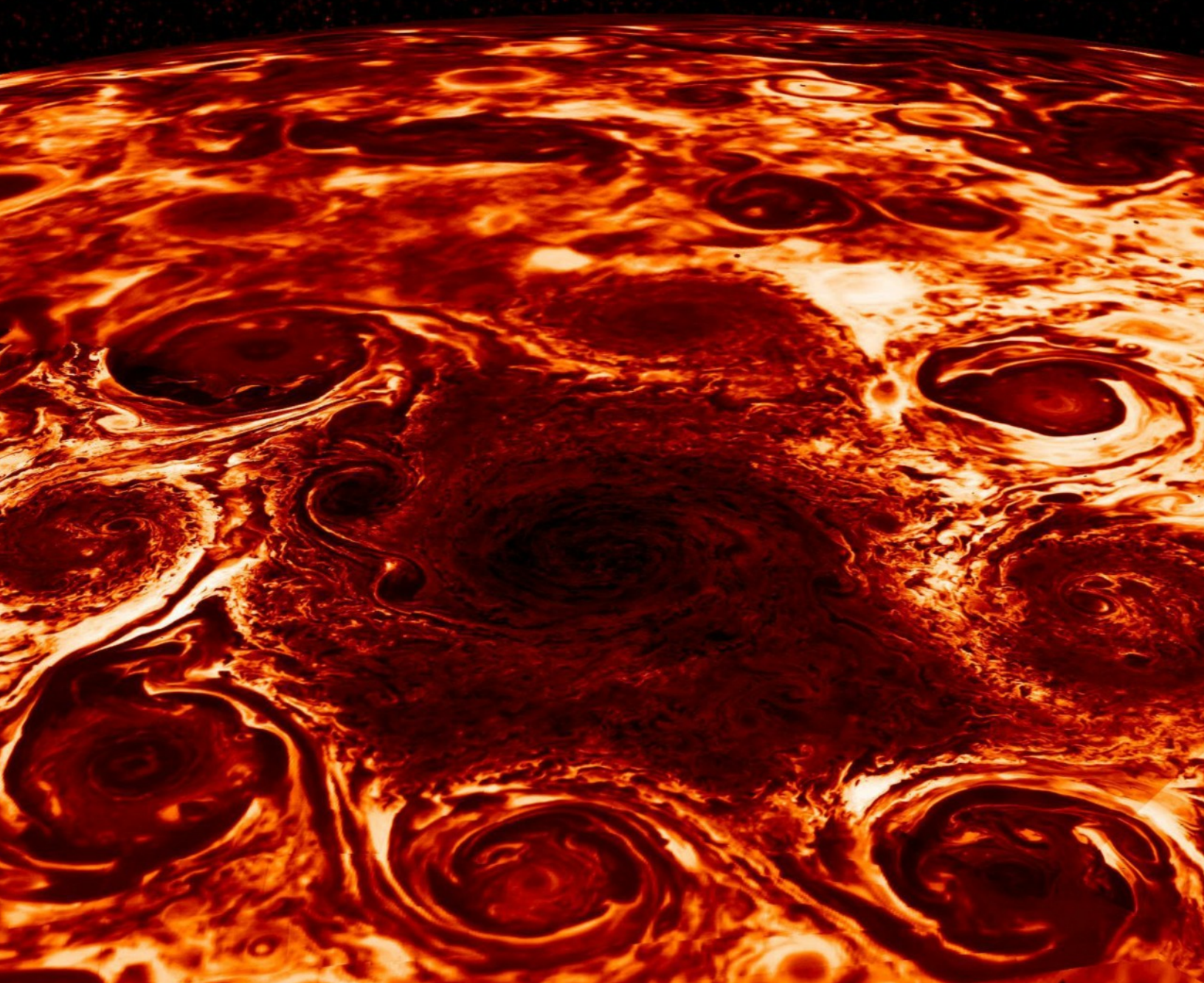


# ***The Prairie Astronomer***

March 2018 Volume 59, Issue #3

## ***Cyclones Encircle Jupiter's North Pole***



**Night Sky Network**



The Newsletter of the Prairie Astronomy Club



# ***The Prairie Astronomer***

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## **NEXT PAC MEETING: March 27, 7:30pm at Hyde Observatory**

### **PROGRAM**

The March program will be a video review of several star parties in the United States.

### **FUTURE PROGRAMS**

April: To be announced

May: Club dinner

June: Solar Star Party

July: To be announced

August: NSP Review

October: Club Viewing Night

November: How to Buy a Telescope

### **CONTENTS**

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*Cover: In this composite image, derived from data collected by the Jovian Infrared Auroral Mapper (JIRAM) instrument aboard NASA's Juno mission to Jupiter, shows the central cyclone at the planet's north pole and the eight cyclones that encircle it. JIRAM collects data in infrared, and the colors in this composite represent radiant heat: the yellow (thinner) clouds are about 9 degrees Fahrenheit (-13° Celsius) in brightness temperature and the dark red (thickest) are around -181 degrees Fahrenheit (-118.33° Celsius).*



**Buy the book! The Prairie Astronomy Club: Fifty Years of Amateur Astronomy.**

Order online from [Amazon](https://www.amazon.com) or [lulu.com](https://www.lulu.com).

# EVENTS



PAC meeting  
Tuesday March 27, 2018, 7:30pm  
A review of star parties

PAC meeting  
Tuesday April 24, 2018, 7:30pm  
To be announced

PAC Meeting  
Tuesday May 29, 2018, 7:30pm  
Club Dinner

PAC Meeting  
Tuesday June 26, 2018, 7:30pm

## 2018 STAR PARTY DATES



Photo by Brian Sivill

	Star Party Date	Star Party Date
January	Jan 12th	<b>Jan 19th</b>
February	Feb 9th	<b>Feb 16th</b>
March	Mar 9th	<b>Mar 16th</b>
April	Apr 6th	<b>Apr 13th</b>
May	May 4th	<b>May 11th</b>
June	Jun 8th	<b>Jun 15th</b>
July	Jul 6th	<b>Jul 13th</b>
August	Aug 3rd	<b>Aug 10th</b>
<b>NSP</b>	<b>Aug 5th -10<sup>th</sup></b>	
September	<b>Sep 7th</b>	Sep 14th
October	<b>Oct 5th</b>	Oct 12th
November	Nov 2nd	<b>Nov 9th</b>
December	Nov 30th	<b>Dec 7th</b>

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



## PAC E-MAIL:

[info@prairieastronomyclub.org](mailto:info@prairieastronomyclub.org)

## PAC-LIST:

Subscribe through [GoogleGroups](#).  
To post messages to the list, send  
to the address:

[pac-list@googlegroups.com](mailto:pac-list@googlegroups.com)

## ADDRESS

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## WEBSITES

- [www.prairieastronomyclub.org](http://www.prairieastronomyclub.org)
- <https://nightsky.jpl.nasa.gov>
- [www.hydeobservatory.info](http://www.hydeobservatory.info)
- [www.nebraskastarparty.org](http://www.nebraskastarparty.org)
- [www.OmahaAstro.com](http://www.OmahaAstro.com)
- [Panhandleastronomyclub.com](http://Panhandleastronomyclub.com)
- [www.universetoday.com/](http://www.universetoday.com/)
- [www.planetary.org/home/](http://www.planetary.org/home/)
- <http://www.darksky.org/>



**Night Sky Network**

# Meeting Minutes

February 27, 2018

President Jim Kvasnicka called the meeting to order at 7:40 p.m.

Jim covered upcoming star parties, March 9 and 16.

After presenting his monthly observing report, Jim again noted that we have not elected a Program Chair, so if anyone has ideas for programs in future meetings, or that you want to

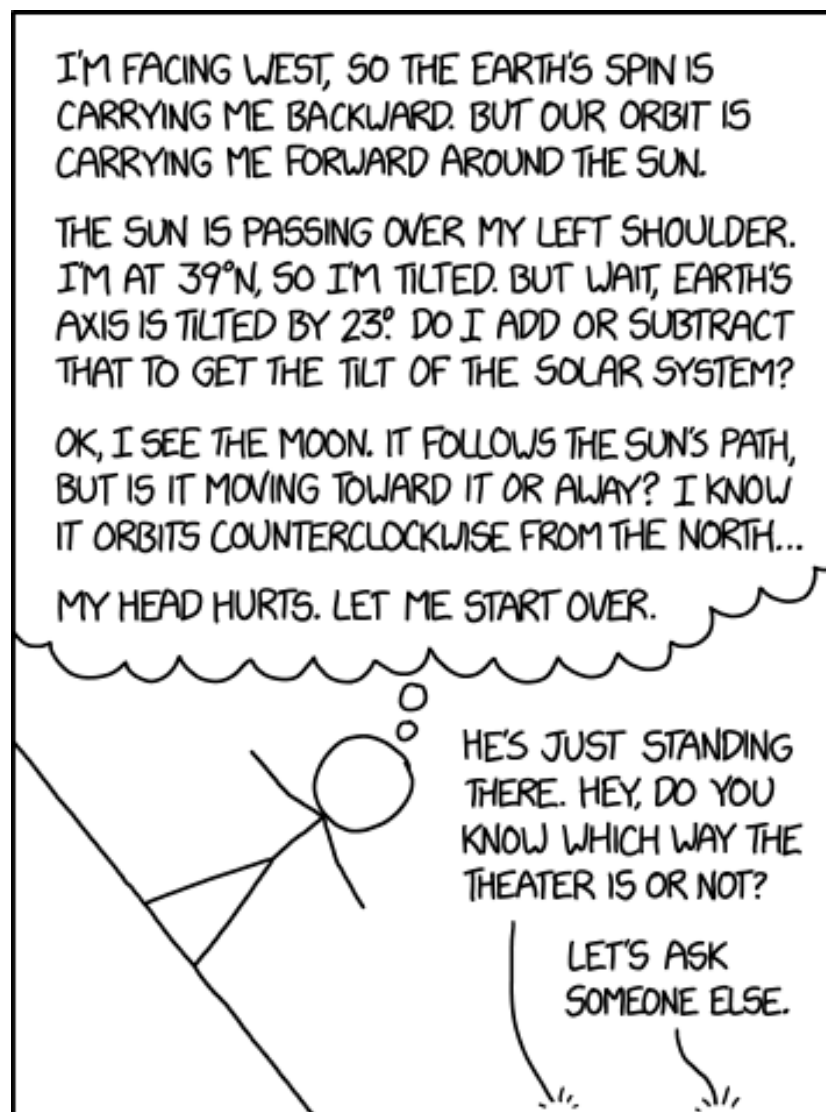
present, pass them along to the any member of the PAC Board.

No other business was on the agenda.

In recurring business, Brian Sivil noted that an accurate quote on the projected telescope pad, which the club has voted to finance for Branched Oak Observatory, has not yet been obtained, but they are working on it. Jim and Brian agreed that

a good idea for an upcoming club meeting would be for PAC to hold it at Branched Oak because few members have been to the new observatory.

The business part of the meeting was concluded at 7:53 p.m., and the month's program, "Antarctica: A Year On Ice" was presented.



xkcd.com

I SPEND WAY TOO MUCH TIME TRYING TO WORK OUT MY ORIENTATION RELATIVE TO OTHER STUFF IN THE UNIVERSE.

## Globe at Night

The Globe at Night program is an international citizen-science campaign to raise public awareness of the impact of light pollution by inviting citizen-scientists to measure their night sky brightness and submit their observations from a computer or smart phone. Light pollution threatens not only our “right to starlight”, but can affect energy consumption, wildlife and health.

More than 100,000 measurements have been contributed from people in 115 countries during the campaigns each winter/spring over the last 9 years, making Globe at Night the most successful light pollution awareness campaign to date.

The Globe at Night website is easy to use, comprehensive and

holds an abundance of background information. The database is usable for comparisons with a variety of other databases, like how light pollution affects the foraging habits of bats.

For more information, see:

[www.globeatnight.org](http://www.globeatnight.org)



The screenshot shows the top of the Globe at Night website. On the left is the logo, which includes a stylized globe icon and the text "Globe at Night". To the right of the logo is a navigation menu with the following items: "About", "Learn", "Observe", "Report", "Maps & Data", and "Resources". Below the navigation menu is a large image of a night sky with a desert landscape in the foreground. A text box on the right side of the image contains the following text: "Globe at Night is an international citizen-science campaign to raise public awareness of the impact of light pollution by inviting citizen-scientists to measure & submit their night sky brightness observations. It's easy to get involved - all you need is computer or smart phone & follow these 5 Simple Steps!". At the bottom left of the image, there is a small caption: "Image courtesy Babak Tafreshi".

### Join us for the March, 2018 campaign!

So far in 2018 citizen scientists from around the world have [contributed 1,930 data points!](#) Help us achieve our goal of 15,000 data points this year!

Thank you for [contributing 15,405 data points](#) last year!

Check out the [Campaign dates & Constellations for 2018!](#)



How you can make a difference by participating in Globe at Night and why...



#### Globe at Night webapp

Whether you use a smartphone,



## Observatory Update: NGC 664 Galaxy Group

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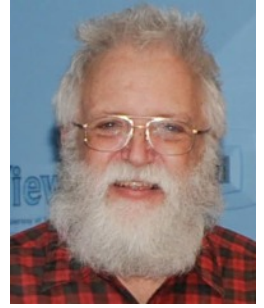
Rick Johnson

The NGC 664 galaxy group is located in the southeastern corner of Pisces about 240 million light-years distant. NED says there are 6 in the group but I find only 4 in my image at the right distance. I was unable to determine where the other two are. The four I imaged are NGC 664, IC 150, PGC 006329 and tiny NSA 130250. NGC 664 is almost 100,000 light-years across while NSA 130250 is only 10,000 light-years long. NGC 664 was discovered by John Herschel on September

24, 1830. IC 150 was found by Stephane Javelle on December 5, 1893.

The asteroid (2682) Soromundi photobombed my image. While the Minor Planet Center said the citation info was unavailable being behind a copyright I found the copyright info in Google Books. It reads "Discovered by E.F Helin and S.J. Bus June 28, 1979. Named by Helin in honor of the Los Angeles Chapter of the YWCA 'sisters of the world'." Google translates the word Soromuni in Latin to "sisters of

the world". When I simply "googled" the term I got back dozens of references to a lesbian chorus by that name. I had to dig many pages down to find the Google Books reference.



This field is only 6 degrees north of the ecliptic so I expected



14" LX200R @ f/10, L=4x10' RGB=2x10' STL-11000XM, Paramount ME

many asteroids but only the one appeared. Though a plane with its bright lights and strobe flew through one of my two red frames it was easy to remove using the other red frame for that part of the color data.

That's why I take two unless I'm around to see the frames as they come in.

Since the frame is near the Zone of Avoidance there was little information on the field. Most

galaxies carried only positional names, often from very obscure catalogs when not from the 2-micron survey. So most are just noted with a G for galaxy along with its redshift distance.



# April Observing: What to View

Jim Kvasnicka

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

## Planets

**Venus:** Increases in altitude to 24° in April at dusk.

**Uranus:** Below Venus but lost in the solar glare.

**Jupiter:** Rises about 3 hours after sunset to start April and by 30 minutes after sunset to end April. Jupiter shines at magnitude -2.5 with a disk 44" wide.

**Mars and Saturn:** On April 2<sup>nd</sup> the two are just 1.3° apart in Sagittarius.

**Neptune and Mercury:** Not visible.

## Meteor Showers

**Lyrids:** Peaks the night of April 22<sup>nd</sup>. Expect no more than 20 meteors per hour.

## Messier List

**M40:** Double star in Ursa Major.

**M65/M66:** Part of the Leo Triplet Group of galaxies.

**M95/M96:** Galaxies in Leo that fit in the same FOV.

**M105:** Galaxy in Leo.

**M106:** Galaxy in Canes Venatici.

**M108:** Galaxy in Ursa Major.

**M109:** Galaxy in Ursa Major.

**Last Month:** M41, M44, M46, M47, M48, M50, M67, M81, M82, M83

**Next Month:** M49, M51, M61, M63, M64, M85, M94, M101, M102, M104

## NGC and other Deep Sky Objects

**NGC 2903:** Galaxy in Leo.

**NGC 3003:** Elongated galaxy in Leo Minor.

**NGC 3384/NGC 3389:**

Galaxies that form a triangle with M105 in Leo.

**NGC 3521:** Galaxy in Leo.

**NGC 3628:** Third member of the Leo Triplet Group with M65 and M66.



## Double Star Program List

**Alpha Leonis:** Regulus, white primary with a pale blue secondary.

**Gamma Leonis:** Algieba, pair of yellow stars.

**54 Leonis:** Yellow primary with a greenish colored secondary.

**Alpha Canum Venaticorum:** Cor Caroli, Blue-white and greenish yellow pair.

**Zeta Ursa Majoris:** White pair.

**Gamma Virginis:** Porrima, close pair of yellow stars.

**24 Comae Berenices:** Yellow and pale blue stars.

**Delta Corvi:** White primary with a rose colored secondary.

## Challenge Object

**NGC 3190 Group:** NGC 3190 is the brightest in a group of galaxies in Leo that include NGC 3185, NGC 3187, and NGC 3193.



## NASA Dawn Reveals Recent Changes in Ceres' Surface

Observations of Ceres have detected recent variations in its surface, revealing that the only dwarf planet in the inner solar system is a dynamic body that continues to evolve and change.

NASA's Dawn mission has found recently exposed deposits that give us new information on the materials in the crust and how they are changing, according to two papers published March 14 in *Science Advances* that document the new findings.

Observations obtained by the visible and infrared mapping spectrometer (VIR) on the Dawn spacecraft previously found water ice in a dozen sites on Ceres. The new study revealed the abundance of ice on the northern wall of Juling Crater, a crater 12 miles (20 kilometers) in diameter. The new observations, conducted from April through October 2016, show an increase in the amount of ice on the crater wall.

"This is the first direct detection of change on the surface of Ceres," said Andrea Raponi of the Institute of Astrophysics and Planetary Science in Rome.

Raponi led the new study, which found changes in the amount of ice exposed on the dwarf planet. "The combination of Ceres moving closer to the sun in its orbit, along with seasonal change, triggers the release of water vapor from the subsurface, which then condenses on the cold crater

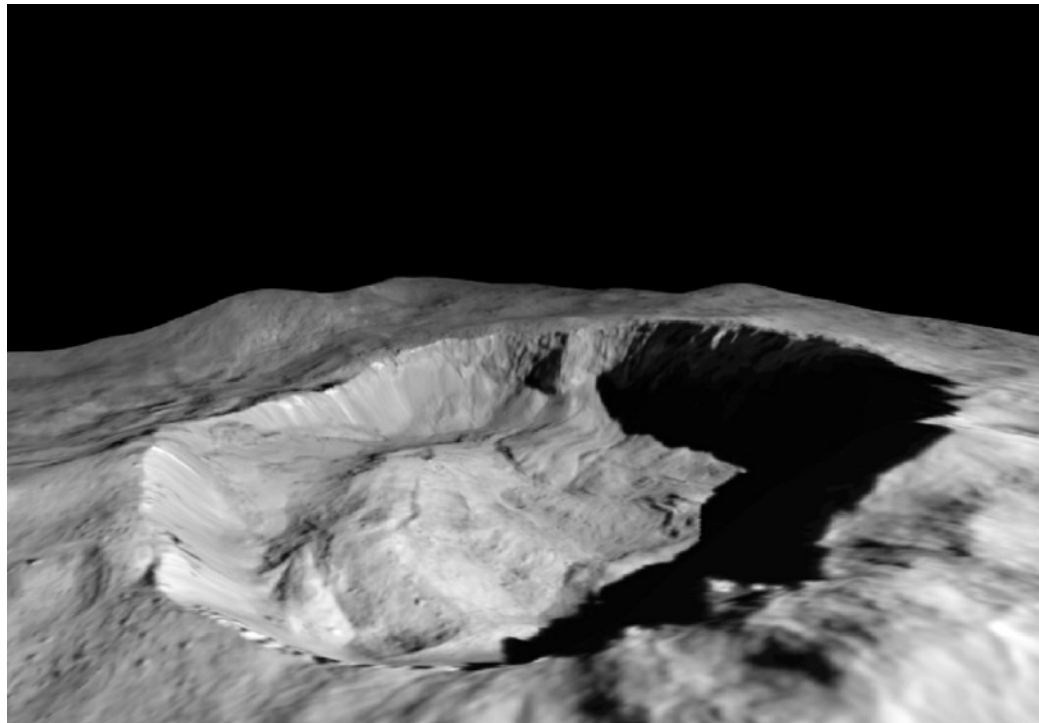
wall. This causes an increase in the amount of exposed ice. The warming might also cause landslides on the crater walls that expose fresh ice patches."

By combining chemical, geological and geophysical observations, the Dawn mission is producing a comprehensive view of Ceres. Previous data had shown Ceres has a crust about 25 miles (40 kilometers) thick and rich in water, salts and, possibly, organics.

In a second study, VIR observations also reveal new information about the variability of Ceres' crust, and suggest recent surface changes, in the form of newly exposed material.

Dawn previously found carbonates, common on the planet's surface, that formed within an ocean. Sodium carbonates, for example, dominate the bright regions in Occator Crater, and material of similar composition has been found at Oxo Crater and Ahuna Mons.

This study, led by Giacomo Carrozzo of the Institute of Astrophysics and Planetary Science, identified 12 sites rich in sodium carbonates and examined in detail several areas of a few square miles that show where water is present as part of the carbonate structure. The study marks the first time



*This view from NASA's Dawn mission shows where ice has been detected in the northern wall of Ceres' Juling Crater, which is in almost permanent shadow. Image credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA/ASI/INAF*

hydrated carbonate has been found on the surface of Ceres, or any other planetary body besides Earth, giving us new information about the dwarf planet's chemical evolution.

Water ice is not stable on the surface of Ceres over long time periods unless it is hidden in shadows, as in the case of Juling. Similarly, hydrated carbonate would dehydrate, although over a longer timescale of a few million years.

"This implies that the sites rich in hydrated carbonates have been exposed due to recent activity on the surface," Carrozzo said.

The great diversity of material, ice and carbonates, exposed via impacts, landslides and cryovolcanism suggests Ceres' crust is not uniform in

composition. These heterogeneities were either produced during the freezing of Ceres' original ocean - which formed the crust - or later on as a consequence of large impacts or cryovolcanic intrusions.

"Changes in the abundance of water ice on a short timescale, as well as the presence of hydrated sodium carbonates, are further evidence that Ceres is a geologically and chemically active body," said Cristina De Sanctis, VIR team leader at the Institute of Astrophysics and Planetary Science.

The Dawn mission is managed by JPL 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. Orbital ATK Inc., 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.

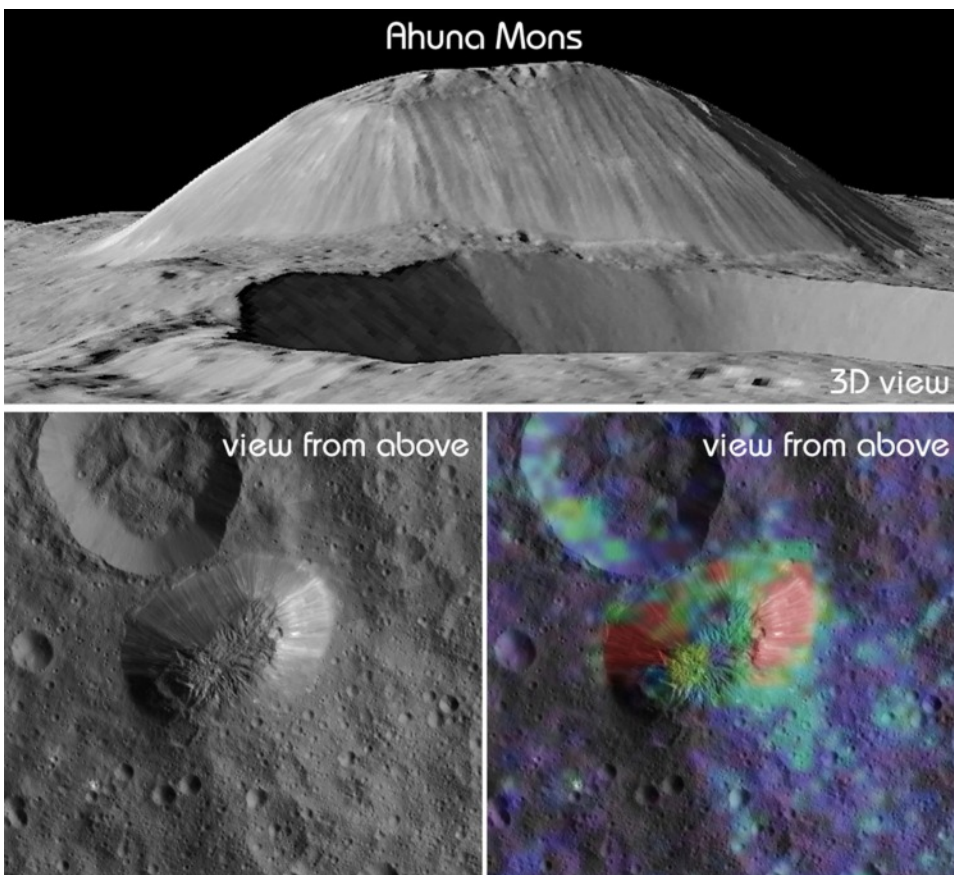
For a complete list of mission participants, visit:

<https://dawn.jpl.nasa.gov/mission>

More information about Dawn is available at the following sites:

<https://www.nasa.gov/dawn>

<https://dawn.jpl.nasa.gov>



*This view from NASA's Dawn mission shows Ceres' tallest mountain, Ahuna Mons, 2.5 miles (4 kilometers) high and 11 miles (17 kilometers) wide. This is one of the few sites on Ceres at which a significant amount of sodium carbonate has been found, shown in green and red colors in the lower right image.*

*The top and lower left images were collected by Dawn's framing camera. The top image is a 3D view reconstructed with the help of topography data.*

*For more information about the Dawn mission, visit <http://dawn.jpl.nasa.gov>.*



# Focus on Constellations: Ursa Major

Jim Kvasnicka

## Ursa Major

Ursa Major, The Great Bear, is the third largest constellation covering 1,280 square degrees. Seven of the brightest stars form the Big Dipper, the best known of all the star patterns. The Big Dipper is only the hind quarters and tail of the Great Bear. Ursa Major lies far away from the Milky Way, therefore it is rich in galaxies, or in the case of Ursa Major it is exceptionally rich in galaxies. Ursa Major is best seen in the month of April.

## Showpiece Objects

**Galaxies:** M81, M82, M101, M108, M109

**Planetary Nebulae:** M97

**Double Stars:** Mizar and Alcor

## Mythology

In Greek mythology Zeus fell in love with Callisto, a beautiful young woman. Hera, Zeus's wife found out and turned Callisto into a bear, but she kept her human feelings. She roamed the woods in fear of the other animals and of hunters. One day she came face to face with a young hunter who she recognized as her own son Arion. She rushed to hug him but Arion didn't know the bear was his mother. Thinking the bear was attacking he raised his spear and was about to throw it

when Zeus turned him into a bear like his mother. Callisto became Ursa Major and Arion became Ursa Minor.

## Number of Objects Magnitude 12.0 and Brighter

**Galaxies:** 84

**Globular Clusters:** 0

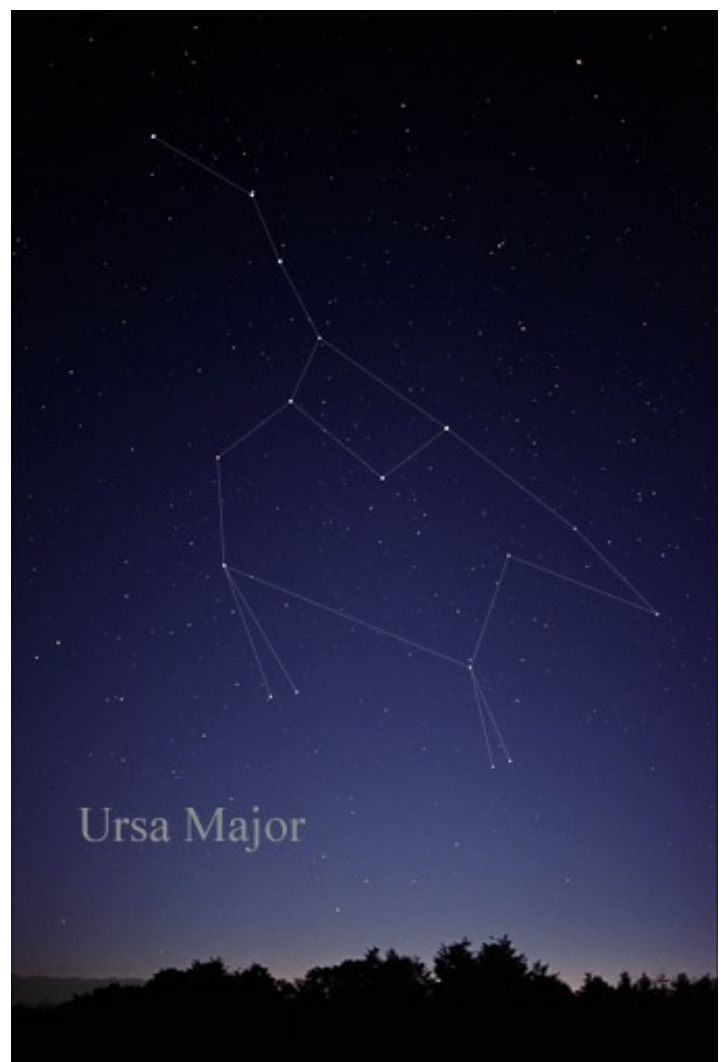
**Open Clusters:** 0

**Planetary Nebulae:** 1

**Dark Nebulae:** 0

**Bright Nebulae:** 0

**SNREM:** 0



*Till Credner - Own  
work: AlltheSky.com  
3.0*

# James Webb Is Enduring Its Final Stage of Testing Before It Ships off for Kourou, French Guiana

Matt Williams, *Universe Today*

Once deployed, the [James Webb Space Telescope](#) (JWST) will be the most powerful telescope ever built. As the spiritual and scientific successor to the Hubble, Spitzer, and Kepler space telescopes, this space observatory will use its advanced suite of infrared instruments to look back at the earliest stars and galaxies, study the Solar System in depth, and help characterize extra-solar planets (among other things).

Unfortunately, the launch of the JWST has been subject to multiple delays, with the launch date now set for some time in 2019. Luckily, on Thursday, March 8th, engineers at the Northrop Grumman company headquarters began the final step in the observatory's integration and testing. Once complete, the JWST will be ready to ship to French Guiana, where it will be launched into space.

This final phase consisted of removing the combined optics and science instruments from their shipping containers – known as the Space Telescope Transporter for Air, Road and Sea (STTARS) – which recently arrived after being testing at NASA's Johnson Space Center in Houston. This constitutes half the observatory, and includes the telescope's 6.5 meter (21.3 foot) golden primary mirror.

The science payload was also tested at NASA's Goddard Space Flight Center last year to ensure it could handle the

the program director for the JWST at NASA Headquarters, said in a recent NASA press statement:



vibrations associated with space launches and the temperatures and vacuum conditions of space. The other half of the observatory consists of the integrated spacecraft and sunshield, which is in the final phase of assembly at the Northrop Grumman company headquarters.

These will soon undergo a launch environment test to prove that they are ready to be combined with the science payload. Once both halves are finished being integrated, addition testing will be performed to guarantee the fully assembled observatory can operate at the L2 Earth-Sun Lagrange Point. As Eric Smith,

*“Extensive and rigorous testing prior to launch has proven effective in ensuring that NASA’s missions achieve their goals in space. Webb is far along into its testing phase and has seen great success with the telescope and science instruments, which will deliver the spectacular results we anticipate.”*

These final tests are crucial to ensuring that the observatory deploys properly and can operate once it is in space. This is largely because of the telescope's complicated design, which needs to be folded in order to fit inside the



Ariane 5 rocket that it will carry it into space. Once it reaches its destination, the telescope will have to unfold again, deploying its sunshield, mirrors and primary mirror.

Not only does all of this represent a very technically-challenging feat, it is the first time that any space telescope has had to perform it. Beyond that, there are also the technical challenges of building a complex observatory that is designed to operate in space. While the JWST's optics and science instruments were all built at room temperature here on Earth, they had to be designed to operate at cryogenic temperatures.

As such, its mirrors had to be precisely polished and formed that they would achieve the correct shape once they cool in space. Similarly, its sunshield will be operating in a zero gravity environment, but was built and tested here on Earth where the gravity is a hefty  $9.8 \text{ m/s}^2$  (1 g). In short, the James Webb Space Telescope is the largest and most complex space telescope ever built, and is one of NASA's highest priority science projects.

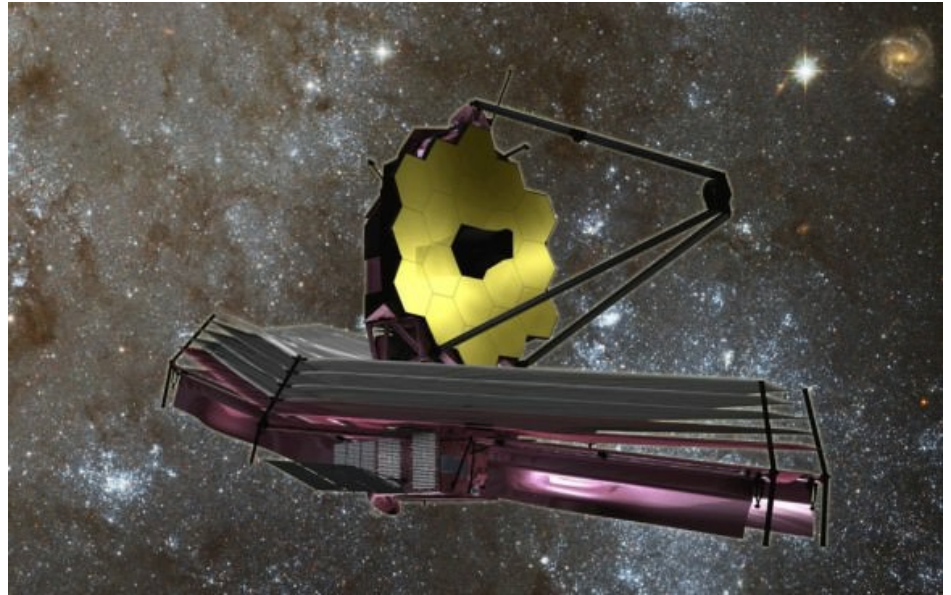
It is little wonder then why NASA has had to put the JWST through such a highly-rigorous testing process. As Smith put it:

*“At NASA, we do the seemingly impossible every day, and it’s our job to do the hardest things humankind can think of for space exploration. The way we achieve success is to test, test and retest, so we understand the complex*

*systems and verify they will work.”*

Knowing that the JWST is now embarking on the final phase of its development – and that its

In other words, there is no indication whatsoever that Congress is considering canceling the project, regardless of further delays or cost overruns. And when the



*The James Webb Space Telescope (which is scheduled to launch in 2019) will be the most powerful telescope ever deployed. Credit: NASA/JPL*

engineers are confident it will perform up to task – is certainly good news. Especially in light of a recent report from the US Government Accountability Office (GAO), which stated that more delays were likely and that the project would probably exceed its original budget cap of \$8 billion.

As the report indicated, it is the final phase of integration and testing where problems are most likely to be found and schedules revised. However, the report also stated that “Considering the investment NASA has made, and the good performance to date, we want to proceed very systematically through these tests to be ready for a Spring 2019 launch.”

JWST is deployed, it will use its 6.5 meter (21-foot) infrared-optimized telescopes will search to a distance of over 13 billion light years, allow astronomers to study the atmospheres of Solar Planets, exoplanets, and other objects within our Solar System.

So while the JWST may not make its launch window in 2019, we can still expect that it will be taking to space in the near future. And when it does, we can also expect that what it reveals about our Universe will be mind-blowing!

Further Reading: [NASA](#).

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## From the Archives: March, 1980

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At a recent club meeting, I heard several complaints from users of small to medium sized telescopes about me not mentioning objects visible in these instruments. This will be difficult in the coming months because, aside from the major planets, the majority of spring objects are faint galaxies.

However, since I used a 2.4-inch refractor for many years, I do have a few objects in mind that most definitely can be seen in smaller telescopes. First, a few words on the proper technique for observing faint deep sky objects with smaller telescopes.

The most important thing to remember is to be properly dark adapted. This means spending 10-20 minutes in total darkness. You gain several magnitudes of light efficiency over those who do not dark adapt and it also gives you time to think about what you want to observe. You also should use a heavily filtered red flashlight if you wish to look at charts, but use the light sparingly. Although the human pupil won't contract as much with exposure to red light as with exposure to the white beam of a flashlight, it does contract, cutting the amount of light entering the inner eye, so go

easy on the light. Also, choose an observing site that is really dark. For most objects, you should use as low a power as possible to concentrate on what little light the telescope gathers into as small an area on the eye as possible, thus making the object easier to see. A black cloth thrown over the head to block out any light at the observing site is also very useful in blocking out unwanted interference reflecting off a shiny eyepiece. Also, use averted vision as much as possible,



Dave Scherping, 1995



and move your eye rapidly around the field of view.

Try using these techniques on a pair of galaxies in Ursa Major, M81 and M82. Look six degrees north and two degrees east of the 3.5 magnitude star Eta Ursa Majoris. M81, the brighter of the two, appears as a faint oval

patch in small telescopes and large instruments only make the galaxy brighter. M82 is a narrow cigar-shaped patch just north of M81. It shows considerable dark detail in large telescopes, but even small telescopes will show a faint dark band near the center of the galaxy. Both galaxies will be easily seen in a

2.4-inch refractor and both will fit nicely into a one degree field of view. More next month.

-- DAVE KNISELY

## ***March, 1980: Some Messier Group Members Approach First Milestone***

Our club's group of novice but hard-core observers has been meeting monthly at Earl Moser's place in Hickman under dark skies, and has been steadily chipping away at the messier list under the expert direction of Steve Myatt, Rick Johnson and Dave Knisely.

The March meeting (on the evening of March 14) was planned as a Messier Marathon, i.e., on that night it was possible, by working straight through, dusk to dawn, to see all 110 Messier objects. The night was clear and warm with excellent seeing, but everyone seemed to agree that only an experienced observer, well-familiar with his instrument, and knowing his way around the sky, could possibly have seen all 110 objects that night, averaging one object every five minutes. Heck, it takes some of us rookies five minutes just to decide which end of the telescope to look through! At

any rate, a few of us stayed around until well after 2:00am, and the evening was judged a total success.

Many members of the group are now approaching the first level of 70 objects observed. The following list gives the names of the members in the group and the number of objects they've recorded so far:

	Mar 14	Total
Allan Daubendiek	-	?
Marvin Garber	-	-
Russ Genzmer	22	53
Steve Kell	12	25
Scott Ladd	-	-
John Lammers	12	40
Jeane Miller	10	10
Kris Miller	7	15
Steve Pierson	-	-
Merton Sprengle	-	60
Lee Thomas	-	60
Scott Underwood	-	-
Ron Veys	23	82

Our observing group meets at Earl's on Friday nearest the new moon each month with the following Friday (nearest third-quarter moon) as a rain-out date. We encourage those in the group to show up and keep plugging away, and invite anyone else interested in observing to come on out, whether you're a member of the Messier Group or not.

## 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: David Pennington  
10 inch Meade Dobsonian: Lee Taylor  
13 inch Truss Dobsonian: Available

## CLUB APPAREL



Order club apparel from [cafepress.com](http://cafepress.com):



Shop through Amazon Smile to automatically donate to PAC:



## CLUB OFFICERS

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Vice President	Brett Boller
2nd VP (Program Chair)	Open
Secretary	Lee Thomas <a href="mailto:lthomas@allophone.com">lthomas@allophone.com</a>
Treasurer	John Reinert <a href="mailto:jr6@aol.com">jr6@aol.com</a>
Club Observing Chair	Jim Kvasnicka <a href="mailto:jim.kvasnicka@yahoo.com">jim.kvasnicka@yahoo.com</a>
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