 people annually in nearly 140 events.

The Society has a telescope loaner program for members. Telescopes may be checked out by members and used for up to a month. You have to provide a deposit check, which will be held until the borrowed equipment is returned. More information about the loaner program is available at <http://www.denverastro.org/scopeloan.html>. If you're interested in checking out one of our loaner scopes, get in touch with DAS Quartermaster Ed Scholes at [scopeloan@denverastro.org](mailto:scopeloan@denverastro.org).

DAS maintains the Terry Schmidt Library located inside of Chamberlin Observatory. Members can check out books through Librarian Phil Klos or the lead operator on any night we're at the observatory.

If you're considering the purchase of your first telescope or are thinking about upgrading one that you already have, head for the south lawn next to DU's historic Chamberlin Observatory during one of our monthly Open Houses—members usually have scopes set up on the park lawn. You'll find other members are more than happy to talk about the pros and cons of their scopes for observing various objects, and let you take a peek through the eyepiece. This will provide an opportunity to evaluate several kinds of scopes, and determine what might be best for your interests. Likewise, if you have a telescope that you'd like help setting up and using, don't be bashful about asking for assistance. You might even find someone with the same make and model telescope as yours.

A few other membership benefits include:

- \* Subscription to *The Denver Observer*, the DAS newsletter featuring astronomical news, articles, and a calendar of upcoming events.

*Continued on Page 8*

## DAS SCHEDULE

### AUGUST 2015

- |       |   |
|-------|---|
| 7     | E-Board Meeting—At DU's Historic Chamberlin Observatory, 7:30 p.m.            |
| 14-16 | Dark Sky Weekend—EGK Dark Site & Brooks Observatory                           |
| 22    | Open House—DU's Historic Chamberlin Observatory—Starts at 8:30 p.m.           |
| 28    | General Meeting at DU's Olin Hall, 7:30 p.m., —Dr. Fran Bagenal - Pluto Flyby |

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 P.M.

October 1 - March 9 at 7:30 P.M.

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](http://www.denverastro.org)) or call (303) 871-5172.

## Society Directory

### DAS Executive Board

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Joe Gafford Ken Sturrock  
Chuck Habenicht Dan Wray  
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### Committees

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*The Executive Board conducts the business of the DAS at 7:30 p.m., at Chamberlin Observatory. Please see the Schedule of Events for meeting dates. All members are welcome. <http://www.denverastro.org>*



## DAS NEWS

*DAS General Meeting*

**Friday, August 28<sup>th</sup>, 7:30pm:** Dr. Fran Bagenal, of the Laboratory for Atmospheric and Space Physics at the University of Colorado, Boulder, and Co-Investigator for the New Horizons mission to Pluto, will share information and insights from the probe's unprecedented encounter with Pluto and its moons.

Dr. Bagenal has presented to DAS in the past, and we look forward to welcoming her again—this promises to be a most interesting presentation!

The meeting will be held at **DU's Olin Hall, Room 105**, and all present will be invited to a reception following the meeting at DU's Historic Chamberlin Observatory. Coffee and light refreshments will be served. ∞

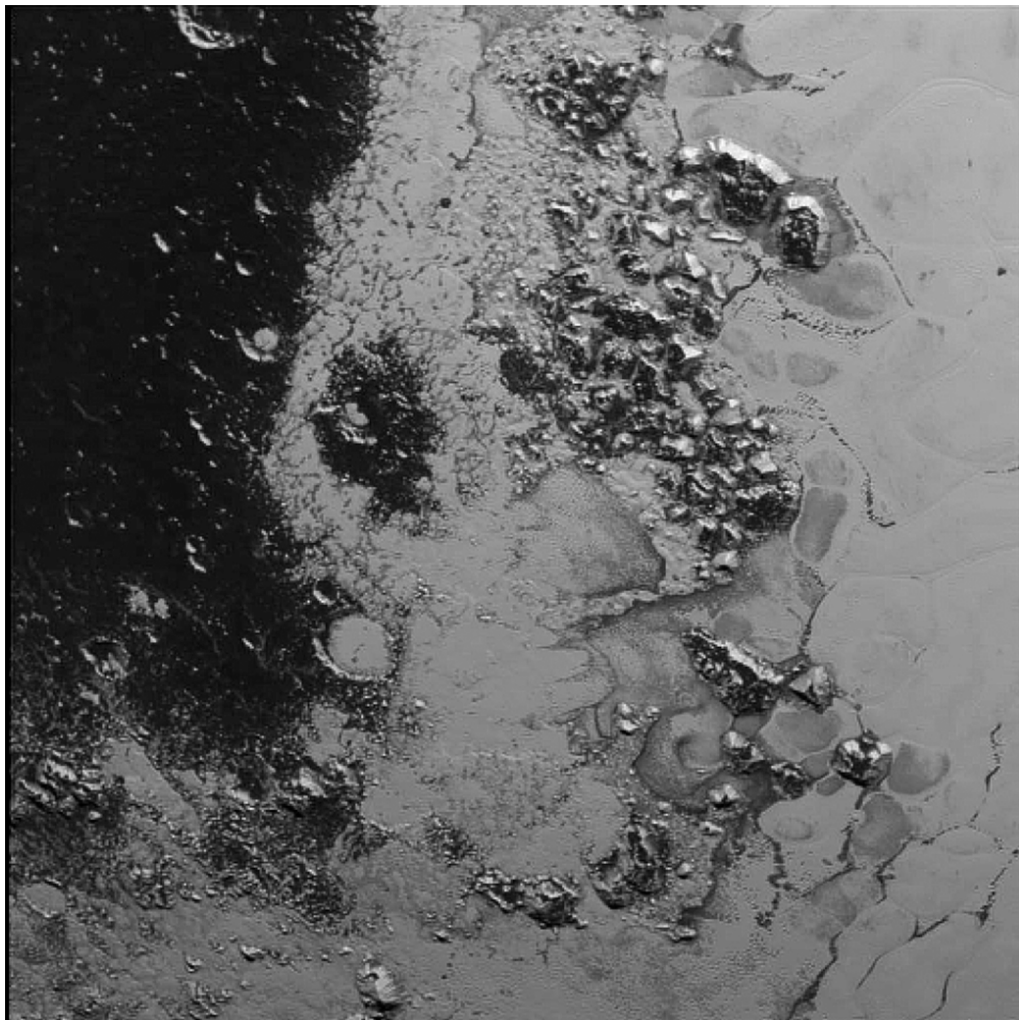
*Writers Wanted*

The Denver Astronomical Society is looking for good, volunteer writers to contribute articles for *The Observer's* "This Month's Skies."

Are you brimming with ideas about how to describe celestial events? If you are, please contact the editor, Zachary Singer, at [editor@denverastro.org](mailto:editor@denverastro.org)

∞

## NEW HORIZONS AT PLUTO!



A newly discovered mountain range lies near the southwestern margin of Pluto's Tombaugh Region (Tombaugh Region), situated between bright, icy plains and dark, heavily-cratered terrain. This image was acquired by New Horizons' Long Range Reconnaissance Imager (LORRI) on July 14, 2015 from a distance of 48,000 miles (77,000 kilometers) and sent back to Earth on July 20. Features as small as a half-mile (1 kilometer) across are visible. (Abridged version of original caption from NASA. Image Credit: NASA/JHUAPL/SWRI)

\*\*\* DAS is excited to host Dr. Fran Bagenal, who will speak to us about this historic mission. For details, see "DAS General Meeting," above left. ∞

## ABOUT THE DAS

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 is a long-time member in good standing of the Astronomical League and

the International Dark Sky Association. 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 Historic Chamberlin Observatory and its telescope in cooperation with the University of Denver.

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 Ed-

mund G. Kline Dark Site Fund.

More information about DAS activities and membership benefits is available on the DAS website at [www.denverastro.org](http://www.denverastro.org). ∞



## GETTING YOUR BEARINGS

... from the editor

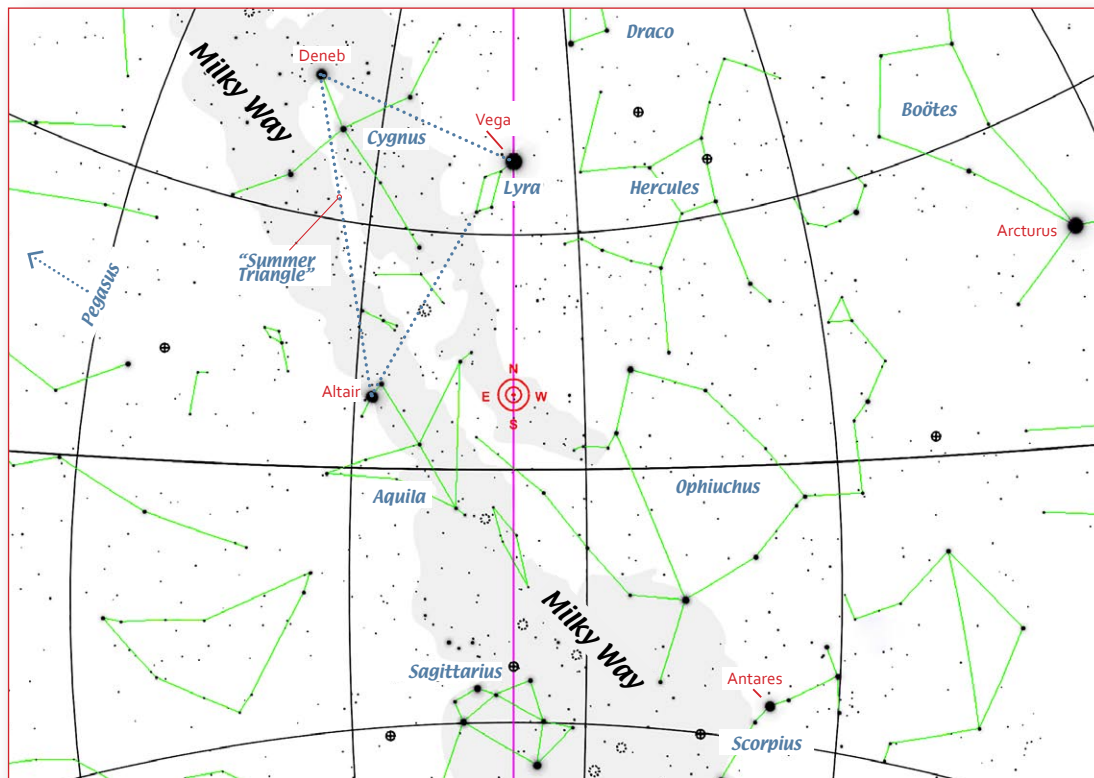
The Summer Triangle and Sagittarius

As night falls in August, you can count on an easy landmark for a large chunk of sky: The Summer Triangle. This large, arrowhead-shaped asterism is made up of the alpha stars of three constellations: Deneb, in the constellation Cygnus; Vega, in Lyra; and Altair, the southern “point” of the arrow, in Aquila. Since they’re all “alpha” stars, you’d expect that they’re likely the brightest stars in their respective constellations—and you’d be right.

As it happens, they’re also the brightest stars in this section of sky—and all three shine at 1<sup>st</sup> magnitude or brighter. That makes them useful for more than just finding their individual constellations—along with being “alignment stars” for computerized telescopes’ go-to systems, they’re a great “jumping-off point” for navigating elsewhere, as Arcturus was a few months ago. We saw last month, for example, that Vega made a convenient starting place for finding the “keystone” in Hercules; the Triangle is also a gateway to the Great Square of Pegasus in the east, Cepheus and Draco to the north, and Sagittarius—where we’ll be spending a lot of time this month—riding below it to the south.

Finding the Summer Triangle isn’t hard—at 10 p.m. at the beginning of August, the asterism is conspicuous in the southeastern sky. By mid-month, its westernmost and brightest star, Vega, is directly overhead, and at the month’s end, Vega has moved westward and the Triangle’s center is now directly overhead. Since the stars are the brightest in the area, there shouldn’t be much confusion about them—in fact, a good sneaky trick for learning the Summer Triangle is to go outside *in the city* at 10-ish, face south, and look up—I’ll bet you the stars of the Triangle will be the first thing you see, and the brighter or hazier the sky gets, the truer this will become. (The urban night sky here in Denver usually doesn’t get much darker than 3<sup>rd</sup> magnitude, more or less, and that unnatural brightness wipes out a lot of the other stars that might otherwise take your attention.)

To make sure, though, you can check that the “arrowhead” of the three stars points roughly southward, and you can double-check the distance between the stars. To do this, make an “L” figure with your thumb and index finger—when you hold your hand straight out in front of you, the distance across the sky from Vega (the brightest star) to Altair (the southernmost one) is about twice the span between your two outstretched fingertips. The distance from Deneb (at “top left” when looking southward) to Altair is only slightly longer than that, so “two L’s” is still about right—but the sweep from Deneb to Vega, “across the top” of the triangle—is narrower, and “one L” should just about do it. I *do* have long arms (apparently, my ancestors were late



The view south at 10:00 p.m. in mid-August, with center (at Telrad circles) 60° up. Note the Summer Triangle at top-center and Sagittarius at bottom-center. Star sizes are plotted in proportion to their brightness—the Summer Triangle’s are the brightest in their vicinity, making their identification simpler.

Objects, constellation and meridian lines charted in SkySafari, and then enhanced.

descending from the trees), so your measurements might vary slightly from mine, but they’ll be close enough.

Because the Summer Triangle overlays the sweep of the Milky Way not far from the galaxy’s center, the field contains many wonders—not just within the constellations that are home to the Triangle-stars, but in other constellations lying within the Triangle and just outside of it. This month’s “Skies” article will make a stop near Vega, and we’ll explore this area more fully next month—for now, though, we can use it to point to Sagittarius.

In ancient times, the shape of Sagittarius, The Archer, was supposed to represent an archer’s torso—with a tensed, curving bow arm and an arrow ready to go—melded onto the body of a bull, or later, horse. In more recent times, the torso’s shape is often reimagined as a “teapot,” with the bow arm now seen as the teapot’s handle, and the point of the arrow now the tip of the spout. This works pretty well for recognizing the star pattern, but when going the “teapot” route, it’s important to remember that the constellation’s borders contain more than the teapot alone.

Once you know what you’re looking for, Sagittarius is easily found using one of two approaches: The first is just to look directly east of the constellation Scorpius, which we covered at the end of this column last month. The other is to drop south and slightly westward from the Summer Triangle, or directly south (straight down at 10 p.m. mid-month) from Vega. As with Scorpius, you’ll need a clear horizon—the teapot is only about 20° up when it’s highest in the south. ∞

# RTMC REPORT

By Jack Eastman

*Astronomy, Optics, and Hobnobbing at the Riverside Telescope Makers' Conference*

... Seems like it snuck up on me, but it was already toward the end of May, and another sojourn to Big Bear, California, lay ahead. Another Riverside Telescope Maker's Conference (RTMC), which is held on the Memorial Day weekend at Camp Oakes near Big Bear Lake in the mountains about 100 miles east of the greater Los Angeles megalopolis. Moby, the Great White Whale—er—van, passed its pre-trip physical and I departed over the Hill (The Rockies) and down the Creek (The Colorado).

On the opening Friday, there were no formal activities, so lots of free time to look up old friends and acquaintances, see new folks, and just hobnob in general. Friday evening, there were informal “show-and-tell” slide shows on telescope design, astro-imaging and the like. An informal headcount suggested about 500 attendees or so, similar to last year.

Saturday brought the traditional large swap meet, lots and lots of stuff. Many vendors were there—Gary Hand from Hands-On-Optics, OPT, Scotty from Explore Scientific, Celestron, and several other vendors under a large tent on the edge of the telescope field. (This time all I bought was a nice 6-inch vernier caliper.) There were numerous activities for kids, astronomical sessions for beginners, as well as a lot of non-astronomical things for families: canoeing, archery, rock climbing and the pool—too cold to swim in, too warm to skate on!

The first paper of the Saturday sessions was from Tim Thompson, this year's G. Bruce Blair Medalist, past president of the Los Angeles Astronomical Society (~10 years!), former vice-president of the Mt. Wilson Observatory Association, and retiree from the Jet Propulsion Laboratory (JPL). His subject was “Multi-Wavelength Astronomy, Freedom from the Tyranny of the Eye,” an in-depth discussion of the appearance of the universe in frequencies from gamma rays to long-wavelength radio. Then, RTMC's “Grand Poobah,” Steve Edberg, gave a progress report on his go at infrared imaging. This was followed by a truly interesting discussion of the history of Griffith Park and the plans that Griffith J. Griffith had for a park, including a zoo, outdoor theater, golf and, of course, an observatory where people could get an education about the cosmos and a telescope for real-time viewing. As you may know, the latter led to the Griffith Observatory and Planetarium. This was elegantly presented by Anthony Cook, Astronomical Observer at Griffith. [*The Griffith Observatory is now a famous landmark sitting high in the Hollywood Hills above Los Angeles. Featured in numerous movies, the observatory is home to a 12-inch Zeiss refractor built for public viewing and said to be among the most-used telescopes in the world. —Ed.*]

The afternoon sessions included a talk by Alex McConahay on Nightscape Photography; it was very similar to our own Roger Clark's discussion at the Spring Banquet. Seems most all of his nightscape sported a dark blue sky, not the greenish, from natural skyglow, that Roger showed. Following this was a discussion of a citizen project that could be carried out all along the eclipse path of our upcoming 2017 Total Solar Eclipse, the Citizen Continental America Telescopic Eclipse Experiment (CATE). This involves having volunteers along the entire path of totality photograph the eclipse with cameras having about a 1° field of view. The idea is to capture the very innermost corona, which is excluded by the coronagraphs on board the Solar Heliospheric Observatory (SOHO), to watch the sorts of activity that

occur “in close.”

The last paper was the construction of a 12-inch f/17 refractor, which, unfortunately, was concurrent with the Western Amateur Astronomers' (WAA) summer board meeting. The WAA's publication, *The New Pacific Stargazer*, is in its 6th edition and contains a bio of Tim Thompson, this year's G. Bruce Blair Medalist and a synopsis of our own august group, the DAS.


The evening activities included award presentations and the keynote speaker, Chuck Claver. He's a systems engineer for the Large Synoptic Survey Telescope (LSST), a true monster of an instrument, with a “three-mirror” design and an 8.4-meter (28-foot) aperture. It boasts a 3.5° field of view and will photograph the entire sky every 2 or 3 days with a 3.2-gigapixel camera, producing 1.28 petabytes of uncompressed data per year. In a very unique approach, the primary's mirror functions as two mirrors on one surface—a second curve ground over its central 5 meters works as the telescope's tertiary mirror. (The light path travels from the outer section of the primary, to a 3.4-meter secondary, and then back to the inner part of the primary/tertiary for the final reflection.) The whole system has the light-grasp of a 6.68-meter aperture, operating at an effective focal length of 10.31 meters.

A couple of notable telescopes were Gerry Logan's coma-free Schmidt-Cassegrain (SCT), demonstrating his uncanny ability as both a master optician and a master machinist, and Bob Pfaff's “vintage” telescope, a small refractor housed in a wine bottle. (Wine bottles in astronomy aren't without precedent, as about 10,900 pounds of St. Gobain wine-bottle glass were consumed in the mirrors for the 60-inch [1908] and 100-inch [1917] reflectors of the Mt. Wilson Observatory.) The smallest Newtonian reflector was, once again, Joe Meyer's 23.4mm. What would have been the largest by far, Mike Clements' 1.78 meter (70-inch) dob, didn't come. Although of a lightweight, cellular design, his primary mirror still weighs in at 900 pounds, and Mike is still trying to figure out how to haul this thing around!

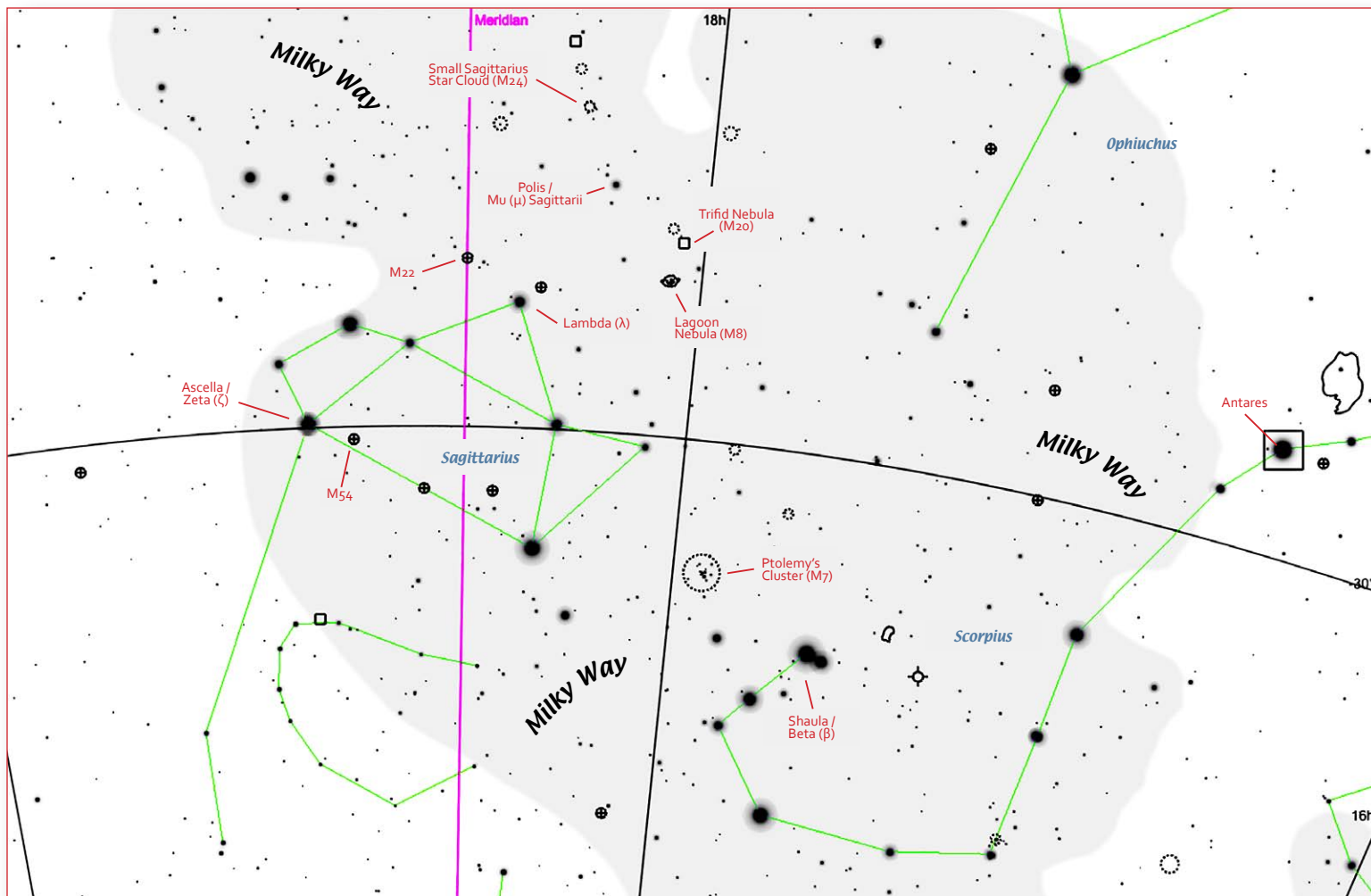
Sunday was a relatively light day, with a few sessions in the afternoon. (I pretty much missed these, as I was more involved in bull sessions with many of the old friends I grew up with back in the Land of Perpetual Smog, the other big reason I make the 1958-mile sojourn.) The evening session was short and sweet.

Monday morning was the final breakfast, and breaking camp—if my culinary skills haven't killed me off by then, I plan to go again in 2016.

## For more information on CATE and LSST:

- \* <http://www.noao.edu/noao/staff/mpenn/eclipse2017.html> (CATE)
- \* [http://en.wikipedia.org/wiki/Large\\_Synoptic\\_Survey\\_Telescope](http://en.wikipedia.org/wiki/Large_Synoptic_Survey_Telescope) (LSST)
- \* <http://www.lsst.org/lst/> (LSST) 





Sagittarius, surrounding constellations, and the Milky Way, as seen from Denver at 10 p.m., mid-month. Except M54, all labelled objects should be visible to the naked eye under clear “dark-sky” conditions. This area is filled with deep-sky objects; dimmer ones are omitted for clarity. (For details on objects in Scorpius, see last month’s “Skies” article.)

Objects, meridian and constellation lines plotted in SkySafari, and then enhanced.

## AUGUST SKIES

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“bulge” within the Milky Way’s flying-saucer shaped cross-section, a view which includes dark lanes, clusters, and nebulae—details you’d find difficult or impossible to see in other galaxies with a telescope.

We’ll start in the “teapot” of Sagittarius and work our way upward—if you’re not familiar with the constellation, though, check out this month’s “Getting Your Bearings.” These past few months, we’ve been looking at globular clusters, because as summer progresses, Earth’s night sky faces the center of our galaxy—where globulars are most commonly found. Since the Sagittarius “teapot” is seen in front of the center of the Milky Way (from the Earth’s point of view), you’d expect to find a great number of globulars in this area—and you’d be right. There are at least 10 of them in the teapot or directly adjacent to it, and *at least 20 more* scattered in the bright patch of the Milky Way north and west of the asterism.

**M22** (18h 38m, -23° 53’), our first telescopic target, can be glimpsed with the naked eye under good conditions. It’s the glow you’ll see to the northeast of the star at the top of the teapot, Lambda (λ) Sagittarii (also known as Kaus Borealis on some maps). In poorer conditions, or if your eyes aren’t fully dark-adapted, you can center the star in your finderscope, and find M22 by moving your scope gently eastward and “up” (northward) a touch. A short hop will put M22 in your finderscope well before Lambda exits the view.

Compared to last month’s showpiece, M13, the visual impression of M22 is that it’s more “spread out”—almost like an “oval open cluster.” Individual stars are easily resolved, but somewhat “mushy” looking, because M22’s southern declination brings it low in the Denver sky, where our turbulent atmosphere scatters its light. Don’t let that discourage you, though—M22 is impressive, and it offers something that M13 can’t—a beautiful, star-laced Milky Way background. To see detail in the cluster, try 125X to 200X magnification, but don’t forget to back the power down and get a wide-field view, too—M22, with our galaxy’s center behind it, is very much worth seeing!

Unlike M22, **M54** (18h 56m, -30° 27’) isn’t a showpiece at all—as we see it here on Earth, it’s much smaller looking and less distinct than M22, with stars remaining unresolved in my 12-inch scope. It is an interesting object, though, for *what* and *where* it is—a very large globular, boasting a physical diameter more than double M22’s (and nearly double M13’s), and packing an absolute magnitude that makes M54 intrinsically more than 6 times brighter. If M54 were located where M22 is, it would be an easy naked-eye object glowing brightly at about magnitude 3.1, compared to M22’s mag. 5.1.

The discrepancy between M54’s actual characteristics and the way we see it is due in part to its great distance—some 86,000 light years—and in part to the scattering of light by inter-

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vening dust particles at the center of our galaxy. Ironically, although M54's line-of-sight projects it onto Sagittarius and our galactic center, M54 lies well beyond—in *another galaxy!* That's right—modern measurements suggest that M54 is a member of the Sagittarius Dwarf Elliptical Galaxy, which though closer than the Large Magellanic Cloud, still lies a considerable distance “behind” the center of the Milky Way from our point of view. Looking through the eyepiece while considering this puts M54 in a whole new light—and M22, too, as a now-“foreground” object at a “close” 10,000 light years!

In theory, M54 is easy to find, as its 7.6-magnitude brightness (and surface brightness about the same as M22's) *should* make it visible in a finderscope. If so, you'll see it right away by centering Ascella, Zeta ( $\zeta$ ) Sagittarii, in your finderscope (the star is where the “base” of the teapot meets the “handle,” towards the southeastern part of the asterism). If visible, M54 will be near the western edge of the finder's field. Considering the conditions we've had in the Denver area these last many months, you may not be so lucky—I wasn't, when I observed this globular a few weeks ago. To find it while “flying blind,” you'll need finely calibrated setting circles, a go-to system, or more precise Telrad techniques than I can fully describe here. For the latter, though, pay *strict* attention to the angles from Ascella to M54, and how they apply to the season and time of night. It *is* possible to find M54 with a Telrad without seeing it first—I hit the globular that way on my second try.

Moving northward, or pretty much “upward,” at our stated time, you'll see brighter patches within the Milky Way's glowing band. Among the first you'll encounter after leaving the teapot is the **Lagoon Nebula, M8**, a huge star-forming region containing a beautiful cluster of the stars it gave birth to, and which now sets the nebula itself alight. The whole complex is about  $1\frac{1}{2}^\circ$  across, so rich-field telescopes—and even finderscopes—will give you a great view. Going up to moderate power (125X) boosts the contrast so the nebula becomes clearer, but I've found a good UHC filter to be worthwhile, too. At the same time, moderate power (without the filter) brings out the cluster itself, which is worth an extended look on its own.

Don't let the suggestion of the filter throw you—M8 is to summer skies what the Orion Nebula, M42, is to the winter—not just a showpiece, but a sure entry on most observers' “Greatest Hits” lists. M8 isn't just bright enough to be seen naked-eye in dark skies, it also remained visible with moderate haze in the “semi-dark” skies south of Chatfield Reservoir, and still showed nebulosity in the telescope there.

Navigation to M8, at 18h 05m,  $-24^\circ 30'$ , is straightforward; since it's bright enough to be seen and pointed at directly, the only problem is making sure you're actually pointing your scope at the right bright patch among the many. To get to the Lagoon, just imagine the teapot's “spout” steaming straight up (relative to the teapot's base), and follow the steam up to the nebula. You'll find it about the same distance from the tip of the spout, as the spout itself is long. If you're in the right place, the Lagoon Nebula's stars will show as a more-or-less horizontal “bar” in your finderscope; when you center the Lagoon, the Trifid Nebula will share the finderscope field to the north (note that the Trifid would then be near the *bottom* of most finderscopes' inverted view).

As both a crosscheck on finding M8, and the way to the next object, look north and slightly eastward from M8 and you'll find Polis, or Mu ( $\mu$ ) Sagittarii—it's the first reasonably bright star in that direction (for reference, it's about the same brightness as the star at the tip of the

teapot's spout). Polis is about the same distance from the teapot's top, Lambda ( $\lambda$ ), as the teapot's top is from M8.


Now that you've got Polis, our next stop, **M24, the Small Sagittarius Star Cloud**, is a quick hop away—to get to M24, at 18h 19m,  $-18^\circ 23'$ , imagine a line from M8 to Polis, extend past the star for about the same distance, and look for the bright patch just above (north of) where you land. You'll know M24 immediately when you see it—a huge, dense field of stars  $1\frac{1}{2}^\circ$  across. Use the lowest power you've got to start with, both to ease navigation and to get the widest view—but when you've taken it all in, try sweeping the area at high power and lose yourself in the expanse.

Realistically, this column could remain in Sagittarius, touring object after object, *for months*—so the objects we have covered here are more of a “taste” than a comprehensive list. Like every “group tour” you've ever been on, we'll move on now, before we've really seen it all.

Unlike the deep-sky objects we saw in Sagittarius, of which the closest (M8) was about 4,700 light years from us, our next target is a multiple-star system in “our local neighborhood,” at a mere 162 light years from Earth: **Epsilon ( $\epsilon$ ) Lyrae**. Also known as “**The Double-Double**,” it's a fascinating system at 18h 45m,  $+39^\circ 41'$ , near enough in the sky to the bright star Vega to make finding it simple. To get to Epsilon Lyrae, just center Vega (see this month's “Getting Your Bearings”) in your finderscope—Epsilon will share the field, and with the finder's modest magnification, it will be clearly split in two.

It's when you have it in your telescope, though, that the magic really happens—the “single” star, which became a “double” in the finder, begins to separate yet again, until at high power it's clearly revealed as *two* close pairs—*four* stars in all! These pairs aren't just line-of-sight coincidences, they're actual binary pairs, with each pair orbiting its own center of mass—while both couples orbit the whole system's combined gravitational center.

With the tight pairs' separations of 2.2-arcseconds and 2.8-arcseconds, my 6-inch reflector can split both at 150-200X in Denver's choppy skies, though on worse nights, the closer pair may only hint at separation. According to Professor James Kaler (Univ. of Illinois), the *average* orbital distances within the pairs are about 145 and 235 astronomical units, respectively (but with very eccentric orbits leading to much larger and smaller values at the extremes). The distance from one pair to the other is at least  $1/6$  of a light year, with an orbital period estimated at 400,000 years or more. If you'd like to add an extra touch of wonder or complexity, though, consider this—data now suggest that the easternmost star of the four may also be double....

—See you next month. 

*President's Message*      *Continued from Page 2*

- \* Discounted subscriptions to *Astronomy* and *Sky & Telescope* magazines.
- \* Optional no-cost subscription to the DAS general membership's Yahoo Group listserv (sometimes known as an e-mail alias, list, or reflector).
- \* Invitation to the summer picnic in July, holiday party in December, and annual banquet in March.
- \* The DAS holds its Board of Directors' meetings, called Executive Board or E-Board meetings, at Chamberlin on a (usually) monthly basis. These tend to run about two hours, and members are welcome to attend. See the calendar on our web site for dates and times.
- \* As a member of the Denver Astronomical Society you're automatically a member of the Astronomical League (<https://www.astroleague.org>). League member benefits include a subscription to the *Reflector*, the quarterly publication of the Astronomical League; participation in the Astronomical League's observing certificate programs, and use of the AL's discounted book service.
- \* While not limited to members, the Van Nattan-Hansen Scholarship program "provides support for worthy graduating high school students or undergraduate college students majoring in astronomy and the physical sciences." See <http://www.denverastro.org/vannattan.html>.

Do you like astronomy outreach? DAS conducts star parties and outreach for a variety of organizations, schools, and civic groups, including Space Day (spring) and Colorado Astronomy Day (fall) at the Denver Museum of Nature and Science. We need volunteers to bring and set up telescopes for observing, and sometimes speak or give multimedia presentations. If this is something that interests you, get in touch with External Outreach Coordinator Lindsey Shaw at [external@denverastro.org](mailto:external@denverastro.org). (More information about our outreach activities can be found at <http://www.denverastro.org/external.html>.) If you're interested in helping out during Public Nights and Open Houses, stop by any of those events and let one of the team leads know, or get in touch with Public Night Coordinator Hugh Davidson at (303) 679-0629.

Arguably the best benefit of being a DAS member is the Society's other members. DAS is a community of people with a wide range of experience and expertise who share an enthusiastic interest in astronomy. More information about DAS and membership benefits can be found on our website: <http://www.denverastro.org/index.html>. ∞

