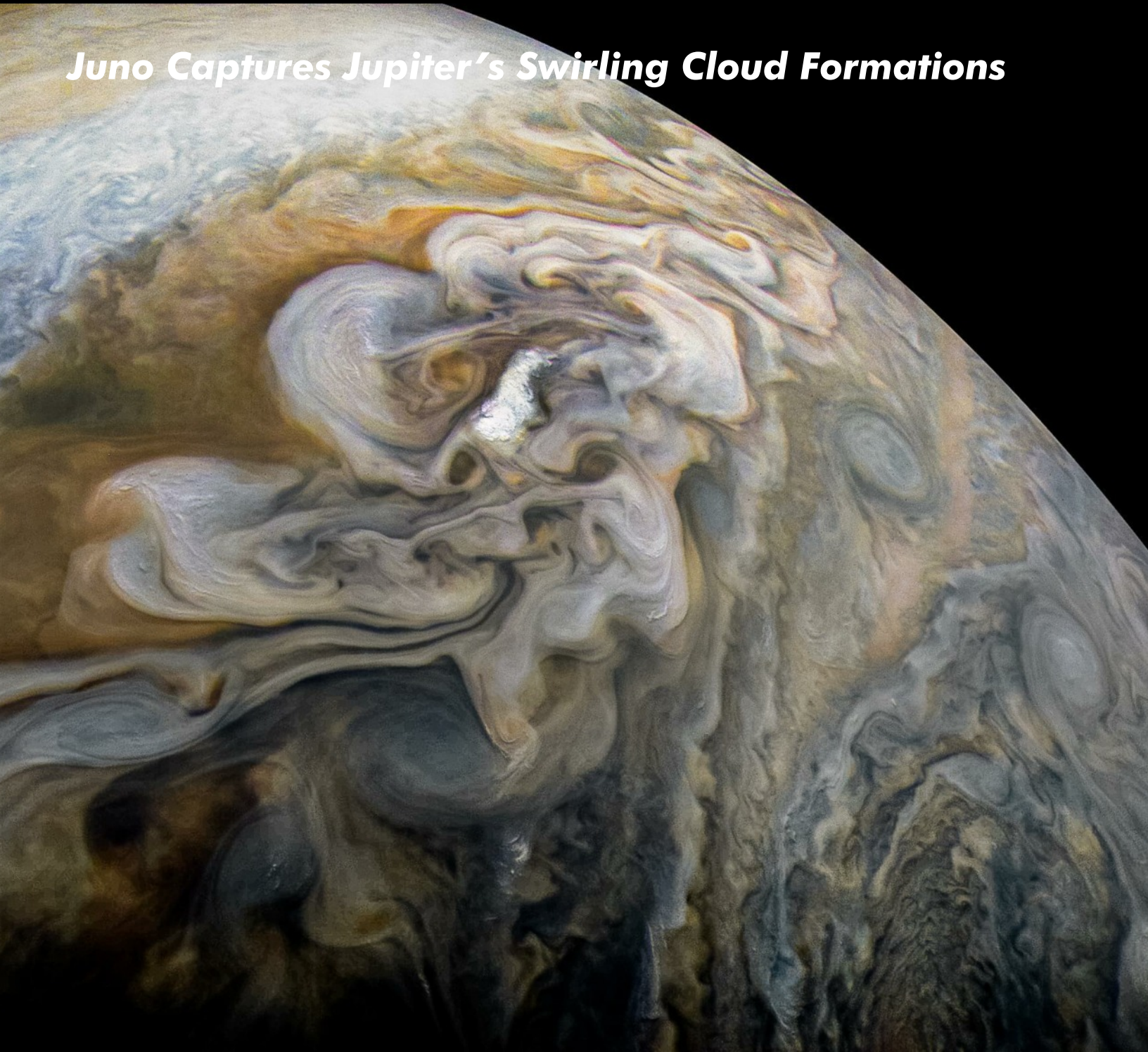


The Prairie Astronomer

February 2018 Volume 59, Issue #2

Juno Captures Jupiter's Swirling Cloud Formations



Night Sky Network



The Newsletter of the Prairie Astronomy Club

The Prairie Astronomer

NEXT PAC MEETING: February 27, 7:30pm at Hyde Observatory

PROGRAM

Video: "Antarctica: A Year On Ice"

The director spent 10 years shooting high-def footage at McMurdo Station and elsewhere on the continent, a lot of it through Antarctic winter. And with total darkness, he produced some spectacular sky footage -- much of it time lapse, and including brilliant auroras.

FUTURE PROGRAMS

March, April: To be announced

May: Club dinner

June: Solar Star Party

August: NSP Review

October: Club Viewing Night

November: How to Buy a Telescope

December: To be announced

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Cover Photo: The color-enhanced image was taken on Feb. 7 at 5:42 a.m. PST (8:42 a.m. EST), as Juno performed its eleventh close flyby of Jupiter. At the time the image was taken, the spacecraft was about 5,086 miles (8,186 kilometers) from the tops of the clouds of the planet at a latitude of 39.9 degrees.

See the JPL site for more information.



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 February 27, 2018, 7:30pm
 Video: "Antarctica: A Year On Ice"

PAC meeting
 Tuesday March 27, 2018, 7:30pm
 To be announced

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

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

2018 STAR PARTY DATES



Photo by Brian Sivill

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

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



PAC E-MAIL:

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

pac-list@googlegroups.com

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WEBSITES

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



Night Sky Network

Meeting Minutes

President Jim Kvasnicka called the meeting to order at 7:39 p.m.

This was our "How To Use Your Telescope" program, so business was abbreviated because members of the public were waiting. Jim asked how they had learned about the meeting, to help us in future planning for advertising special events. Of the 6 who answered, 2 found out from Facebook, 3 from newspaper, and 1 "Googled it."

Jim covered upcoming star parties, a request from Kaneko, a non-profit organization, for participation in a light pollution

event in Omaha; we will coordinate with John Johnson at OAS.

Viewing possibilities from Lincoln for the upcoming lunar eclipse (Blue Moon/Blood Moon/SuperMoon, etc.) were discussed.

Jim announced Astronomical League observing awards for PAC members who were not present to receive them at the meeting:

Brett Boller's 4th observing award, this one for Solar Eclipse 2017.

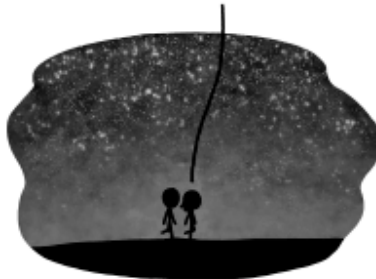
Bob Kacvinsky, 2 awards: Bright Nebula Program and Asterism Observing Program – his 9th and 10th AL awards.

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.

Business was concluded at 7:52 p.m., and club members began working with visitors to resolve their telescope problems.



THAT'S WHY IT'S NICE TO UNPLUG. LEAVE THE PHONES AT HOME, GO FOR A WALK, AND LOOK UP AT THE STARS. IT HELPS YOU FOCUS ON WHAT REALLY MATTERS.



xkcd.com

Photos from the January Meeting: How to Use Your Telescope



Observatory Update: ARP 206

Rick Johnson

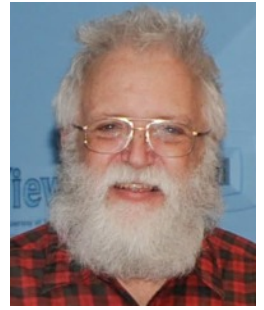
I am bringing back one from 2008. Many have been added to the list since that update but the real reason is I've discovered there is something rare in my image of the galaxy I had no idea, until a couple days ago even existed yet I'd taken an image of one - An LBV. Here's the story starting with what I wrote back in 2008.

ARP 206/NGC 3432 is cataloged by Arp as a spiral with "material ejected from the nuclei." That apparently refers to the blob of material at the

upper left end of the galaxy as all others in this category have similar detached pieces though he has a category for detached arms that would seem to also fit. The distortion seems caused by interaction with UGC 05983 a dwarf galaxy at the lower right end of the galaxy. The distance to Arp 206 is also rather hard to come by. Redshift data says 40 to 50 million light years though since these are likely orbiting each other this value is somewhat questionable. This seems to be one of the lesser

studied Arp galaxies. Anyone looking for a Ph.D. thesis might find good hunting here. Edit: When I wrote this in 2008 I didn't realize how interesting it was -- see below.

The galaxy was discovered on March 19, 1787 by William Herschel. It is in the original Herschel 400 observing



14" LX200R @ f/10, L=4x10' RGB=1x10'x3, STL-11000XM, Paramount ME, Annotated

program. My note on it from April 15, 1985 with my 10" f/5 at 50 to 150x under rather bad humidity reads: "Large, edge on galaxy evenly bright. Hard to see without averted vision due to humidity. At 50x its easier to see but much of it is lost in 12th magnitude field stars."

This is where my story ended in 2008. Then, nearly 10 years later I learned what an amazing story I totally missed.

This image was taken March 12.21, 2008 UT. At the time I did no research on my images. Big mistake, especially in this case. If I'd even compared my image to Arp's I'd have seen a star in the galaxy in my image but not his. It is annotated in the cropped image. It is SN 2000ch. Yeah, 2000 not 2008. SN don't stay bright for 8 years. So something very unusual is going on here. When seen in 2000 it was considered a blue variable star in our galaxy but once redshift was taken it became a

nova in this galaxy. But it was too bright for any nova. That caused it to be reclassified as a type II_n supernova and got its SN name. The only problem is it has blown several more times while SN blow up totally leaving nothing to erupt a second time. It was not seen in February 2008 but was when I took my image a month later. It was also seen in October of that year. I find nothing between my image and the October one. So what is going on here? It is now thought to be an LBV, Luminous Blue Variable. These erupt several times with periods of months to decades and longer. Eta Carina is the most well-known example with a very long period. Eventually, it is thought, they will blow in a true supernova. Why they have these outbursts is unknown. In my case, I just happened to catch it while in eruption. One paper shows a period of 200 to 225 days. If so, it faded between my March image and

the October image. How long they stay bright seems to vary as well. Here are links to two papers others pointed out to me about this.

<http://inspirehep.net/record/857000/plots>

<https://www.jstor.org/stable/pdf/10.1086/382997.pdf>

I totally missed this until Derek Santiago took an image of it in 2018, saw the object again in eruption and did some investigation. He found it likely an LBV but not much else. He posted it and others dug in and found the links above. Not knowing anything about this I just happened to take my image during an outburst. Dumb luck to have caught one of its outbursts.

Arp's image:

http://ned.ipac.caltech.edu/level5/Arp/Figures/big_arp206.jpeg

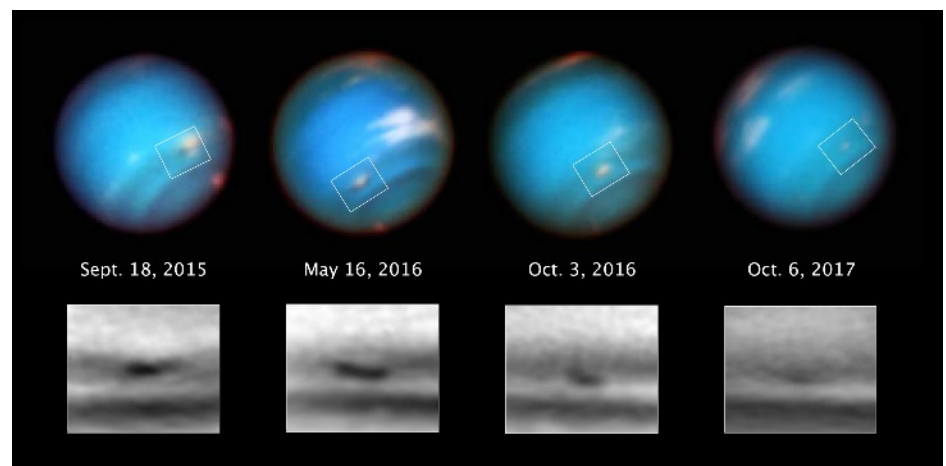
I've reprocessed the images as the ones from 2008 were not up to my standards for today.

Hubble Sees Neptune's Mysterious Shrinking Storm

Three billion miles away on the farthest known major planet in our solar system, an ominous, stinky, dark storm is shrinking out of existence as seen in pictures of Neptune taken by the Hubble Space Telescope. Immense dark storms on Neptune were first discovered in the late 1980s by the Voyager 2 spacecraft. Since then, only Hubble has tracked these elusive features that play a

game of peek-a-boo over the years. Hubble found two dark storms that appeared in the mid-1990s and then vanished. This latest storm was first seen in

2015, but is now shrinking away. The dark spot material may be hydrogen sulfide, with the pungent smell of rotten eggs.



Full story:

http://hubblesite.org/news_releases/news/2018-08

March Observing: What to View

Jim Kvasnicka

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

Planets

Venus and Mercury: Start the month just $1\frac{1}{2}^\circ$ apart in the west at dusk.

Uranus: Has a close conjunction with Venus on March 28th, look for Uranus 4' slight above and to the right of Venus.

Jupiter: Rises about 20 minutes before midnight to start March.

Mars and Saturn: They begin the month rising about 70 minutes apart. By month's end they are just 1 minute apart. Mars rises around 2 am to start the month.

Neptune: Not visible.

Messier List

M41: Open cluster in Canis Majoris

M44: The Beehive Cluster in Cancer.

M46/M47: Open clusters in Puppis.

M48: Open cluster in Hydra

M50: Open cluster in Monoceros.

M67: Open cluster in Cancer.

M81/M82: Galaxy pair in Ursa Major.

M93: Open cluster in Puppis

Last Month: M1, M35, M36, M37, M38, M42, M43, M45, M78, M79

Next Month: M40, M65, M66, M95, M96, M105, M106, M108, M109

NGC and other Deep Sky Objects

NGC 2438: Planetary nebula in open cluster M46 in Puppis.

NGC 2440: Planetary nebula in Puppis.

NGC 2451: Open cluster in Puppis.

NGC 2477: Open cluster in Puppis.

NGC 2775: Galaxy in Cancer.

Double Star Program List

Epsilon Canis Majoris:

White and light blue pair.

Delta Geminorum:

Wasat, Yellow and pale red stars.

Alpha Geminorum:

Castor, White primary with a yellow secondary.

12 Lyncis: Close pair of yellow-white stars.

19 Lyncis: White pair.

38 Lyncis: White primary with a yellow secondary.

Zeta Cancri: Yellow and pale yellow stars.

Iota Cancri: Yellow and pale blue pair.



Challenge Object

NGC 2749 Group: NGC 2749 is the brightest in a group in Cancer that includes NGC 2747, NGC 2751, and NGC 2752.

Tiny Crystal Shapes Get Close Look From Mars Rover

Star-shaped and swallowtail-shaped tiny, dark bumps in fine-layered bright bedrock of a Martian ridge are drawing close inspection by NASA's Curiosity Mars rover.

This set of shapes looks familiar to geologists who have studied gypsum crystals formed in drying lakes on Earth, but Curiosity's science team is considering multiple possibilities for the origin of these features on "Vera Rubin Ridge" on Mars.

One uncertainty the rover's inspection may resolve is the timing of when the crystal-shaped features formed, relative to when layers of sediment accumulated around them. Another is whether the original mineral that crystallized into these shapes remains in them or was subsequently dissolved away and replaced by something else. Answers may point to evidence of a drying lake or to groundwater that flowed through the sediment after it became cemented into rock.

The rover team also is investigating other clues on the same area to learn more about the Red Planet's history. These include stick-shaped features the size of rice grains, mineral veins with both bright and dark zones, color variations in the bedrock, smoothly horizontal laminations that vary more than tenfold in thickness of individual layers, and more than fourfold variation in the iron content of

local rock targets examined by the rover.

"There's just a treasure trove of interesting targets concentrated in this one area," said Curiosity Project Scientist Ashwin Vasavada of NASA's Jet Propulsion Laboratory, Pasadena, California. "Each is a clue, and the more clues, the better. It's going to be fun figuring out what it all means."

Vera Rubin Ridge stands out as an erosion-resistant band on the north slope of lower Mount Sharp inside Gale Crater. It was a planned destination for Curiosity even before the rover's

2012 landing on the crater floor near the mountain. The rover began climbing the ridge about five months ago and has now reached the uphill, southern edge. Some features here might be related to a transition to the next destination area uphill, which is called the "Clay Unit" because of clay minerals detected from orbit.

The team drove the rover to a site called "Jura" in mid-January to examine an area where -- even in images from orbit -- the bedrock is noticeably pale and gray,



This exposure of finely laminated bedrock on Mars includes tiny crystal-shaped bumps, plus mineral veins with both bright and dark material. This rock target, called "Jura," was imaged by the

compared to the red, hematite-bearing bedrock forming most of Vera Rubin Ridge.

"These tiny 'V' shapes really caught our attention, but they were not at all the reason we went to that rock," said Curiosity science-team member Abigail Fraeman of JPL. "We were looking at the color change from one area to another. We were lucky to see the crystals. They're so tiny, you don't see them until you're right on them."

The features are about the size of a sesame seed. Some are single elongated crystals. Commonly, two or more coalesce into V-shaped "swallowtails" or more complex "lark's foot" or star configurations. "These shapes are characteristic of gypsum crystals," said Sanjeev Gupta, a Curiosity science-team member at Imperial College, London, who has studied such crystals in rocks of Scotland. Gypsum is a form of calcium sulfate. "These can form when salts become concentrated in water, such as in an evaporating lake."

The finely laminated bedrock at Jura is thought to result from lakebed sedimentation, as has been true in several lower, older geological layers Curiosity has examined. However, an alternative to the crystals forming in an evaporating lake is that they formed much later from salty fluids moving through the rock. That is also a type of evidence Curiosity has documented in multiple geological layers, where subsurface fluids deposited features such as mineral veins.

Some rock targets examined in the Jura area have two-toned mineral veins that formed after the lake sediments had hardened into rock. Brighter portions contain calcium sulfate; darker portions contain more iron. Some of the features shaped like gypsum crystals appear darker than gypsum, are enriched in iron, or are empty. These are clues that the original crystallizing material may have been replaced or removed by later effects of underground water.

The small, stick-shaped features were first seen two days before Curiosity reached Jura. All raw images from Mars rovers are quickly posted online, and some showing the "sticks" drew news-media attention comparing them to fossils. Among the alternative possibilities is that they are bits of the dark vein material. Rover science team members have been more excited about the swallowtails than the sticks.

"So far on this mission, most of the evidence we've seen about ancient lakes in Gale Crater has been for relatively fresh, non-salty water," Vasavada said. "If we start seeing lakes becoming saltier with time, that would help us understand how the environment changed in Gale Crater, and it's consistent with an overall pattern that water on Mars became more scarce over time."

Such a change could be like the difference between freshwater mountain lakes, resupplied often with snowmelt that keeps salts diluted, and salty lakes in

deserts, where water evaporates faster than it is replaced.

If the crystals formed inside hardened rock much later, rather than in an evaporating lake, they offer evidence about the chemistry of a wet underground environment.

"In either scenario, these crystals are a new type of evidence that builds the story of persistent water and a long-lived habitable environment on Mars," Vasavada said.

Variations in iron content in the veins, smaller features and surrounding bedrock might provide clues about conditions favorable for microbial life. Iron oxides vary in their solubility in water, with more-oxidized types generally less likely to be dissolved and transported. An environment with a range of oxidation states can provide a battery-like energy gradient exploitable by some types of microbes.

"In upper Vera Rubin Ridge, we see clues that there were fluids carrying iron and, through some mechanism, the iron precipitated out," Fraeman said. "There was a change in fluid chemistry that could be significant for habitability."

For more about NASA's Curiosity Mars rover mission, visit:

<https://mars.jpl.nasa.gov/msl>

Focus on Constellations: Crater

Jim Kvasnicka

Crater the Cup represents a wine goblet. Even though its stars are faint they do form a pattern that does suggest a wine goblet. Crater is the 53rd constellation in size at 282 square degrees.

Showpiece Objects

Galaxies: NGC 3511, NGC 3672, NGC 3887, NGC 3955, NGC 3962

Double Stars: Gamma Crateris, Jc 16

Mythology

Crater is the cup of the god Apollo. In mythology Crater is associated with Corvus and Hydra. Apollo sent his pet raven down to Earth to bring him a cup of fresh water. On arriving at the spring the raven saw a fig tree that was just beginning to bear fruit. The raven thought, does it matter if I wait a couple of days until the fruit ripens. The raven waited until the fruit ripened and ate all the fruit. He then filled the cup with fresh water but realized that his master would be angry for the long delay. The raven saw a water

serpent nearby and grabbed it in his claws. With the water cup in his mouth and the serpent in his claws he flew back to Apollo. Apollo was not taken in with the bird's lie and flung him, the cup, and the serpent into the night sky. We see them today as Corvus, Crater, and Hydra.

Number of Objects Magnitude 12.0 and Brighter

Galaxies: 13

Globular Clusters: 0

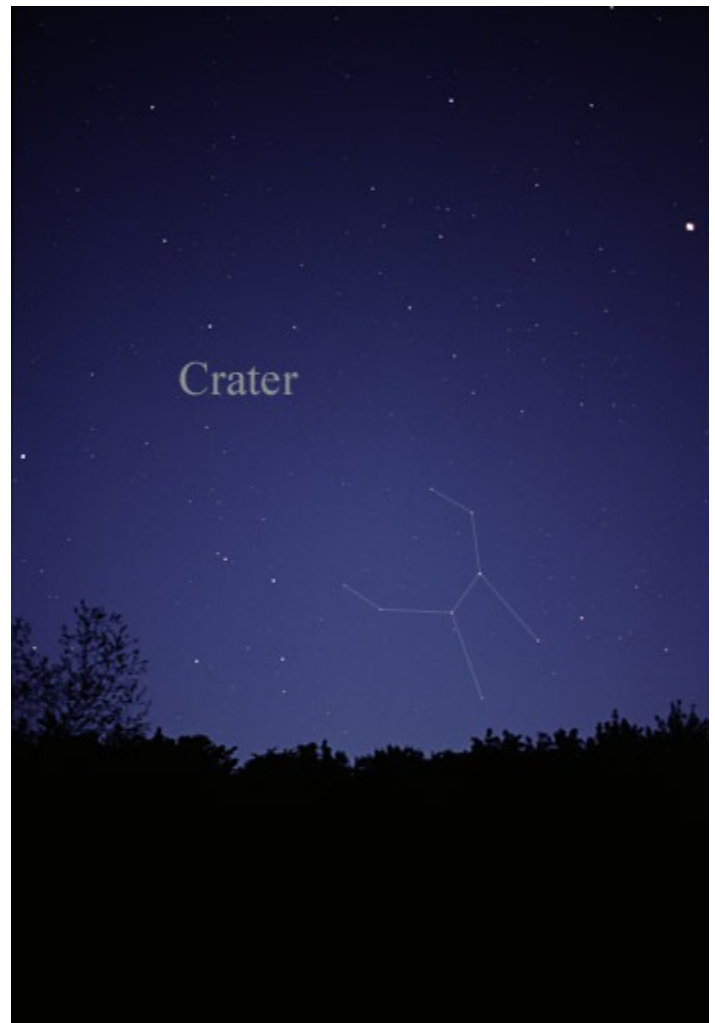
Open Clusters: 0

Planetary Nebulae: 0

Dark Nebulae: 0

Bright Nebulae: 0

SNREM: 0



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

What is the Ionosphere?

*This article is provided by NASA Space Place.
With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.
Visit spaceplace.nasa.gov to explore space and Earth science!*

Linda Hermans-Killiam



High above Earth is a very active part of our upper atmosphere called the ionosphere. The ionosphere gets its name from ions—tiny charged particles that blow around in this layer of the atmosphere.

How did all those ions get there? They were made by energy from the Sun!

Everything in the universe that takes up space is made up of matter, and matter is made of tiny particles called atoms. At the ionosphere, atoms from the Earth's atmosphere meet up with energy from the Sun. This energy, called radiation, strips away parts of the atom. What's left is a positively or negatively charged atom, called an ion.

The ionosphere is filled with ions. These particles move about in a giant wind. However, conditions in the ionosphere change all the time. Earth's seasons and weather can cause changes in the ionosphere, as well as radiation and particles from the Sun—called space weather.

These changes in the ionosphere can cause problems for humans. For example, they can interfere with radio signals between Earth and satellites. This could make it difficult to use many of the tools we take for granted here on Earth, such as

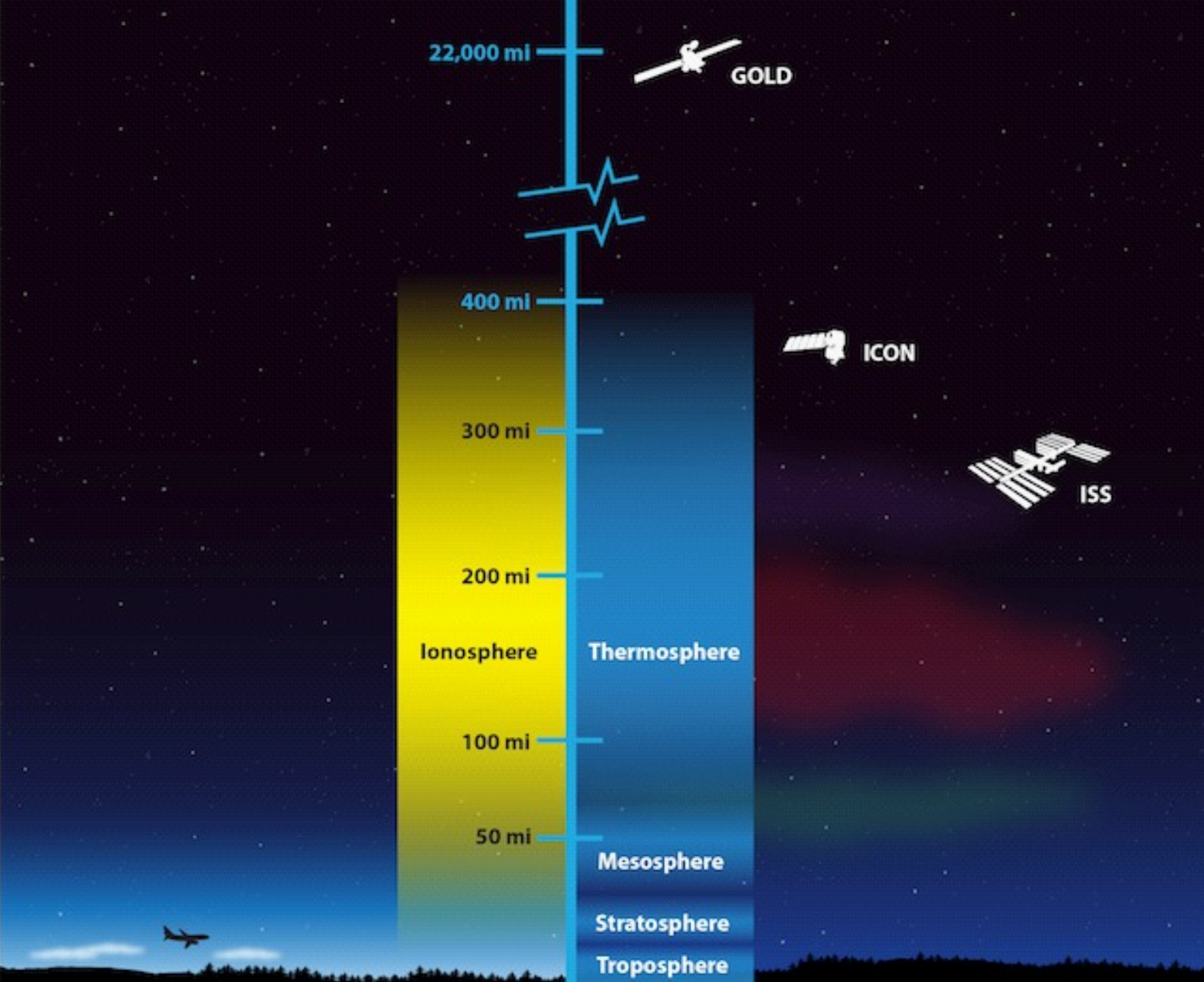
GPS. Radio signals also allow us to communicate with astronauts on board the International Space Station, which orbits Earth within the ionosphere. Learning more about this region of our atmosphere may help us improve forecasts about when these radio signals could be distorted and help keep humans safe.

In 2018, NASA has plans to launch two missions that will work together to study the ionosphere. NASA's GOLD (Global-scale Observations of the Limb and Disk) mission launched in January 2018. GOLD will orbit 22,000 miles above Earth. From way up there, it will be able to create a map of the ionosphere over the Americas every half hour. It will measure the temperature and makeup of gases in the ionosphere. GOLD will also study bubbles of charged gas that are known to cause communication problems.

A second NASA mission, called ICON, short for Ionospheric Connection Explorer, will launch later in 2018. It will be placed in an orbit just 350 miles above Earth—through the ionosphere. This means it will have a close-up view of the upper atmosphere to pair with GOLD's wider view. ICON will study the forces that shape this part of the upper atmosphere.

Both missions will study how the ionosphere is affected by Earth and space weather. Together, they will give us better observations of this part of our atmosphere than we have ever had before.

To learn more about the ionosphere, check out NASA Space Place:
<https://spaceplace.nasa.gov/ionosphere>



This illustration shows the layers of Earth's atmosphere. NASA's GOLD and ICON missions will work together to study the ionosphere, a region of charged particles in Earth's upper atmosphere. Changes in the ionosphere can interfere with the radio waves used to communicate with satellites and astronauts in the International Space Station (ISS). Credit: NASA's Goddard Space Flight Center/Duberstein (modified)

From the Archives: March, 1977

As nice weather returns, we have a number of activities coming up. Our calendar for the next month is crowded with interesting events. This Friday, March 25 there will be an open house at Behlen Observatory, sort of an amateur astronomer's night. The Prairie Astronomy Club and the Omaha Astronomical Society are invited to bring telescopes as we did last Fall, and there may be several hundred enthusiastic observers there, weather permitting. Last Fall our club brought eight portable scopes, from a Questar to a 12.5 inch, and I hope we can top that this time. Next Tuesday, March 29, is our meeting at Olin Hall of Science on the Nebraska Wesleyan Campus. Jack Dunn has an interesting program, for us, and Rick Johnson has offered to bring his videotape of the interview he and I had on Channel 10.

One of KOLN-TV's reporters, Larry Hall, has taken an interest in our club and in the City Observatory, and has run two stories on amateur astronomy during the last month. The first of these was coverage of the

arrival and inspection of the Celestron-14 telescope which is now in Lincoln, waiting for construction of the observatory to be completed. I have seen the new telescope, and can report that it seems to be a fine instrument, at least mechanically. We have not yet tested it optically.

Professor Moore says that bids for construction of the observatory will be opened at the end of March with construction to start fairly soon after that.

On March 30, Jack Dunn would like members of our club to bring telescopes to the planetarium to help students in his Backyard Astronomy class learn more about the sky. We have done this before; and it is always a lot of fun.

On March 31, Professor Moore would like some help with a public night at Wesleyan, for several hundred elementary students and their parents. We will need some portable instruments if possible, and also some members without telescopes to man (person?) the scopes on the roof of Olin Hall. I

know this makes three evenings in a row for club events, so perhaps we can have some members help Wednesday, and others Thursday.

Did anyone see the Soviet booster re-enter on March 13? Numerous reports of a UFO were received because of the reentry, which appeared as a fireball in the western sky-about 10 p.m., according to newspaper reports.

Remember: March 25, 29, 30 and 31. As always, everyone is welcome at any of our events, guests included. See you there... and there... and...

-- Larry Stepp

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:



Shop through Amazon Smile to automatically donate to PAC:



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