The Denver
OBSERVER
JANUARY 2016

The Orion Nebula, M42, is a huge and well-studied region of star formation about 1,400 light-years away. ***Image © Jon Martin***

JANUARY SKIES

by Zachary Singer

On the hit parade to start the new year, we have a comet, a tight conjunction, a favorable occultation, and some deep-sky targets (some challenging, and one "must-see" for the newbies).

Our Local Sky

First up, our comet—it's **C/2013, US10 (Catalina)**, which as mentioned last month, is now moving northward from Boötes. It will be in Ursa Major by mid-month, and Camelopardalis at the end, by which time it will have dimmed to about 6th magnitude. Along the way, though, it will pass close enough to a number of deep-sky objects to share binocular or telescopic views. After midnight on the night of January 13th-14th (i.e., Wednesday night/Thursday morning), Comet Catalina will be only 12' from the 11th-magnitude spiral NGC 5377 (13h 57m, +47° 10') in Canes Venatici. Perhaps more conveniently, on the night of Friday the 15th (morning of the 16th), Catalina comes within about 2¼° of M101; the pair will be about 30° up in the northeast after midnight and 45° up around 2 a.m. On that night, a first-quarter Moon will set early enough to avoid trouble, but the Moon will be increasingly vexing after the middle of the month.

Venus will be seen *very* close to Saturn in the southeastern sky on the mornings of the 8th and 9th. The roughly ⅔° gap between them on the 8th narrows to less than ½° the next morning; both planets appear 12° above the horizon at 6 a.m.

If you've been reading this column the last several months, then you've heard that the Moon's orbital plane currently aligns with **Aldebaran**, setting up repeated cycles of occultations. The next one, **on the 19th**, will at last be at a convenient hour! From my location just north of the Denver Tech Center, **the star is expected to wink out at 6:28 p.m.** The exact time, though, is dependent on your location—*those to the west and south will see it earlier.* Littleton, for example, should run about 15 seconds earlier, and those in Boulder will watch the star disappear towards the end of 6:27 p.m. Along with the differing times by location, the Moon's darkened limb may not reveal its approaching edge, so it's best to start observing early, keeping a close eye on things.

Sky Calendar

1	Last-Quarter Moon
9	New Moon
16	First-Quarter Moon
23	Full Moon
31	Last-Quarter Moon

In the Observer

President's Message 2
Society Directory 2
Schedule of Events 2
DAS News 3
About the DAS 3
Getting Your Bearings 4
NASA's Space Place 5

Continued on Page 6

Society Directory

DAS Executive Board

President:
Ron Hranac
president@denverastro.org

Vice President:
Stuart Hutchins
vp@denverastro.org

Secretary:
Jeff Tropeano
secretary@denverastro.org

Treasurer:
Michael Nowak
treasurer@denverastro.org

Executive Board Members:

Johnny Barela	Ed Scholes
Jack Eastman	Sorin
Joe Gafford	Ken Sturrock
Chuck Habenicht	Dan Wray

Past President, Ron Pearson
President Emeritus, Larry Brooks

Committees

Van Nattan-Hansen Scholarship Fund:
Ron Pearson (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:
Lindsey Shaw
external@denverastro.org

Public Night Coordinator:
Hugh Davidson 303 679-0629

Librarian:
Phil Klos

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 p.m., 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

State of the Society

It seems like an old cliché, but 2015 came and went way too fast. Even so, it was a good year for Denver Astronomical Society. Here's a quick recap of some of the highlights…

Let's look at membership first, which was 428 as of our December 4th E-Board meeting. We were just shy of 400 at the end of 2014, so it's nice to see year-over-year membership numbers on the increase.

In early December, the University of Denver's Dr. Robert Stencel reported that paid visits to DU's historic Chamberlin Observatory were about 4,000, a bit ahead of the 3,773 guest total at the end of 2014. Those paid visits include our twice-weekly Public Nights, monthly Open Houses, and special observing events such as September 27th's total lunar eclipse.

The aforementioned lunar eclipse event attracted well in excess of 1,000 members of the public to Observatory Park to enjoy views of the Moon through 'scopes and binoculars set up on the park lawn by DAS members. About 400 lined up for a chance to look through the eyepiece of Chamberlin's 20-inch aperture, f/15 Alvan Clark-George Saegmuller refractor. Two local TV stations—CBS4 and 7NEWS—were on site providing coverage of the event.

We made a few behind-the-scenes changes to the Public Night reservation system, including automated e-mail reminders to folks who have made reservations, and set up an on-line pay-in-advance feature. The changes resulted in fewer no-shows, and DAS volunteers consistently reported average PN attendance in the 20+ range per night.

Our external outreach has been over-the-top successful. We easily averaged two or more events per month, during which members set up 'scopes for daytime solar observing or nighttime star parties, as well as providing astronomy-themed lectures and hands-on demonstrations at schools, museums, and other venues. When combined with Open Houses and Public Nights, figure about 145 events reaching an estimated 6,000 or so members of the public in 2015.

Recognizing that membership in an organization such as DAS is very much a discretionary choice, and that a downturn in the economy could negatively impact the Society, the E-Board established a reserve fund to tide us over should things turn sour. The finances of DAS are sound, and our bank accounts are in good shape. Look for a financial summary by Treasurer Mike Nowak during February's annual membership meeting.

Continued on Page 3

DAS SCHEDULE

JANUARY 2016

8-10	Dark Sky Weekend—EGK Dark Site & Brooks Observatory
16	Open House—DU's Historic Chamberlin Observatory—Starts at 5:30 PM
22	General Meeting at DU's Olin Hall, Rm. 105, 7:30 PM—**Featured Speaker: Carla Johns, who will discuss past and current operations on Mt. Wilson; DAS E-Board Nominations**
29	E-Board Meeting—At DU's Historic Chamberlin Observatory, 7:30 p.m.

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

Volunteer Opportunities

January 13, 6:00 PM-7:30 PM: Science Night for students & their families at Bradley International School in Denver. Approximately 10 parents will bring telescopes out for evening observing for an expected 500 attendees. They'd like us to supplement the event with a few more telescopes and expert knowledge. They've offered to provide pizza for DAS volunteers too!

January 24, 12:20 PM (rescheduled event): Space presentation for Temple Sinai's Youth Group at Temple Sinai in Denver. The woman who contacted me requested a presentation on rockets, planets and/or stars. There will be approx. 60 children ages Kindergarten through Fifth grade in attendance. I will put whoever signs up for this event in touch with the organizer to hash out details and logistics.

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

Get Involved! DAS Leadership

Have you thought about a leadership role with DAS? Our annual elections are just around the corner. If you're interested in running for a position on the E-Board or would like to nominate someone, be sure to attend this month's general membership meeting at DU's Olin Hall on Friday, January 22nd. Nominations will open at the January meeting, and continue until our annual membership meeting on February 19th.

How to Use Your New Telescope

Did you get a telescope for Christmas? Stop by this month's Open House, during which DAS member Digby Kirby will give a talk and hands-on presentation on how to use that new 'scope. The January 16th Open House gets underway at 5:30 PM at DU's historic Chamberlin Observatory; Digby's presentation will be at 7:00 PM.

President's Message

Continued from Page 2

The Van Nattan-Hansen Scholarship Committee awarded two scholarships last year. Conner Bray and Ariel Sandberg each received $1500 from VNH Committee Chair Ron Pearson at the August general membership meeting.

October 24th's annual auction raised more than $1200 for the Van Nattan-Hansen scholarship fund, up from about $800 the year before.

Following the October auction, we held a well-attended farewell reception for S&S Optika's Cathie and Tim Havens. (They announced their retirement during our August general membership meeting, and have since closed the store.)

Our web site received a facelift and several useful updates, implemented with new and easier-to-use software. Navigating the new site is easy—give it a test drive if you haven't yet done so (http://*www.denverastro.org*).

We maintain a presence on social media, something we started a couple years ago. We're on Facebook, Twitter, and YouTube. Our Facebook page alone had 1,132 "likes" as of mid-December.

Our monthly general membership meetings at DU's Olin Hall feature top-notch speakers. For those who can't make the meetings or would like to see the presentations again, and for general outreach, we continue to videotape meeting presentations and upload them to our YouTube channel (*https://www.youtube.com/user/denverastro*). Just the meeting videos on YouTube have been viewed nearly 10,000 times. If all of the videos we've posted are included, the viewing total is in excess of 20,000.

"Membership has its privileges," an advertising slogan used by American Express from the late 1980s through the mid-'90s, can be said to apply to DAS to some extent. Okay, you don't get a credit card, but there are more benefits to being a DAS member than you might imagine. Take a gander at my President's Message in the August 2015 issue of The Denver Observer for an overview (*http://www.denverastro.org/newsletters/august2015_denverobserver.pdf*).

Not only was 2015 a good year for DAS, it was a busy year. All of this and much more wouldn't have been possible without the time and commitment of dozens of volunteers. Thanks!

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.

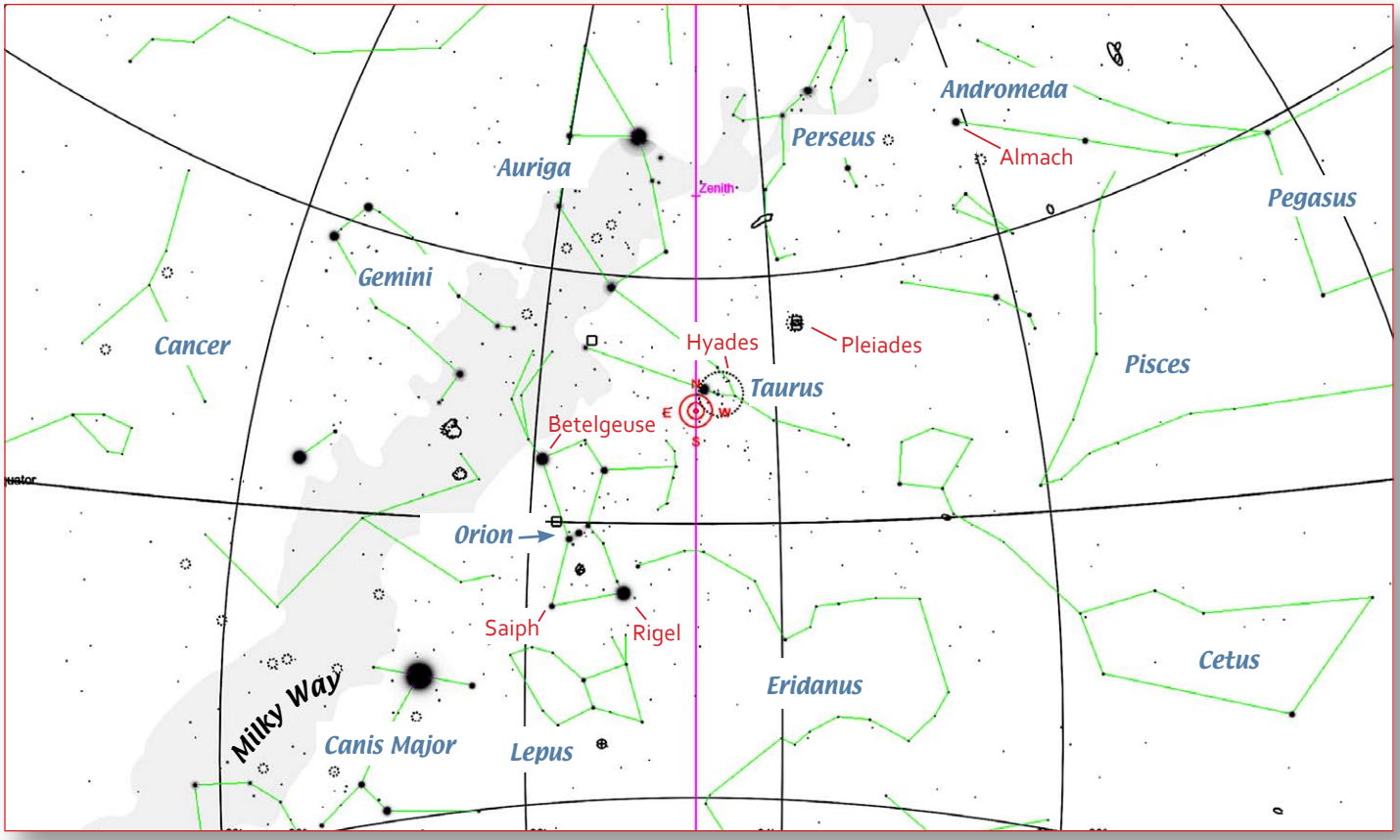
The DAS is a 501 (c)(3) tax-exempt corporation and has established three tax-deductible funds: the Van Nattan-Hansen Scholarship Fund, the DAS General Fund, and the Edmund G. Kline Dark Site Fund.

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

GETTING YOUR BEARINGS

...from the editor

Orion, the Milky Way, and Surrounding Constellations



View of Denver's southern sky at 9:00 p.m. in mid-January. ***Center of Telrad circles is about 65° above southern horizon.***

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

Now that winter is officially here, astronomy fans can count on two things—one, *it's cold outside*—and two, there are some really bright stars in the southern sky! A great many of those belong to the constellation Orion; around 9 p.m. in mid-January, you'll see its distinctive shape high over the south horizon.

Even if you're unfamiliar with the constellation, the three blue-white, 2nd-magnitude stars of Orion's "belt" stand out—about 45° up when they're at their highest, all three fit easily inside a 4° field, making an obvious grouping on their own. As Orion's belt, though, they're considered to be the midsection of a giant human figure, Orion the Hunter.

His left "shoulder," from our point of view, is the red supergiant Betelgeuse, glowing a bright orange at 1st magnitude. Betelgeuse is hard to miss—it's brighter than all the other stars in Orion except brilliant blue-white Rigel. That star sits on the opposite side of the belt, an equal distance from the belt as Betelgeuse—roughly 10°, or about the same as the width of your knuckles when you hold a fist straight out in front of you. Rigel is traditionally seen as Orion's right foot (he'd say his left one), and Saiph, also bright at magnitude 2.0, makes up the left one (or Orion's right one, if you ask him). Looking where you might expect a right shoulder, you'll find Bellatrix, a blue-white, magnitude 1.6 star.

Taken together, these stars make up the body of Orion, and all of them are easily visible in the city. Because of the brightness of these stars, and the constellation's simple outline (people will say it "looks like a man"), Orion is easy to find. That's important, both because Orion contains many objects worth looking at on their own (some of which we'll explore in this month's "Skies" column), and because the stand-out patterns of stars within its outline point the way to other objects and constellations, making this part of the sky easier to get familiar with.

If you follow the belt from left to right (east to west), for example, and extend its line outward, you'll soon encounter a dimmer arc of stars that are imagined as Orion's shield. Go a little farther, though, and you'll see the bright "V" of stars that make up the "head" of Taurus the Bull. (This grouping is circled on our chart, because most of the stars within it also make up the Hyades, a beautiful open cluster. It reveals many more members when viewed in binoculars.) A similar jump in the same direction brings you to the Pleiades Cluster, a beautiful object for binoculars and wide-field telescopes, and itself a landmark—it's the halfway point from Orion's belt to the double star Almach, the eastern end of the constellation Andromeda. We took a good look at this area in the November and December *Observers*, and now you have a good approach for finding them from the other side (if you missed the articles, though, the back issues of the *Observer* are online: *http://www.denverastro.org/das/denver-observer/*).

Directly above (north of) Orion's head, the "horns" of Taurus extend out from the bull's head; this area is also where we look toward a rich arm of the Milky Way. The region is loaded with open clusters like the Hyades and Pleiades (some of them shown as small circles on our chart), and with many nebulae. We'll start in on some of these next time...

NASA SPACE PLACE

How Will We Finally Image the Event Horizon of a Black Hole?

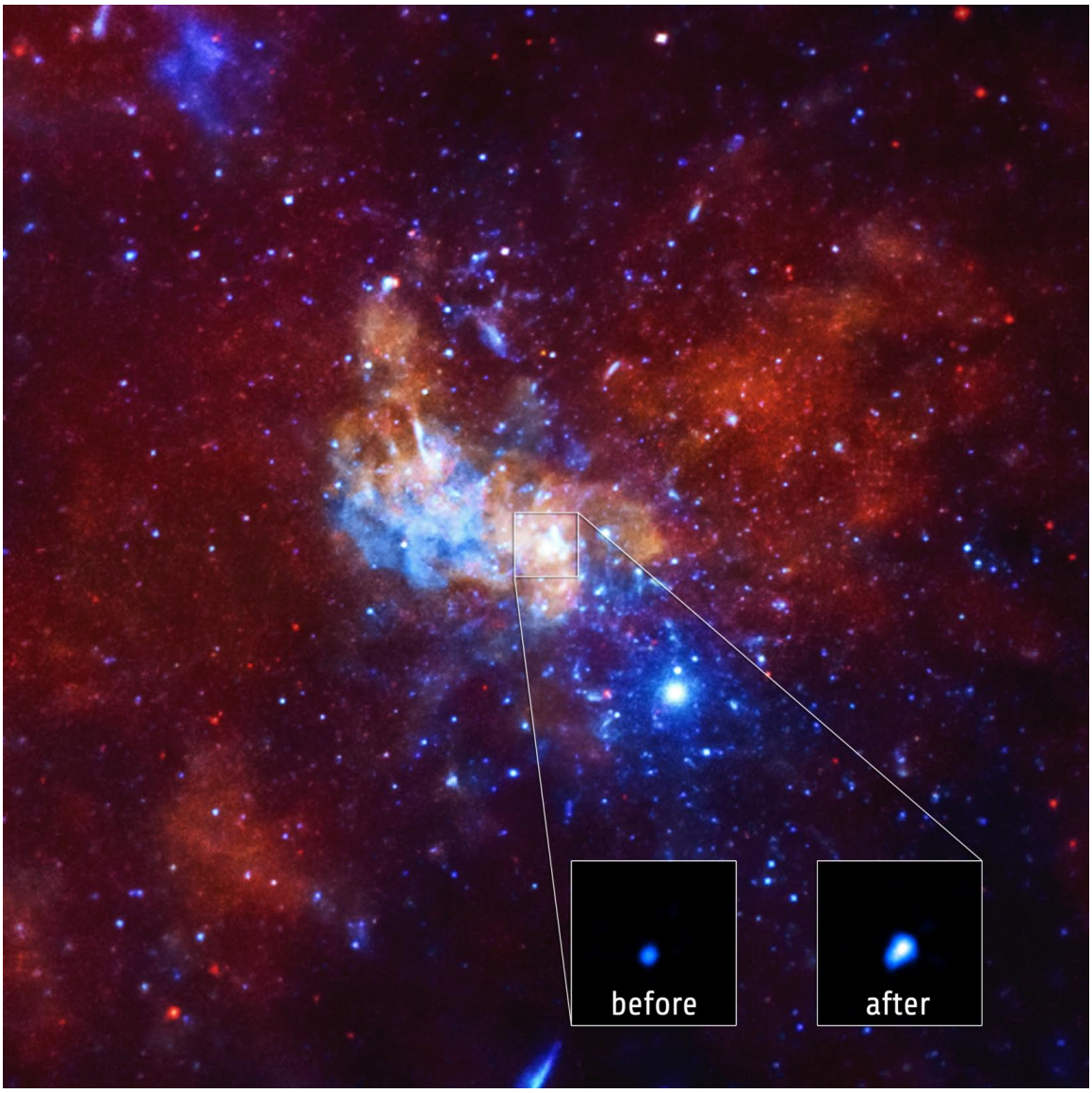
By Ethan Siegel

One hundred years ago, Albert Einstein first put forth his theory of General Relativity, which laid out the relationship between spacetime and the matter and energy present within it. While it successfully recovered Newtonian gravity and predicted the additional precession of Mercury's orbit, the only exact solution that Einstein himself discovered was the trivial one: that for completely empty space. Less than two months after releasing his theory, however, the German scientist Karl Schwarzschild provided a true exact solution, that of a massive, infinitely dense object, *a black hole*.

One of the curious things that popped out of Schwarzschild's solution was the existence of an event horizon, or a region of space that was so severely curved that nothing, not even light, could escape from it. The size of this event horizon would be directly proportional to the mass of the black hole. A black hole the mass of Earth would have an event horizon less than a centimeter in radius; a black hole the mass of the sun would have an event horizon just a few kilometers in radius; and a supermassive black hole would have an event horizon the size of a planetary orbit.

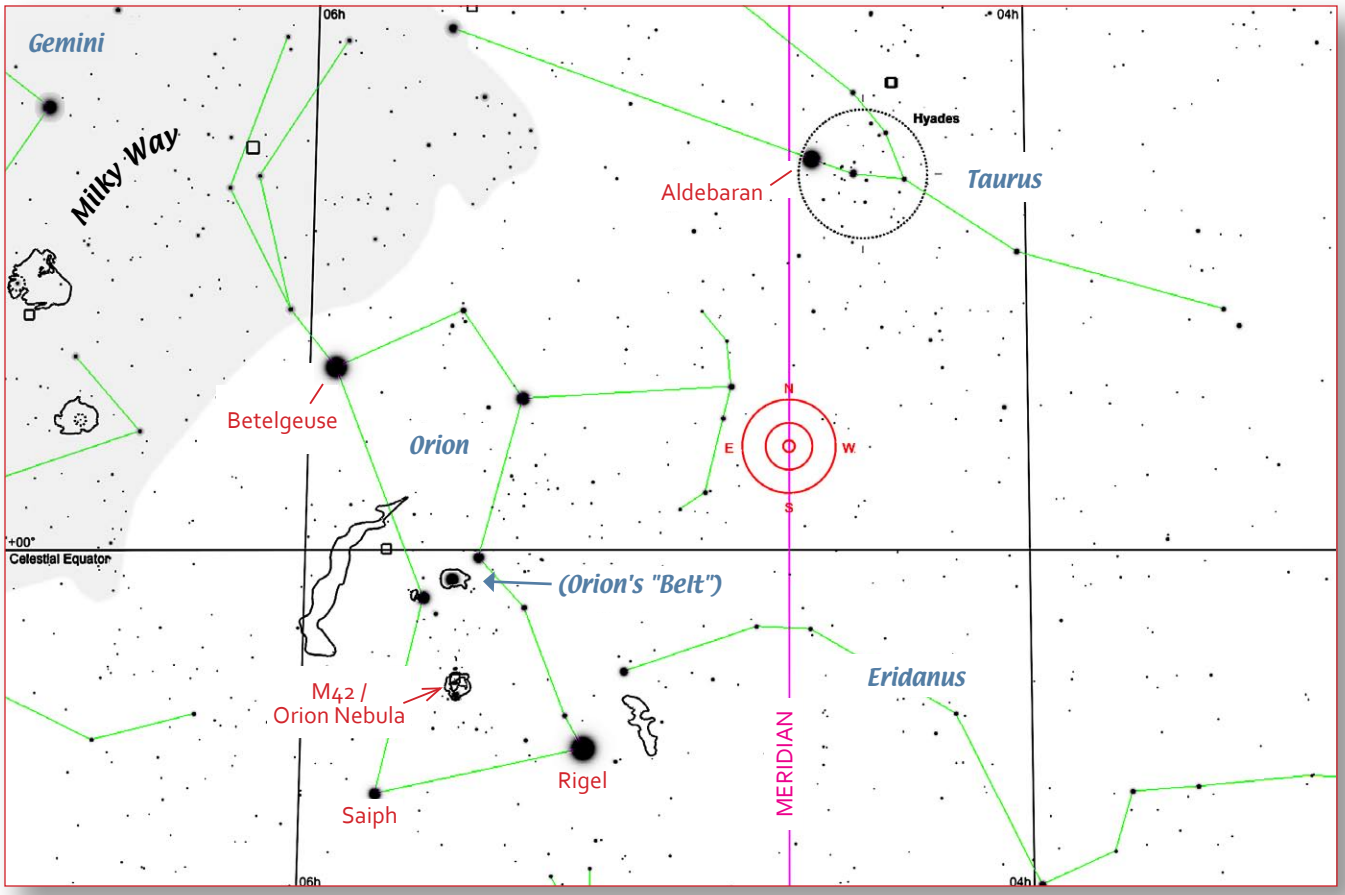
Our galaxy has since been discovered to house a black hole about four million solar masses in size, with an event horizon about 23.6 million kilometers across, or about 40 percent the size of Mercury's orbit around the sun. At a distance of 26,000 light years, it's the largest event horizon in angular size visible from Earth, but at just 19 micro-arc-seconds, it would take a telescope the size of Earth to resolve it – a practical impossibility.

But all hope isn't lost! If instead of a single telescope, we built an *array* of telescopes located all over Earth, we could simultaneously image the galactic center, and use the technique of VLBI (very long-baseline interferometry) to resolve the black hole's event horizon. The array would only have the light-gathering power of the individual telescopes, meaning the black hole (in the radio) will appear very faint, but they can obtain the resolution of a telescope that's the distance between the farthest telescopes in the array! The planned Event Horizon Telescope, spanning four different continents (including Antarctica), should be able to resolve under 10 micro-arc-seconds, imaging a black hole directly for the first time and answering the question of whether or not they truly contain an event horizon. What began as a mere mathematical solution is now just a few years away from being observed and known for certain!



Sagittarius A* is the supermassive black hole at our Milky Way's center, which normally emits X-ray light of a particular brightness. However, 2013 saw a flare increase its luminosity by a factor of many hundreds, as the black hole devoured matter. The event horizon has yet to be revealed. *Image credit: NASA/CXC/Amherst College/D.Haggard et al., of the galactic center in X-rays.*

Note: This month's article describes a project that is not related to NASA and does not suggest any relationship or endorsement. Its coverage is for general interest and educational purposes.



Looking southward from Denver skies at 9 p.m. mid-month. Note Telrad centered over Meridian (line running between North, South, and the Zenith) for reference; Telrad circles are 4°, 2°, and ½°, respectively, and the center is placed about 55° above the southern horizon.

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

January Skies

Continued from Page 1

Aldebaran should reemerge from the Moon's bright western limb at roughly 7:45 p.m., with similar variation in time by location. The star will reappear at the Moon's "3 o'clock" position (relative to an observer's normal "up" and "down") when looking directly at the Moon from the Denver area.

Finally, **Jupiter** starts January rising just after 10:30 p.m., and ends the month by coming up two hours earlier. For the enthusiastic observer, those timings put the giant planet more than 35° above the horizon at 2 a.m. as the month begins, and at the same height at a more civilized midnight by month's end.

Deep Sky

This month, I'm going to reverse the usual order of targets and put the best-known one *last*. That object, M42 or the Great Orion Nebula, is so familiar to most of our members that I'd usually skip it—but this is the time of year when many folks get their first telescope…. So, if you're a newbie, welcome—check out the other objects in our tour and enjoy the "extra" one I slipped in for you at the end.

With the above in mind, we have an interesting, beautiful, and challenging binary hiding in plain sight—**Rigel, or Beta (β) Orionis**. It's safe to say that if you're familiar with Orion, then you know Rigel, the big blue-white star making up one of Orion the Hunter's "feet." (If you don't know Orion, don't worry—just check out this month's "Getting Your Bearings.") At the same time, I'll bet there are a good number of observers who are unaware of Rigel's binary nature—I had no idea myself until I saw it through the Chamberlin Observatory's 20-inch refractor a few years ago.

The reason is simple enough—in spite of the fairly wide 9-arcsecond gap between the main components, the pair can be difficult or impossible to split in smaller telescopes—I've not been successful with my 6-inch reflector, for example. That's because the magnitude 6.8 secondary (which would be easily visible on its own in binoculars) is lost in the glare of the 0-magnitude primary. Even in a 10-inch reflector, *the diffraction spike* from the bright primary can be enough to obscure the companion! If you have a big enough scope, though, Rigel's components make a beautiful white-and-blue pair—it's a guilty pleasure in my 12-inch. If your scope's not big enough, don't despair—go and see it at a Public Night at the Chamberlin—it's free for DAS members and DU students. The raw power and inherent contrast of the 20-inch refractor is made to order for a star like Rigel, and the view is memorable. (If any of you had luck with apertures below 10 inches, I'd love to share it with our other readers—drop me a line at *editor@denverastro.org*, and let me know what setup works for you.)

As beautiful as Rigel is, there's another aspect of the star that's worth taking a closer look at—the primary's visual magnitude of 0. While that's not unheard of (from our point of view on Earth, Sirius appears next to it at an even brighter magnitude -1.4), it's a lot more interesting when you realize that *Rigel is roughly 800 light years away!* At that distance, our own Sun would be much too dim to be seen at all—*even in binoculars*.

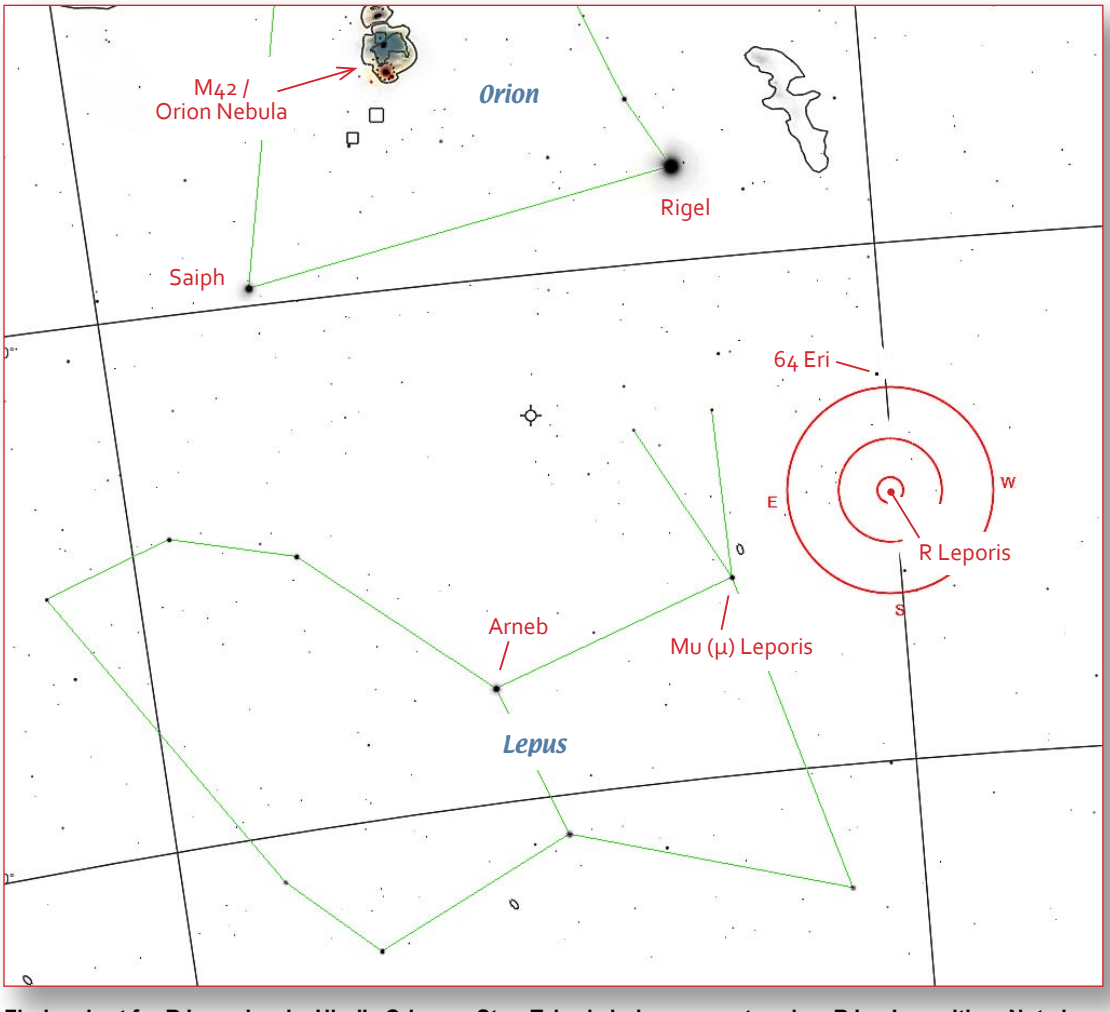
To get a feel for the scale of the Rigel system, consider that the 9.3" separation between the star's primary and secondary works out to a physical distance of about 2500 AUs, or more than 60 times the average distance from Pluto to the Sun. And then

Continued on Page 7

January Skies

Continued from Page 6

there's this—try comparing Rigel's brightness in your telescope with that of Achird in Cassiopeia, which we covered last month (it's now high in the northwest around 9 p.m.). Have a look at both, and then consider that Achird's primary, no match for Rigel's at an unremarkable 3rd magnitude, is a good stand-in for our Sun. At Achird's distance of less than 20 light years, it's *40 times closer* than Rigel—and therefore some 1600 times brighter than it would be at Rigel's distance….



Finder chart for R Leporis, aka Hind's Crimson Star: Telrad circles are centered on R Lep's position. Note how Rigel and Saiph form a rough equilateral triangle with Arneb, and the star 64 Eri located just above the Telrad circle.

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

Next up, a star for the experienced, the stubborn, or those with a computerized "go-to" or "push-to" mount: the beautiful scarlet carbon-star, **R Leporis**. Located at 5h 00m, -14° 47', southwest of Rigel in the constellation Lepus (the Hare), R Lep is also known as "Hind's Crimson Star" for the astronomer who found it and its unusually deep color. Like all carbon stars, much of the color comes from carbon dredged up from within the star's envelope by convection—the carbon removes blue light very efficiently, leaving only redder wavelengths. In R Lep's case, the relatively low temperature of its surface—just 2300K—gives the star a fairly reddish appearance to start with, so the result is a remarkable deep-scarlet star when the carbon has accumulated (over a roughly 430-day cycle).

At the end of the cycle, though, the star's outer layers are blown off into space, clearing out the carbon and leaving the star brighter but less colorful. Though carbon stars are all variables and change in brightness, R Lep does variability with real gusto. Unlike, say, V Aquilae, a carbon star whose brightness varies by less than 2 magnitudes, R Leporis ranges from as bright as magnitude 5.5, all the way down to 11.7—more than 200 times dimmer!

On a practical basis, R Lep's variability and mass ejection mean that when the star is at its most colorful—that is, *at its dimmest*—it's also quite invisible in a 10x50 finderscope. To find it by star-hopping, you'll need first-rate Telrad skills, because you'll be "flying blind" without the finderscope for intermediate views. A few months ago, an experienced observer at the DAS Dark Sky Site joined me to find R Leporis with the Telrad on my 6-inch reflector—with some effort, we eventually got it, but I had an ace up my sleeve—a wide-field 24mm eyepiece and the telescope's short 750mm focal length gave me a broad 2° field of view, making aiming much less critical.

To find R Leporis, look for Arneb, or Alpha (α) Leporis first--it's the magnitude 2.6 star that makes a rough equilateral triangle with two brighter stars north of it, Rigel and Saiph, the two "feet" of Orion (see chart). Arneb represents the "neck" of the hare, and Mu (μ) Leporis, about a Telrad circle to the right/west, is the top of the hare's head. (In our chart, the "ears" branch northward from Mu Lep like two old TV antennas pointing toward Rigel; these will be landmarks for confirming you're in the right place when searching out R Lep in the dark.) Our target, centered within the inner Telrad circle on our chart, is about 3½° west of Mu Lep—*almost* a Telrad's width. (Note 64 Eri, 5th-magnitude star just above the Telrad, which may help with positioning.)

The big trick to finding R Leporis is to imagine an extension of the line from Arneb to Mu Lep, and put the Telrad's center just less than than another full Telrad-diameter from Mu. Then note how R Lep is actually *above, or roughly northward* of the Arneb-Mu Lep line—putting the bottom of the innermost (½°) Telrad circle on this line should get you pretty close.

And now, as promised, the showpiece for the beginners—**M42,** or the **Great Orion Nebula.** There are several aspects of this nebula that make it among the most popular with observers: It's big, it's bright, and it's very easy to find! The first two mean that the nebula is visible in small instruments in the city—even a finderscope will show you M42's glow from suburban Denver. Out in the country, though, it's even better—telescopes will show a large cloud of brilliant glowing gas, a star factory that's both the origin of many bright stars (and many more that are hidden within the cloud) and a great reflector (and "re-emitter") of those stars' collected light. As for the last quality, ease in location, there's little need for computerized

Continued on Page 8

January Skies

Continued from Page 7

systems—with just the least bit of practice, you'll see that it's faster to point the telescope at M42 yourself than to call up the object in your computer's database. (Directions will follow shortly.)

When you look at the nebula, you'll be seeing a gigantic cloud of gas and dust some 20-25 light years across and about 1,400 light years away. A wide-field view in dark skies will reveal a complex area, with Rembrandt-like chiaroscuro effects as the stars within the billowing cloud light vast areas while throwing others into shadow. Careful observation with averted vision will reveal more detail with time. The light you'll see is a combination of *emission*, where the gas glows like a fluorescent tube from the ultraviolet energy of the hottest stars, and *reflection*, as visible light bounces off the clouds in the manner that you're more accustomed to. (There are related clouds with different catalog numbers not far away, and like M42 itself, they're all part of an immense system that fills a large part of the Orion constellation.)

"Zooming in" with a more powerful eyepiece (or a bigger telescope!) brings you more detail within the nebula—look for the Trapezium cluster of stars, all grouped together in a little more than a 20" area within the brightest part of the cloud—it's their light which makes this region so spectacular, and their radiation pressure which has blown away enough of the cloud to make the stars visible. And finally, "zoom in" with your mind, the Internet, and DAS acquaintances—the Orion Nebula is a deep subject, and rates more attention than I can give it here. A quick search online will bring great volumes of information that will broaden your perceptions while observing, and the Hubble Telescope's incredible images of this cloud will show you detail that even the best Earth-based scopes can't. The DAS connection is that someone with more experience or better equipment may be able to show you something you've missed within the great cloud—just because what's written here isn't news to them, doesn't mean they're tired of looking at the nebula!

To find the Orion Nebula, M42, look first for the three bright stars in Orion's "belt." The whole constellation is high in the southern sky around 9 o'clock this month, with the belt running at a slight diagonal upwards toward the west, about 45° or so above the horizon. Looking above the belt, you'll see bright, reddish Betelgeuse forming Orion's shoulder; Rigel, Orion's "foot," about the same distance below; and Saiph forming Orion's other foot. With a closer look, you'll see a dimmer collection of stars running vertically, centered between Saiph and the western star of the belt—the ancients imagined this small grouping as Orion's "dagger" or "sword" hanging below his belt. M42 surrounds the middle star in this group, and pointing your finderscope or Telrad directly at it will put the great nebula in your scope.

—See you next month.

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