

OBSERVER



Composite image of the January 31st total lunar eclipse, showing the Moon's gradual entry into Earth's umbra (deepest part of the shadow). As seen in Denver, the Moon set after soon after totality and just before dawn in a brightening sky.

Image Credit: Don Lynn

MARCH SKIES

by Zachary Singer

The Solar System

Mercury starts off March at magnitude -1.2, and a in a conjunction with Venus. On the 2nd, the two planets are less than 1½° apart, narrowing to just over 1° on the 3rd and 4th. By the 6th, the pair widen to just under 2°; they'll still fit easily into a finderscope or binocular field through at least the 8th. Look for them very low in the west, a half-hour after sunset.

You'll likely get much better views of Mercury mid-month, when it is at greatest elongation—that is, when it appears farthest from the Sun in our sky. The planet will be almost 12° above the horizon, 30 minutes after

sunset at that point. (Note that the onset of Daylight Saving Time will cause the time of day to go willy-nilly a few days beforehand, so don't get confused.)

Venus will be nearly mag. -4 all month and will climb a touch higher into the sky as the month progresses. The planet's phase will become slightly less full as well. Venus will be in an exceptionally tight, but difficult conjunction on the evening of the 28th—see *Uranus*, below.

Mars is still too far away for a rewarding telescopic observation, but recent naked-eye views (at a downright silly hour) have been very beautiful indeed. Early in March, you'll

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PRESIDENT'S MESSAGE

by Ron Hranac

External Outreach

One of the most important things that members of Denver Astronomical Society do in the community is share our love of astronomy with others. As noted in the January 2018 "President's Message" (https://www.denverastro.org/newsletters/january2018_denverobserver.pdf), last year we reached more than 5,000 people in 140 to 150 events. Our monthly Open Houses and twice-weekly Public Nights at DU's historic Chamberlin Observatory accounted for the majority of that (don't forget the visitors and guests at our monthly General Membership Meetings), but *external outreach* wasn't far behind.

For those of you unfamiliar with our External Outreach Program, more information is available at <http://www.denverastro.org/das/star-parties/>. In a nutshell, external outreach volunteers—on behalf of DAS—do star parties, lectures, and educational programs in a variety of venues: libraries, schools, museums, and nature centers, and occasionally for some private events.

With the exception of January (the two scheduled events were cancelled—one by the requesting group, the other because of

weather), we did external outreach in every month of 2017. I asked our External Outreach Coordinator, July Candia, for a summary of last year's events. Both of us were surprised by just how busy those events kept our volunteers!

Looking through the following list, it's clear that schools and libraries are popular outreach venues. We also cooperate with the Denver Museum of Nature and Science a couple times per year. Because of the August 21st solar eclipse, several of last year's outreach events focused on that topic. Not surprisingly, we received several requests to host events in the Denver area during the eclipse itself, but had to decline because most DAS members traveled out of state to see totality.

- * February 16: Clear Sky Elementary (solar observing)
- * February 28: Wilmore-Davis Elementary (nighttime observing)
- * March 3: Coronado Hills Elementary (reading for Dr. Seuss Day)
- * April 9: 8th Annual Frank Shorter RACE4Kids' Health 5K and Expo
- * May 13: Dinosaur Ridge Scout Day

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DAS SCHEDULE

March 2018

- | | |
|--------------|---|
| 3 | Spring Banquet |
| 9 | E-Board Meeting—At DU's Historic Chamberlin Observatory, 7:30 PM. All members welcome. |
| 10 | DAS Member In-Reach—At DU's Chamberlin Observatory, 7:00 PM |
| 17 | Dark Sky Weekend—(Messier Marathon) EGK Dark Site & Brooks Observatory |
| 24 | Open House—DU's Historic Chamberlin Observatory—Starts at 7:00 PM |
| (April 2018) | |
| 6 | E-Board Meeting—At DU's Historic Chamberlin Observatory, 7:30 PM. All members welcome. |
| 7 | DAS Member In-Reach—At DU's Chamberlin Observatory, 7:00 PM |

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

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

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

March 10 - September 30 at 8:30 PM

October 1 - March 9 at 7:30 PM

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

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

President's Message

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- * May 16: Lone Tree Library (eclipse presentation)
- * May 2017: Home-schooled kids
- * May 30: Kiwanis Club, Centennial
- * June 2017: Candelas Community
- * June 4: Denver Museum of Nature and Science (Space Day)
- * June 7: Cory Elementary School (star party at Observatory Park)
- * June 10: American Cancer Society, Relay for Life (nighttime observing)
- * June 12: Meadows Neighborhood (nighttime observing)
- * June 29: Outdoor Discovery Camp (girls' camp)
- * July 19: Denver Public Library (eclipse presentation)
- * August 6: Denver Museum of Nature and Science Eclipse Day (solar observing, educational presentations and demonstrations related to the then-upcoming eclipse)
- * August 7: Eloise May Library (eclipse presentation)
- * August 15: Belmar Library (eclipse presentation)
- * August 18-21: Glendo State Park w/Colorado Springs Astronomical Society (eclipse, night observing)

- * September 26: William Smith High School (nighttime observing)
- * October 1: Sing the Celestial (Colorado Chorale) at Chamberlin
- * October 20: Colorow Elementary School (solar observing)
- * October 27-29: MileHiCon (lecture and informational table)
- * November 10: Arvada High School (solar observing)
- * November 12: Tesoro Cultural Center (nighttime observing at The Fort restaurant for the organization's annual "Night the Stars Fell" lecture/dinner)
- * December 8: Godsman Elementary (solar observing)

July Candia announces external outreach opportunities at our monthly membership meetings, and passes around signup sheets (keep in mind that people who volunteer to help out at any DAS event **MUST** be current members of the Society—this is an insurance requirement). If July's unable to rustle up enough volunteers at the membership meetings, she'll post something on the Yahoo listserv and publish a list in the Observer (see page 5). If you're interested in participating in DAS external outreach, let July know at external@denverastro.org.



March Skies

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still see the red planet hiding in the tail of Scorpius, where it makes a striking foil to Antares; by month's end, Mars lies in Sagittarius. (Look for a lovely **conjunction with Saturn—and M22—in the waning days of March, and most especially on April 1st and 2nd.**)

Jupiter is now a reasonable telescopic target by about 2 AM—that hour, it will be just over 20° up in the southeast. By month's end, the same will be true at 1 AM (we would've had it at midnight, but Daylight Time pushes our clocks ahead). April will be even better.

Saturn lies eastward of Mars, and thus is a sight for the wee hours, just 7° up at 4 AM, early in March. Still, early risers can get a telescopic peek at the planet 30 minutes before sunrise—it will be 20° up in the southeast. By the end of March, the planet will be at about the same height, *in a dark sky*, by 5 AM.

Uranus begins March at a decent altitude for observation just as soon as evening twilight ends, but sinks lower throughout the month—as April begins, Uranus is barely above the horizon an hour after sunset. As

noted above, Uranus will be seen *very* close to Venus on the 28th—the two planets will be just 4' apart around 6:55 PM, Mountain *Daylight* Time, but the Sun will still be up. An hour later, they'll still be only 5' from each other—wider, but nonetheless spectacularly close. (This minimal separation is tight enough to fit inside even a Plossl eyepiece's narrow-ish field at 200x.) Unfortunately, the pair will be

Sky Calendar

| | |
|----|---|
| 1 | Full Moon |
| 9 | Last-Quarter Moon |
| 17 | New Moon |
| 24 | First-Quarter Moon |
| 28 | Venus-Uranus Conjunction (See "March Skies," at left.) |

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ABOUT THE DENVER ASTRONOMICAL SOCIETY

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

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



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

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

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



ASTRO UPDATE

Selected Summaries of Space News

by Don Lynn

Distant Exoplanets

Astronomers have for many years used microlensing to find exoplanets. When a planet happens to pass exactly in front of a distant star, it gravitationally bends the starlight, and like a lens, brightens and magnifies the star. As long as the star is imageable in telescopes, it does not matter how far away the planet or star is. This technique had already found some of the most distant exo-planets, but it rose to a whole new level with the discovery of planets in a galaxy 3.8 *billion* light-years away, the first known exoplanets outside our own galaxy. The imaging was done in X-rays using the Chandra space telescope.

TRAPPIST-1 Planets

The sizes and masses, and therefore the densities, have been accurately measured for the seven planets in the TRAPPIST-1 system. From the densities, these conclusions have been drawn: the b and c planets probably have rocky cores and thick atmospheres; it is uncertain whether ice, ocean or atmosphere causes planet d's density; e is denser than Earth, so it probably has a large iron core, and may not have ice, ocean or atmosphere to reduce that density; f, g and h may have frozen surfaces and little atmosphere. All seven are mostly rock, and the less-dense ones may have substantial (much more than Earth) material lighter than rock, such as water.

Interstellar Visitors

In December, we reported that an asteroid (named 'Oumu-mua) had been discovered whose orbit showed that it came from outside our solar system and would soon exit again. A new computer simulation of the Sun and Jupiter showed that gravitational capture of such visitors should be common enough that perhaps a few thousand of them have been captured and are lurking among the bodies native to the Solar System. Differences in oxygen isotope ratios might be able to distinguish the visitors from the natives. The simulation was also run using the two largest stars in the Alpha Centauri system (rather than the Sun and Jupiter) and the results showed that that system would much more readily capture interstellar visitors, even planet-sized ones.

Neutron Star Mass Limit

It has long been debated how massive a neutron star can be before it collapses into a black hole, since that involves physics at higher pressures than we can create. A new study that combines theory with observed properties of the first-seen merging of two neutron stars detected (by gravitational wave and various forms of light) comes up with the value 2.16 times the Sun's mass. This is a much more precise value than the previously used gap between the most massive known neutron star (about 2) and the least massive known black hole (roughly 3). Theoretically, a very fast-rotating neutron star could be a little over this mass limit before collapsing.

Titan Sea Level

A new study of Cassini data has determined that all the ethane-methane seas on Saturn's moon Titan are at the same elevation. This implies that they are connected by an underground aquifer (or whatever the liquid methane equivalent of "aquifer" is). Some smaller lakes are at higher elevations, so not all liquid bodies on

Titan are connected.

Dark Energy Survey (DES)

This survey is using a wide-field 4-meter telescope in Chile to completely image in five wavelengths a large fraction of the entire sky. The goal is to analyze the gravitational lensing in the images in order to make a 3-dimensional map of dark matter. The first release of data from the DES was just made, and it covered about 1/8 of the sky. Naturally, DES has found a lot of other interesting things besides dark matter, including 11 new streams of stars that resulted from the Milky Way's gravity shredding dwarf galaxies. Several of those streams appear to have originated near the Magellanic Clouds, and thus the shredded galaxies may have been the Clouds' satellites.

Additionally, a value for the Hubble Constant (the rate at which the Universe is expanding) was calculated from the DES data. At 67.2, it lies between the discordant values calculated from the Cosmic Microwave Background and from the supernova surveys, but it is nearer to the former. The precision of the Hubble value should increase as the DES gathers further observations.

Rare Black Hole

Astronomers using the Very Large Telescope in Chile have found a star that appears to be orbiting an invisible object with about four times the Sun's mass. Likely it is a black hole that does not happen to have any matter falling into it currently (else it would be visible). This is located in the globular cluster NGC 3201. Each orbit of the star takes 167 days. Black holes are rare in globular clusters; this is the only known instance of an inactive black hole in a globular.

Meteor

A brilliant slow-moving fireball (very bright meteor) was seen on January 16th over Michigan and nearby states. Its shock wave caused a magnitude 2 earthquake. Analysis of images, weather data, and seismic data narrowed down the area where pieces of the meteoroid may have fallen to the Hamburg Township area of Michigan. Searches there have turned up fragments. Preliminary analysis shows them to be L6 chondrites, a common type of meteorite.

Falcon Heavy

In February, SpaceX launched its Falcon Heavy rocket for the first time. It can lift the most mass into orbit of any current rocket, though it is less than the Apollo Saturn V rockets did. There was no contracted payload, so SpaceX owner Elon Musk used a red Tesla electric car as test payload. The car will spend the next few months on its way to Mars' orbit, though Mars will not be at that point. The car is expected to orbit the Sun for millions of years, in an elongated path that touches Mars's orbit and Earth's orbit each time around the Sun. In the driver's seat is a test dummy who is testing SpaceX's new design for a space suit. The Falcon Heavy first stage is made up of three smaller rockets bundled together. The three parts separated, as planned, and attempted to land for later reuse. Two of the three landed successfully.



DAS NEWS

March and April Member In-Reach

Anyone who has recently purchased or is thinking about buying a computerized “go-to” equatorial mount will enjoy and benefit from this talk by veteran amateur astronomer Ed Scholes, to be presented at the next Member In-Reach on **Saturday, March 10th, at Chamberlin Observatory from 7 to 10 PM**. This talk is tailored not only for veteran observers, but also for those new to the hobby.

If you are an experienced observer, you’ll enjoy the “tricks of the trade” Ed will present; secrets Ed has learned from years of observing will help you get the most out of a go-to equatorial mount. If you are a “newbie,” this talk will give you the flavor of equatorial and computerized telescope mounts—good information to have as you progress toward buying a telescope of your own. This In-Reach is also a great opportunity for new members to meet some of the veteran members of the DAS and get involved in our society. You’ll find we are a friendly group, eager to help with questions and discussions of astronomy concepts, from the most basic to the advanced levels, depending on where you are with the hobby.

For the **April In-Reach on April 7th, at Chamberlin Observatory from 7 to 10 PM**, we’ll have a talk on telescope basics—what you need to know to set up and effectively use your first telescope or a loaner telescope furnished by the DAS. We’ll also have tips on learning the night sky and planning an observing session, with “hands-on” opportunities on the lawn after the talk is over. (We’ll include a discussion of books we

Volunteer Opportunities

March 15th, 2018, ~ 8:00 PM, Star Party, Carson Elementary (3rd grade), Denver, CO.

March 21st, 2018, ~ 8:00 PM, Cub Scouts Star Party, Homestead Elementary, Centennial, CO.

March 24th, 2018, ~ 8:00 PM, private Star Party, Highlands Ranch, CO.

April 8th, 2018, 8:00 AM-2:00 PM, Frank Shorter Race4Kid’s Health, Broomfield, CO.

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

recommend and apps for your smart phone, tablet or computer, too.)

Finally, we’ll give a preview of upcoming In-Reach talks and programs to give you an idea of what’s in store in the coming months. So come on out to the March and April In-Reach events at Chamberlin Observatory. **For further information, contact Digby Kirby, DAS New Member Ambassador, odigby@gmail.com, (970) 301-2287.**

2018 Bill Ormsby Memorial Volunteer Award Presented

Long-time DAS member Bill Ormsby left us in December of 2012, and was a beloved fixture at Open Houses and other DAS events. Bill served the Society in many ways, but most members and guests remember him as the “Minder of the Chain” at the bottom of the Chamberlin Observatory’s stairway. Good weather or bad, cloudy or clear, Bill faithfully presided over the number of guests in the dome room for as long as many of us can remember.

Four years ago, we decided to remember Bill by creating and presenting the Bill Ormsby Memorial Volunteer Award to a DAS member who has done unusually heavy lifting for the organization. Darrell Dodge was the award’s inaugural recipient in 2014, David Shouldice was the 2015 recipient, Dave Tondreau our 2016 recipient, and Dena McClung was last year’s. During Saturday night’s Spring Banquet at the Embassy Suites DTC, we honored 2018’s recipients, Johnny and Eileen Barela.

Johnny and Eileen have been members of DAS for many years, and are likely well-known to most of you, especially those who volunteer in various Society activities. They volunteer in our Open House and External Outreach programs, and they are familiar faces during our activities at locations such as the Denver Museum of Nature and Science, and Dinosaur Ridge. Johnny has served on the E-Board as a trustee, and Eileen is the DAS librarian. They attend most of our membership and E-Board meetings, and do much on behalf of DAS and astronomy in general at a variety of venues and events. They take DAS literature and fliers to libraries, schools, and other locations. They show up early at Open Houses to help set up, and Eileen has become the new “Minder of the Chain” at the bottom

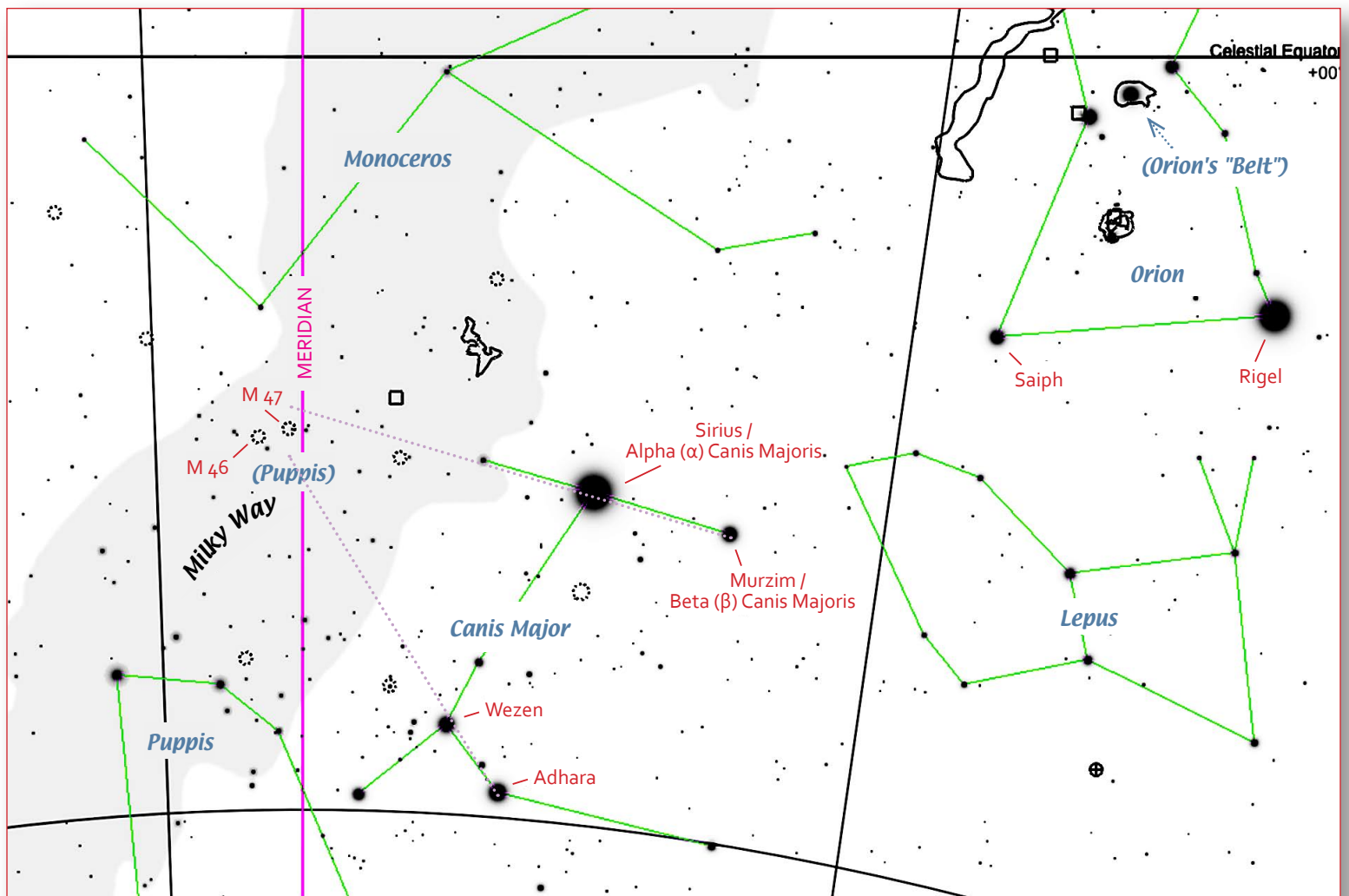


Johnny and Eileen Barela (left) receive the 2018 Bill Ormsby Memorial Volunteer award from Ron Hranac and Dena McClung at the DAS Spring Banquet, March 3rd, 2018.

of the Chamberlin stairway. And so much more...

Please join me in congratulating Johnny and Eileen Barela as the deserving recipients of this year’s Bill Ormsby Memorial Volunteer Award.

—Ron Hranac, DAS President



Looking due south (at the Meridian line) in Denver sky at 9:00 PM in mid-March. Note dotted lines showing how to quickly get near M47, as described in text. (The cluster is about 35° above the horizon at the described time.) Our third target, NGC 2438, isn't visible at this scale; it's shown in the close-up chart on page 7.

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

March Skies

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only a little more than 10° up at that time, and the Sun's afterglow, just a half-hour after sunset, won't help, either.

Frankly, I'm not sure that the difficulties in observing this event (or the other conjunctions this month) matter—for one thing, we've had such lousy weather over the past many months that we've missed many of them anyway. So for this event, this fantastically close conjunction, let me suggest you do your best with your scope—but *reach out with your mind*, whether you can actually see it or not. After all, even if it were cloudy, you would still *know* that these two planets had lined up for Earthbound observers. Reach out, and imagine these two tiny dots, one rather dimmer than the other, as what they are—great planets, many *millions of miles apart*, that just happen to lie along a single line with us for a brief period.... Using your mind's eye, you're sure to be *enthralled* with the view, cloudy or not. If that sounds radical to you, remember that almost everything we look at “up there” (“out” there, really), benefits from that same active imagination at the eyepiece or under the stars.... Just a thought.

Stars and Deep Sky

This month, we'll visit two open clusters and a less well-known planetary nebula, all of which are in the constellation Puppis. If this constellation doesn't ring a bell for you, don't worry—our targets lie close to the bright star Sirius, and just a bit farther from familiar Orion.

Our first object, **M47, at 7h 37m, -14° 32'**, is a brilliant cluster of magnitude +4.4—bright enough to be a naked-eye object under a clear, dark sky. M47 is relatively young, with an age of less than 100 million years, so the stars we see there are still comparatively hot and blue (in older clusters, similarly hot stars ran through their hydrogen fuel long ago and have quit shining brightly). Multiple references list a distance of about 1,600 light-years, more or less the same distance as the Orion Nebula, so the relative sizes and brightnesses of these structures can be compared, or “felt,” visually.

M47 spans just less than ½°, so you can use your experience observing the Moon to gauge which eyepieces will give you a good field. In my 12-inch Newtonian, my 38mm eyepiece gives a 1.8° field, which was good for a “Wow!” in my notes—the view was

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wide enough to include adjacent orange giants. The view was still “Terrific!” in a 1° field, but a bit tight at ½°—on the other hand, it was cool to go surf the cluster that way, slewing the telescope through the cluster’s stars. Don’t let the large aperture scare you off—this cluster shows easily in a 9x50 finderscope and gives rewarding views in small telescopes.

While you’re taking in the higher-power view, check out one of the brighter stars in the cluster—it’s quite noticeable toward the center. The star is Struve 1121, a nice blue double; it splits easily at 120x. (If you want more of a challenge, try 60x—it’ll split, but tightly; at this magnification, it’s often washed out in poor seeing.)

M47 isn’t hard to find—start your search at the bright star Sirius, the brightest star in our sky—at 9 PM mid-month, it’s about 30° up and somewhat west of due south. (Weirdly, it’s in about the same place at 9 PM at the beginning of the month—the stars usually drift gradually westward as the days pass, but the change to Daylight Time “resets” the usual arrangement mid-month.) Regardless of exactly where Sirius may be, its brightness is a dead giveaway, and you can confirm you’ve got the right star by noting that Orion’s belt points straight to it.

From Sirius, take a quick peek a little more than 5° westward to a bright, 2nd-magnitude star, Murzim, aka Beta (β) Canis Majoris.

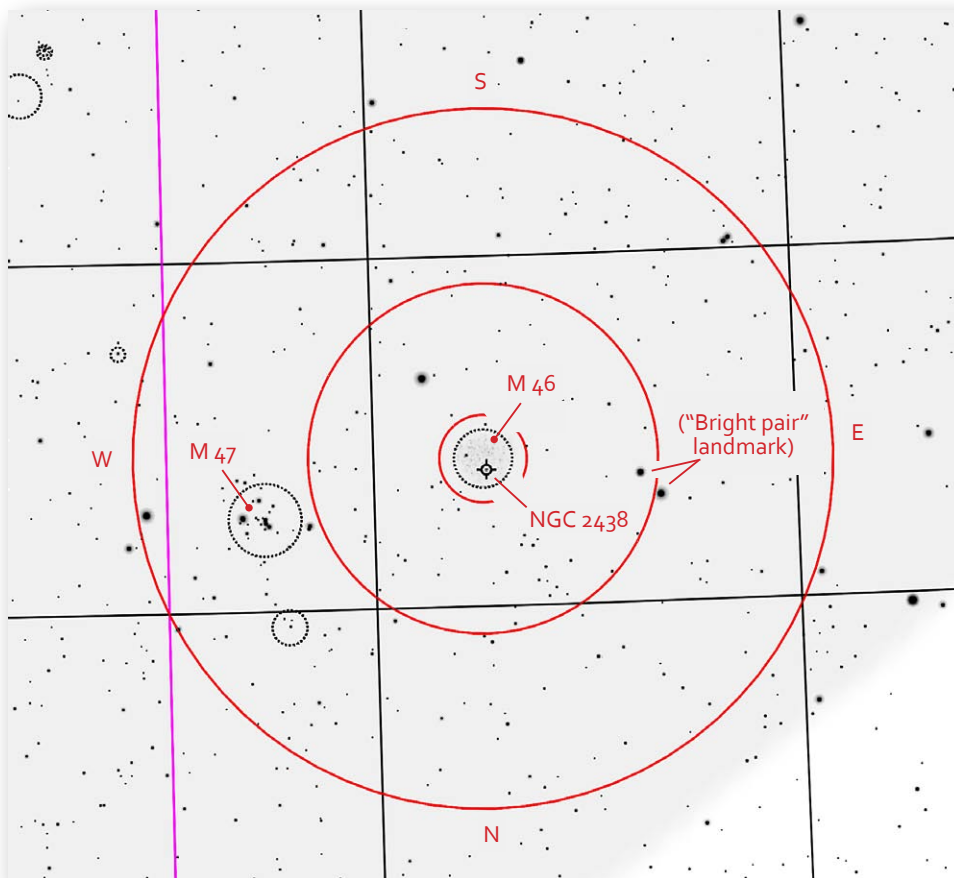
(For comparison, Murzim looks very similar to Orion’s dimmer foot, Saiph.) Now, from Murzim, imagine a line running back through Sirius, and take that line a bit over twice as far beyond Sirius as Sirius is from Murzim. Point your instrument there, and M47 should be near the center of your finderscope. If it helps, you can also look for two bright stars, Adhara and Wezen, in the “hind legs” of Canis Major (the constellation is supposed to be a hunting dog, with Sirius and Murzim its front, and the Sirius-Wezen line its spine). A line from Adhara through Wezen will extend straight to M47, so imagine the intersection of this line with the Murzim-Sirius line, and *boom!* You’re in.

M46 lies just over a degree eastward from M47, at **7h 43m, -14° 51’**, close enough for the two clusters to appear together in a binocular or finderscope field. (You’ll need a *dark* sky, though—M46 often fails to appear in my 9x50 finderscope from a “somewhat” dark site south of Chatfield State Park.) At magnitude +6.1, M46 appears dimmer to earthbound observers than M47, but that’s an illusion caused by M46’s greater distance—it’s some 5,000 light-years from us, more or less. If we could compare the two clusters directly, side-by-side, you’d see that M46 is really about ¾ of a magnitude brighter than M47.

M46 is older than M47, too, with an age of around 300 million years. Because it’s been around longer, M46’s stellar population is different than M47’s: As you might expect, many of the hotter, bluer, and brighter stars that we could still see in M47 have already died off in M46. For M46 to remain intrinsically brighter, then, it must have a greater overall number of stars within it—and this logical expectation is borne out at the eyepiece. A view of M46 reveals many more stars, a much *richer*-looking field, than M47’s; it makes a beautiful view even though it’s visually dimmer.

A 1° field gives this cluster plenty of room, but a higher magnification may let you see the stars better, depending on your telescope’s aperture; if you narrow your field to ½° (when you boost your magnification) the cluster will still fit the view nicely. Even if the resulting field narrows too much to see the cluster all at once, that might be worth trying, too.

Finding M46 should be simple, once you’ve found M47 (how’s *that* for a deal?). In a truly dark sky, you may see it sharing the finderscope field when M47 is centered; but as I mentioned, M46 has failed to appear in my 9x50. In that case, center M47 anyway, and slew your telescope gently eastward—you’ll quickly see a noticeable pairing of bright stars enter the field, if they weren’t already in the view. Put the finderscope’s crosshairs halfway between M47 and those stars, and then slew slightly “downward” toward the south, and you should have M46 in your telescope’s eyepiece. If not, you’re very close—gently nudging your ‘scope in a spiral around that point should pick up the cluster. (See close-up chart, at left.)



Simulated field centered on M46—the view is inverted, as it would be in a straight-through finderscope. Under imperfect skies, M46 may fail to appear; if so, center its expected position, which is halfway between M47 (center-left) and the bright pair of stars at center-right. (Telrad circles included for reference—outer is 4°, middle 2°, and inner ½°.) Note position of NGC 2438; it appears “within” M46, but is actually a foreground object.

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

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Sharp-eyed readers will note that our last object this month, the planetary nebula NGC 2438, at 7h 43m, -14° 47', has nearly identical coordinates to M46's. That's because they share the same field, to the degree that the nebula looks like it's a member of the cluster. Visual appearances aside, astronomers know NGC 2438 isn't in the cluster, because the distance calculated for the nebula is thousands of light-years closer to us, and because its motion through space isn't the same as the cluster's. (That second factor and other clues truly help to seal the deal, because the distances of most planetary nebulae are both challenging to calculate and notorious for the inaccuracy of the estimates.)

Don't let NGC 2438's dim-sounding 11th-magnitude fool you—the nebula's *surface brightness* is much better than many galaxies you may have looked at, like M51 (the Whirlpool Galaxy), and only negligibly dimmer than its famous cousin, the Ring Nebula, M57, in Lyra. If you use the same eyepiece on the same 'scope as you would for M57, you'll see NGC 2438 as brightly—just smaller. You should be fine under a dark sky with a 5- or 6-inch reflector; try adding a UHC or O-III filter, too. (I have seen reports of at least *seeing* this object in 75mm or 80mm 'scopes, though I doubt there was anything remarkable about the view.)

Under good conditions with a large 'scope, NGC 2438 reveals structure much like that of the Ring Nebula. Deep astrophotos confirm the ring-like structure; 2438's "donut" though, looks fatter

than M57's, and its "donut hole" is noticeably smaller.

In my 12-inch Newtonian, you can see the planetary nebula well at 120x, without a filter. At 200x, the nebula arguably shows up better and the finer stars in the background do too, but you don't see all of M46 anymore. (I use a TeleVue Radian eyepiece for this magnification; it has "only" a 60° apparent field, so the true field is less than 1/3°—those of you with Naglers or similar 82° eyepieces may have a different experience getting more of M46.) At either power, I needed averted vision to see the nebula—it had a ghostly appearance, especially at 200x, but the "ring" wasn't obvious—it was more like a pale white disk, slightly dimmer in the center.

You should be able to see NGC 2438 just north of M46's center and about halfway between the center and its edge. As with most planetaries, 2438 may appear stellar, or like a "fuzzy" star, in low-power views, so if you don't see it at first, try increasing your magnification a bit and have another look.

—See you next month.

