

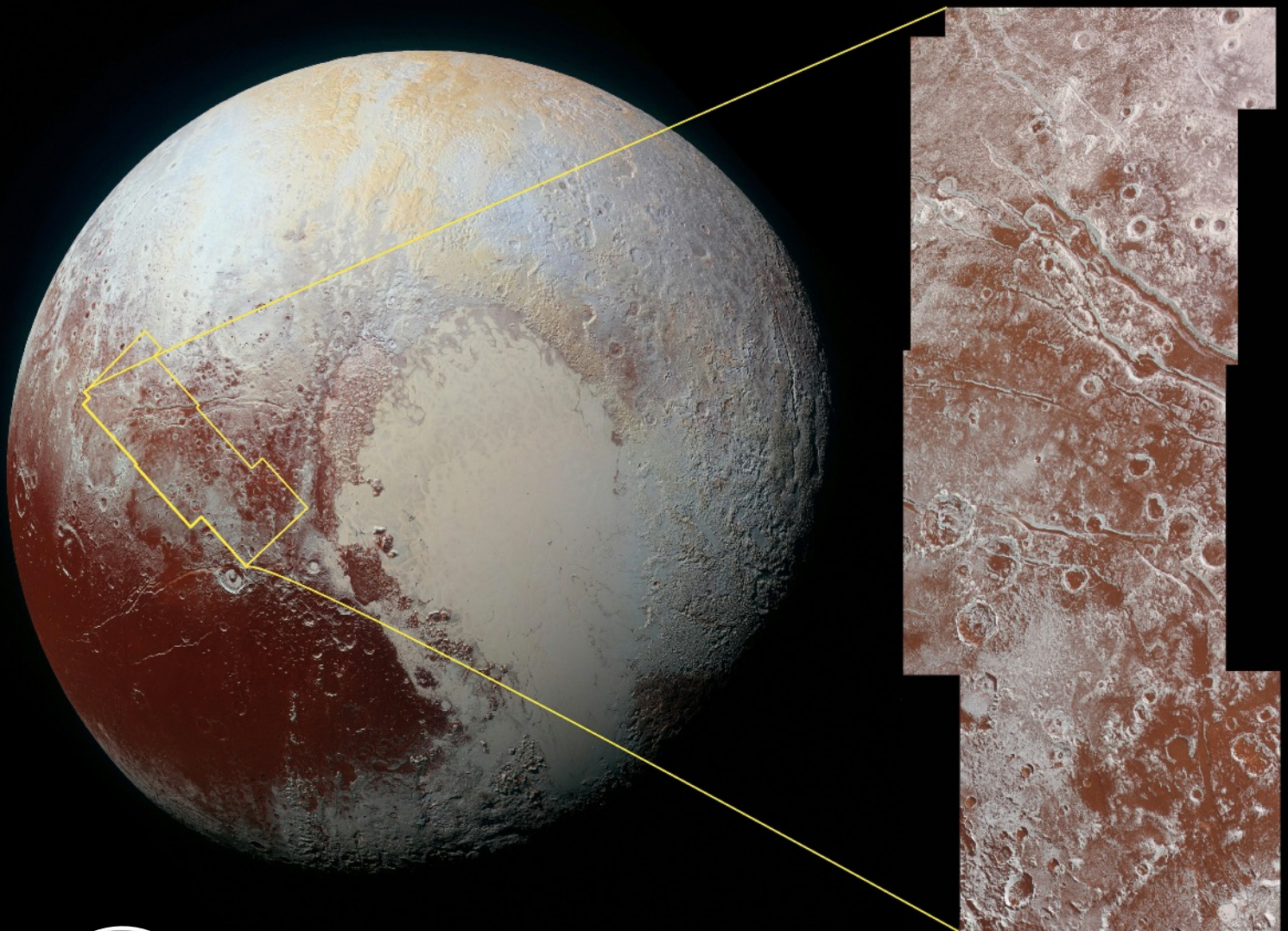
# ***The Prairie Astronomer***

January 2016 Volume 57, Issue #1

**January  
Program:**

**How to  
Use Your  
Telescope**

## ***Particles 'Go with the Flow' on Pluto's Surface***



**Night Sky Network**



The Newsletter of the Prairie Astronomy Club

# ***The Prairie Astronomer***

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## **NEXT PAC MEETING: January 26, 7:30pm at Hyde Observatory**

### **PROGRAM**

The Prairie Astronomy Club will offer its annual free session: “How to Use Your Telescope” at Hyde Observatory, Tuesday evening January 26th at 7:30 p.m. Do you own a telescope and need help getting started using it? The Prairie Astronomy Club would like to help. Every year at our January meeting, we offer a session to give hands-on assistance. There is no charge for this session. It is open to the public and if you have a telescope you want to use you are encouraged to bring it. The meeting will start at 7:30pm on Tuesday January 26th and the program will start around 8pm. Meetings are at Hyde Observatory and are open to the public.

### **FUTURE PROGRAMS**

February: Space Law (tentative)

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**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  
 "How to Use Your Telescope"  
 Tuesday January 26th, 2016, 7:30pm  
 Hyde Observatory

Newsletter submission deadline February 13

PAC Meeting  
 Tuesday February 23rd, 2016, 7:30pm  
 Hyde Observatory

PAC Meeting  
 Tuesday March 29th, 2016, 7:30pm  
 Hyde Observatory

## 2016 STAR PARTY DATES



Photo by Brian Sivill

	Star Party Date	Star Party Date	Lunar Party Date
January	Jan 1st	<b>Jan 8th</b>	
February	Jan 29th	<b>Feb 5th</b>	
March	Mar 4th	<b>Mar 11th</b>	
April	Apr 1st	<b>Apr 8th</b>	Apr 15th
May	Apr 29th	<b>May 6th</b>	May 13th
June	May 27th	<b>Jun 3rd</b>	
July	<b>Jul 1st</b>	Jul 8th	
<b>NSP</b>	<b>July 31st</b>		
	<b>- Aug 5th</b>		
August	Jul 29th	<b>Aug 5th</b>	Aug 12th
August	Aug 26th	<b>Sep 2nd</b>	Sep 9th
September	Sep 23rd	<b>Sep 30th</b>	
October	Oct 21st	<b>Oct 28th</b>	
November	Nov 25th	<b>Dec 2nd</b>	
December	Dec 23rd	<b>Dec 30th</b>	



### 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)

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- [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**

## PAC Board Meeting Minutes

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Board meeting minutes for  
Monday, January 11, 2016

Members present:

Jim Kvasnicka, President  
Brett Boller, Vice-President  
Beth Jenckes, 2<sup>nd</sup> Vice President  
John Reinert, Treasurer  
Lee Taylor, Secretary  
Dan Delzell, Outreach  
Coordinator  
Mark Dahmke, Newsletter editor

Jim called the meeting to order at 7:00 PM. The main reason for the meeting was to discuss the January meeting, and the program 'How to Use Your Telescope'. Jim anticipates a turnout similar to last year, and would be ready for it. We will keep the format the same as last year: members with certain telescopes helping those with 'scopes similar to what they are familiar with. We will be trying to publicize this like last year, through newspapers, and various media websites. Jim recommended having proper tools available, as well as some greeters available to welcome newcomers. Beth offered to greet people. We will also have handouts and a sign up sheet.

We discussed planning for programs for the coming year. Several ideas were presented, reviewing programs from the past and other ideas. Jim raised the question of having 'get-togethers', as they haven't been well attended. Lee and Mark were thinking of talking to

Michael Sibbersen about providing a program, or student speakers. Jim mentioned the Space Law department at UNL. The main idea is to find programs that appeal to a broad range of members, and will raise attendance.

Club property

There has been some concern about checking out club telescopes. With Brett living so far out of town, Dave Churilla had been keeping track of club property. With Beth taking over 2<sup>nd</sup> VP, Jim wanted to discuss the logistics of checking out 'scopes, etc. Beth wanted to know how long the telescopes were usually checked out, etc. Lee reviewed the benefits, procedures, etc. for having club equipment, and noted how much we have acquired in recent years. Discussion centered around how long equipment would be checked out, keeping track of who has it, and where it is. **We decided to have members wishing to check out club equipment do so at club meetings with the expectation of having it returned at the next club meeting. This would not preclude someone from checking something out for two consecutive months, as long as no other members requested it, but a monthly return would allow reliable tracking.** We will also have a sign out sheet for club equipment, as we do for the club

library.

Mark asked for an accounting of club equipment, including 'scopes and the accessories that go with each 'scope. Lee volunteered to provide these things.

Treasurer's Report

John is working on assembling an audit committee, as well as the files necessary for the audit. John expressed difficulty in file handling, bank hours, and other problems. Mark suggested a couple of solutions, but we are considering other options, including changing banks. This would be a last resort, but we are talking about this.

John is also trying to straighten out our insurance situation with UNL, as we have discussed before, as well as well getting our PO box settled into the new post office.

PAC domain name and website administration

Mark Dahmke has been our webmaster for 20 years, providing server space, domain names, etc. through his company Information Analytics. He and his partner recently sold the company and is providing these services to PAC through his personal resources. To cover

his costs, Mark asked the board for compensation totaling \$145.00, annually. We discussed this and unanimously agreed to his request.

### Eclipse 2017

The eclipse committee has been busy. Dan and Dave C. met with the Lincoln Public Schools science director in November. He is interested in having us

train the LPS teachers on how to observe the eclipse, and understand it. They are looking at training sometime next year.

### Earl Moser memorial

We still need to order the sundial for Earl Moser, and find the best position for it.

Finally, we need to make sure our roster is up to date and

accurate. We will be asking members to log in to the night sky network and make sure their contact info. is current.

Meeting adjourned

Respectfully submitted by,

Lee Taylor

# **Cassini's Final Close Flyby of Enceladus**

Credit: NASA/JPL-Caltech/Space Science Institute

## 'X' Marks a Curious Corner on Pluto's Icy Plains

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"X" marks the spot of some intriguing surface activity in the latest picture of Pluto returned from NASA's New Horizons spacecraft.

Transmitted to Earth on Dec. 24, this image from the Long Range Reconnaissance Imager (LORRI) extends New Horizons' highest-resolution views of Pluto to the very center of Sputnik Planum, the informally named icy plain that forms the left side of Pluto's "heart" feature.

Sputnik Planum is at a lower elevation than most of the surrounding area by a couple of miles, but is not completely flat. Its surface is separated into cells or polygons 10 to 25 miles wide, and when viewed at low sun

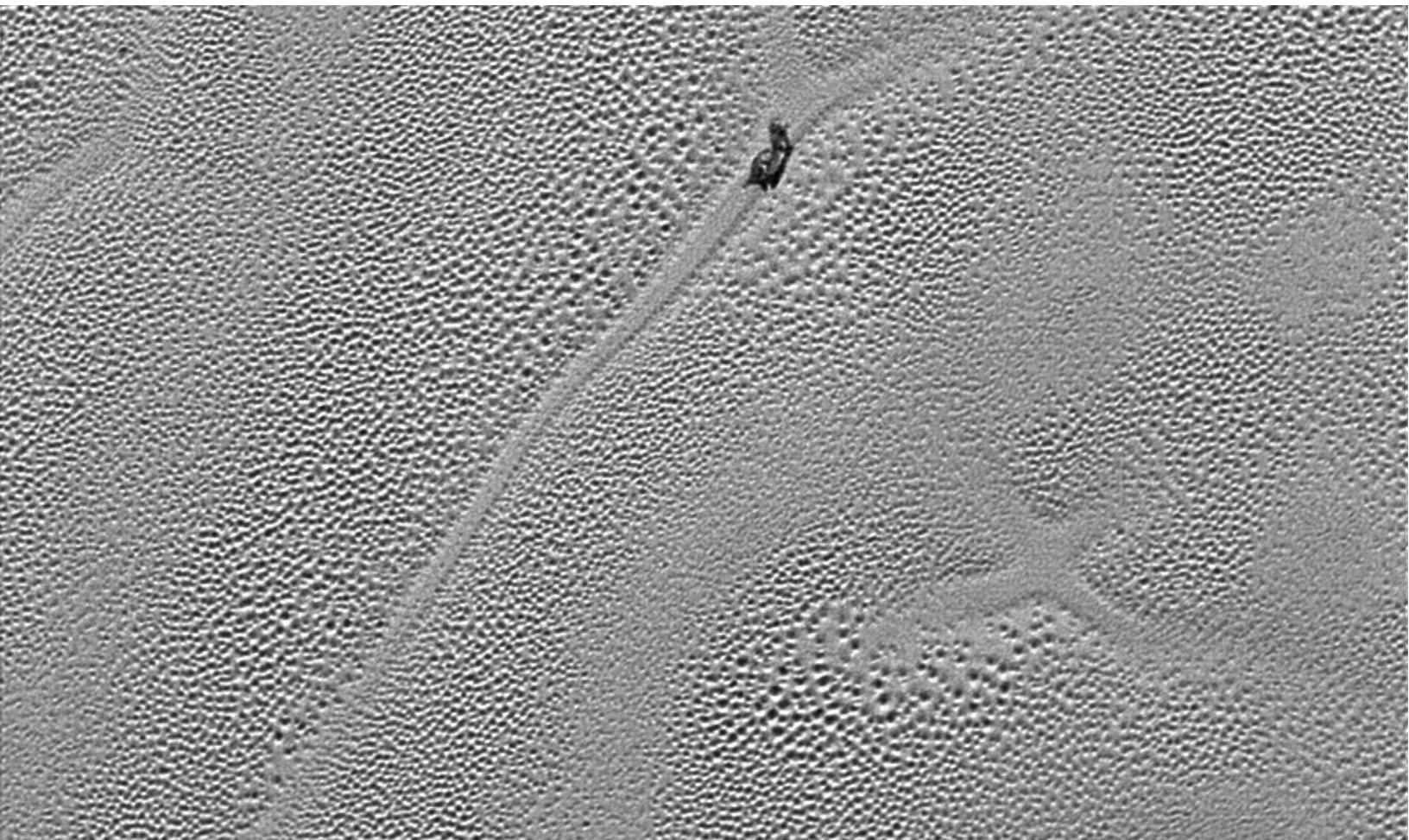
angles (with visible shadows) the cells are seen to have slightly raised centers and ridged margins, with about 100 yards of overall height variation.

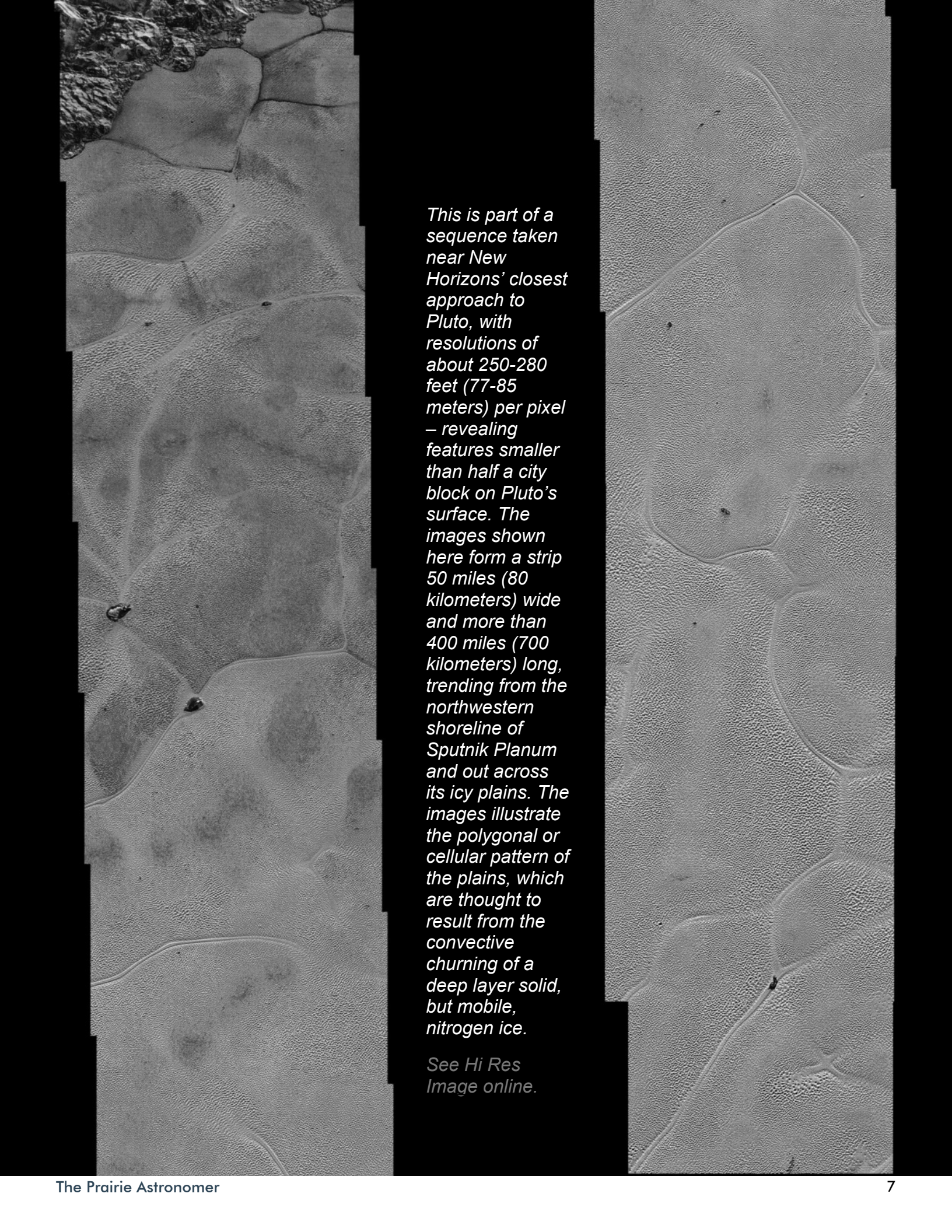
Mission scientists believe the pattern of the cells stems from the slow thermal convection of the nitrogen-dominated ices that fill Sputnik Planum. A reservoir that's likely several miles or kilometers deep in some places, the solid nitrogen is warmed at depth by Pluto's modest internal heat, becomes buoyant and rises up in great blobs, and then cools off and sinks again to renew the cycle.

"This part of Pluto is acting like a lava lamp," said William McKinnon, deputy lead of the

New Horizons Geology, Geophysics and Imaging team, from Washington University in St. Louis, "if you can imagine a lava lamp as wide as, and even deeper than, Hudson Bay."

Computer models by the New Horizons team show that these blobs of overturning solid nitrogen can slowly evolve and merge over millions of years. The ridged margins, which mark where cooled nitrogen ice sinks back down, can be pinched off and abandoned. The "X" feature is likely one of these – a former quadruple junction where four convection cells met. Numerous, active triple junctions can be seen elsewhere in the LORRI mosaic.





*This is part of a sequence taken near New Horizons' closest approach to Pluto, with resolutions of about 250-280 feet (77-85 meters) per pixel – revealing features smaller than half a city block on Pluto's surface. The images shown here form a strip 50 miles (80 kilometers) wide and more than 400 miles (700 kilometers) long, trending from the northwestern shoreline of Sputnik Planum and out across its icy plains. The images illustrate the polygonal or cellular pattern of the plains, which are thought to result from the convective churning of a deep layer solid, but mobile, nitrogen ice.*

*See Hi Res Image online.*

# NGC 6764

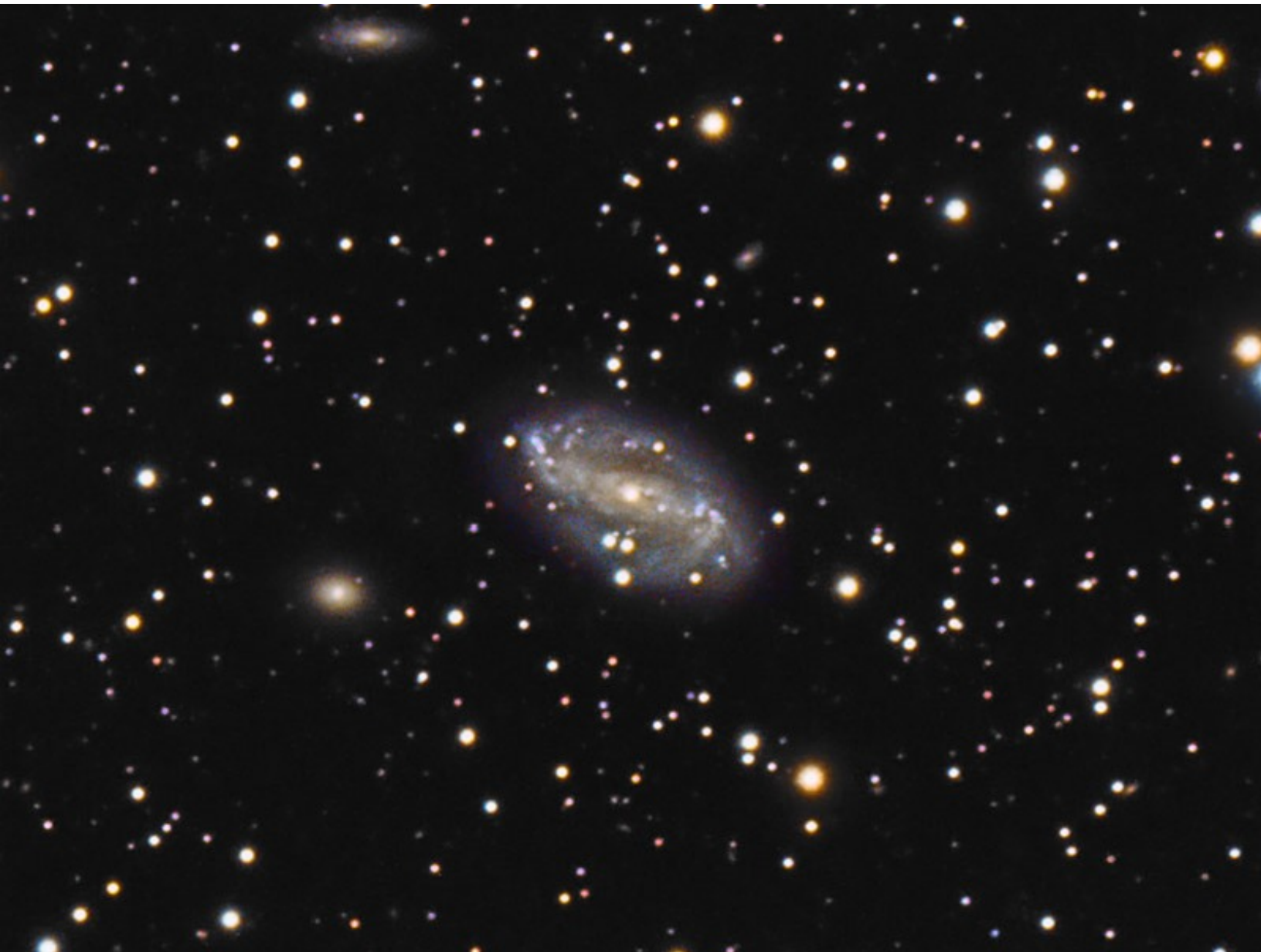
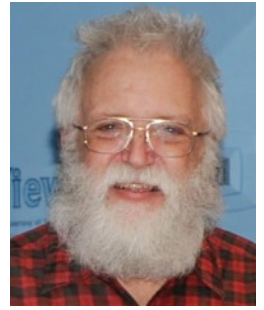
*Rick Johnson*

NGC 6764 is a barred spiral in Cygnus only a couple minutes of arc from the border with Draco. It is about 100 million light-years distant by both redshift and the median of Tully-Fisher measurements at NED. That makes the galaxy about 86,000 light-years in diameter. NED classifies it as SB(s)bc;LINER Sy2, The NGC Project says SBb while Seligman says SBbc?. Reading a few papers on it some say it is a LINER galaxy,

others say it is a Seyfert 2 galaxy, Some say it is both and some say neither. NED says both. Nearly all agree that the spectrum shows a lot of lines normally associated with Wolf Rayet stars, especially in the bar. They also say there's strong HII in the bar though I didn't pick that up. The galaxy was discovered by Lewis Swift on July 4, 1885. Too bad I didn't pick up the HII as if I had it might have been the "real" fireworks

galaxy with that discovery date.

This part of the sky is in the Zone of Avoidance so there's little on it. Only two galaxies have any redshift data. The spiral toward the upper right corner is PGC 2387415 with a redshift distance of 480 million light-years. It is





about 80,000 light-years in diameter. The edge on spiral at the far left level with NGC 6764 is LEDA 2384950 at a distance of 580 million light-years. Look closely and you'll see it has a

faint extensions to the left as if it is a plume. This gives it a rather large size of nearly 200,000 light-years. Leave off the faint plumes and it is half that size. While there are many other

interesting looking galaxies in the frame none have redshift data at NED. For that reason I didn't prepare an annotated image.



# NASA's Great Observatories Weigh Massive Young Galaxy Cluster

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Astronomers have used data from three of NASA's Great Observatories to make the most detailed study yet of an extremely massive young galaxy cluster. This rare cluster, which is located 10 billion light-years from Earth, weighs as much as 500 trillion suns. This object has important implications for understanding how these megastructures formed and evolved early in the universe.

The galaxy cluster, called IDCS J1426.5+3508 (IDCS 1426 for short), is so far away that the light detected is from when the universe was roughly a quarter of its current age. It is the most massive galaxy cluster detected at such an early age.

First discovered by the Spitzer Space Telescope in 2012, IDCS 1426 was observed using the Hubble Space Telescope and the Keck Observatory on Mauna Kea, Hawaii, to determine its distance. Observations from the Combined Array for Millimeter Wave Astronomy indicated it was extremely massive. New data from the Chandra X-ray Observatory confirm the galaxy cluster's mass and show that about 90 percent of the mass of the cluster is in the form of dark matter, a mysterious substance detected so far only through its gravitational pull on normal matter composed of atoms.

"We are really pushing the boundaries with this discovery," said Mark Brodwin of the

University of Missouri at Kansas City, who led the study. "As one of the earliest massive structures to form in the universe, this cluster sets a high bar for theories that attempt to explain how clusters and galaxies evolve."

Galaxy clusters are the largest objects in the universe bound together by gravity. Because of their sheer size, scientists think it should take several billion years for them to form. The distance of IDCS 1426 means astronomers are observing it when the universe was only 3.8 billion years old, implying that the cluster is seen at a very young age.

The data from Chandra reveal a bright knot of X-rays near the middle of the cluster, but not exactly at its center. This overdense core has been dislodged from the cluster center, possibly by a merger with another developing cluster 500 million years prior. Such a merger would cause the X-ray emitting, hot gas to slosh around like wine in a glass that is tipped from side to side.

"Mergers with other groups and clusters of galaxies should have been more common so early in the history of the universe," said co-author Michael McDonald of the Massachusetts Institute of Technology in Cambridge. "That appears to have played an important part in this young cluster's rapid formation."

Aside from this cool core, the hot gas in the rest of the cluster is very smooth and symmetric. This is another indication that IDCS 1426 formed very rapidly. In addition, astronomers found possible evidence that the amount of elements heavier than hydrogen and helium in the hot gas is unusually low. This suggests that this galaxy cluster might still be in the process of enriching its hot gas with these elements as supernovae create heavier elements and blast them out of individual galaxies.

"The presence of this massive galaxy cluster in the early universe doesn't upset our current understanding of cosmology," said co-author of Anthony Gonzalez of the University of Florida in Gainesville. "It does, however, give us more information to work with as we refine our models."

Evidence for other massive galaxy clusters at early times has been found, but none of these matches IDCS 1426 with its combination of mass and youth. The mass determination used three independent methods: a measurement of the mass needed to confine the hot X-ray-emitting gas to the cluster, the imprint of the cluster's gaseous mass on the cosmic microwave background radiation, and the observed distortions in the shapes of galaxies behind the cluster, which are caused by the bending of light from the

galaxies by the gravity of the cluster.

These results were presented at the 227th meeting of the American Astronomical Society in Kissimmee, Florida. A paper describing these results has been accepted for publication in The Astrophysical Journal and is available online.

NASA's Jet Propulsion Laboratory, Pasadena, California, manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate, Washington. Science operations are

conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena. Spacecraft operations are based at Lockheed Martin Space Systems Company, Littleton, Colorado. Data are archived at the Infrared Science Archive, housed at the Infrared Processing and Analysis Center at Caltech. Caltech manages JPL for NASA.

The Hubble Space Telescope is a project of international cooperation between NASA and ESA (European Space Agency). NASA's Goddard Space Flight

Center manages the telescope. The Space Telescope Science Institute (STScI) in Baltimore, conducts Hubble science operations. STScI is operated for NASA by the Association of Universities for Research in Astronomy in Washington, D.C.

NASA's Marshall Space Flight Center in Huntsville, Alabama, manages the Chandra program for NASA's Science Mission Directorate. The Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, controls Chandra's science and flight operations.



*Astronomers have made the most detailed study yet of an extremely massive young galaxy cluster using three of NASA's Great Observatories. image credit: NASA/CXC/Univ of Missouri/M.Brodwin et al; NASA/STScI; JPL/CalTech*

# After Eight Years, Nasa's Dawn Probe Brings Dwarf Planet Ceres into Closest Focus

Marc D Rayman,  
Dawn Chief Engineer and Mission Director  
at JPL, NASA

## THE CONVERSATION

More than a thousand times farther from Earth than the moon, farther even than the sun, an extraordinary extraterrestrial expedition is taking place. NASA's Dawn spacecraft is exploring dwarf planet Ceres, which orbits the sun between Mars and Jupiter. The probe has just reached the closest point it ever will, and is now beginning to collect its most detailed pictures and other measurements on this distant orb.

Ceres is a remnant from the dawn of our solar system nearly 4.6 billion years ago. All the data Dawn is now sending back will provide insight into Ceres' history and geology, including the presence of water, past or present. Scientists believe that by studying Ceres, we can unlock some of the secrets of the epoch in which planets, including our own, formed.

But this mission isn't only for scientists. Discovering the nature of an uncharted world is a thrill that can be shared by anyone who has ever gazed up at the night sky in wonder, been curious about the universe and Earth's place in it, or felt the lure of a bold adventure into the unknown.

I happen to fall into all those categories. I fell in love with space at the age of four, and I knew by the fourth grade that I wanted to earn a doctorate in physics. (It was a few more years before I did.) My passion for the exploration of space and the grandeur of scientific discovery and understanding has never wavered. It's a dream come true for me to be the mission director and chief engineer on Dawn at JPL.

Ceres before Dawn

Named for the Roman goddess of agriculture and grain, Ceres was the first dwarf planet discovered, in 1801. That's 129 years before Pluto – and in fact, both were originally considered planets, only later to be designated dwarf planets.

Although Ceres appeared as little more than a fuzzy blob of light amidst the stars, scientists determined that it's the behemoth of the main asteroid belt between Mars



*Ceres, as seen by NASA's Dawn spacecraft on December 10, around a crater chain called Gerber Catena. NASA/JPL-Caltech/UCLA/MPS/DLR/IDA, CC BY*

and Jupiter – nearly 600 miles in diameter. Its surface area is more than a third of the area of the continental US. Before Dawn’s arrival, Ceres was the largest object between the sun and Pluto that a spacecraft had not visited.

Since well before Dawn, we’ve had telescopic evidence that Ceres harbors water. While it’s mostly in the form of ice, scientists have good reason to believe an underground ocean once circulated. The question of whether reservoirs still lurk beneath the alien surface remains open. Dawn’s studies of Ceres may even provide hints about how Earth acquired its own supply of that precious liquid billions of years ago.

#### Dawn en route to Ceres

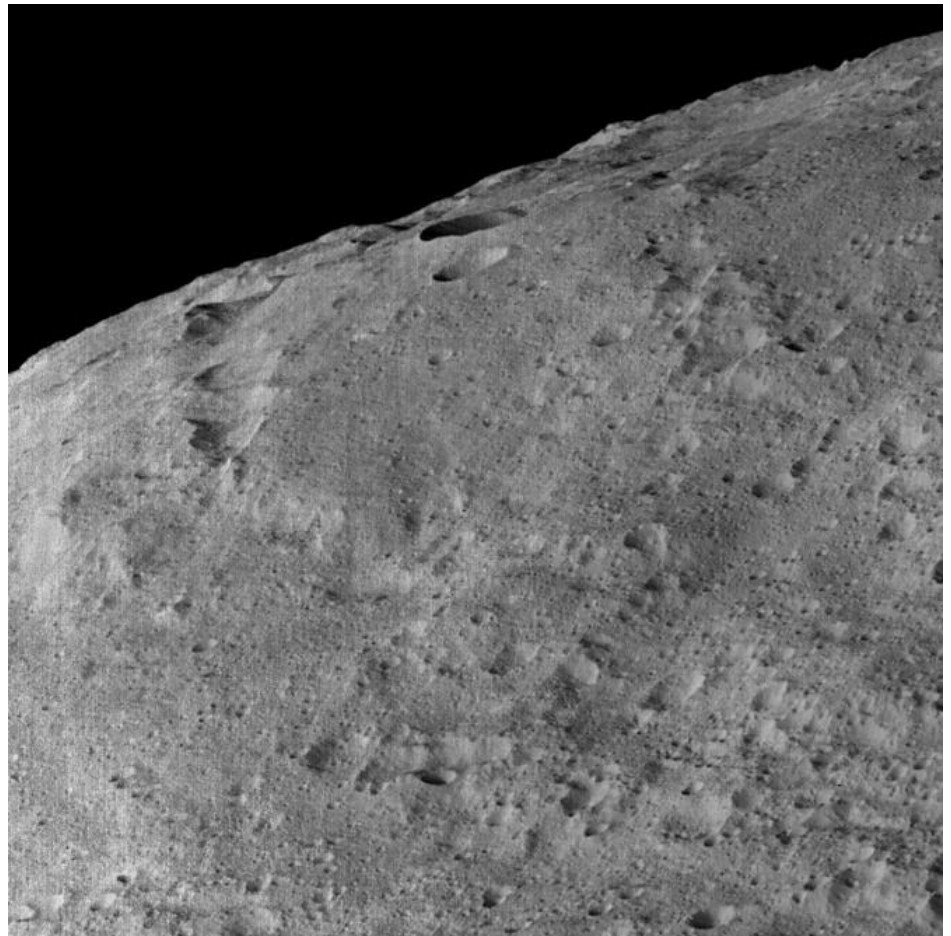
In 2007, we launched Dawn from Cape Canaveral, and it will never again visit its erstwhile planetary home. In 2011, it became the only spacecraft ever to orbit an object in the main asteroid belt, devoting 14 months to scrutinizing protoplanet Vesta. Dawn showed us this second most massive resident of the belt is more closely related to the terrestrial planets (including Earth) than to the much smaller chunks of rock that are typical of asteroids.

The unique capability to travel to worlds beyond Mars, enter orbit and maneuver extensively and then depart for yet another destination is achieved with

advanced ion propulsion. The technology spent much of its history in the domain of sci-fi, including Star Trek and Star Wars. (Darth Vader’s TIE Fighter is named for its twin ion engines.) But what may have seemed only science fiction is science fact. Without its three ion engines (note that Dawn does the TIE Fighters one better), Dawn’s mission wouldn’t be possible.

The ion engines use xenon gas, a chemical cousin of helium and neon. With electrical power from

Dawn’s large solar panels, the xenon is given an electrical charge in a process called ionization. The engines use high voltage to accelerate the ions. They’re then shot out of the engines at up to 90,000 mph. When the ions leave the spacecraft at this fantastically high speed, it’s pushed in the opposite direction. Dawn’s ion propulsion system is exceptionally efficient – 10 times as efficient as conventional spacecraft propulsion. It’s comparable to



*Dawn took this image in its low-altitude mapping orbit from an approximate distance of 240 miles (385 kilometers) from Ceres on December 10. NASA/JPL-Caltech/UCLA/MPS/DLR/IDA, CC BY*

your car getting 250 miles per gallon.

Dawn drops into Cerean orbit

Finally, after a journey of more than seven years and three billion miles, our interplanetary ambassador reached Ceres on March 6 2015, and gracefully entered the dwarf planet's permanent gravitational embrace.

Mission controllers at JPL then piloted the craft to three orbits at successively lower altitudes, so we could first obtain an overview and then gain better and better views of this vast unexplored territory. And Dawn has just performed the penultimate act in its grand celestial choreography. It's spent the last seven weeks maneuvering to its lowest altitude. Orbiting now about 240 miles above the exotic terrain of rock and ice, Dawn is closer to Ceres than the International Space Station is to Earth.

Dawn brings Ceres into focus

Included in the spacecraft's suite of sophisticated sensors is a camera that has already taken 10,000 pictures of alien landscapes on Ceres. Following from Ceres' own name, features Dawn discovers are named for agricultural deities and festivals from around the world.

We see rugged terrain and smooth areas, sometimes with streaks of material that's flowed across it. There are craters large and small, created by billions of years of assaults in the rough-

and-tumble neighborhood of the asteroid belt. We see mountains and valleys, huge fissures in the ground and bright spots that glow with a mysterious luster, reflecting much more sunlight than most of the dark surface.

The most striking of these shining regions, inside the 55-mile-wide Occator Crater (named for the Roman deity of harrowing), is so bright that the Hubble Space Telescope detected a hint of it a decade ago. Dawn's pictures to date have been more than 200 times sharper than Hubble's. The images we're starting to get back now will be even better, revealing 850 times the detail that Hubble had provided.

Dawn has shown us a mountain named Ahuna Mons that towers more than 20,000 feet in an otherwise unremarkable area, comparable to the elevation of North America's tallest peak, Mt Denali. (Ahuna is a celebration of thanksgiving for the harvest among the Sumis of northeast India.) Bright streaks seem to suggest some unidentified material once flowed down the steep slopes of Ahuna Mons. While scientists have not yet determined what forces and processes shaped this conical mountain, it doesn't take a geologist to notice its resemblance to terrestrial volcanic cones. Imagine what it might have been like to witness an eruption of some strange combination of water and other chemicals on this cold, distant world.

Beyond photos, Dawn will take a great many other measurements from its new orbital perch before its mission concludes in 2016. It will measure radiation to help scientists determine what types of atoms are present on Ceres. It will use infrared light to identify the minerals on Ceres' surface. And it will gauge subtle variations in the gravitational field to reveal the interior structure of the dwarf planet.

Once the spacecraft exhausts the small supply of conventional rocket propellant it squirts through thrusters to control its orientation in the zero-gravity, frictionless conditions of spaceflight, it will no longer be able to point its solar arrays at the sun, its antenna at Earth, its sensors at Ceres or its ion engines in the direction needed to travel elsewhere. But the ship will remain in orbit around Ceres as surely as the moon remains in orbit around Earth and Earth remains in orbit around the sun. Its legacy in the history of our efforts to reach out from our humble home to touch the stars is secure. Dawn will become an inert celestial monument to humankind's creativity, ingenuity, and passion for exploring the cosmos.

# February Observing: What to View

Jim Kvasnicka

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

## Planets

**Jupiter:** Rises just 25 minutes after the Sun sets to end February. Jupiter shines at magnitude -2.5 with a disk 44" wide.

**Uranus:** Still visible in evening twilight. See finder chart in September Sky & Telescope.

**Neptune:** Not visible in the evening twilight.

**Mars:** In Libra at magnitude 0.3 with a disk 8.6" wide.

**Saturn:** Rises around 3:00 am to start February and by 1:30 am to end the month.

**Venus:** Rises just an hour before the Sun to end February at magnitude -3.9.

**Mercury:** Close to Venus. On February 13<sup>th</sup> Mercury is 4° to the lower left of Venus.

## Messier List

**M1:** The Crab Nebula in Taurus.

**M35:** Open cluster in Gemini.

**M36/M37/M38:** Open clusters in Auriga.

**M42:** The Orion Nebula.

**M43:** Emission nebula next to M42.

**M45:** The Pleiades in Taurus.

**M78:** Emission nebula in Orion.

**M79:** Class V globular cluster in Lepus.

**Last Month:** M33, M34, M52, M74, M76, M77, M103

**Next Month:** MM41, M44, M46, M47, M48, M50, M67, M81, M82, M93

## NGC and other Deep Sky Objects

**NGC 2244:** Open cluster in the Rosette Nebula in Monoceros.

**NGC 2261:** Hubble's Variable Nebula in Monoceros.

**NGC 2264:** The Christmas Tree Cluster in Monoceros.

**NGC 2362:** Tau Canis Majoris Cluster.

**NGC 2392:** Eskimo Nebula in Gemini.

## Double Star Program List

**32 Eridani:** Yellow primary with a white secondary.

**55 Eridani:** Yellow and pale yellow pair.

**Gamma Leporis:** Pair of yellow stars.

**Epsilon Monocerotis:** White and pale yellow stars.

**Beta Monocerotis:** Two bluish white stars.

**Kappa Puppis:** Equal pair of white stars.

**Alpha Ursa Minoris:** Pale yellow and white pair.

**N Hydrae:** Equal yellow stars.



## Challenge Object

**NGC 2158:** A faint open cluster just SW of M35 in Gemini. Look for a faint splash of stars in a 4' area.

# Focus on Constellations: Canis Major

Jim Kvasnicka

## Canis Major

Canis Major, the Big Dog, along with Canis Minor are the two hunting dogs of Orion who help him track and fetch game. Canis Major is located southeast of Orion, standing beside the hunter's feet. The Big Dog has his eye, Sirius, fixed on Lepus the Hare, crouched at Orion's feet. Canis Major contains Sirius, the brightest star in the sky at a magnitude -1.4. The constellation covers only 380 square degrees but is not lacking for deep sky objects. It is rich in open clusters including Messier 41. There are several complex nebulosities and galaxies, a planetary nebula, and numerous double stars. Canis Major is best seen in the month of February.

## Showpiece Objects

**Open Clusters:** M41, NGC 2362 (Tau Canis Majoris Cluster), NGC 2360

**Double Stars:** h3945, Mu Canis Majoris, Pi Canis Majoris, 17 Canis Majoris

## Mythology and History

Canis Major is the larger of Orion's two hunting dogs. The Arabic title for the constellation was The Dog of the Giant. The ancient Egyptians believed the flooding of the Nile was caused by the power of the star Sirius. The name Sirius comes from the Greek meaning "scorching". Sirius, the Dog Star, was associated with the Sun. During the hot summer months the ancients believed the heat of Sirius was added to the Sun.

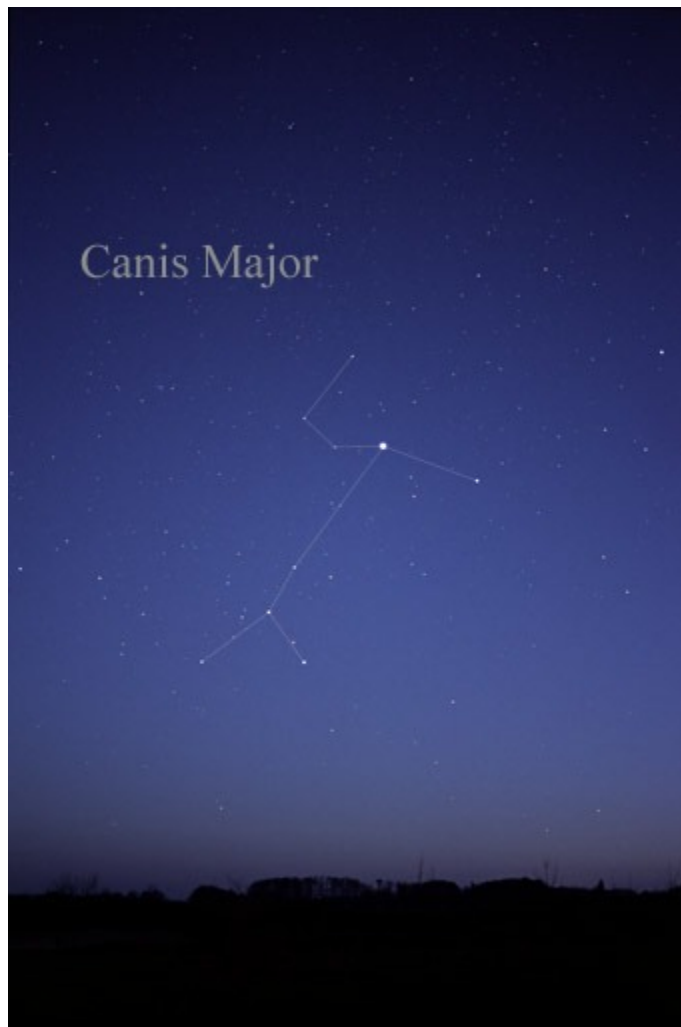
To this day we call the hottest portion of summer the "dog days".

## Number of Objects Magnitude 12.0 and Brighter

**Galaxies:** 10

**Open Clusters:** 20

**Planetary Nebulae:** 2



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



# The Loneliest Galaxy in the Universe

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](http://spaceplace.nasa.gov) to explore space and Earth science!

Ethan Siegel



Our greatest, largest-scale surveys of the universe have given us an unprecedented view of cosmic structure extending for tens of billions of light years. With the combined effects of normal matter, dark matter, dark energy, neutrinos and radiation all affecting how matter clumps, collapses and separates over time, the great cosmic web we see is in tremendous agreement with our best theories: the Big Bang and General Relativity. Yet this understanding was only possible because of the pioneering work of Edwin Hubble, who identified a large number of galaxies outside of our own, correctly measured their distance (following the work of Vesto Slipher's work measuring their redshifts), and discovered the expanding universe.

But what if the Milky Way weren't located in one of the "strands" of the great cosmic web, where galaxies are plentiful and ubiquitous in many different directions? What if, instead, we were located in one of the great "voids" separating the vast majority of galaxies? It would've taken telescopes and

imaging technology far more advanced than Hubble had at his disposal to even detect a single galaxy beyond our own, much less dozens, hundreds or millions, like we have today. While the nearest galaxies to us are only a few million light years distant, there are voids so large that a galaxy located at the center of one might not see another for a hundred times that distance.

While we've readily learned about our place in the universe from observing what's around us, not everyone is as fortunate. In particular, the galaxy MCG+01-02-015 has not a single known galaxy around it for a hundred million light years in all directions. Were you to draw a sphere around the Milky Way with a radius of 100 million light years, we'd find hundreds of thousands of galaxies. But not MCG+01-02-015; it's the loneliest galaxy ever discovered. Our Milky Way, like most galaxies, has been built up by mergers and accretions of many other galaxies over billions of years, having acquired stars

and gas from a slew of our former neighbors. But an isolated galaxy like this one has only the matter it was born with to call its own.

Edwin Hubble made his universe-changing discovery using telescope technology from 1917, yet he would have found absolutely zero other galaxies at all were we situated at MCG+01-02-015's location. The first visible galaxy wouldn't have shown up until we had 1960s-level technology, and who knows if we'd have continued looking? If we were such a lonely galaxy, would we have given up the search, and concluded that our galaxy encompassed all of existence? Or would we have continued peering deeper into the void, eventually discovering our unusual location in a vast, expanding universe? For the inhabitants of the loneliest galaxy, we can only hope that



*Image credit: ESA/Hubble & NASA and N. Gorin (STScI);  
Acknowledgement: Judy Schmidt, of the loneliest void galaxy  
in the known: MCG+01-02-015.*

## ***From the Archives: November, 1963***

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To those club members who received their second notice from Sky and Telescope, let me inform you, the renewals have all been taken care of by your Treasurer, Dr, John Howe, To those who have not sent in your checks do so at once so we may bring things up to date.

Last meeting was a Jim Dandy, We had a very good program and a very fine turn out. Richard Johnson gave a lecture on "OUR MOON," It was as you might expect from "RICK" Tops.

Part of our program for next regular meeting Nov, 12th will be a talk by our own Prof. Carol Moore on the July total Eclipse of the Sun, This also should be one of our Best, Don't Miss IT.

Our Own Sky Party out Cheney Way was spoiled by a change of weather which moved in after 9 PM. We had a good turnout even under adverse conditions. We will have a repeat performance of this later.

Now that we are into November (Nearly) and chilly nights are with us again, it takes some doing to get the SCOPE out, but after so doing you will find the best sky subjects of the year at hand. LYRA, CYGNUS? CAPRICORNUS? AQUARIUS? And later in evening PISCES, CETES, and Andromeda.

The above is just a start for this seasons viewing, If a person just stays up a little later and keeps his eyes to the EAST you can just watch the curtain rise and new fields and sights come into view,

Around midnight our old friend ORION just pops up. This page won't hold what can be seen at this time of year.

One subject of special interest is the Variable STAR ALGOL, the DEMON STAR IN PERSEUS. It is a short period Variable, 2 days, 20 Hrs., 48 min, Minimum lasts just about 20 minutes, Fluctuations caused by dark Eclipsing Body.

Had a nice letter from Pete Schultz. He misses us, and we sure miss that spark plug "PETE". Says he has seen some northern lights, but nothing outstanding as of date, Pete is in school, Carlton College, Northfield, Minn.

A Note Of Interest: The Edmund Scientific Co, have a new catalogue out NOW, and if you will just write them they will send you one, I think it is one of the best arranged catalogues covering the subject We as amateur Astronomy fans are interested in, The address is EDMUND SCIENTIFIC CO, BARRINGTON, NEW JERSEY, 08007, You will find answers in this catalogue such as Light gathering, resolving power, Magnification, Eyepieces, Mountings, Refractors, Reflectors, and a host of other valuable information, Two very valuable booklets they have listed are "TIME IN ASTRONOMY NO. 9054 – 60 cents and How to Use Your Telescope No. 9055, also 60 cents.

Jess Williams

## 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: Checked out  
10 inch Meade Dobsonian: Available  
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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