The Denver
OBSERVER
SEPTEMBER 2015

On the evening of the 27th, Coloradoans will get to see a total eclipse of the moon, like the one pictured here. (See story on page 5.) This image was taken near the end of totality during the April 15th, 2014 lunar eclipse, as seen in Lakewood, Colorado. ***Image © Jeff Tropeano***

SEPTEMBER SKIES

by Zachary Singer

On the "to-see" list for this month, we have a total lunar eclipse, a relatively easy-to-find example of a rare carbon star, two different sets of binary stars, a well-known and brilliant open cluster, and an equally well-known supernova remnant, as well as some notes on other happenings in the solar system.

The big headline, of course, is the **total lunar eclipse on the evening of Sunday, September 27th;** the first subtle (penumbral) darkening begins at 6:12 p.m. For full details of the eclipse's timing, as well as the Denver Astronomical Society's public eclipse viewing event at Chamberlin Observatory, please see "Lunar Eclipse!," on page 5.

Next to an eclipse, the motions of the planets might seem anticlimactic, but there are still sights to be seen. Among the first is **Venus** as a very thin, bright crescent, large in a telescope at dawn as September begins. Look for the (-4.4)-magnitude planet about 14° above the eastern horizon at 6:00 a.m.; it should be easy to spot in the pre-dawn sky. By month's end, Venus will have "fattened up" to a lemon-wedge appearance, and will be nearly 30° above the horizon in a darker sky. (The planet's eastern bearings and later sunrise are, of course, a harbinger of fall's arrival.)

Saturn is now low in the west in the evening; by the end of the month, it will be close to setting as the sky becomes dark, and will reappear this winter as a morning object in Scorpius. Meanwhile, **Neptune** comes to opposition on the night of Aug. 31/Sep. 1, and is therefore at its best around midnight at the beginning of the month—and at 10 p.m. at month's end. Unlike a planet nearer to us, Neptune's size and appearance won't change much as Earth's orbit begins to move our planet away from Neptune. The disk will shrink from a tiny 2.4" at opposition to a slightly tinier 2.3" two months from now…. (For the newbies, Neptune should be a detectable disk at high power; if space permits next month, there will be some help with finding the planet then.)

Unfortunately, September's meteor showers are worth noting only to say that they're hardly worth noting: The Aurigids, a minor shower, will be obscured by a nearly full moon. Another minor shower, the

Continued on Page 6

In the Observer

Sky Calendar

5	Last-Quarter Moon
13	New Moon
21	First-Quarter Moon
27	Full Moon—***Total Lunar Eclipse*** (see story p. 5)

PRESIDENT'S MESSAGE

by Ron Hranac

Astronomy and Pseudo-Science

Although most of us are not professional scientists, what we amateur astronomers do still rests solidly on *the accuracy of scientific facts* and *logical reasoning*. When we deal with the general public, though, we're occasionally confronted with the *unscientific* side of things.

As I write this month's President's Message, the annual "Mars Spectacular" hoax is making its rounds via the Internet: The claim is that Mars will appear as big as the full Moon in our night sky. That's clearly nonsense, but when the hoax surfaces every year, I get asked about it anyway. This year was no exception.

The origin of the hoax is the August 27, 2003, Mars opposition, when the red planet was unusually near to Earth. Even during that close approach, Mars still looked like an orange "dot" to the unaided eye—but *when viewed through a telescope,* at a moderate magnification of 75X, it would appear about the size of the naked-eye full Moon. (I enjoyed observing Mars around the time of the '03 opposition, although I don't recall its appearance in the eyepiece being as big as the Moon.)

What the hoax leaves out, of course, is "when viewed through a telescope (in August of 2003)." Instead, the hoax surfaces each summer, promising that in August of the current year, one will be able to see a Moon-sized Mars. A variation of the hoax this year even has a photo with two moons in the sky, and the following text superimposed on the obviously Photoshopped image: "Aug 27th you will see two moons in the sky, but only one will be the Moon. The other will be Mars. It won't happen again until 2287. No one alive today has ever witnessed this happening."

Um, *no*, not even close to being true. Ever.

For what it's worth, the angular diameter of Mars as of mid-August this year is a tiny 3.7 arc-seconds—some 500 times smaller than the hoaxers suggest, and barely large enough to see the planet's disk, *even in a telescope*.

Another bit of the unscientific is UFOs. I'm not referring to legitimate unidentified flying objects, which are just that: objects that are simply *unidentified*. (After all, people can be caught off guard the first time they see an Iridium flare or an International Space Station pass.) Rather, I'm talking about the "flying saucer" variety. During the UFO craze of the late '60s, a neighbor insisted he saw a UFO each night around sunset. One time I asked him to point it out, *and there it was!* (I explained that what we were looking at was the planet Venus.)

Continued on Page 5

DAS SCHEDULE

SEPTEMBER 2015

4	E-Board Meeting—At DU's Historic Chamberlin Observatory, 7:30 PM
6	LAST "Solar Sunday" at S&S Optika—10:30 AM - 2 PM—See "DAS News"
11-13	Dark Sky Weekend—EGK Dark Site & Brooks Observatory
12-20	Okie-Tex Star Party—Kenton, OK
19	Open House—DU's Historic Chamberlin Observatory—Starts at 8:30 PM
25	General Meeting at DU's Olin Hall, 7:30 PM —Dr. John Bally
26	LAST Backyard Star Party at S&S Optika—Starts at 8:00 PM
27	Solar Day at Denver Museum of Nature and Science—10 AM - 4 PM
27	Total Lunar Eclipse: Open House—DU's Chamberlin Observatory—Starts at 6:30 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.

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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

— S&S Optika to Close Its Doors —

As many of you heard at the recent DAS General Meeting, Cathie and Tim of S&S Optika have decided to close the store—a move that leaves many of us sad to see them go, but excited for their future happiness…

We'll have more to say about this next month, but in the meantime, we were able to make room in the Observer for a note from them:

S & S Optika thanks YOU for 43 years.

It has been a pleasure to serve you.

We are retiring the retail store. We will be open our regular business hours for all of September. The final closing date will be announced a little later.

Please join us for our LAST Solar Sunday on September 6th at 10:30 AM, and our LAST Backyard Star Party on September 26th at 8:00 PM.

Personally, while we still have reasonably good vision for observing, we will be moving out of state to more southerly (~ 34° North Latitude) DARK skies.

Thank YOU again!

Volunteer Opportunities

September 5, 8:30 PM: Star Party at Cherry Creek State Park. Every weekend, Cherry Creek SP has a campfire program, and on September 5, they would like us to host a star party. Campfire programs are held at the Campground Amphitheater, inside the campground, but our contact also mentioned maybe setting up scopes near the swim beach because it might provide a nice area with open views of the sky above the lake.

September 12, 10:00 AM-2:00 PM (8:30 AM setup): Rocky Mountain PBS Kids Fun Fest at 1089 Bannock Street, Denver. They've invited us to host a booth with an interactive activity for kids from preschool age to 4th/5th grade. I'll reach out to everyone so we can brainstorm an activity, and I can send more details.

September 27, **10:00 AM-4:00 PM (8:30 AM setup): Solar Observing at Denver Museum of Nature and Science.** The museum will open at 9:00 a.m., so DAS volunteers will have to be set up no later than about that time (the Sun won't pop up above the building until closer to 10 in the morning). *Given the DMNS free day, DAS volunteers should arrive early to get a parking place, probably no later than about 8:30 a.m. or so*. (Free days at DMNS tend to attract something like 10,000 or so visitors, which can make parking a challenge.) **Note: For those DAS volunteers who will be putting out scopes at *both* this event and the Lunar Eclipse at Chamberlin Observatory (6:30 the same evening), the DAS will provide free pizza at Chamberlin, so you won't have to worry about grabbing dinner in-between.

To volunteer, please contact Lindsey Shaw at *external@denverastro.org*—and thanks!

DAS General Meeting

Friday, September 25th, 2015, 7:30 PM: Dr. John Bally will speak on recent discoveries about the formation and evolution of star clusters in giant molecular clouds. (The nearest and largest example of these phenomena is the Orion Nebula, which actually spreads throughout the surrounding region, and which is the origin of many of the stars in the constellation itself.)

Dr. Bally is a professor at CU, Boulder, in the Center for Astrophysics and Space Astronomy (CASA). His main research interests include the interstellar medium, molecular clouds and star formation, the formation of clusters and massive stars, and proto-stellar outflows and jets. Major recent projects include the Bolocam Galactic Plane Survey and the Herschel Plane Survey (Hi-GAL).

Professor Bally authored with Bo Reipurth the excellent popular book for laymen, *The Birth of Stars and Planets*.

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.

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 Edmund G. Kline Dark Site Fund.

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

GETTING YOUR BEARINGS

...from the editor

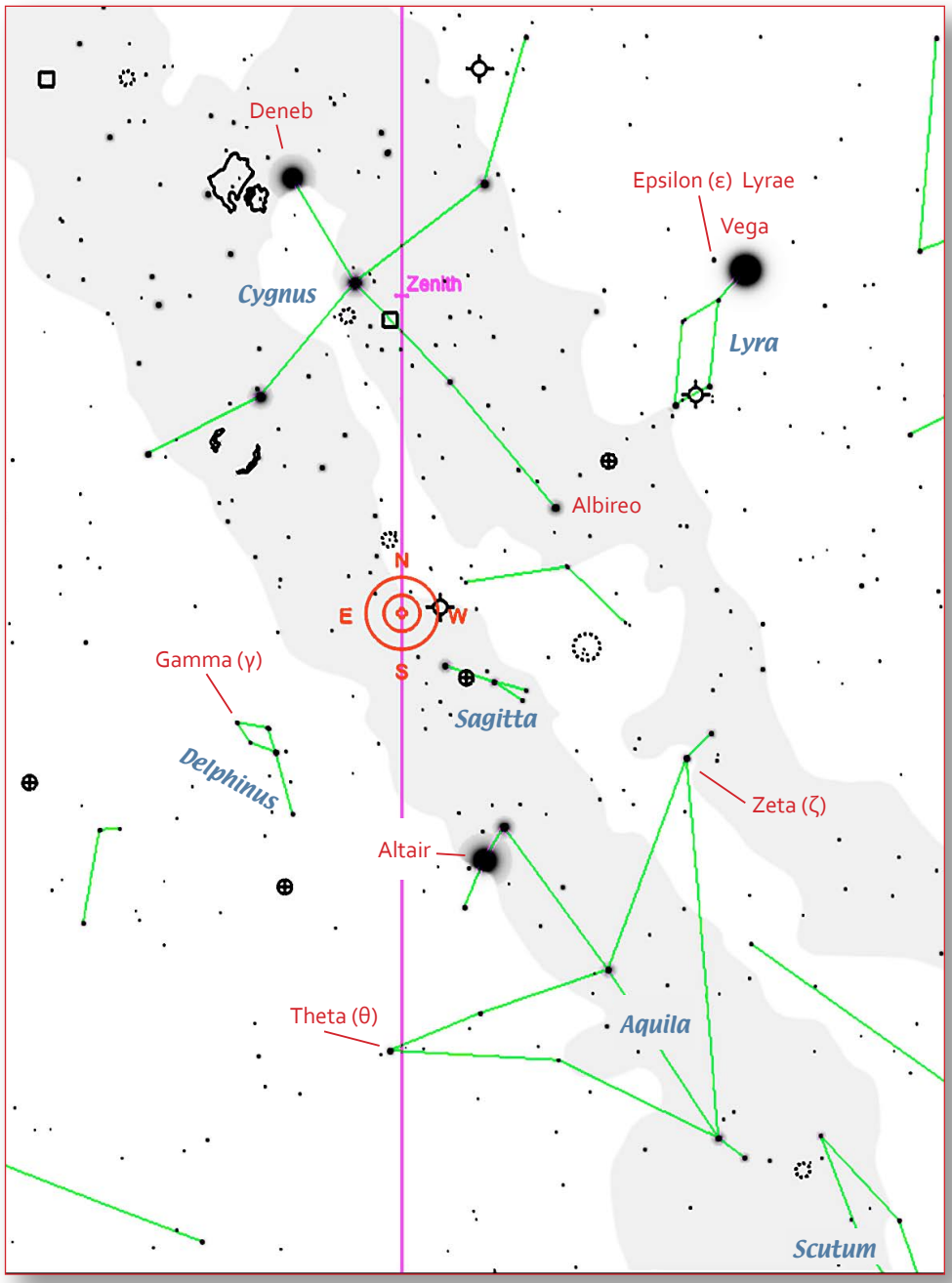
Constellations of the Summer Triangle

Last month, this column described the three bright stars in the Summer Triangle, how to find them, and how they could be useful as landmarks. (If you missed it, see *http://www.denverastro.org/observer.html*.) This time, we'll use look at the constellations within the triangle and a few "next-door neighbors."

Since it's been a month since our last tour, the star field has shifted westward about 30 degrees—Vega was the star to look for near the zenith then, but now the 1st-magnitude star Deneb, at the "top-left" of the triangle (when looking southward and up) is closest, and Vega lies west of there. Deneb is the brightest star in the constellation Cygnus, the Swan, which clearly resembles a long-necked swan in flight, with Deneb at its tail (see star map).

As the map shows, Cygnus can also be described as a cross (in which case Deneb is at the top); the cross's arms are the inner part of the swan's wings, and the bottom of the cross, Albireo, is the swan's head or nose. (Albireo, a beautiful double star in a telescope, can also be found by looking just northeastward of the halfway point between Vega and Altair, the two other bright stars at the corners of the Summer Triangle.) All the stars in Cygnus's traditional outline, except the stars at each "wingtip," are fairly bright—they're visible in the city under decent conditions.

Vega, the brightest of the Summer Triangle's stars, is the fastest way to find the constellation Lyra, the Lyre. In the city, Vega is sometimes Lyra's only visible star—the rest are 3rd-magnitude or dimmer, so while they're well within the 6th-magnitude limit of average human night vision, they're easily washed out by a combination of city lights, haze, or clouds. In the country, though, on a clear night, Lyra's parallelogram shape is easily seen, along with Epsilon Lyrae, the famous "Double-Double" star system, looking like a solitary "accent" star near Vega. Since Lyra is, like Cygnus, a simple shape to learn and filled with interesting objects, it's definitely a constellation worth familiarizing yourself with.



The view south at 9:30 p.m. in mid-September, looking nearly straight up. The vertical line near the chart's center is the Local Meridian, the line that runs directly north to south through the zenith. The Telrad circles are 4°, 2°, and 1/2° across and included for scale.

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

Altair, the last of the bright Summer Triangle stars, is at the top of the constellation Aquila, the Eagle. The constellation's outline as drawn here to evokes the eagle's outstretched wings—the two stars Theta (θ) and Zeta (ζ) Aquilae are the wingtips. It's easy to misjudge the size of this constellation—it's much bigger than people often assume, and Aquila's eagle is actually almost as long as Cygnus's swan. (In both cases, an "L" shape made with outstretched thumb and index finger and held at arm's length serves as a rough guide to their size in the sky.)

Finally, there's Delphinus, whose outline looks like either a dolphin, as the name suggests, or a kite with a long tail. Look for it just east of the line running between Deneb and Altair. Since most of its stars are 4th-magnitude, it's often washed out in the city, but it's obvious in dark skies once you look for it. As with many constellations, its official boundaries extend well past its traditional outline, so there are some objects (some globular clusters come to mind) that are well outside of the dolphin shape but still within Delphinus.

Finally, there's Sagitta, the Arrow, halfway between Altair and Albireo. Though we won't be touring there this month, there are some important objects in and near it (like the Dumbbell Nebula), and it's worth taking a quick peek at the map to note its position. Sagitta is also somewhat in a line with Albireo (or Vega/Lyra, further out) and Delphinus—and since its stars are about as bright as those in Delphinus, if you can see one constellation, you should be able to spot the other.

LUNAR ECLIPSE!

Special Event at the Chamberlin Observatory, Sunday, Sep. 27

The Denver Astronomical Society is hosting a special event for September's **total lunar eclipse on Sunday, September 27th** at DU's historic Chamberlin Observatory. DAS members will have telescopes set up on the park lawn south of the observatory building, starting at about 6:30 p.m. Viewing through DAS member telescopes is free of charge.

This month's eclipse happens during a so-called "Super Moon," so it will appear about 10% larger than the average full moon. Even better, unlike many recent lunar eclipses, it will occur early enough in the evening that folks won't have to worry about staying up too late for work or school the next day! The Moon will rise here in Denver at 6:43 p.m., so by the time the Moon gets above the trees on the east side of Observatory Park, the first (penumbral) stage of the eclipse will be underway. By 7:07 p.m., the Moon will enter the umbra, the darker part of Earth's shadow, and it will look like a sharp "bite" has been taken out of the Moon's brighter area. The total-eclipse stage will happen about an hour later, when the moon will be entirely within the umbra—the chart included here has all of the eclipse's timings.

DU's historic Chamberlin Observatory will be open to the public. Since the Moon will be low in the east at the beginning of the eclipse, it's likely that the observatory's 20-inch Clark-Saegmuller refractor telescope will be pointed at Saturn or something else until the Moon is high enough to view. (Cost: $2 per person or $5 per family for Clark-Saegmuller viewing—no charge for viewing through DAS members' scopes.)

Eclipse Timings

(PM)	
6:12	Penumbral Eclipse Begins
7:07	Umbral Eclipse Begins
8:11	Total Eclipse Begins
8:47	Mid-Eclipse
9:23	Total Eclipse Ends
10:27	Umbral Eclipse Ends
11:22	Penumbral Eclipse Ends

DAS PICNIC

Images from the July 25 Event at Chamberlin Observatory

A successful picnic is one where the company is even better than the food—and as you might guess with the DAS, this event was a success...

Later that same evening, some (happy and well-fed) DAS'ers put their scopes out on the lawn and welcomed the public for the July Open House.

All photos © Don Lynn

President's Message

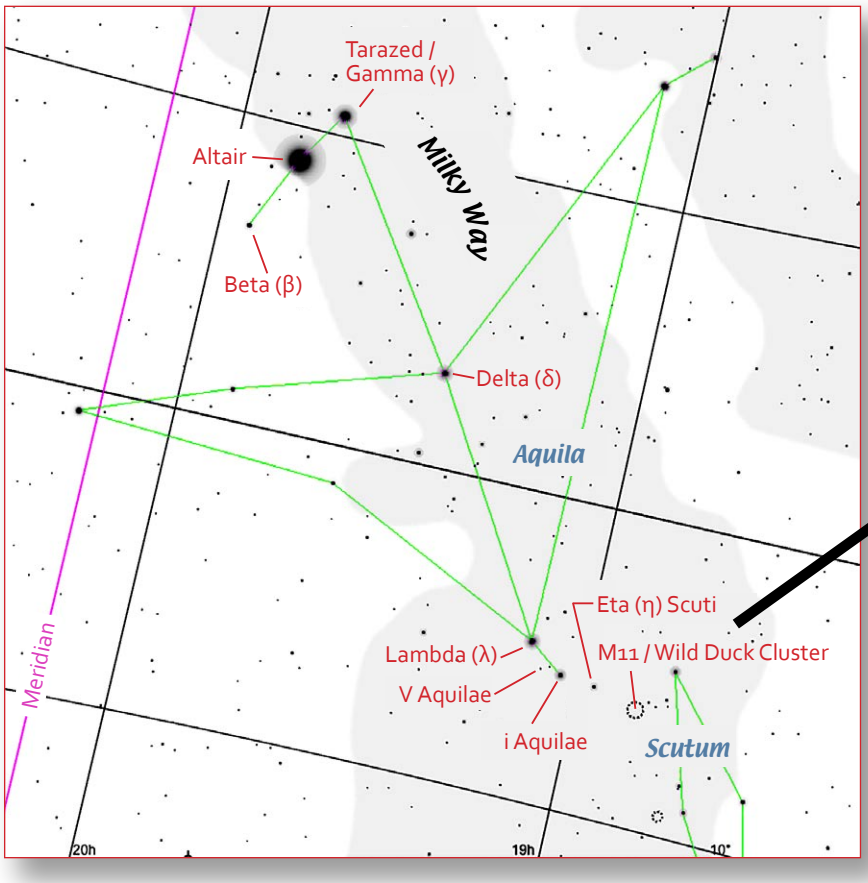
Continued from Page 2

A few years ago, I had a telescope set up at Daniels Park in Denver's southern suburbs. I invited several folks who were at the park to take a peek through the eyepiece. A little later in the evening, someone walked up and explained that he belonged to a UFO-related club or organization. After some polite chitchat, he asked me if I had ever seen any unexplained "flying" objects while enjoying astronomy. He seemed disappointed when I said no.

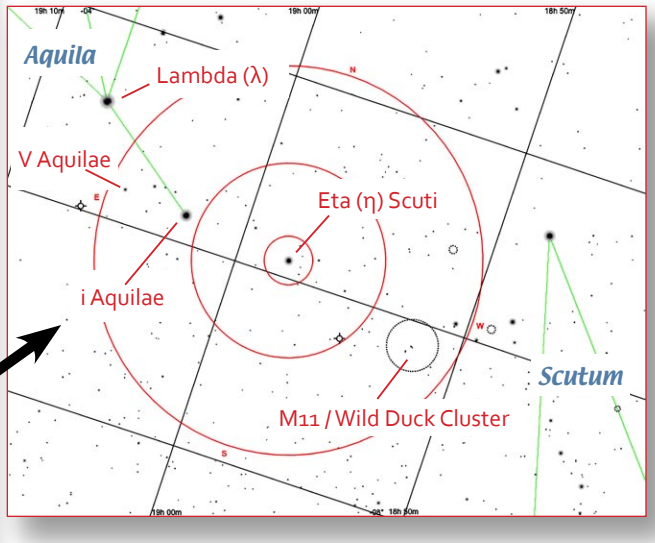
I did tell him that the only truly *unidentified* flying object I had ever seen was in the daytime, back in the early 1970s. On the afternoon of August 10, 1972, I was riding my motorcycle with a friend in my northern Idaho hometown. We saw something appear at the southern horizon, emitting what looked like flames or sparks as it moved across the sky. At first we thought it might be an aircraft on fire. We stopped and turned off the motorcycle's engine, but heard nothing. The object continued on its northbound trajectory, disappearing over the northern horizon.

That was my first and only UFO, but by the next day, it was no longer unidentified. The object was an Earth-grazing meteoroid that was seen in nine states and parts of Canada. It's now known as the 1972 Great Daylight Fireball.

How should we react when someone asks about topics that are clearly in the pseudo-science camp? Be polite, and emphasize that *science* is what astronomy is about. Then again, sometimes it's simply best to just say something like, "That's outside of my area of expertise," and leave it at that.



The constellations Aquila and Scutum, as oriented at 9:30 p.m. in mid-September. Note Altair, easy to find at 1st-magntude, at top left, and M11 and V Aquilae at bottom right.



Closeup view of M11 / V Aquilae area from chart at left. Note Telrad circles, showing 4°, 2° and 1/2° fields centered on Eta (η) Scuti. Though V Aquilae is too dim to be seen in a Telrad, it will appear in a finderscope with the same field of view—remember that the finderscope image will likely be inverted or reversed. V Aql may be more easily seen in the finderscope by centering the view midway between Lambda (λ) and i Aquilae.

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

SEPTEMBER SKIES

Continued from Page 1

September Epsilon Perseids (not to be confused with the well-known August shower known simply as the Perseids) occurs from the 5th to the 21st, peaking on the 9th, according to Guy Ottewell. As he notes, the peak rate is only 5 per *hour,* but they are "often bright." The same source says the shower should be visible all night, with its radiant highest around 4 a.m.

Leaving the solar system this month, our first stop is at the "bottom" of the Summer Triangle, near the southernmost part of the constellation Aquila. (This month's "Getting Your Bearings" has a detailed map of the Triangle—for its general location compared to other constellations, see last month's article.) We have two targets in this area, and they're "next door" to one another, which will make finding the second one—the carbon star—a little easier.

The first one, the **Wild Duck Cluster, also known as M11 (Messier 11),** is just over the border of the constellation Scutum, southwest of Aquila, at 18h 52m, -6° 15'. M11 is a very large, bright and dense open cluster—it's visible in a 6-inch telescope in the city, on a decent night. (If you're going to try for that, use 80X or higher to help separate the cluster from the light-polluted background.) Out in the country, M11 is among the finest objects you can aim at with a small telescope, and in larger instruments, like a 10- or 12-inch, its bluish stars are dazzling. Either size gives a great view: The 6-inch scope allows the cluster to stand out more from the background, as the dimmer stars behind M11 fade away with the smaller aperture; on the other hand, the raw power of a bigger scope renders M11 with remarkable brightness, and the stellar Milky Way background is a wonder in itself.

To find M11, start at Altair, the bright star in the northern part of Aquila. If you look carefully under dark skies, you'll see that Altair, or Alpha (α) Aquilae, is roughly in the middle of two close-by, dimmer stars, Beta (β) and Gamma (γ) Aquilae. (*See maps above.*) Look at the latter (it's listed as Tarazed on some maps), and you'll see it's also the "topmost," or northernmost, of three stars forming the long, diagonal "backbone" (or centerline) of Aquila's "eagle" outline—the other two are Delta (δ) and Lambda (λ) Aquilae, in that order as you progress along them to the southwest.

When you get to Lambda, you're close—a careful look at the area reveals two more stars: i (or 12) Aquilae, at mag. 4.0, about a half-magnitude dimmer than Lambda; and Eta (η) Scuti (*of the constellation Scutum*), dimmer still at mag. 4.8. As you can see from the star chart, they curve away from Lambda, in hops of about 1½°. Centering the last one, Eta Scuti, in your Telrad will put M11 into your finderscope (if you can't see Eta Scuti for whatever reason, then roughly estimating its position should get you close enough).

To get to **V Aquilae,** our carbon star, at 19h 05m, -5° 39', just center your Telrad (or finderscope's crosshairs) midway between Lambda and i Aquilae, which we just passed on the way to M11—a notably red star should be in the finderscope's field. V Aquilae is of the same rare type as R Leporis ("Hind's Crimson Star"), an especially cool, and therefore red, supergiant with a twist—large amounts of carbon and carbon compounds near the star's surface cause even deeper reddening of its light, much as soot from fires reddens our skies here on Earth. Since carbon stars accumulate more and more

Continued on Page 7

SEPTEMBER SKIES

Continued from Page 6

carbon over time, they become increasingly dimmer and redder—until they blow off the carbon shell and start over again. Some of the stars with the best reputation for deep color, like R Leporis, can vary by as much as 6 magnitudes.

Though the numerical measures of V Aquilae's spectrum suggest that it's not quite as red as some of its carbon-star cousins (some of which are described by various authorities as "scarlet"), it's "very red" nonetheless. It's also a less-variable star than the others, dimming less than two magnitudes during its roughly year-long cycle.

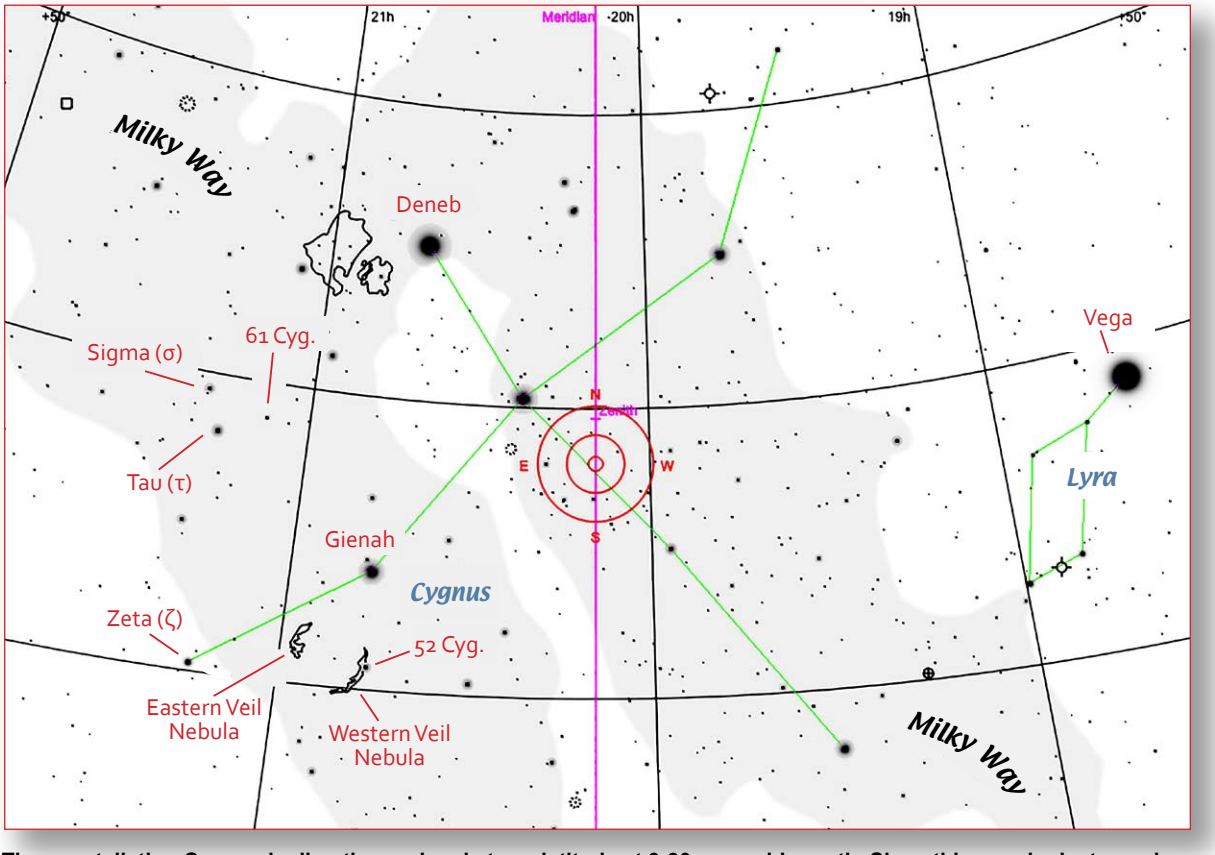
In practice then, V Aquilae offers a practical trade-off: In exchange for somewhat weaker color, the star's limited variability allows the star to remain visible in a finderscope—even at minimum, when it's most colorful. The combination of V Aquilae's relatively high brightness and its easily found "Telrad companions" (Lambda and i Aquilae) makes this star one of the easiest carbon stars to locate visually, and a great starting point for beginning the observation of carbon stars in general.

Our next stop is the binary system of **Gamma (γ) Delphini;** at 20h 47m, +16° 11', it's the "nose" of the dolphin- or kite-shaped constellation Delphinus. (See "Getting Your Bearings" for Delphinus' location.) The two stars here, with masses 50% and 70% greater than the Sun's, both started out somewhat hotter and bluer (or perhaps better, "less yellow") than our home star is. The larger one, though, has already run through the hydrogen-fusing part of its lifecycle, having cooled and expanded to become a sub-giant, and the smaller star will do the same eventually.

The result is two stars of somewhat disparate color temperature and brightness, leading to a "95 Herculis" sort of condition, in which some observers describe one star as having a significantly different color than the other, even though the two aren't *greatly* different. In Gamma Delphini's case, the historically described colors are yellow for the one, accompanied by "green," "blue," and even "lilac" for the other, when both stars are pretty much white or yellowish. Still, they're both reasonably bright at 4th and 5th magnitude, an easy split even in small telescopes, and lovely to look at.

Professor James Kaler (Univ. of Illinois) states that the system's orbit is highly eccentric, with an average value of 330 Astronomical Units (AUs)—about 11 times the Neptune-Sun distance. At the extremes, they're as close as 40 AUs or as far as 600 AUs apart. While these two stars aren't "monsters" in size or luminosity, they are as a pair some 24 times brighter than the Sun, enough to make them easily visible to the naked eye from more than 100 light-years out.

In contrast, the pair of stars we know as **61 Cygni** are together less than 1/4 of our sun's intrinsic brightness—dim enough that were they just 5 or 6 light-years farther than their actual distance of 11 light-years, the individual stars would be on the edge of invisibility to unaided eyes. The reason for this "half-hearted" performance is that these two relatively cool dwarf stars, both of class K, are each only about 2/3 the Sun's diameter and less than 2/3 of our star's mass—so there's less surface area to radiate energy, and (because of the low mass) less energy from fusion to radiate in the first place.



The constellation Cygnus is directly overhead at our latitude at 9:30 p.m. mid-month. Since this area looks toward an arm of the Milky Way, star backgrounds are rich, and there are many more objects than are plotted here—the rest are omitted for clarity. This map shows all the objects in Cygnus mentioned in "September Skies," plus a few others for reference.

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

Because of 61 Cygni's close proximity, though, the pair is wonderfully visible, even in small telescopes, with a beautiful red-orange tint that comes from its coolness (try comparing 61 Cygni to Gamma Delphini, and you'll see what I mean). 61 Cygni's actual separation of about 120 AUs, together with the system's nearness, gives a wide apparent separation of 32 arc-seconds as seen here on Earth, making the pair a very easy split, even at low power.

To find 61 Cygni, at 21h 8m, +38° 49', look for the two brightest stars on the southeastern "wing" of the Cygnus "swan": Gienah/Epsilon (ϵ) Cygni, and Zeta (ζ) Cygni (see detailed map of Cygnus, above). Imagine these two stars as the base of an equilateral triangle, and look northeast ("up and left" when facing southward around 9:30 p.m. mid-month) for the third star, Tau (τ) Cygni, which is just half a magnitude dimmer than Zeta. With a closer look, you'll see that Tau is half of a duo, with its sidekick, Sigma (σ) Cygni, about 1½° away, roughly to the north. Tau's pairing with Sigma makes a great landmark, ensuring you're in the right place.

When you center Tau in your Telrad, your

Continued on Page 8

SEPTEMBER SKIES ***Continued from Page 7***

finderscope's view will include both Sigma and our target, 61 Cygni. 61 Cyg will be just slightly farther from Tau than Tau is from Sigma, and 61 Cyg will be the dimmest of the three. Once you have it in your telescope, 61 Cygni should appear as two stars, regardless of the eyepiece in use.

Our last object, the **Veil Nebula,** is a huge, glowing shell of gas, about 100 light-years across. It's the left-over debris from a supernova that exploded some 5,000-8,000 years ago. In that regard, you can also think of it as a still-expanding shockwave from that long-ago explosion. (Robert Burnham, in his *Celestial Handbook,* points out that because this shockwave has swept away much of the interstellar dust in this area, low-brightness stars are more visible behind the wave than in front of it—where the dust still remains, for now. This effect is visible on deep photographs of the region, and worth an Internet search for images on a cloudy night—Burnham also has examples in his book.)

The Veil's looping outline is more than 2½° across, so you won't get all of it into a telescope's field—in fact, it's so large that early astronomers failed to realize that its various sections were all part of the same object. Because of all this, the two areas most visible in amateur telescopes are now known as the "Eastern" and "Western" Veil Nebula. The former is somewhat brighter and easier to see in a telescope, while the latter is perhaps easier to locate visually, as it runs behind the star 52 Cygni. Both sections of the nebula, though, have a very low surface brightness, which led to this object's description, in years past, as very difficult to see. There's also an intense star field behind it (since the Veil is found along an arm of the Milky Way), which helps "camouflage" the nebula.

To get a higher-contrast view that "pops out" the nebula, you'll need either a UHC or O-III filter. With either of these, the Veil is a striking object! (Ironically, I also like the "difficult" view, without the filter, *after* I've seen the area *with* the filter. It's easier to perceive the nebula's subtle form once you've seen where it is, and the filter-less, star-filled view is more easily appreciated if you know you're not stuck with it.)

To find the Eastern Veil, at about 20h 57m, +31° 48', go back to Gienah and Zeta Cygni (the stars we just used to find 61 Cygni), center the Telrad between them, and then sweep your scope perpendicularly to the two stars, *in the opposite direction from 61 Cyg*. A bit less than a 1° sweep should do it. The Eastern Veil is at least 1° across, so use lowest power to get it all in.

The Western Veil requires less guesswork—just center 52 Cygni (20h 46m, +30° 47') in your Telrad or finderscope, and there you are. 52 Cygni is the first reasonably bright (4th-magnitude) star west of the Eastern Veil, and it makes a skinny version of the Summer Triangle with Gienah and Zeta Cygni—it's easy to see, once you know where to look. The expanse of the Western Veil is even greater than that of the Eastern, so once again, start off with low power here.

—See you next month.

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