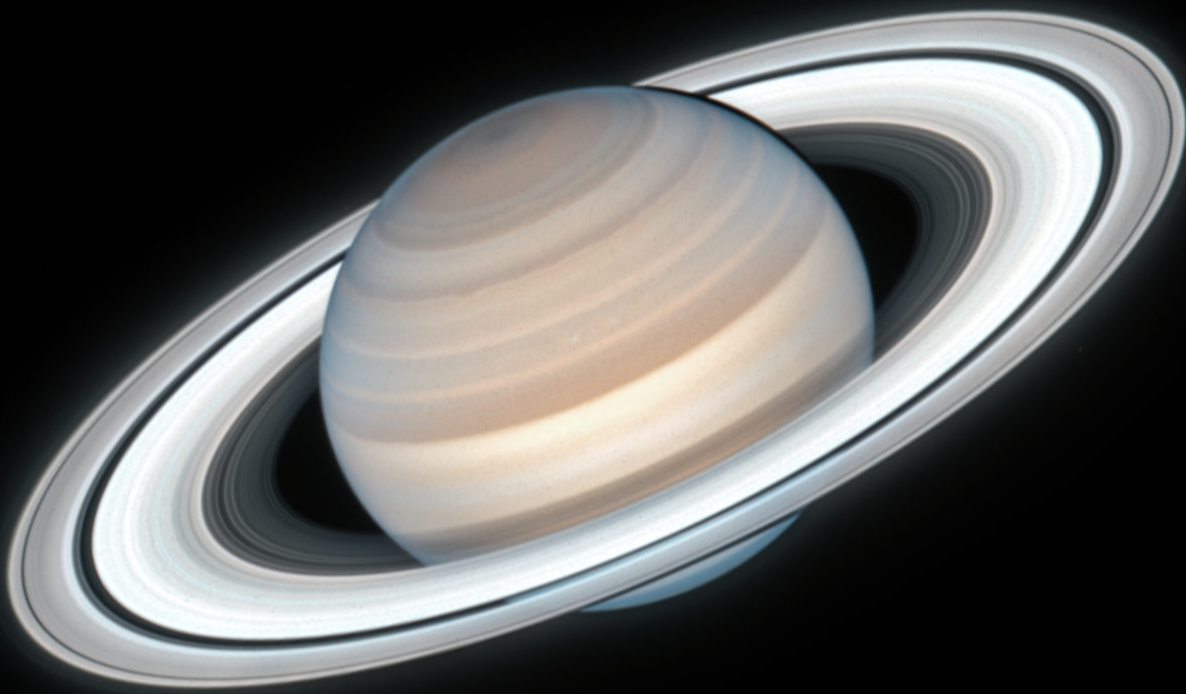


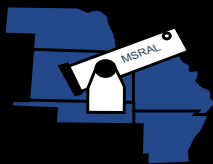
# ***The Prairie Astronomer***

**August 2020 Volume 61, Issue #8**

**August Meeting:  
Nearest Star Party**



***Hubble Images  
Saturn, Mimas and Enceladus***



**Night Sky Network**



The Newsletter of the Prairie Astronomy Club

# The Prairie Astronomer



## NEXT MEETING AND PROGRAM

August 25, 6pm

Program: Solar Star Party at a location to be announced. Dave Churilla will also give short program on solar observing.

## FUTURE PROGRAMS

September - The Artemis Project

October - Club Viewing Night

November - How to Buy a Telescope

December - Holiday Gathering for club members

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Cover: The Hubble Space Telescope was used to capture this image of Saturn on July 4, 2020.

Credit: NASA, ESA, A. Simon (Goddard Space Flight Center), M.H. Wong (University of California, Berkeley), and the OPAL Team.



# CALENDAR

PAC Meeting  
 Tuesday August 25, 2020, 6pm  
 Solar Observing (location to be announced)

PAC Meeting  
 Tuesday, September 29, 2020, 7:30pm  
 The Artemis Project

Wildwood Star Party, Nebraska City  
 September 11 or 12 (TBD)

PAC Meeting  
 Tuesday, October 27, 2020, 7:30pm

## 2020 STAR PARTY DATES

	Date	Date
January	17	<b>24</b>
February	14	<b>21</b>
March	13	<b>20</b>
April	17	<b>24</b>
May	15	<b>22</b>
June	12	<b>19</b>
July	10	<b>17</b>
August	14	<b>21</b>
September	11	<b>18</b>
October	9	<b>16</b>
November	6	<b>13</b>
December	11	<b>27</b>

Dates in **BOLD** are closest to the New Moon.

## CLUB OFFICERS

President	Bob Kacvinsky kacvinskyb@yahoo.com
Vice President	Rick Brown rickbrown2000@gmail.com
2nd VP (Program Chair)	James Quach jamesq@utexas.edu
Secretary	Bill Lohrberg wmlohrberg89@gmail.com
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Outreach Coordinator	Mike Kearns mkearns@neb.rr.com
Website and Newsletter Editor	Mark Dahmke mark@dahmke.com



Shop through Amazon Smile to automatically donate to PAC:  
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[www.prairieastronomyclub.org](http://www.prairieastronomyclub.org)

# Meeting Minutes

Bill Lohrberg

PAC meeting minutes  
July 28, 2020 as  
recorded by Bill Lohrberg

PAC meeting via Zoom  
President Bob Kacvinsky  
hosting with 17  
participants at time of  
start 7:35pm, increased to  
25 as meeting  
progressed. Welcome all  
and introductions. Bob  
shared a photo of comet  
NEOWISE by Brett Boller  
taken from the "Non-NSP.  
(Some members made  
the trip to Merritt  
Reservoir despite  
Nebraska Star Party 2020  
having been cancelled)

Jim Kvasnicka presented  
the observing report for  
August.

- Star parties scheduled  
for August 14 and  
August 21 at Cortland  
site
- Planets for August:  
Jupiter at Mag -2.6 in  
Sagittarius, Saturn, at  
Mag + 0.3 in Sag, Mars  
increases to Mag -1.8.
- Other planets pre dawn:  
Neptune in Aquarius,  
Uranus in Aries, Venus  
decreases in brightness  
to -4.3 and rises about  
3am, Mercury very low  
in dawn sky will be  
difficult to see.
- Meteor shower –

Perseids peak night of  
Aug 11-12.

- Comet NEOWISE is  
getting dimmer will be  
more and more difficult  
to observe as it speeds  
away. Jim displayed a  
sketch he made of the  
comet made at Merritt  
Reservoir while there.  
Jim noted that he can't  
remember seeing a  
comet with so long a tail  
as this one – was a  
wonderful comet to  
observe naked eye.
- Messiers for August;  
M6, 7 in Sorpius, M8  
Lagoon nebula in  
Sagittarius, M9, 10 GC's  
in Ophiucus, M12, 19  
GC's in Ophiucus, M20  
Trifid nebula in Sag,  
M21 & 23 OC's in Sag,  
M62 and 107 GC's in  
Ophiucus.
- Other non-M objects:  
NGC 6717, 6741, 6781,  
6818, B86 – "ink spot"

In the news

NASA set to launch  
Perseverance rover July  
30-31

Announcements

Hyde still on hold until  
further notice, stay tuned  
for any changes or  
updates

Bob reminds, encourages

all who can to attend  
upcoming star parties,  
Aug 14<sup>th</sup> and 21<sup>st</sup>, recent  
star parties in June turned  
out very well and were  
well attended.  
Maintaining safe  
distancing etc. is no  
problem.

August meeting will likely  
not be at Hyde, however  
discussion is under way  
about possibly moving the  
meeting to Branched Oak  
Observatory for solar  
observing. Alternately  
another Zoom meeting.

Bob again thanked  
everyone for continued  
patience.

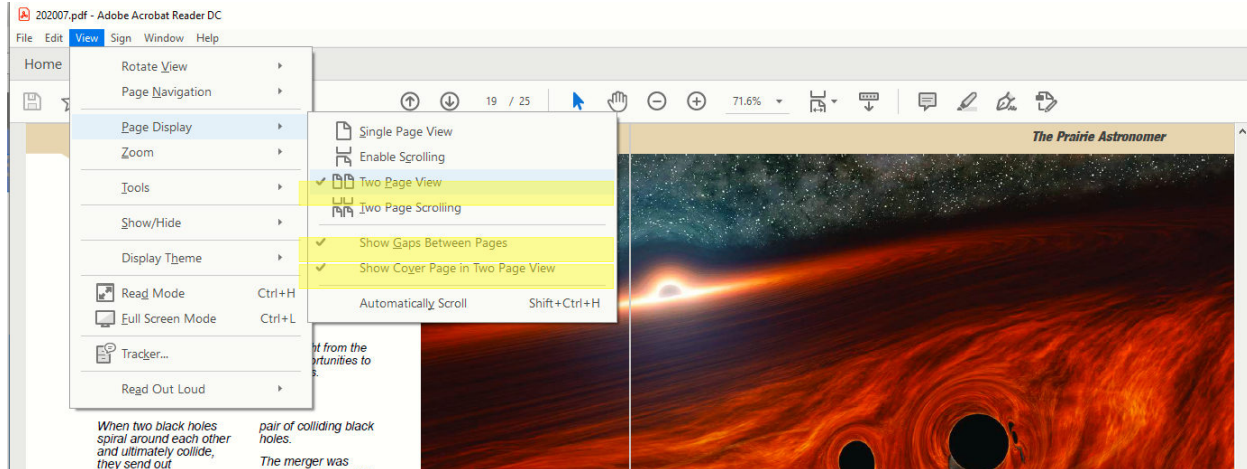
John Reinert gave a brief  
treasurers update –  
numbers line up as we  
would expect, account  
balances were stated, if  
any questions John is  
available to answer those.

With no further business,  
the meeting was  
adjourned to the program  
– an enthralling  
presentation by Martin  
Gaskill on active galactic  
nuclei.

Photos from "Non-NSP  
2020" participants were  
shared.

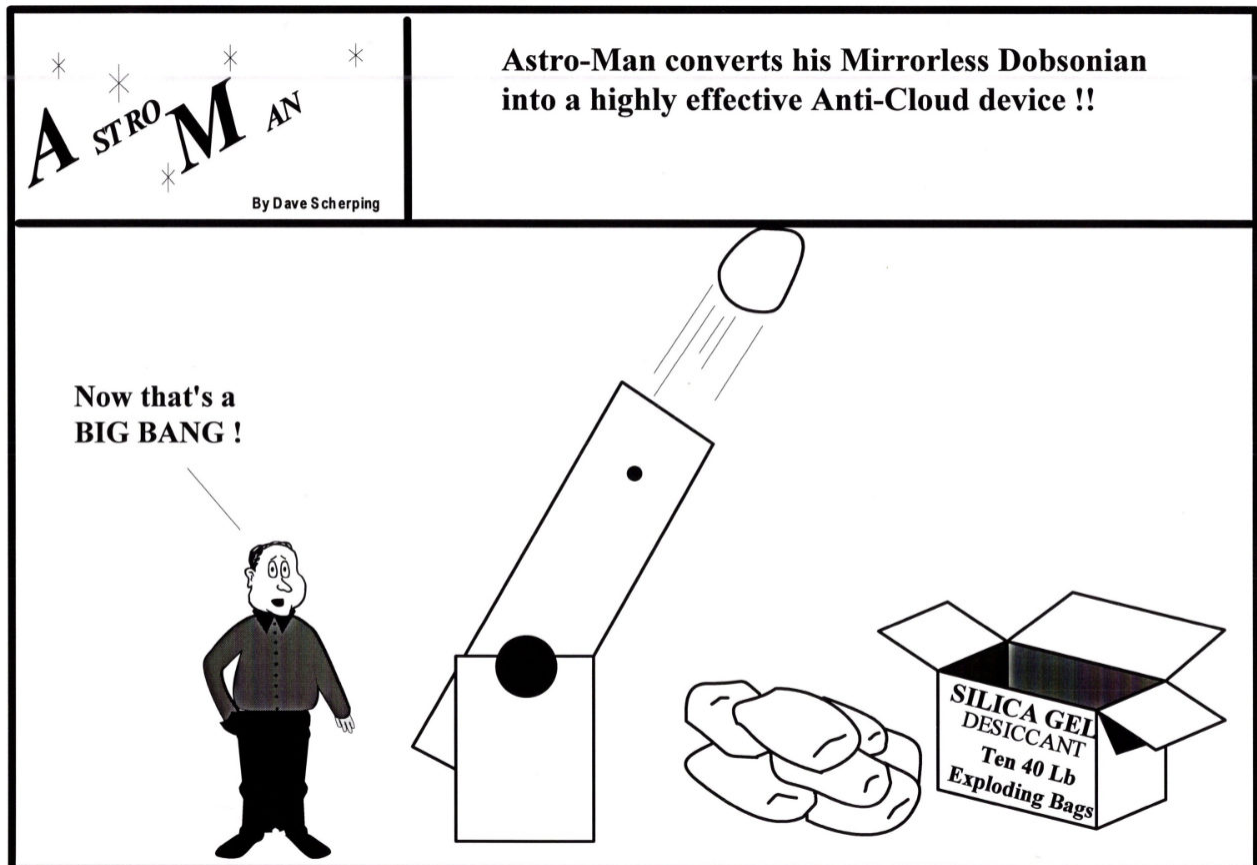
# New Newsletter Format

## How to Adjust Adobe Acrobat Settings for Two Page View



To view this newsletter in magazine spread format in Acrobat, select **View ->Page Display->Two Page View**. Acrobat will then show two pages side by side. Also make sure the checkboxes “Show Cover Page in Two Page View” and “Show Gaps Between Pages” are checked.

*If you have it setup correctly, the cover page will be displayed by itself and subsequent pages will be side by side with the odd numbered pages on the left.*



# The President's Message

*Bob Kacvinsky*



2020 has sure been a different time for PAC and the community. All our "public" star parties and programs have been canceled, although our regular club star parties have been held. In July NSP was canceled but about 75 observers still traveled to Merritt Reservoir for an ad hoc star party. The highlight in July was the naked eye comet NEOWISE. I hope everyone had a chance to get out and view the comet.

One positive that has come out of the COVID-19 pandemic is our ability to have some excellent speaker programs during our Zoom virtual meetings. Our July meeting program hosted Dr. Martin Gaskell with a talk focused on Galactic Nuclei research. We have been very fortunate to have several excellent talks from speakers across the country.

We postponed the Solar Observing Party from our June meeting due to risks of the general public crowds at Hyde and in

hopes that the COVID restrictions would be reduced. Since we have had several outside observing parties this summer, we felt we could offer to the PAC membership the opportunity to have the Solar Observing party at our August 25<sup>th</sup> PAC Meeting. We still want to avoid a public crowd event and have arranged to have the Solar Observing at a private location in SE Lincoln. We will send out details via the Nightsky Network to members later next week. If you have a Solar Telescope and would like to help please let myself or Dave Churilla ([DChurilla@neb.rr.com](mailto:DChurilla@neb.rr.com)) know. We will plan to set up at 6 PM and observe till 7:30 or so. At 7 PM Dave will provide an explanation of the different observing telescopes, what to look for, and explain the features on the sun. Please don your face covering and plan to join us for the open air solar observing party.

The Hyde Board met this month and plans are slowly progressing towards options for opening although it will likely be closer to the beginning of next year. Stay tuned.

In September the Wildwood Foundation in Nebraska City have asked us to assist with their fall celebration to set up telescopes for an evening star party. We are looking at September 11 or 12<sup>th</sup> for the event. Please let me know if you would be willing to attend and set up. We are set up in a fairway of the golf course and easily separated. Everyone has been asked to wear face coverings and observe social distancing. We would ask that telescope operators bring a package of "wet wipes" to wipe down any tough points between families. We have 3 telescopes lined up so far but could use a couple more to help spread out the visitors. Please let me know if you are interested.

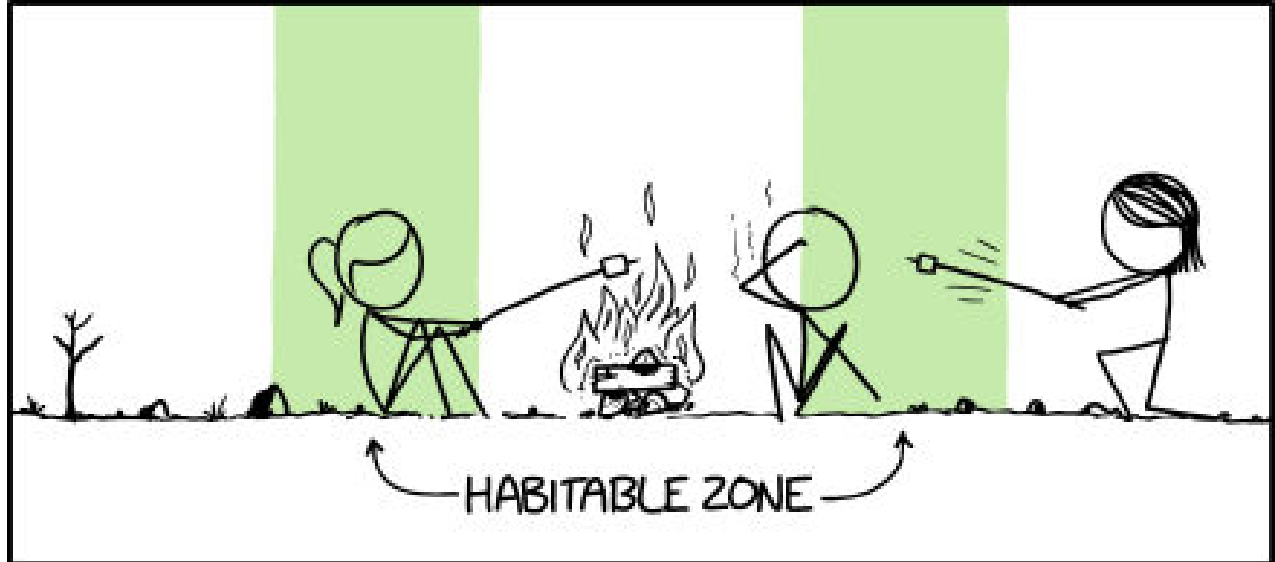
Our September meeting will have speaker(s) from Dynetics in Huntsville, Al. They were recently selected to be one of the three principle contractors in supporting the Artemis project focusing initially on the return to the moon. My daughter has been selected to work on one of the teams and it is really amazing the complexity required to coordinate the thousands

of groups together to plan and build the mission. Much of the planning process is still in the “nonpublic” format but we will have the opportunity to learn about some insights into how the project is being pulled together.

Looking forward to seeing everyone at the August 25<sup>th</sup> Solar Observing Program. If you have any ideas of future club

meeting speakers or subjects, please pass them along. Until then, wishing you all Dark and Clear Skies.

Bob Kacvinsky PAC  
President  
[kacvinskyb@yahoo.com](mailto:kacvinskyb@yahoo.com)  
402-840-0084 (text)



ASTRONOMERS DEFINE THE CAMPFIRE HABITABLE ZONE AS THE REGION WHERE YOU'RE FAR ENOUGH NOT TO BE BURNED BUT CLOSE ENOUGH TO ROAST MARSHMALLOWS.

[xkcd.com](http://xkcd.com)



*Rick Johnson*

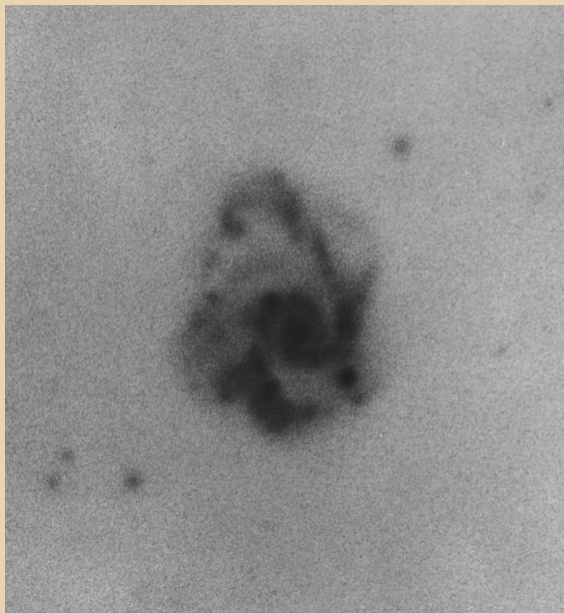
# ARP 21

Arp 21 is located in eastern Leo Minor a bit over 400 million light-years distant. It falls into Arp's class: Spiral Galaxies; 3 armed. That much seems fairly certain. Things get rather fuzzy beyond this. For instance, where's the third arm? I really don't see a definite third arm in his image, my image or the Sloan image. Is it the fuzzy detached spur running parallel to the arm wrapping around the bottom of the core ending to the

north by a round object? Or is the odd looping feature east of the south going arm that is strangely drawn-out ending in a sudden backward "j" shape? Arp made no comment on this one. NED does say it is a three-armed spiral. It just classes it as a spiral, however.

Now about that "round object" northeast of the core. The SDSS has two entries for it. One calls it a

## ARP's Image





# *The Mantrap Skies Image Catalog*

*Rick Johnson, a founding member of the Prairie Astronomy Club, passed away in January, 2019. His legacy lives on through his comprehensive catalog of over 1600 images at [www.mantrapskies.com](http://www.mantrapskies.com).*



## *The Mantrap Skies Image Catalog, Continued.*

star while the other says it is a galaxy with a redshift also about 400 million light-years distant. Arp 21 is in the Vorontsov-Velyaminov Interacting Galaxies catalog as VV552b. That would indicate they too considered that object a galaxy. Now about that "b"; where's VV552a you ask? Nearly 4 hours west and 17 degrees north! Confusing isn't it? VV552? It apparently doesn't exist. The catalog has no separate entry for the round object. I used the galaxy designation and distance in my annotated image.

Arp 21 was picked up by IRAS so is a strong IR emitting galaxy indicating

a lot of star formation is going on hidden behind dust warmed by the stars it hides. This makes it likely the galaxy did encounter another in the recent past. It might be the round object or one of the other galaxies in the area.

Looking around the area, even in the limited field of the cropped, enlarged image, there's a lot of distorted galaxies. Near the right edge of the cropped image is a red spiral that has a faint plume going north. In the lower left corner is a ring galaxy much like M94 with its very faint outer ring. Both would seem to be due to long ago encounters. There's an

obvious pair of red elliptical interacting galaxies northeast of Arp 21. At the top are two, very blue, interacting galaxies. They have one entry in a rather obscure catalog, MAPS-NGP O\_318\_0293285. That stands for Minnesota Automated Plate Scanner - North Galactic Pole. Minnesota and North Pole describe my winter perfectly. Looking around the full image will turn up others. This is a very interesting field. Unfortunately, I found virtually no papers on any of the objects, including Arp 21. Seems oddly ignored in the literature.



# Astrophotography

Brett Boller

*Canon t3i, Jack Dunn's  
Fisheye Lens, 30  
seconds, photoshopped  
by Michael Sibbersen.*

*Below: NEOWISE,  
13mm wide angle.*

*All of Brett's photos  
were taken at the non-  
NSP gathering at Merritt  
Reservoir in July.*



*Brett Boller*



*Top: Comet NEOWISE,  
Skywatcher Esprit 150*

*Bottom: 80mm, Canon T3i, CGE  
Pro Mount, 3 and 5 minutes*



*Composite of three lightning shots, Canon T3i*

*Star trails, Canon T3i, 13mm wide angle, 1 hour*



# September Observing

*Jim Kvasnicka*



This is a partial list of objects visible for the upcoming month.

## Planets

**Mercury:** Very low at dusk setting less than 50 minutes after the Sun.

**Jupiter:** Shines at magnitude -2.4 with a disk 40.7" wide.

**Saturn:** Shines at magnitude +0.5 with a disk 17.2" wide.

**Uranus and Neptune:** Look for Uranus in Aries and Neptune in Aquarius.

**Mars:** Shines at magnitude -2.5 in Pisces with a disk 22.4" wide.

**Venus:** Rises about 3.5 hours before the Sun at magnitude -4.1.

## Messier List

**M13:** The Great Hercules Cluster, Class V globular cluster.

**M14:** Class VII globular cluster in Ophiuchus.

**M22:** Class VIII globular cluster in Sagittarius.

**M28:** Class IV globular cluster in Sagittarius.

**M54:** Class III globular cluster in Sagittarius.

**M69:** Class V globular cluster in Sagittarius.

**M70:** Class V globular cluster in Sagittarius.

**M92:** Class IV globular cluster in Hercules.

**Last Month:** M6, M7, M8, M9, M10, M12, M19, M20, M21, M23, M62, M107

**Next Month:** M11, M16, M17, M18, M24, M25, M26, M55, M75

## NGC and other Deep Sky Objects

**NGC 6826:** The Blinking Planetary in Cygnus.

**NGC 6905:** The Blue Flash Nebula in Delphinus.

**NGC 6960:** Veil Nebula – Western Segment, SNR in Cygnus.

**NGC 6974/6979:** Veil Nebula – Central Segment, SNR in Cygnus.

**NGC 6992/6995:** Veil Nebula – Eastern Segment, SNR in Cygnus.

**NGC 7006:** Class I globular cluster in Delphinus.

## Double Star Program List

**Otto Struve 525:** Yellow and blue pair in Lyra.

**Gamma Delphinus:** Yellow primary with a yellow-green secondary.

**Zeta Aquarii:** Yellow and white pair.

**94 Aquarii:** Yellow primary with a pale blue secondary.

**Alpha Capricornus:** Wide pair of yellow stars.

**Beta Capricornus:** Yellow and blue stars.

**36 Ophiuchi:** Yellow-orange pair of stars.

**Omicron Ophiuchi:** Yellow primary with a light yellow secondary.

**70 Ophiuchi:** Yellow and orange stars.

## Challenge Object

**Stephan's Quintet:** Galaxy group in Pegasus containing NGC 7317, NGC 7318A, NGC 7318B, NGC 7319, and NGC 7320. Large aperture is required to identity individual galaxies.

# Focus on Observing

## The Bright Nebula Observing Program

*Jim Kvasnicka*

Bright nebulae are interstellar clouds of gas and dust where stars are born or have died. Their complex shapes and colors make them objects of great interest and beauty.

Bright nebulae occur in two main classes depending on their source of illumination: emission and reflection. They can be a combination of the two. There is also a third much less common type of bright nebula, the supernova remnant (SNR).

Emission nebulae are clouds of dust and glowing hydrogen gas. The atoms in the cloud are ionized by nearby stars and when they fall back to their previous energy state they release energy in the form of visible light.

Reflection nebulae have the same composition of emission nebulae but lack stars hot enough to cause the gas to fluoresce. They shine by the dust in the nebula scattering starlight, the gas does not actually reflect any light.

A supernova remnant is the remains of a stellar explosion, where much of the star's material is ejected, often as a highly-structured cloud.

For the program 150 bright nebulae have been selected, some are famous showpieces in the night sky. Some of the 150 are big and bright where others will test your observation skills. You will need a telescope 8" or larger to complete the program. Nebula filters (UHC and OIII) will help your observing. There is the possibility that some of the objects are beyond detection for some observers and the program allows negative observations.

The program offers three levels of accomplishment:

**Basic Visual:** Observe 60 objects from the list of 150.

**Advanced Visual:** Observe 100 objects from the list of 150.

**Imaging:** Image 100 objects from the list of 150.

You can use your own observing logs to record your observations. Your observations should include: object name, date and time, power, seeing, telescope used, filters used, latitude and longitude, and your observing notes. Device aided searches are allowed. Observers who find all objects manually will receive special recognition on their certificate.

Once you complete the Bright Nebula Observing Program you will need to submit your observing logs to me for review. I will contact the Bright Nebula Observing Program chair for approval. Once I receive your certificate and pin I will present them to you at the next PAC meeting.

# A Short-lived UFO Experience

*Bill Lohrberg*

Date: Monday July 27<sup>th</sup>,  
Time: approximately  
8:45pm – 9:00pm  
Location: Lancaster  
County, Nebraska,  
Lincoln, Lohrberg  
Residence, backyard

On Monday evening July 27, 2020 at sunset I went out onto my backyard deck, looked up and saw what looked like a planet – only not anywhere near where I'd expect to see a planet. This bright and big-as Venus-sized object was hanging almost due north approximately 60 to 75 degrees above the horizon. I went further out into my back yard and eyeballed it a little longer expecting it to disappear thinking it could be some sort of iridium-type satellite flare, but it remained bright and stayed put like a planet (which also ruled out an ISS pass). I scanned the rest of the sky and behold, I saw another strange out of place planet-like object shining brightly in the southwest a little west of the first quarter Moon. I wondered if these were Space X deployed Starlink satellite flares, but didn't seem typical of those either which I expected would not sit there and shine for very long. These were for the most part both

stationary and bright - the object in the southwest shining a little less bright than the one to the north and appearing slightly smaller. For the moment I had witnessed for the first time in my life, a pair of UFOs!

So as fast as I could run I went inside, grabbed my 7x35 binoculars and ran back out to get a "closer" view. I was a little surprised to see they were both where I left them. But 7x magnification didn't reveal much detail except what looked to be a translucent and globular shaped orb like a jelly fish. All I could guess was these were some sort of weather balloon, but I could not figure out how they remained nearly stationary.

The sun was dipping lower on the horizon and the sky was beginning to darken to a deep dark blue, but there these objects remained. So once again, as fast as I could I set up my telescope (Orion Sky Quest XT10 Dob-mount Newtonian with 1200mm focal length, F/4.7), I threw in a 25 mm eyepiece and at 48x got a real good view of these strange orbs. Starting with the

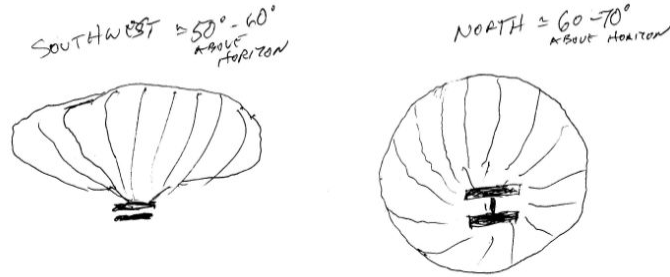
one overhead I immediately noticed rectangular shaped pair of structures in the center hanging beneath an opaque balloon. I could see blinking lights indicating some sort of intelligent control. Turning my view to the object in the southwest, it was identical except viewed from a more shallow angle giving me a side view. Within a few minutes both objects disappeared with the sunlight from their balloon structures no longer bouncing back to earth.

I went inside and drew a rough sketch of each object – the one almost overhead and then the other to the Southwest. (see sketches)

I then got online and did a search under "drone powered weather balloons" and alas the mystery was solved. I found information and photos that matched what I was seeing. What began as a Google X project developed further into a company called "Loon." Their purpose is to provide internet and communication service to remote areas.



JULY 27, 2020 ≈ 8:35 pm AFTER SUNSET



FOUND INFO ONLINE  
GOOGLE X "LOON" PROJECT  
HIGH ALTITUDE BALLOONS  
FLY 11 TO 16 MILES UP  
IN STRATOSPHERE  
WORKING TO PROVIDE INTERNET ACCESS  
TO REMOTE AREAS

The following is copied and pasted from Wikipedia:

Loon LLC is an [Alphabet Inc.](#) subsidiary working on providing [Internet access](#) to [rural](#) and remote areas. The company uses [high-altitude balloons](#) in the [stratosphere](#) at an altitude of 18 km (11 mi) to 25 km (16 mi) to create an aerial [wireless network](#) with up to 1 Mbps speeds.<sup>[1][2][3][4]</sup> A reference to the balloons used,<sup>[1]</sup> Project Loon began as a research and development project by [X](#) (formerly Google X), but later spun out into a separate company in July 2018.<sup>[5]</sup>

The balloons are maneuvered by adjusting their altitude in the [stratosphere](#) to float to a wind layer after identifying the wind layer with the desired speed and direction using wind data from the [National Oceanic and Atmospheric Administration](#) (NOAA). Users of the service connect to the balloon network using a special Internet antenna attached to their building. The signal travels through the balloon network from balloon to balloon, then to a ground-based station connected to an [Internet](#)

[service provider](#) (ISP), then into the global Internet. The system aims to bring Internet access to remote and rural areas poorly served by existing provisions, and to improve communication during [natural disasters](#) to affected regions.<sup>[6][7]</sup> Key people involved in the project include Rich DeVaul, chief technical architect, who is also an expert on [wearable technology](#); [Mike Cassidy](#), a project leader; and Cyrus Behroozi, a networking and telecommunication lead.<sup>[1]</sup> The balloons use [patch antennas](#) – which are [directional antennas](#) – to transmit signals to ground stations or LTE users. Some smartphones with Google SIM cards can use Google Internet services. The whole infrastructure is based on LTE; the [eNodeB](#) component (the equivalent of the "base station" that talks directly to handsets) is carried in the balloon.

More information can be found at their web site [Loon.com](#).

I wondered how the balloons I saw were able to stay in place for what seemed about 10 to 15 minutes as I observed them... I did not have to continually "chase" to keep them in the field of view. I found more detailed information that explains how they are maneuvered and what their payloads are designed to do in an article by Bernadette Johnson – search "How Stuff Works" > How Google Loon works

I also wondered why they would be needed in our area, but perhaps they were being tested or had wound up here on air currents from remote areas of Nebraska, South Dakota or Wyoming....(or maybe leftover from the "Non-NSP" at Merritt Reservoir! ☺ )

# Astrophotography

Mark Dahmke

*Right: Moonset over Pawnee Lake, July 22. 1/3 second at f/2.8, ISO 400, Panasonic Lumix G9, Lumix 12-35 f/2.8 lens.*

*Below: July 24, 1/15 second, f/6.7, ISO 200 at 600mm, Olympus 300-600mm lens.*

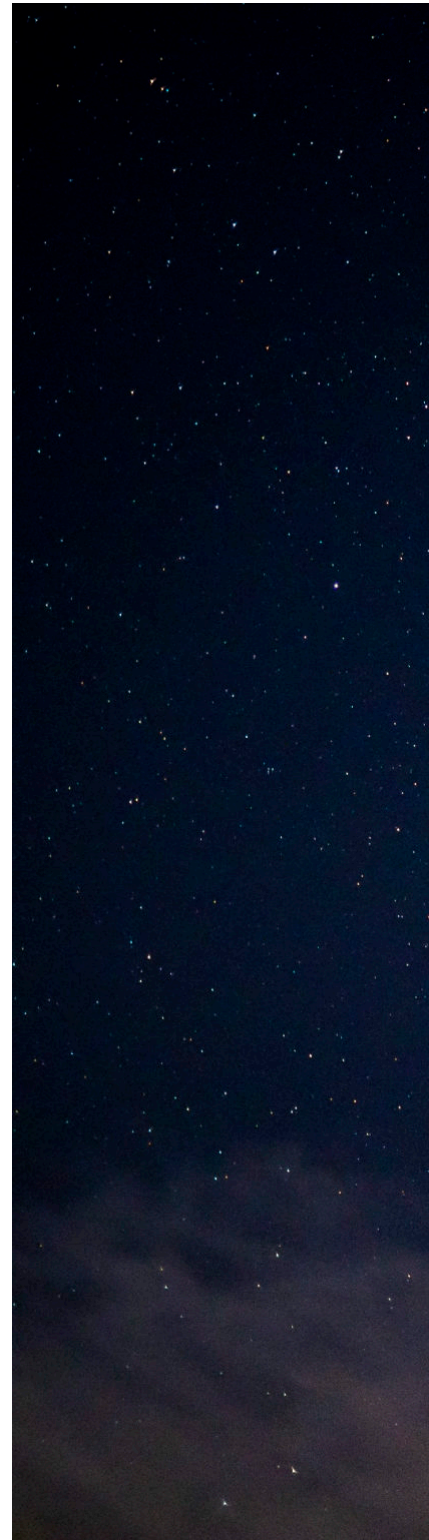




# Astrophotography

Mark Dahmke

*Comet NEOWISE, July 22 at Pawnee Lake, Mark Dahmke.  
30 second exposure, 40mm, f/2 ISO 1600  
MIOPS Capsule360, Star Tracker Mode*



*NEOWISE, Ursa Major and a satellite, July 24, Mark Dahmke  
13 seconds at f/1.8 ISO 800, 40mm focal length.*



# Mystery Solved: Bright Areas on Ceres Come From Salty Water Below

*Data from NASA's recent Dawn mission answers two long-unresolved questions: Is there liquid inside Ceres, and how long ago was the dwarf planet geologically active?*

NASA's Dawn spacecraft gave scientists extraordinary close-up views of the dwarf planet Ceres, which lies in the main asteroid belt between Mars and Jupiter. By the time the mission ended in October 2018, the orbiter had dipped to less than 22 miles (35 kilometers) above the surface, revealing crisp details of the mysterious bright regions Ceres had become known for.

Scientists had figured out that the bright areas were deposits made mostly of sodium carbonate - a compound of sodium, carbon, and oxygen. They likely came from liquid that percolated up to the surface and evaporated, leaving behind a highly reflective salt crust. But what they hadn't yet determined was where

that liquid came from.

By analyzing data collected near the end of the mission, Dawn scientists have concluded that the liquid came from a deep reservoir of brine, or salt-enriched water. By studying Ceres' gravity, scientists learned more about the dwarf planet's internal structure and were able to determine that the brine reservoir is about 25 miles (40 kilometers) deep and hundreds of miles wide.

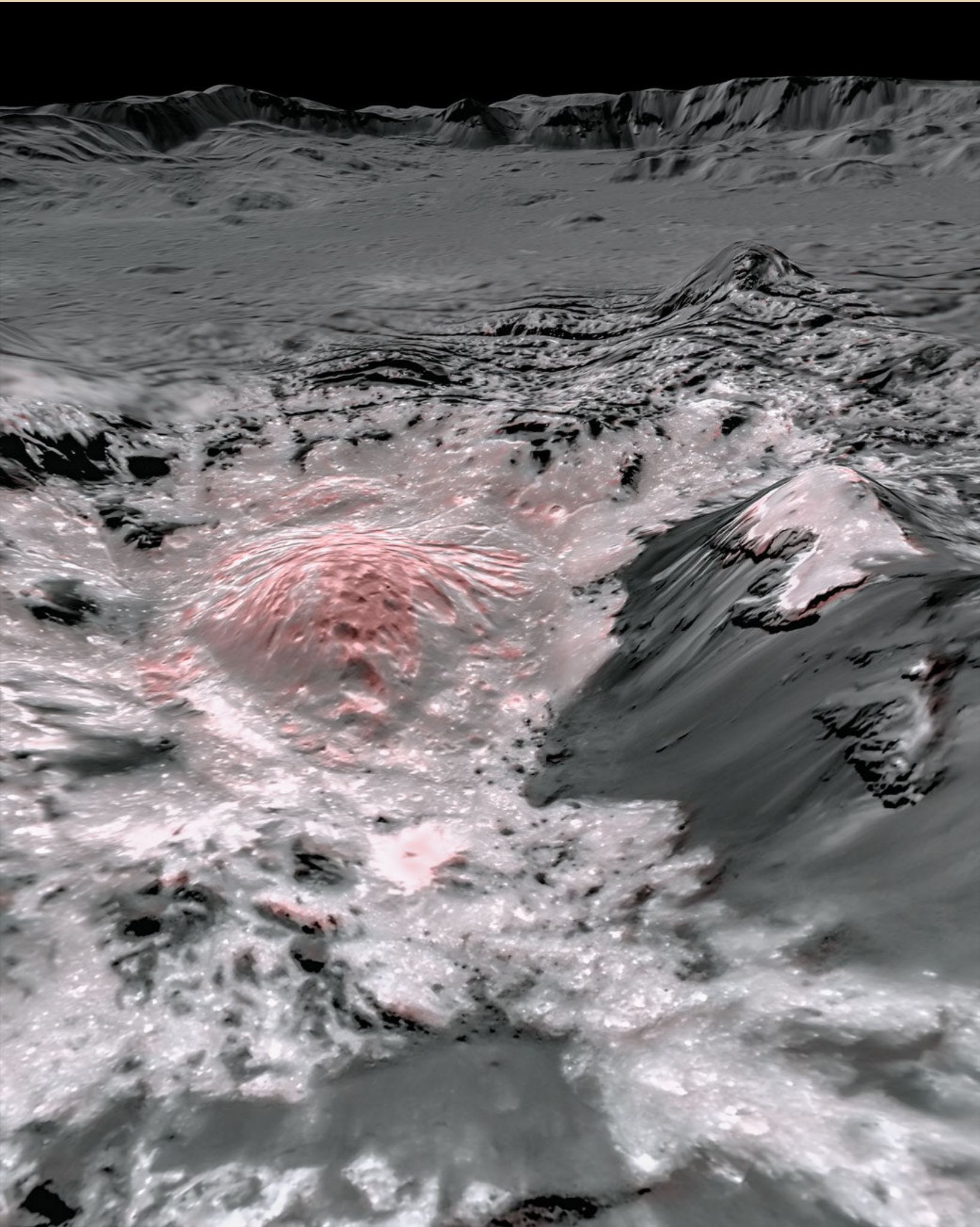
Ceres doesn't benefit from internal heating generated by gravitational interactions with a large planet, as is the case for some of the icy moons of the outer solar system. But the new research, which focuses on Ceres' 57-mile-wide (92-kilometer-wide) Occator Crater -

home to the most extensive bright areas - confirms that Ceres is a water-rich world like these other icy bodies.

The findings, which also reveal the extent of geologic activity in Occator Crater, appear in a special collection of papers published by Nature Astronomy, Nature Geoscience, and Nature Communications on Aug. 10.

"Dawn accomplished far more than we hoped when it embarked on its extraordinary extraterrestrial expedition," said Mission Director Marc Rayman of NASA's Jet Propulsion Laboratory in Southern California. "These exciting new discoveries from the end of its long and productive mission are a wonderful tribute to this remarkable

*This mosaic image uses false color to highlight the recently exposed brine, or salty liquids, that were pushed up from a deep reservoir under Ceres' crust. In this view of a region of Occator Crater, they appear reddish. Image credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA*



interplanetary explorer."

### Solving the Bright Mystery

Long before Dawn arrived at Ceres in 2015, scientists had noticed diffuse bright regions with telescopes, but their nature was unknown. From its close orbit, Dawn captured images of two distinct, highly reflective areas within Occator Crater, which were subsequently named Cerealia Facula and Vinalia Faculae. ("Faculae" means bright areas.)

Scientists knew that micrometeorites frequently pelt the surface of Ceres, roughing it up and leaving debris. Over time, that sort of action should darken these bright areas. So their brightness indicates that they likely are young. Trying to understand the source of the areas, and how the material could be so new, was a main focus of Dawn's final extended mission, from 2017 to 2018.

The research not only confirmed that the bright regions are young - some less than 2 million years old; it also found that the geologic activity driving these deposits could be ongoing. This conclusion depended on scientists making a key discovery: salt compounds (sodium

chloride chemically bound with water and ammonium chloride) concentrated in Cerealia Facula.

On Ceres' surface, salts bearing water quickly dehydrate, within hundreds of years. But Dawn's measurements show they still have water, so the fluids must have reached the surface very recently. This is evidence both for the presence of liquid below the region of Occator Crater and ongoing transfer of material from the deep interior to the surface.

The scientists found two main pathways that allow liquids to reach the surface. "For the large deposit at Cerealia Facula, the bulk of the salts were supplied from a slushy area just beneath the surface that was melted by the heat of the impact that formed the crater about 20 million years ago," said Dawn Principal Investigator Carol Raymond. "The impact heat subsided after a few million years; however, the impact also created large fractures that could reach the deep, long-lived reservoir, allowing brine to continue percolating to the surface."

### Active Geology: Recent and Unusual

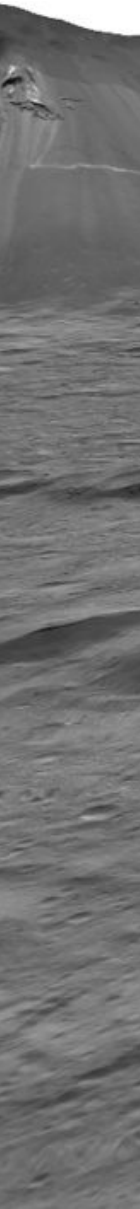
In our solar system, icy

geologic activity happens mainly on icy moons, where it is driven by their gravitational interactions with their planets. But that's not the case with the movement of brines to the surface of Ceres, suggesting that other large ice-rich bodies that are not moons could also be active.

Some evidence of recent liquids in Occator Crater comes from the bright deposits, but other clues come from an assortment of interesting conical hills reminiscent of Earth's pingos - small ice mountains in polar regions formed by frozen pressurized groundwater. Such features have been spotted on Mars, but the discovery of them on Ceres marks the first time they've been observed on a dwarf planet.

On a larger scale, scientists were able to map the density of Ceres' crust structure as a function of depth - a first for an ice-rich planetary body. Using gravity measurements, they found Ceres' crustal density increases significantly with depth, way beyond the simple effect of pressure. Researchers inferred that at the same time Ceres' reservoir is freezing, salt and mud are incorporating into the lower part of the crust.

*This mosaic of Ceres' Occator Crater is composed of images NASA's Dawn mission captured on its second extended mission, in 2018. Bright pits and mounds (foreground) were formed by salty liquid released as Occator's water-rich floor froze after the crater-forming impact about 20 million years ago. Image credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA/USRA/LPI*





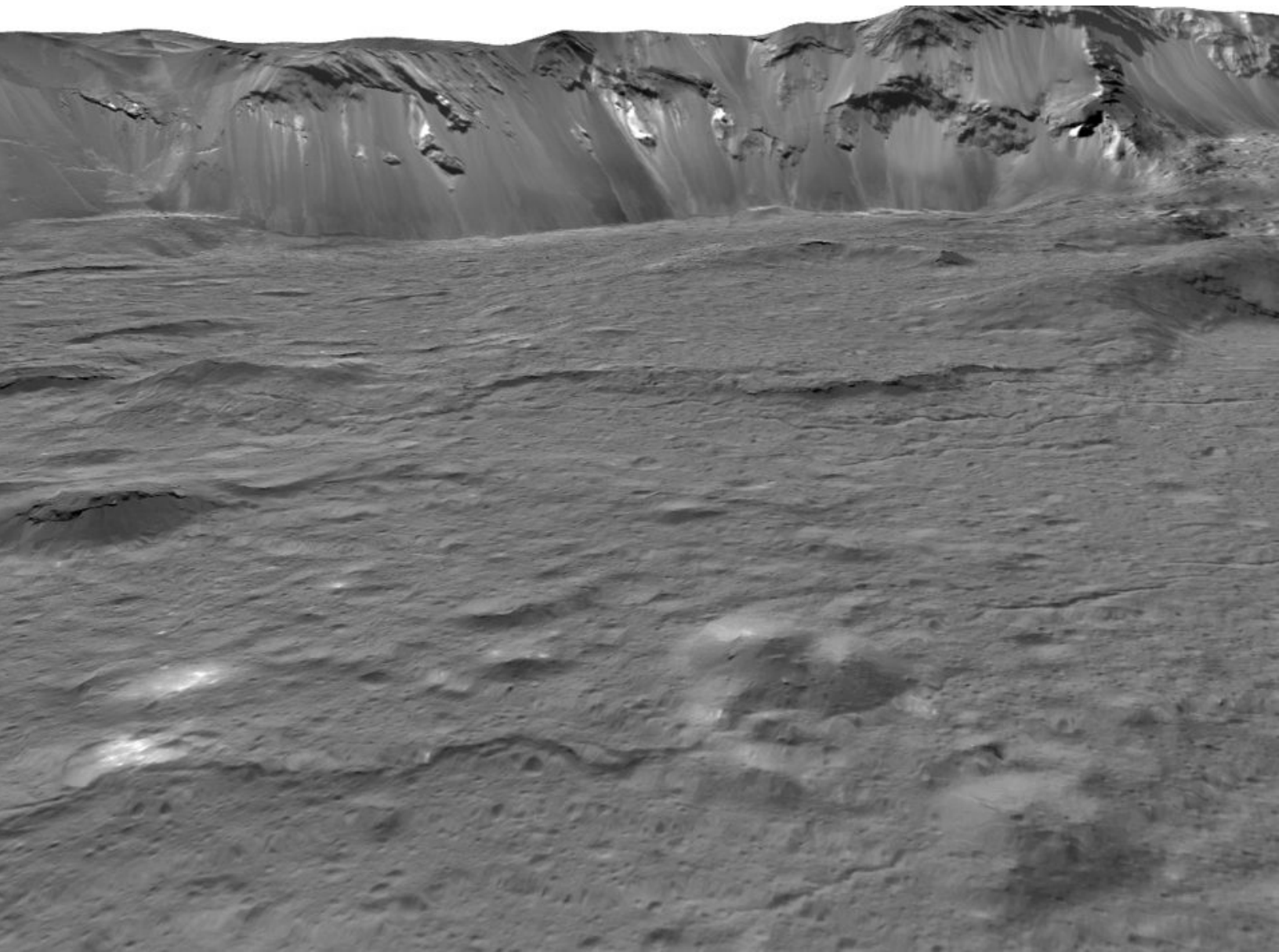
Dawn is the only spacecraft ever to orbit two extraterrestrial destinations - Ceres and the giant asteroid Vesta - thanks to its efficient ion propulsion system. When Dawn used the last of a key fuel, hydrazine, for a system that controls its orientation, it was neither able to point to Earth for communications nor to point its solar arrays at the Sun to produce electrical power. Because Ceres was found to have organic materials on its surface and liquid below the surface, planetary

protection rules required Dawn to be placed in a long-duration orbit that will prevent it from impacting the dwarf planet for decades.

JPL, a division of Caltech in Pasadena, California, manages Dawn's mission for NASA's Science Mission Directorate in Washington. Dawn is a project of the directorate's Discovery Program, managed by NASA's Marshall Space Flight Center in Huntsville, Alabama. JPL is responsible for overall

Dawn mission science. Northrop Grumman in Dulles, Virginia, designed and built the spacecraft. The German Aerospace Center, Max Planck Institute for Solar System Research, Italian Space Agency and Italian National Astrophysical Institute are international partners on the mission team.

For a complete list of mission participants, visit: <https://solarsystem.nasa.gov/missions/dawn/overview/>



# Dawn Stereo Anaglyph of Southeast Floor and Rim of Occator Crater, Ceres

The Dawn spacecraft captured these stereo views of Occator Crater on the dwarf planet Ceres in 2018. More than 70 framing camera images were used to construct this anaglyph view (which requires red-blue stereo glasses for viewing) of the southeastern floor of the crater, including the rim at far left in this view. This area is largely covered with impact melt and features a variety of pits and low mounds,

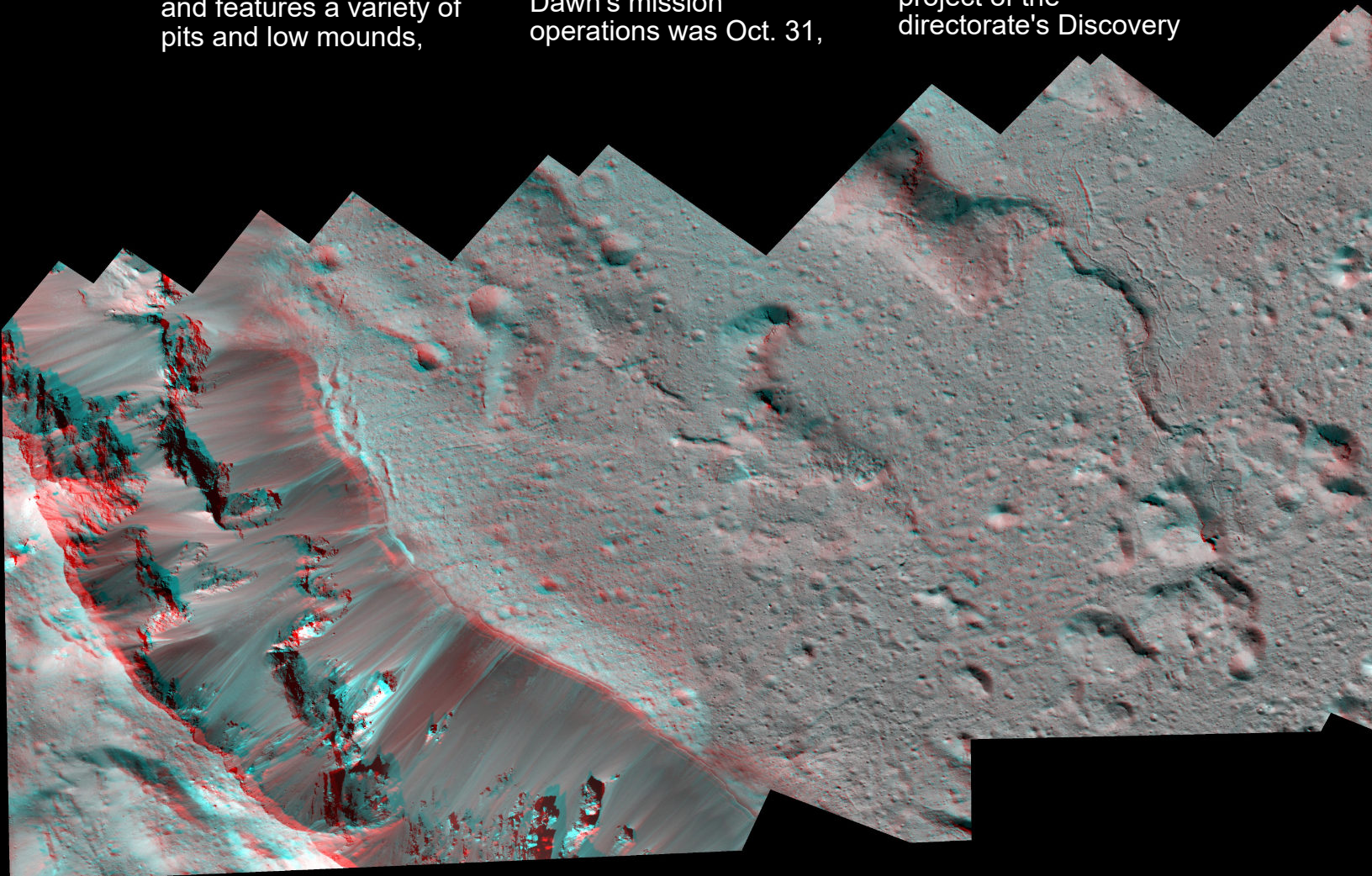
some of which are related to impact debris but others to subsurface brine seepage and deposition. The spatial resolution of the stereo images is about 11 feet (3.5 meters) per pixel. Occator Crater, named after the Roman god of the agricultural practice of harrowing, is about 57 miles (92 kilometers) in diameter.

The conclusion of Dawn's mission operations was Oct. 31,

2018, when the spacecraft depleted its hydrazine used for attitude control.

This image was produced by Dr. Paul Schenk at the Lunar and Planetary Institute in Houston.

Dawn's mission is managed by JPL for NASA's Science Mission Directorate in Washington. Dawn is a project of the directorate's Discovery



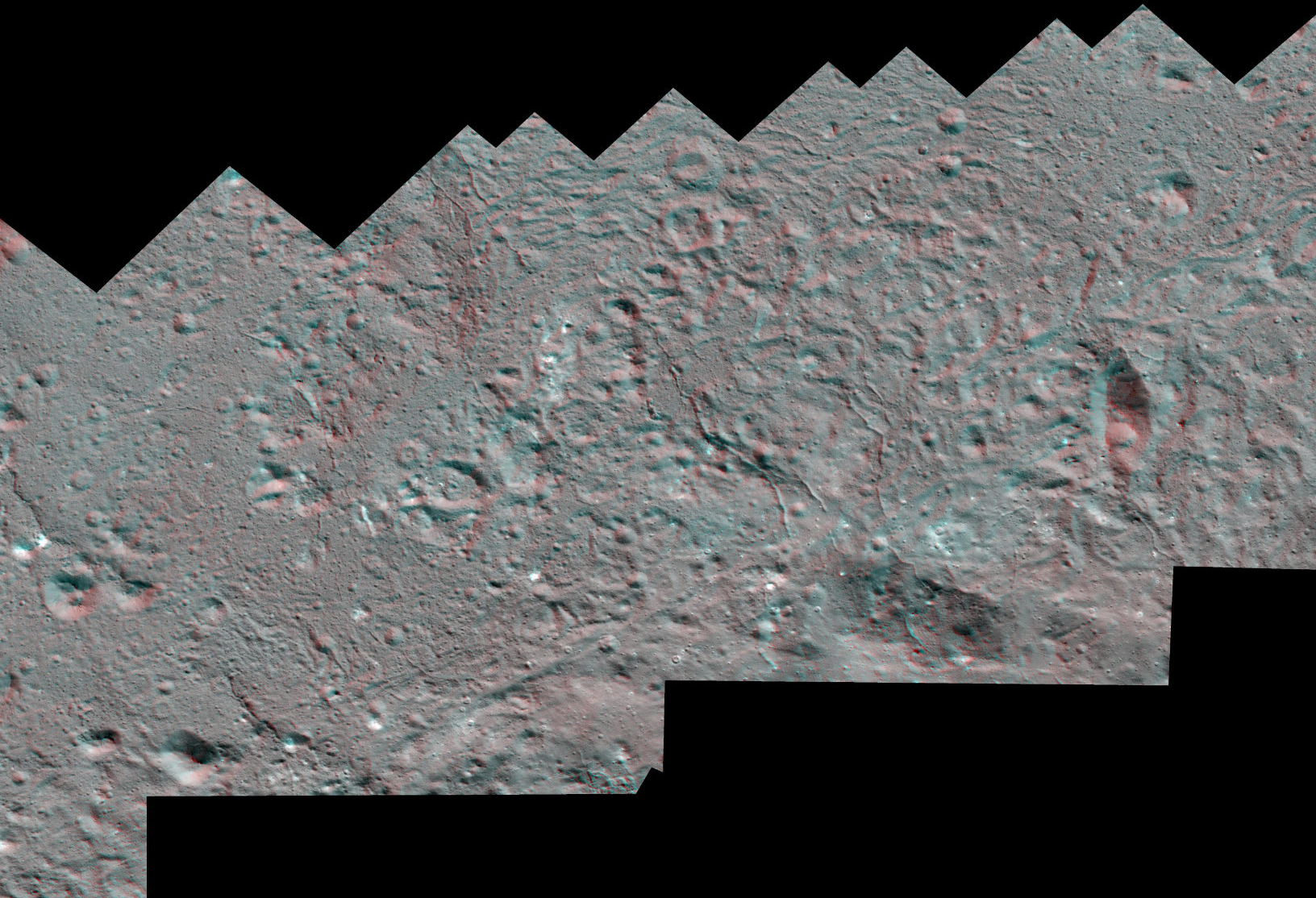
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The Lunar and Planetary Institute is operated by USRA under a cooperative agreement with the Science Mission Directorate of the National Aeronautics and Space Administration.

For a complete list of Dawn mission participants, visit <https://solarsystem.nasa.gov/missions/dawn/mission/the-team/partners/>.

For more information about the Dawn mission, visit <https://solarsystem.nasa.gov/missions/dawn/overview/>.

For more information about the Lunar and Planetary Institute, visit <https://www.lpi.usra.edu>.



# Summer Triangle Corner: Altair

David Prosper

Altair is the final stop on our trip around the Summer Triangle! The last star in the asterism to rise for Northern Hemisphere observers before summer begins, brilliant Altair is high overhead at sunset at the end of the season in September. Altair might be the most unusual of the three stars of the Triangle, due to its great speed: this star spins so rapidly that it appears “squished.”

A very bright star, Altair has its own notable place in the mythologies of cultures around the world. As discussed in our previous edition, Altair represents the cowherd Niulang in the ancient Chinese tale of the “Cowherd and the Weaver Girl.” Altair is the brightest star in the constellation of Aquila the Eagle; while described as part of an eagle by ancient peoples around the Mediterranean, it was also seen as part of an eagle by the Koori people in Australia! They saw the star itself as representing a wedge-tailed eagle, and two nearby stars as his

wives, a pair of black swans. More recently one of the first home computers was named after the star: the Altair 8800.

Altair’s rapid spinning was first detected in the 1960s. The close observations that followed tested the limits of technology available to astronomers, eventually resulting in direct images of the star’s shape and surface by using a technique called interferometry, which combines the light from two or more instruments to produce a single image. Predictions about how the surface of a rapidly spinning massive star would appear held true to the observations; models predicted a squashed, almost “pumpkin-like” shape instead of a round sphere, along with a dimming effect along the widened equator, and the observations confirmed this! This equatorial dimming is due to a phenomenon called gravity darkening. Altair is wider at the equator than it is at the poles due to

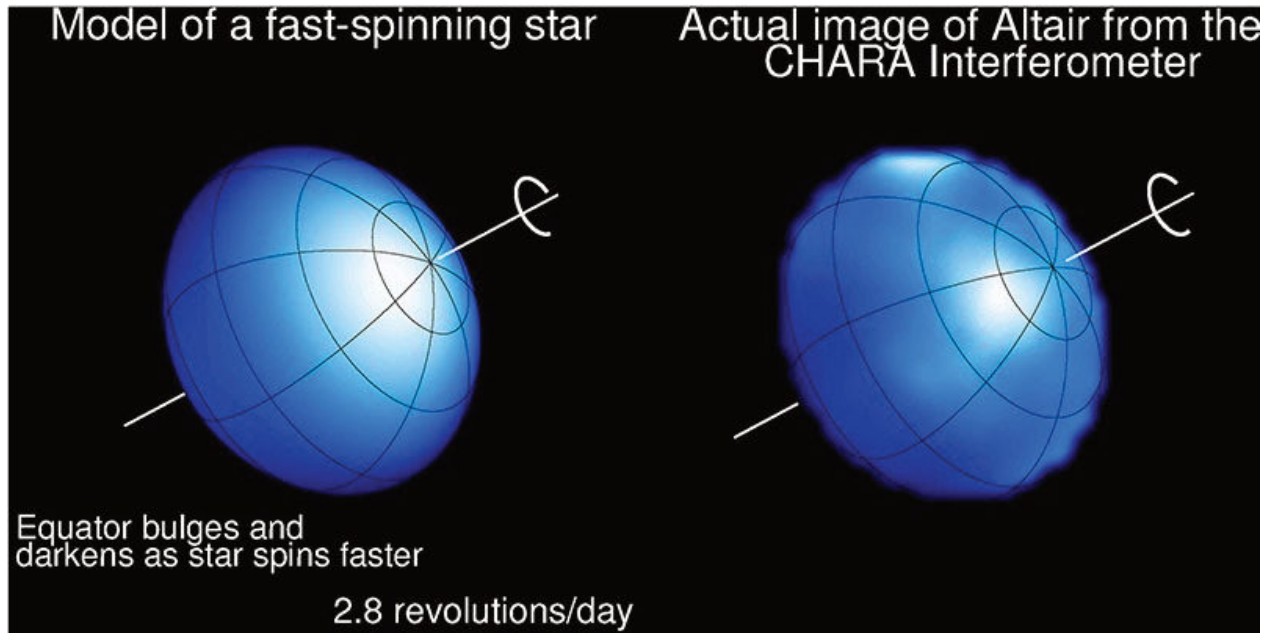
centrifugal force, resulting in the star’s mass bulging outwards at the equator. This results in the denser poles of the star being hotter and brighter, and the less dense equator being cooler and therefore dimmer. This doesn’t mean that the equator of Altair or other rapidly spinning stars are actually dark, but rather that the equator is dark in comparison to the poles; this is similar in a sense to sunspots. If you were to observe a sunspot on its own, it would appear blindingly bright, but it is cooler than the surrounding plasma in the Sun and so appears dark in contrast.

As summer winds down, you can still take a Trip Around the Summer Triangle with this activity from the Night Sky Network. Mark some of the sights in and around the Summer Triangle at: [bit.ly/TriangleTrip](http://bit.ly/TriangleTrip). You can discover more about NASA’s observations of Altair and other fast and furious stars at [nasa.gov](http://nasa.gov).

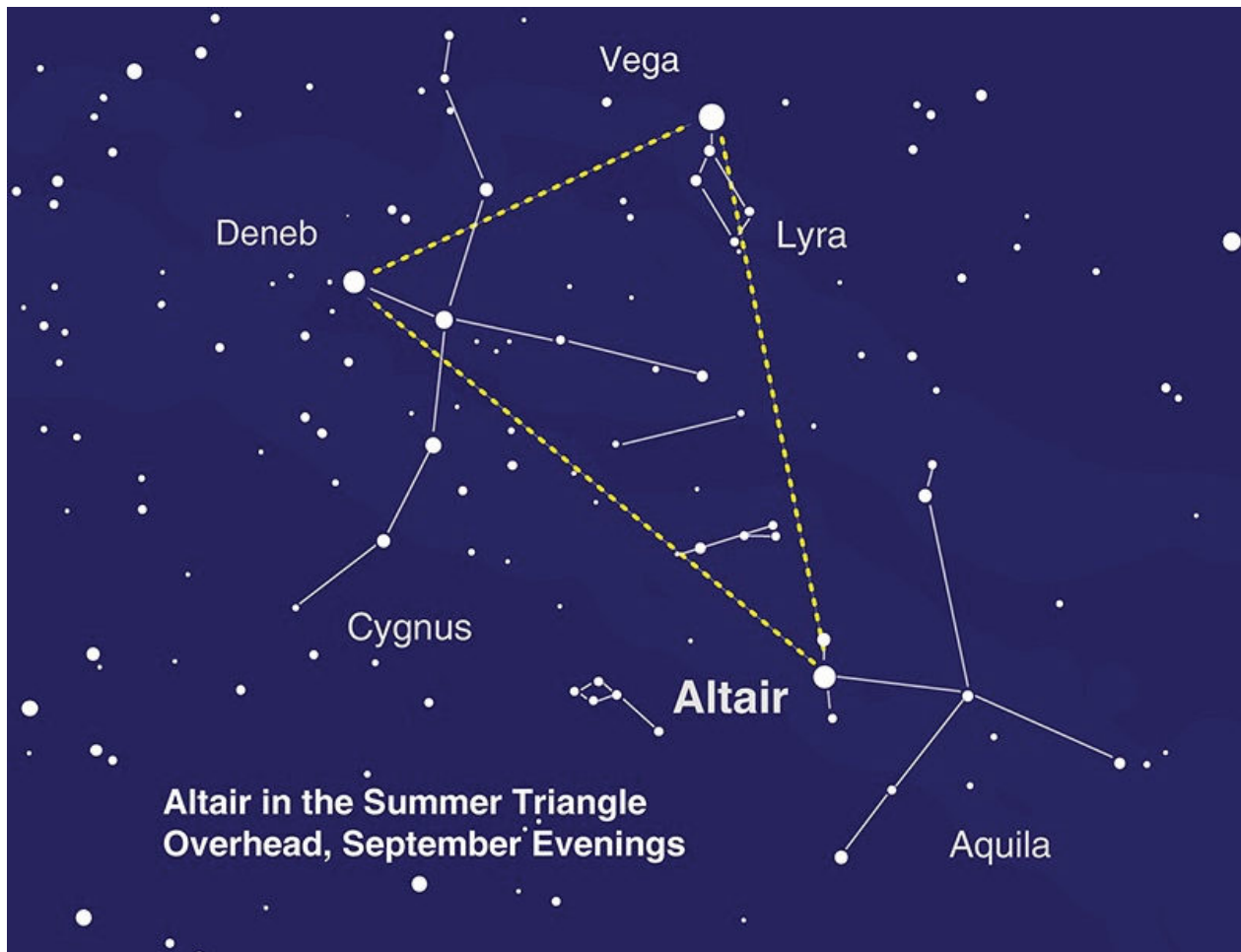


***This article is distributed by NASA Night Sky Network***

*The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit [nightsky.jpl.nasa.gov](http://nightsky.jpl.nasa.gov) to find local clubs, events, and more!*



The image on the right was created using optical interferometry: the light from four telescopes was combined to produce this image of Altair's surface. Image credit: Ming Zhao. More info: [bit.ly/altairvsmodel](http://bit.ly/altairvsmodel)



Altair is up high in the early evening in September. Note Altair's two bright "companions" on either side of the star. Can you imagine them as a formation of an eagle and two swans, like the Koori?

# From the Archives

August, 1970

## Hints and Kinks

There is a tendency for the beginner in mirror-making to test the mirror, see an atrocious figure, and then try to figure out a stroke that will take care of it. This is not the way to do it. If a terrible figure shows up, just polish for three or four hours before testing again. This will generally reduce your difficulties.

Rick Johnson suggests that for both high-resolution astrophotography and low contrast visual observing the wide-angle lens of a good-quality movie camera will surpass any other eyepiece. I have seen his lunar pictures taken with such a lens, and I can vouch for it's high performance.

P.S. Although Rick has not tried it, I suspect that a telephoto lens of the same movie camera would make an admirable eyepiece for deep-sky work, especially for locating galaxies and faint nebulosity. The field of view would be somewhat restricted, but the view would be worth the trouble of using it. The Editor

## CLUB MEMBERSHIP INFO

REGULAR MEMBER - \$30.00 per year. Includes club newsletter, and 1 vote at club meetings, plus all other standard club privileges.

FAMILY MEMBER - \$35.00 per year. Same as regular member except gets 2 votes at club meetings.

STUDENT MEMBER - \$10.00 per year with volunteer requirement.

If you renew your membership prior to your annual renewal date, you will receive a 10% discount.

Club members are also eligible for special subscription discounts on Sky & Telescope Magazine.

## CLUB TELESCOPES

*To check out one of the club telescopes, please contact a club officer. Scopes can be checked out at a regular club meeting and kept for one month. Checkout can be extended for another month if there are no other requests for the telescope, but you must notify a club officer in advance.*

100mm Orion refractor: Available  
 10 inch Meade Starfinder Dobsonian: Available  
 13 inch Truss Dobsonian: Needs repair  
 10 inch Zhumell: Needs mount

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