The Denver
OBSERVER
AUGUST 2016

Messier 57 (M57), also known as the "Ring Nebula," is a planetary nebula in the constellation Lyra. These beautiful glowing clouds are shells of gas thrown off by dying stars. The Ring, along with Beta Lyrae, an eclipsing binary, and T Lyrae, a deep-red carbon star, are featured in "August Skies," below. ***Image © Sorin***

AUGUST SKIES

by Zachary Singer

After seeing all the planets make an appearance last month, August, 2016 might appear relatively quiet—but don't give up the ship: This month, we have the Perseid Meteor Shower and an unusual conjunction between Venus and Jupiter to draw our attention, as well as the extraordinary central region of our galaxy for deep-sky sights.

The Solar System

First off, then, the **Perseids**. It's a given for meteor showers that some years will be better than others—for one thing, moonlight might wash out an otherwise-good event, preventing all but the brightest meteors from being seen, and lowering the overall count. Or Earth might pass through a denser or less-dense section of the originating comet's debris trail (so, more meteors per hour, or fewer, respectively)…

It's also a given that for many showers, much activity is predicted—while some events do meet the estimates, it's sadly common for all the ballyhoo beforehand to lead to disappointment. With all this in mind, this year's Perseid shower is widely expected to be an especially good one, with Zenithal Hourly Rates (the number of meteoroids passing through the top of the sky in 60 minutes), or ZHRs, significantly above the norm. The underlying reason for this is a theorized interaction between Jupiter's gravitational field and the comet's debris. Since Jupiter crosses the comet's orbit roughly every 12 years, it's thought that such extra-strong showers should occur with similar frequency. Sure enough, unusual showers have occurred in the expected pattern—*and* 2016 *is the 12th year since the last one*.

Whether the predictions hold or not, it's safe to say that no one expects this year's event to be *worse* than usual—and the Moon will not interfere. Though the precise peak occurs in daylight for us on the 12th, the nights of the 11th and 12th (or perhaps better expressed, the wee hours of the 12th and 13th) will be fine—best viewing should occur when the shower's radiant is high enough—that is, after about 2 AM either night.

In the Observer

Sky Calendar

2	New Moon
10	First-Quarter Moon
11-12	Perseid Shower Peaks
18	Full Moon
24	Last-Quarter Moon

Continued on Page 6

Society Directory

DAS Executive Board

President:
Ron Hranac
president@denverastro.org

Vice President:
Stuart Hutchins (Interim)
vp@denverastro.org

Secretary:
Jeff Tropeano
secretary@denverastro.org

Treasurer:
Michael Nowak
treasurer@denverastro.org

Executive Board Members:
Johnny Barela — Ed Scholes
Jack Eastman — Lindsey Shaw
Joe Gafford — Ken Sturrock
Chuck Habenicht — Dan Wray
Past President, Ron Pearson
President Emeritus, Larry Brooks

Committees

Van Nattan-Hansen Scholarship Fund:
Jeff Tropeano (Chair)
PO Box 100621
Denver, CO. 80250-0621

EGK Dark Site Committee:
Darrell Dodge, Interim Chair
darksite@denverastro.org

IDA Representative:
Dr. Robert Stencel
coloida@hotmail.com

Volunteers or Appointed Representatives

ALCor:
Darrell Dodge 303 932-1309

Newsletter Editor:
Zachary Singer 303 718-4188
editor@denverastro.org

Newsletter Proofreaders:
Darrell Dodge, Ron Hranac
The Observer is available in color PDF format from the DAS website.

Website:
Darrell Dodge
webmaster@denverastro.org

IT Coordinator:
Ken Sturrock
itdept@denverastro.org

External Outreach Coordinator:
Julie Candia
external@denverastro.org

Public Night Coordinator:
Hugh Davidson 303 679-0629

Librarian:
Eileen Barela

DAS Information Line:
(303) 871-5172

DAS Correspondence:
Denver Astronomical Society
P.O. Box 102738
Denver, Colorado 80250
president@denverastro.org

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

PRESIDENT'S MESSAGE

by Ron Hranac

2017's Nearby Total Solar Eclipse

Over the years, I've compiled a list of astronomical objects that have what I call a high "wow factor" for members of the public. At the top of the list is the Moon, which is especially impressive when using a binoviewer. (Indeed, people have told me the Moon looks three-dimensional in a binoviewer, even though the latter doesn't provide a true stereoscopic view.) Next on my list is Saturn, which is all about the rings. Right behind Saturn on the list is Jupiter and its Galilean moons. A few other goodies on my list include the double star Albireo (β Cygni), the Ring Nebula (also known as M57), and Brocchi's Cluster, aka the Coathanger Cluster—best seen using wide-field binoculars.

But there is one astronomical event that is arguably deserving of the Grand Prize spot on the wow factor list: a total solar eclipse. During totality, the sky darkens to a false "night," the stars become visible, and the sun's glowing corona reveals itself. A total solar eclipse is breathtaking, and for some, a very emotional event. If you've experienced one, you know what I mean.

Unfortunately, most people haven't. The reason? While total solar eclipses happen somewhere on Earth roughly once every year or two, that somewhere is often in remote and difficult-to-access locations. Once totality occurs in a given area, an average of 375 years passes before another one will be visible in the same place again.

The last total solar eclipse visible in the continental United States was on February 26, 1979, and that was in the northwest part of the country. I was living in Richland, Washington at the time and fortunately, the path of totality included Richland. During the 2 minutes and 17 seconds of totality, the temperature dropped, birds stopped chirping, and the streetlights came on. It would be 38 years before another total solar eclipse could be seen in the U.S.

Well, that 38 years is just about up. On August 21, 2017, a total solar eclipse will once again grace the U.S. This time, the path of totality includes—from west to east—a narrow strip through parts of Oregon, Idaho, Montana (barely), Wyoming, Nebraska, Kansas, Iowa (also barely), Missouri, Illinois, Kentucky, Tennessee, Georgia, North Carolina, and South Carolina. The majority of people in the U.S. will be within 1500 miles or so of the path of totality, which means that millions will have the opportunity to see a total solar eclipse, most for the first time. NASA has maps of the 2017 eclipse at *http://eclipse.gsfc.nasa.gov/SEmono/TSE2017/TSE2017.html*. Other websites of interest include *www.EclipseWise.com*, *www.GreatAmericanEclipse.com*, and *www.Eclipse2017.org*.

Continued on Page 5

DAS SCHEDULE

AUGUST 2016

5-7	Dark Sky Weekend—EGK Dark Site & Brooks Observatory
13	Open House—DU's Historic Chamberlin Observatory—Starts at 8:00 PM
19	General Meeting at DU's Olin Hall, Rm. 105, 7:30 PM—Dr. John C. Barentine
26	E-Board Meeting—At DU's Historic Chamberlin Observatory, 7:30 PM
2-4	(September) Dark Sky Weekend—EGK Dark Site & Brooks Observatory

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.

DAS NEWS

DAS General Meeting

Friday, August 19th, 7:30 PM: Dr. John C. Barentine will present, "Dark Skies Beyond Astronomy," a talk about efforts to conserve naturally dark nighttime environments, which are approaching a tipping point at the confluence of environmentalism, public policy, and a once-in-a-lifetime revolution in how we light our cities. Though the reasons astronomers should care about light pollution are more relevant than ever, *we now know that the social, environmental, and human implications of the issue are as important and more acute then previously understood*.

Involved in amateur astronomy from grade school, John did research at the National Optical Astronomy Observatories and National Solar Observatory headquarters in Tucson, and was on the staff of Apache Point Observatory in New Mexico, serving as an observing specialist on the Astrophysical Research Consortium 3.5-meter telescope and an observer for the Sloan Digital Sky Survey. He currently manages the International Dark Sky Places Program for the International Dark-Sky Association in Tucson. Dr. Barentine holds a master's degree in physics and a master's and Ph.D. in astronomy, and is the author of two books on the history of astronomy, *The Lost Constellations* and *Uncharted Constellations*.

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.

Volunteer Opportunities

**** No outreach events for August. (You deserve a break!) Here are our events for September:**

Saturday, 9/3/16, 8:00PM-? Cherry Creek State Park: Night Viewing

Saturday, 9/10/16, 10:00AM-2:00PM. PBS Rocky Mountain Kids Fun Fest, Denver: Solar viewing and booth.

Tuesday, 9/13/16, 10:00-11:30PM. Omni Interlocken after party, Broomfield: Night Viewing

Thursday, 9/15/16, 7:30-8:00AM. Kiwanis Club, Castle Rock: Astronomy lecture.

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

RTMC 2016 REPORT

by Jack Eastman

Road Tripping Across the Desert, En Route to the Stars

Memorial Day was fast approaching and, yea, verily, another Riverside Telescope Maker's Conference at Camp Oakes, near Big Bear (almost dry) Lake in the mountains of Southern California, about 100 miles East of the greater Los Angeles megalopolis. The dates for this were May 26-30. Although the camp opens for earlybirds Thursday, there's no activities or meal service 'til Friday.

I shoved off Wednesday, the 25th, and made the usual stops along the way, especially Mom's Cafe in Salina, Utah. Great place! [*Been there, too*. –Ed.] Full tummy and on to I-15, then south to California. About 35 miles into that state, I turned off the highway at a small desert road at Halloran Summit and made camp. The Moon had just risen, so the sky was not all that dark.

Next morning off to Barstow, then south on Highway 247 to Lucerne Valley, iced up the beer chest and then up the windy and steep Highway 18 to Big Bear, and a motel for the night. (Yes, once again the Mexican piggout at La Paws, always a treat!)

Friday morning, off to the camp, found my usual spot along "Telescope Alley" and deployed the 'scopes. This year, it was the "Ridiculously Tiny Trio" [1] (the 23.4-mm Meyers Newtonian, my 40-mm and 47-mm Newts), the 6-inch Mak-Newt Comet Hunter, the 6-inch Clark refractor, and my latest acquisition, a 25x100 Skymaster binocular, a product of last year's Okie-Tex swap meet.

Shortly after I got situated, Dan Schechter arrived and set up his monster AP-900 mount, and, as before, jury-rigged my 6-inch refractor on it, which made for very pleasant observing.

The weather was letter perfect, temperatures in the mid-60s daytime and 32-34 nights. No wind! I was able to use the Clark on its original mount after Dan left early.

Lunch and dinner were served and there was an informal "show-and-tell" in the evening, and, of course, after-dark observing. I was rather amazed at how good the seeing was—great views of Jupiter and then later, Mars and Saturn. Nice transparency, and with the thick marine layer clouds over the coastal regions, the light pollution from the greater L.A. megalopolis was not too bad. There was, however, a very noticeable light dome to the East from all the desert communities: Palm Springs, Rancho Mirage, and the like. All of these have grown big time since I used to visit out there. SQM (Sky Quality Meter) readings were 21.63 +/- 0.5 at zenith all three nights, 20.3 to the east (light from the desert cities), and 21.2 toward the L.A. basin.

On the subject of light domes, I did see a few of the new LED lighting fixtures—not good. While some of them did reduce spillover and glare, they illuminated a fairly small area, suggesting that it would take many, many more for a given situation, negating any advantage of the design. The very worst were in Salina, Utah, designed to put almost all of their illumination out horizontally, maybe +/- 40 degrees. They produced absolute maximum glare and spillover, with very little getting to the ground below the fixture.

A newcomer to RTMC was Jon Baker, currently working with Scott Roberts of Explore Scientific. Jon is doing a documentary series, "Starchaser." He buttonholed me, and it looks like episode 4 will feature this old toad and lots of the goings on at RTMC-2016. Jon claims to be an artist/producer, not a scientist, but I have a suspicion that will change with his association with Explore Scientific.

Saturday, dawn, brought the traditional swap meet—lots and lots of interesting stuff (no, I didn't bite on anything this time), then began the more formal part of the meeting with talks

Continued on Page 5

VENUS AND JUPITER PREPARE FOR THEIR CLOSE-UP THIS AUGUST

by Ethan Siegel

NASA Space Place

As Earth speeds along in its annual journey around the Sun, it consistently overtakes the slower-orbiting outer planets, while the inner worlds catch up to and pass Earth periodically. Sometime after an outer world—particularly a slow-moving gas giant—gets passed by Earth, it appears to migrate closer and closer to the Sun, eventually appearing to slip behind it from our perspective. If you've been watching Jupiter this year, it's been doing exactly that, moving consistently from east to west and closer to the Sun ever since May 9th.

On the other hand, the inner worlds pass by Earth. They speed away from us, then slip behind the Sun from west to east, re-emerging in Earth's evening skies to the east of the Sun. Of all the planets visible from Earth, the two brightest are Venus and Jupiter, which experience a conjunction from our perspective only about once per year. Normally, Venus and Jupiter will appear separated by approximately 0.5° to 3° at closest approach. This is due to the fact that the Solar System's planets don't all orbit in the same perfect, two-dimensional plane.

But this summer, as Venus emerges from behind the Sun and begins catching up to Earth, Jupiter falls back toward the Sun, from Earth's perspective, at the same time. On August 27th, all three planets—Earth, Venus and Jupiter—will make nearly a perfectly straight line.

As a result, Venus and Jupiter, at 9:48 PM Universal Time, will appear separated by only 4 arc-minutes, the closest conjunction of naked eye planets since the Venus/Saturn conjunction in 2006. Seen right next to one another, it's startling how much brighter Venus appears than Jupiter; at magnitude -3.80, Venus appears some *eight times brighter than* Jupiter, which is at magnitude -1.53.

Look to the western skies immediately after sunset on August 27th, and the two brightest planets of all—brighter than all the stars—will make a dazzling duo in the twilight sky. As soon as the sun is below the horizon, the pair will be about two fists (at arm's length) to the left of the sun's disappearance and about one fist above a flat horizon. You may need binoculars to find them initially and to separate them. Through a telescope, a large, gibbous Venus will appear no more distant from Jupiter than Callisto, its farthest Galilean satellite.

As a bonus, Mercury is nearby as well. At just 5° below and left of the Venus/Jupiter pair, Mercury achieved a distant conjunction with Venus less than 24 hours prior. In 2065, Venus will actually occult Jupiter, passing in front of the planet's disk. Until then, the only comparably close conjunctions between these two worlds occur in 2039 and 2056, meaning this one is worth some special effort—including traveling to get clear skies and a good horizon—to see!

To teach kids more about Venus and Jupiter, visit the NASA Space Place webpages titled "All About Venus" (*http://spaceplace.nasa.gov/all-about-venus/en/*) and "All About Jupiter" (*http://spaceplace.nasa.gov/all-about-jupiter/en/*)

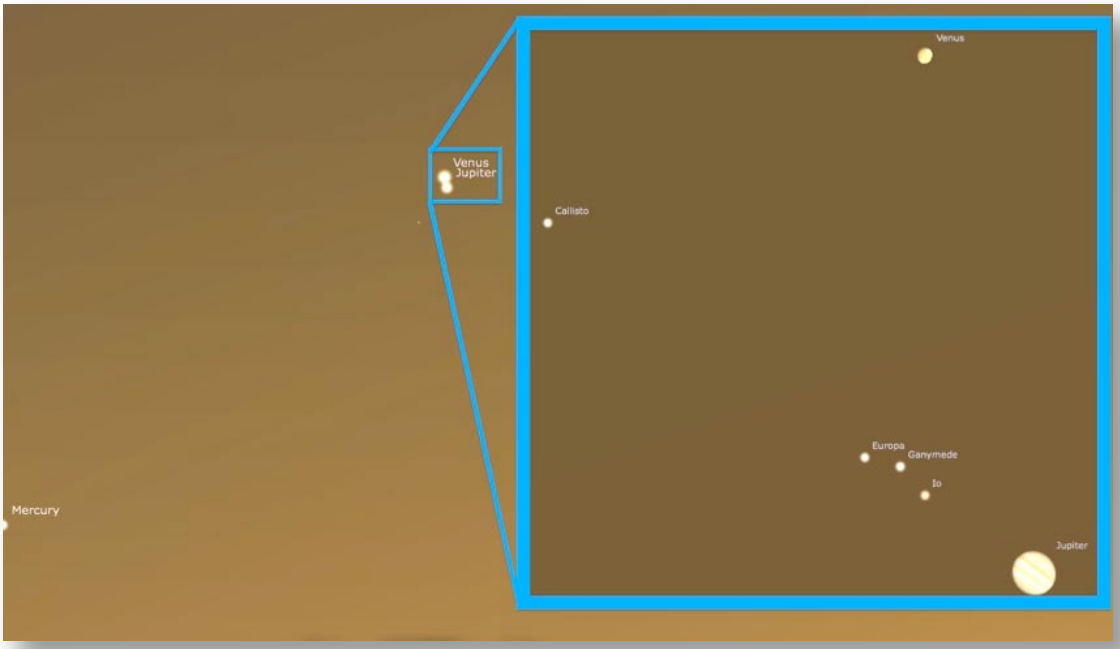


Image credit: E. Siegel, created with Stellarium, of a small section of the western skies as they will appear this August 27th just after sunset from the United States, with Venus and Jupiter separated by less than 6 arc-minutes as shown. Inset shows Venus and Jupiter as they'll appear through a very good amateur telescope, in the same field of view.

This article is provided by NASA Space Place.

With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.

Visit **spaceplace.nasa.gov** to explore space and Earth science!

President's Message

Continued from Page 2

For those of us in Colorado, our neighboring states of Wyoming and eastern Nebraska will be the closest vantage points from which to see totality. The centerline of totality will pass through Casper, where the National Convention of the Astronomical League will be held just before the eclipse, on August 16-19 (*https://astrocon2017.astroleague.org/*). The eclipse centerline passes from Casper east to Glendo State Park and Glendo Reservoir (about where I-25 jogs briefly to the west on its way to Casper), crossing just south of Douglas and Glenrock, both of which are also within the path of totality. I expect Casper will be the proverbial zoo, with a lot of eclipse observers temporarily swelling the local population. Accommodations? After this month, they will be hard to come by.

It's important to note that one must be within the path of totality; if not, what will be seen is a partial eclipse. Unlike in totality, the sky will dim somewhat, but "daylight" conditions will remain. Partial solar eclipses are nice, but pale in comparison to totality. In Denver, the Sun will be about 92% eclipsed at maximum during the morning of August 21, 2017—close, but *not* total. **Quick and important side note: When observing a solar eclipse in its partial phases, one MUST use a proper solar filter (or solar projection). Only during totality is it safe to look at the Sun naked-eye.**

The August 2016 issues of *Astronomy* and *Sky and Telescope* magazines include informative articles about the 2017 eclipse. A pair of excellent publications that I highly recommend are, *"Road Atlas for the Total Solar Eclipse of 2017,"* by Fred Espenak, and *"Eclipse Bulletin: Total Solar Eclipse of 2017 August 21"* by Fred Espenak and Jay Anderson. Both are available from *www.astropixels.com*.

If you haven't already made plans for next year's astronomical wow! event, start doing so now.

RTMC

Continued from Page 3

from Tony Cook, Tim Thompson, etc. After lunch, Anthony Cook of the Griffith Observatory gave his presentation, "Masters of the Sky," an in-depth discussion of Celestial Navigation as applied to aircraft during and after World War II, with emphasis on Griffith Observatory's contribution using the planetarium[(2)] to teach these navigators the sky, as well as educating many future astronauts. (An interesting note is that the Naval Academy has reintroduced the teaching of Celestial Navigation after a long hiatus.)

This was followed by Tim Thomson's talk on a timely subject, "Gravitational Waves." He made sure we understood the difference between "Gravitational Waves," the rattling of spacetime from merging black holes and the like, and "Gravity Waves," the undulations in the atmospheres of the Earth and other planets, similar to waves on the surface of a body of water. Later on, Pamela Shivak talked about the use of social media as a tool to "get the message out." As we have found out, this is a great way to advertise our existence and what we are all about to the younger generation. Then Dr. Michael Rich talked about the motions of galaxies, titled "Andromeda Galaxy—Milky Way Crash," with interesting simulations of our collision with M31. The evening session was the usual door prize drawings, presentations of awards to a number of folks, astro-imaging, observing in general, and telescope merit awards, to mention a few. The keynote lecture was Dr. Mulligan Skov, with an in depth discussion of "Space Weather": solar winds, magnetic field interactions and all that goes with this sort of thing. Then, out to a beautiful, windless and rather comfortable session of observing. (By tradition, I always try to look up NGC 6144, a tiny globular cluster between Antares and M4; it's a comet "pseudo-discovery" from over a half century ago. Yes, I found it even in the 100mm binoculars.)

Sunday, up to the Cantina for eggs, sausage, biscuit, potatoes and a load of coffee, then to the Western Amateur Astronomer's (WAA) Executive Board meeting: We (DAS) are in good standing, and our $20 got to them, unlike a few years ago, when our check took 2½ years to get there! We didn't have a quorum, so no important business was carried out, but reports from some of the clubs represented were presented and, in general, all is well. The latest issue of the WAA newsletter, *The New Pacific Stargazer*, has also just hit the streets[(3)].

Later on, there were more presentations, among these was Alex McConahay, "Which Way is Up? Musing about Direction and Motion in the Universe" (bottom line—there's no preferred direction in the Universe at large). Tim Thompson was back, with "Contributions of Women in Science and Astronomy," and then Dr. Rich again, with a discussion of the environments of nearby galaxies. Toward evening, there was a protracted session, basically a workshop on improving the RTMC, with many good suggestions for making this event even better. The evening was devoted to just the door prizes, and we were done before dark! (Then another really nice session at the telescopes.)

While these presentations were being given in the main hall, there were many more going on nearby, primarily aimed at beginners and kids. There were also many activities for non-astronomers: fishing, canoeing, zip lines, archery and many more such things.

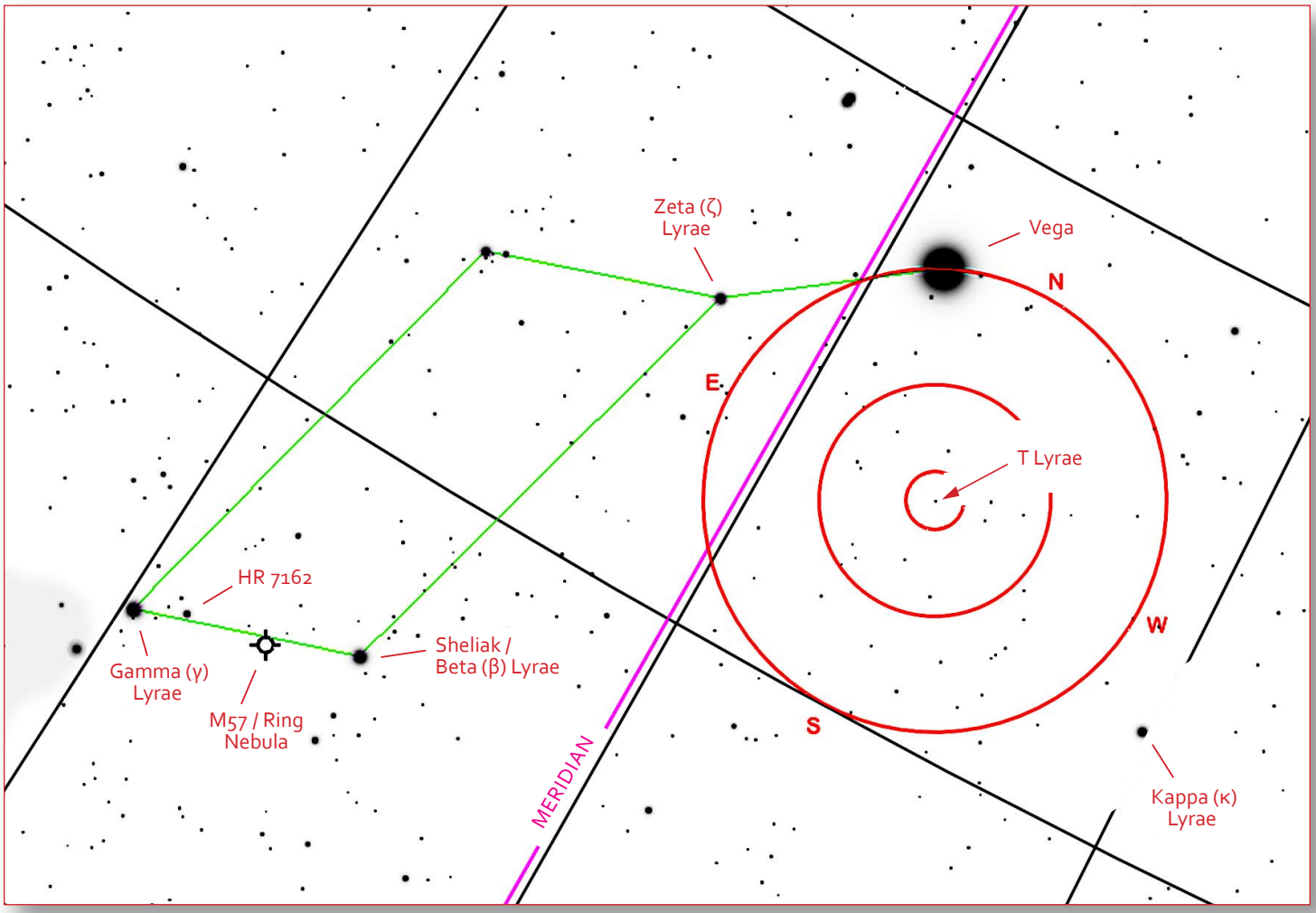
Monday morning, the farewell breakfast, break camp, and head out. The trip home was uneventful, but there was a huge (26-miles) of traffic jam for folks heading toward the Los Angeles area from Las Vegas, jammed up at the California line—sure glad I was going the other way! Monday night, Beaver, Utah, and another Mexican dinner at Maria's Cocina. (Seems word is out about this place, a tiny restaurant in an RV park at the west edge of town with a seemingly interminable waiting line!) A couple of local fellows and I struck up a conversation, they fed me a beer, and we shared a table. Good, or I might still be waiting! Arrived home and took a well-deserved rest!

Notes:

(1) An article in two parts, "Ridiculously Tiny Telescopes," from the DAS Observer (see page 6 of both issues): Part 1: *http://www.denverastro.org/newsletters/FEBRUARY2013fortheweb.pdf*. Part 2: *http://www.denverastro.org/newsletters/MARCH2013forweb.pdf*

(2) Griffith Observatory Planetarium, from the Denver Observer, page 4: *http://denverastro.org/newsletters/AUGUST2013forweb.pdf*

(3) New Pacific Stargazer: *http://www.waa.av.org/INSIDE.html* (Note that the index about halfway down the page.) DAS is covered the Spring 2015 issue (pp. 2-4): *https://drive.google.com/file/d/0B5I869rZBwb5c0NaLUhIMWFZY0E/view*



Viewing south-southwest and nearly straight up in Denver at 10 PM in mid-August. Note Telrad circles centered over T Lyrae, one of this month's targets. Centering the Telrad beteen Zeta (ζ) and Kappa (κ) Lyrae, and then "nudging" it so Vega lies near outer circle should roughly center T Lyrae.

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

August Skies

Continued from Page 1

The other big-ticket event occurs later in the month, as **Venus and Jupiter come very, *very* close to each other** as seen from Earth's line of sight **on the evening of the 27th**. NASA has kindly provided an article to explain this event, "Venus and Jupiter Prepare for Their Close-Up This August;" it's on page 4 in this issue. Before you go, though, note that Jupiter's proximity in our sky to Venus, and the Sun itself, hints that the great planet is about to be lost in the solar glare…

Mars this month continues to fall behind Earth in their orbits around the Sun, and as the Earth pulls ahead, the increasing distance between the planets leads to a smaller and dimmer Martian disk as seen from Earth. Just 13" across at the beginning of August, Mars is already 1/3 smaller in angular diameter than at opposition a few months ago, and will shrink still further to just 10" and lose a ½-magnitude in brightness as September arrives—the great show is coming to an end. On a brighter note, Mars will make a beautiful pairing with Antares, the bright orange star in the "body" of the constellation Scorpius (the Scorpion), appearing less than 2° above the orange supergiant on the 23rd and 24th of the month.

As Earth speeds quickly ahead of Mars, so it does with **Saturn**, too—as a result, though the planet is still about 28° above the south-southwest horizon at 10 PM at the beginning of the month, it sinks to just 15° above the horizon (at the same hour) by the 31st. By then, sunset will occur earlier, so you can solve *part* of the problem by observing at 9 PM instead—the planet will still be 22° up at that time. Ultimately, though, even with the extra hour, Saturn won't be an observing target much longer this year, so look while you can.

Because they orbit so slowly, **Uranus** and **Neptune** appear close to where we left them last month—but as Earth catches up to them, we see them earlier in the evening. Neptune is at opposition next month, so it's already quite high by midnight; Uranus follows, rising after 11 PM early in the month, and around 9 PM by the 31st.

Stars and Deep Sky

Since we looked right into the very center of our Milky Way Galaxy, in and around the constellation Sagittarius, in "August Skies" last year, we're going to head north of there, into the constellation Lyra (the Harp or Lyre) this time around. If you're unfamiliar with this region of the sky, see "Getting Your Bearings"—in the same August issue last year—to help you find your way around. You can find the year-ago issue at: *http://www.denverastro.org/newsletters/august2015_denver-observer.pdf*. For a quick start, though, just remember that the bright star Vega, which dominates Lyra, is more-or-less straight up at 10 PM mid-month—a little east of there at the beginning of the month, and a bit to the west at the end.

If you noticed our cover photo and its caption this month, then you already know we'll be heading to the Ring Nebula, M57—but since this object is quite well-known to intermediate

Continued on Page 7

August Skies

Continued from Page 6

and advanced observers, we'll hold it for last. (Our other two targets will be of interest to all levels, and our first object, though interesting on its own, will also help the beginner find M57 easily.)

Our first target, then, is **Sheliak**, or **Beta (β) Lyrae**, at **18h 51m, +33° 23'**—*it's the southwestern-most star in the "parallelogram" shape of Lyra* (see chart). As alluded to earlier, Sheliak is frequently used as a waypoint en route to the Ring Nebula, but the star's characteristics are fascinating and it's beautiful in an eyepiece.

Sheliak is a special type of variable star—an *eclipsing binary*. Star systems like this drop in brightness in regular, predictable cycles, when one star in the pair eclipses the other. (There is also a more subtle "secondary" eclipse, when the other star is eclipsed by the first.) Sheliak's cycle lasts about 13 days—at its brightest, it's mag. +3.4—dimly visible under city lights here in Denver—but at minimum, it's mag. +4.1—lost in our light pollution. If you watch Sheliak naked-eye night by night in the city, and compare it with its neighbor of similar brightness, Gamma (γ) Lyrae (at the corner of the parallelogram farthest from the bright star, Vega), they'll look about the same most nights—but Sheliak will seem to "disappear" on some nights while Gamma remains visible, and Sheliak's unseen, eclipsing partner is the reason.

The dynamics of the system would take more room to describe than we have available to us here. For now, we can say that the paired stars are so close together that they distort each other's shapes, and stellar gases flow from one to the other, affecting the lifecycles of both. Though some of his numbers are now outdated, Robert Burnham's *Celestial Handbook, Volume 2* (pp. 1144-1150), will give you a deeper understanding—and Prof. James Kaler's more modern, if briefer, explanation will fill in the gaps (*http://stars.astro.illinois.edu/sow/sheliak.html*).

Finally, Sheliak's eclipsing pair has at least one companion star in orbit around them—you'll find it some 46" to the southeast. Another star is thought likely to be in orbit, as well—that star is 86" away, and just a bit east of north from the main pair. A *third* star, 67" from the center, roughly to the northwest, isn't related—but with that beautiful triangle of stars around its primary, Sheliak is a very striking object in a telescope! The first time I stumbled across it, out at the DAS dark sky site, years ago, neither I nor the fellow I was observing with knew what it was, but the view through his 12-inch scope was haunting. I still love to look at Sheliak, and it's a shame it's not better known by amateur astronomers.

Our next object, **T Lyrae**, is a deep-red carbon star, not far from Vega at **18h 33m, 37° 01'**. Like Beta Lyrae, this star is a variable—but for a vastly different reason. Here, the usual brightness variations of a dying supergiant star are accompanied by increasing dimming caused by carbon building up in the star's outer envelope—until much of that material is shed by the star, and the process begins anew. As the carbon accumulates, the star reddens noticeably—and that's compared to the already orange-tinged hue caused by the coolness of the star's outer layers. We've seen other stars of this type, like R Leporis, over the past year in this column, but this one is both lovely and relatively easy to find.

To get to T Lyrae, look first for 4th-magnitude Zeta (ζ) Lyrae, the closest star in Lyra's parallelogram to Vega. Then find Kappa (κ) Lyrae, another 4th-mag. star, off on its own a little over 4° southwest of Vega. Imagine a line drawn between Zeta and Kappa, and center your Telrad on the midpoint of that line—T should be just to the north, less than ½° from there. As our star chart shows, if you nudge your telescope slightly towards Vega, *so that Telrad's outermost (4°) circle just kisses the bright star*, T Lyrae should be in your telescope's low-power field of view.

If T Lyrae is a somewhat esoteric object, our last target is an unabashed crowd-pleaser: **M57**, or the **Ring Nebula**, at **18h 54m, 33° 03'**. This great cloud, estimated to be the better part of a light-year across, is an example of a "planetary nebula," shells of expanding gas thrown out by a dying star while it morphs from being a giant to a white dwarf. (Our own Sun is expected to do this itself, several billion years from now.)

Planetaries' often complex-looking structure comes from the interactions of multiple ejected shells overtaking each other (think of expanding shock waves, or "ripples," overlapping each other), the effects of intense UV radiation from the central star ionizing parts of the cloud, and the simple fact that certain shapes look one way when seen in three dimensions, but distorted when projected onto just two—as happens when looking at distant objects like M57. In the Ring's case, astronomers are still trying to determine the nebula's true form: While they're increasingly certain it's not donut-shaped (what you see isn't always what you get in astronomy!), there is disagreement over whether it's barrel-shaped (so the "ring" we see is rather like looking down the front of a gun), or hourglass-shaped, like the Dumbbell Nebula, M27 (in which case, we see it from the "top" or "bottom," along the line of sight that sand would see when it falls through a real hourglass).

Whatever the Ring Nebula actually looks like out in deep space, it's a marvelous object in a telescope—even my 6-inch will show it under suburban skies. In a big 'scope, though, especially under clear, dark skies away from the city, M57 really shines! In all cases, keep in mind that this object has a fairly small angular diameter—just about one arc-minute across the shorter side, or only slightly larger than the planet Jupiter would appear. To see more than a simple glow, you'll need to add magnification—try 75-100X to start.

To find M57, imagine a line between Sheliak and Gamma Lyrae, and center your Telrad on it, putting each of the two stars in contact with the Telrad's midsized (2°) circle. In clear dark skies, you'll then likely see M57 glowing dimly near the middle of your finderscope, where you can better center it; note that while you may see the glow, it will be very small and you're unlikely to recognize the "ring" shape. If you don't see it in your finderscope, you might still find the Ring in your telescope's field of view; if not, a gentle nudge toward Sheliak should do it.

One thing to watch for—there's a 5th-magnitude star just northwest of Gamma Lyrae, lying almost along the line between Gamma and Sheliak. It's easy to confuse it with Gamma in a finderscope unless you remember that Gamma is both the "outer" star on the line from Sheliak, and the brighter one. At the same time, this star, HR 7162, can be useful—you'll get a more accurate, though still imperfect, centering of M57 if you balance 7162 and Sheliak on opposite ends of your finderscope's crosshairs.

Before we go, let me remind new Dobsonian owners that aiming dobs at targets near the zenith (as ours are this month) can be difficult and frustrating. It's best to observe an hour or so after objects pass the zenith (or that far *before*, if possible) to make pointing the 'scope easier.

—See you next month.

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'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 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*.

The Denver Astronomical Society
P.O. Box 102738
Denver, Colorado 80250