

# *The Prairie Astronomer*

April 2016 Volume 57, Issue #4

## **Hubble Unveils Monster Stars**

(cover photo)

*April Program:  
"Space Law Part 2"*



**Night Sky Network**



The Newsletter of the Prairie Astronomy Club

# ***The Prairie Astronomer***

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

## **PROGRAM**

April: Space Law Part II - Elsbeth Magilton & Prof Frans Von der Dunk

Space law is the branch of law addressing all mankind's activities in or with respect to outer space. Originally international in nature, a number of key treaties provide the basis of agreement between all major spacefaring nations, including the United States, although regularly new developments arise which require reassessment, adaptation or amendment of the current regime. Such developments range from prospective space mining and space tourism to issues of space debris and military uses of outer space. Increasingly, such developments are (also) addressed by national legislation, which however has to fit within the broader framework of international space law. The presentation provides a high-level overview of these developments and puts them into legal perspective.

## **FUTURE PROGRAMS**

May: New Horizons and Pluto - Nathaniel Cuningham, NWU Physics and Astronomy Dept.

June: Solar Star Party

August: NSP Review

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

# EVENTS



PAC Meeting  
 Tuesday April 26th, 2016, 7:30pm  
 Hyde Observatory

Mercury Transit, May 9th

Tuesday May 31st, 2016, 7:30pm  
 Hyde Observatory  
 Program: New Horizons and Pluto

PAC Meeting  
 Tuesday June 28th, 2016, 7:30pm  
 Hyde Observatory  
 Solar Star Party

Newsletter submission deadline May 16

## 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>	



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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**

## PAC Meeting Minutes

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Minutes for the meeting of March 29, 2016 President Jim Kvasnicka called the meeting to order. Welcome to our visitors and guests, including our presenter, Mark Els and his guests. Jim listed some upcoming events for the month of April. Branched Oak Observatory will hold a star party on Friday April 15 from 8-11PM Dan Delzell mentioned the Salt Valley District Boy Scouts Camporee on Saturday the 16th. There are few volunteers for this event, with 200-250 participants. If you'd like to help out, contact Dan. Astronomy Day is Sunday April 17th at Morrill Hall. The next PAC meeting is Tuesday April 26. The Mid-States

Regional convention of the Astronomical League is June 3-5 at the University of Missouri. Jim reviewed benefits and dues of membership in the club. Jim presented his April Observing report. Club business; Jim's family provides us use of their land as an observing site for our star parties. We have been compensating Jim for mowing the site and paying Jim's mother-in-law to express our appreciation. Jim asked for comments and questions about this and for a decision on continuing to do this. Dan Delzell made a motion that we continue this at the current rates and Lee Taylor seconded. Motion carried. Treasurer's Report John

provided a summary of the club's finances and asked for questions and comments. One recent member asked about our high balances and John and other senior members reviewed our former ownership of the Atlas site. Earl Moser memorial. The sundial has arrived! We now have to find a proper location for it in front of Hyde. With the conclusion of business. Jim adjourned to our program on space law, presented by Mark Ells.

Respectfully submitted by,  
Lee Taylor

## Observing Awards

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Congratulations to Bob Kacvinsky for completing the *Two In the View* Program. This is Bob's 8<sup>th</sup> observing award having already completed the Messier Program, Lunar Program, Double Star Program, Herschel 400 Program, Binocular Messier Program, Caldwell Program, and the Globular Cluster Program. Bob

has also received an Outreach Award.

Congratulations to Jim Kvasnicka for completing the *Herschel 400* Program. This is Jim's 10<sup>th</sup> observing award having already completed the Messier Program, Binocular Messier Program, Lunar Program, Double Star Program,

Caldwell Program, Globular Cluster Program, Urban Program, Binocular Deep Sky Program, and the Comet Observing Program (Silver). Jim has also received an Outreach Award.

Congratulations again to Bob and Jim.

*Cover photo: An international team of astronomers using the ultraviolet capabilities of NASA's Hubble Space Telescope has identified nine monster stars with masses over 100 times the mass of the sun in the star cluster R136. This makes for the largest sample of very massive stars identified to date. The results, which will be published in the Monthly Notices of the Royal Astronomical Society, raise many new questions about the formation of massive stars. R136 is only a few light-years across and is located in the Tarantula Nebula within the Large Magellanic Cloud, about 170,000 light-years away from Earth. The young cluster hosts many extremely massive, hot, and luminous stars whose energy is mostly radiated in the ultraviolet.*

# Lincoln's First Total Eclipse?

Rick Brown



With excitement now growing about the “Great American Eclipse” of August, 2017 (which will bless Hyde Observatory with 89 seconds of totality), I became curious about previous eclipses in this area. I wanted to know: when was the last time our fair city of Lincoln stood in the path of totality? To help with this query, I took advantage of the many maps and tables available at Fred Espenak’s NASA eclipse website (<http://eclipse.gsfc.nasa.gov>), and here is what I found.

If we go back to the total eclipse of August 7, 1869, we get a “near miss.” At Lincoln’s location, the sun was about 98% covered that day. But the city was still about 65 miles shy of the path of totality, and as anyone who’s witnessed a total eclipse will tell you, the difference between 100% and 98% is like...well, night and day. This one doesn’t count.

If we go back a few more years, to October 19, 1865, we encounter Lincoln’s most recent *annular* eclipse (although the city was called Lancaster back then). For observers here, annularity started around 9 in the morning and lasted around 7 minutes. 94.8% of the sun’s diameter was covered by the moon. This was undoubtedly a wonderful event, because it was the first annular eclipse to be witnessed in this spot in nearly a thousand years (the previous one having been in the year 881). But this is not the eclipse we are looking for.

For that, we have to wind the clock all the way back to July 7, 1442. A few Pawnee and Lakota may have been here to see it. The place we now call Lincoln was right at the southern limit of the path of totality. An interactive map of the eclipse path can be found here ([http://eclipse.gsfc.nasa.gov/SEsearch/SEsearch\\_map.php?Ecl=14420707](http://eclipse.gsfc.nasa.gov/SEsearch/SEsearch_map.php?Ecl=14420707)). You can zoom in, and click on any spot to find local circumstances. If you look at that map, you’ll see that the spot where Hyde observatory now stands was,

according to best estimates, only *a mile* from the path’s southern limit, and got only 37 seconds of totality (compared to 3.5 minutes at the path’s center).

But there is room for some doubt about whether Hyde’s location actually fell within the 1442 path of totality at all. There are a couple of sources of uncertainty when calculating eclipse paths:

There’s the “lunar limb profile.” The outline of the moon’s disk is not perfectly circular, but is full of irregularities due to lunar mountains and valleys at the edge. These can affect the accurate calculation of the width of the path of totality. Fortunately, Fred Espenak (who generated the data from which this map was made) has said that he purposely errs on the conservative side, essentially predicting a narrow path which may turn out to be slightly wider due to the lunar limb profile. So this is a point in favor of Hyde’s location lying within the path.

Of greater concern is the fact that the speed of the earth’s rotation varied in the past, by amounts that are not completely well known. There’s an estimated time offset value called “ $\Delta T$ ” which goes into eclipse calculations to try to account for this; but it’s only an estimate. According to Espenak, the uncertainty in  $\Delta T$  for the 15th century is around 20 seconds; and this basically means our calculation of the rotation angle of the earth (and thus Lincoln’s location with respect to the eclipse path) could be off by that much. At Lincoln’s latitude, the earth spins at about 1170 feet per second. This means, in the worst case, the actual location of the path of totality may conceivably be shifted up to 4.4 miles farther east than what’s shown in the interactive map. In that worst-case scenario, about half of the (future) city would

still be in the path of totality; but (future) Hyde Observatory would not.

So, I think it's fair to say we've identified the most recent date that the umbra of a total solar eclipse crossed this area. So, why have I called this

article, "Lincoln's *First Total Eclipse?*" Because it's also fair to say that, to date, there has *never* been a total solar eclipse here as long as the place has been known as "Lincoln." In that sense, we can truly say that *Lincoln's* first total solar eclipse will be on August 21, 2017.

## ***Huygens Spots Methane Fog on Saturn's Moon Titan***

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*Matt Williams, Universe Today*

Titan is a moon shrouded in mystery. Despite multiple flybys and surface exploration conducted in the past few decades, this Cronian moon still manages to surprise us from time to time. In addition to having a dense atmosphere rich in hydrocarbons, which scientists believe may be similar to what Earth's own atmosphere was like billions of years ago, it appears that methane is to Titan what water is to planet Earth.

In addition, methane fog was also observed by the Cassini space probe back in 2009 as it conducted a flyby of Titan. But recent findings by a team of researchers from York University indicates that the Huygens lander also detected fog during its descent towards the surface in 2005. This evidence, combined with the data obtained by Cassini, have helped to shed light on the weather patterns of this mysterious moon.

In a paper that appeared in arXiv on March 14th, Dr. Christina Smith – a postdoctoral researcher from York University's Center for Research in Earth and Space Sciences (CRESS) – described how the Huygens probe's Side Looking Imager (SLI) obtained information that has since been

analyzed to identify potential atmospheric features. These features show that Titan experiences meteorological phenomena which were not previously known.

In total, the team looked over 82 SLI images, which were all taken after the lander reached the surface. These were then calibrated, processed and examined for signs of atmospheric features. Of these, six showed evidence of an extended horizontal feature that differed in radiance from what was predicted at higher and lower regions. No other discernible features were detected.

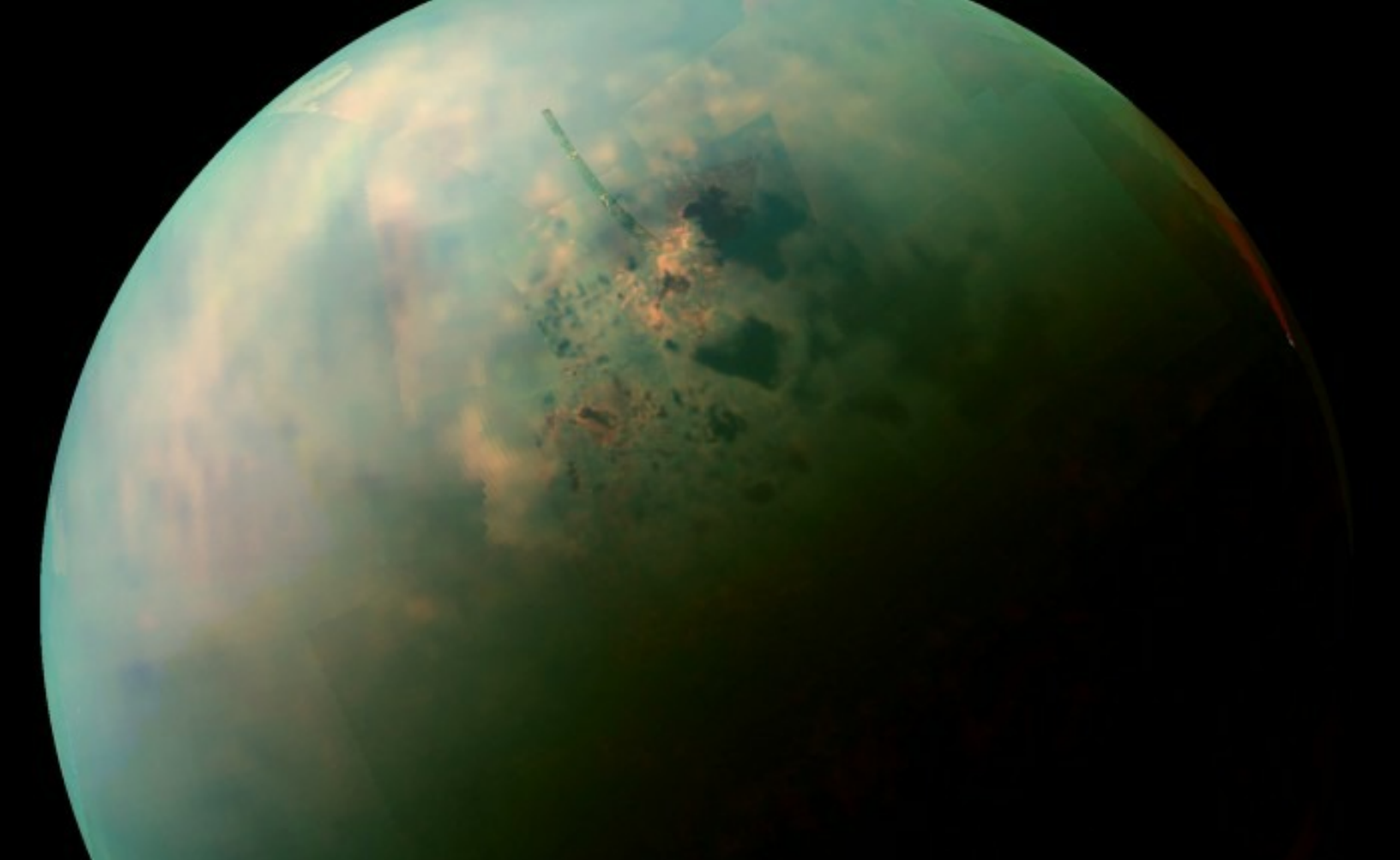
The team concluded that this feature most likely originated from the presence of a fog bank close to the horizon that rose and fell during the period of observation. This indicated that it had recently rained in the area, which was a rather surprising find. Much like the observations made in 2009, the presence of methane fog shows that Titan has an active methane hydrological cycle.

In essence, this means that methane on Titan is subject to the same transfer process as water is here on Earth. Basically,

liquid methane on the surface evaporates and is exchanged with the atmosphere, where it condenses to form fog banks and rain clouds. As Christina Smith told Universe Today via email:

"We initially set out to see if we could see features such as clouds from the Huygens SLI data, but the features we found don't seem to be consistent with clouds and more likely are caused by a fog bank rising and falling over the time of observation. Fog had been seen before from orbit but never from the surface of Titan – this is what makes this work so exciting. This work is also a great example of how new insights and new findings can be made from "older" data sets."

Looking over this old data for the sake of making new discoveries was made possible, in part, because of the ongoing investigations conducted by Martian rovers and their respective science teams. Brittney Cooper – an undergraduate research assistant at CRESS and the second author of the paper – explained via email:



*Titan's dense, hydrocarbon rich atmosphere remains a focal point of scientific research. Credit: NASA*

“We applied a technique of image analysis developed by Mark Lemmon for use with the Mars Exploration Rovers that was adapted by John Moores for use on the Mars Phoenix lander mission. This analysis method allowed the faint, barely observable atmospheric features captured by the Huygens’ probe Side Looking Imager (SLI) on Titan to be amplified and more easily discerned.”

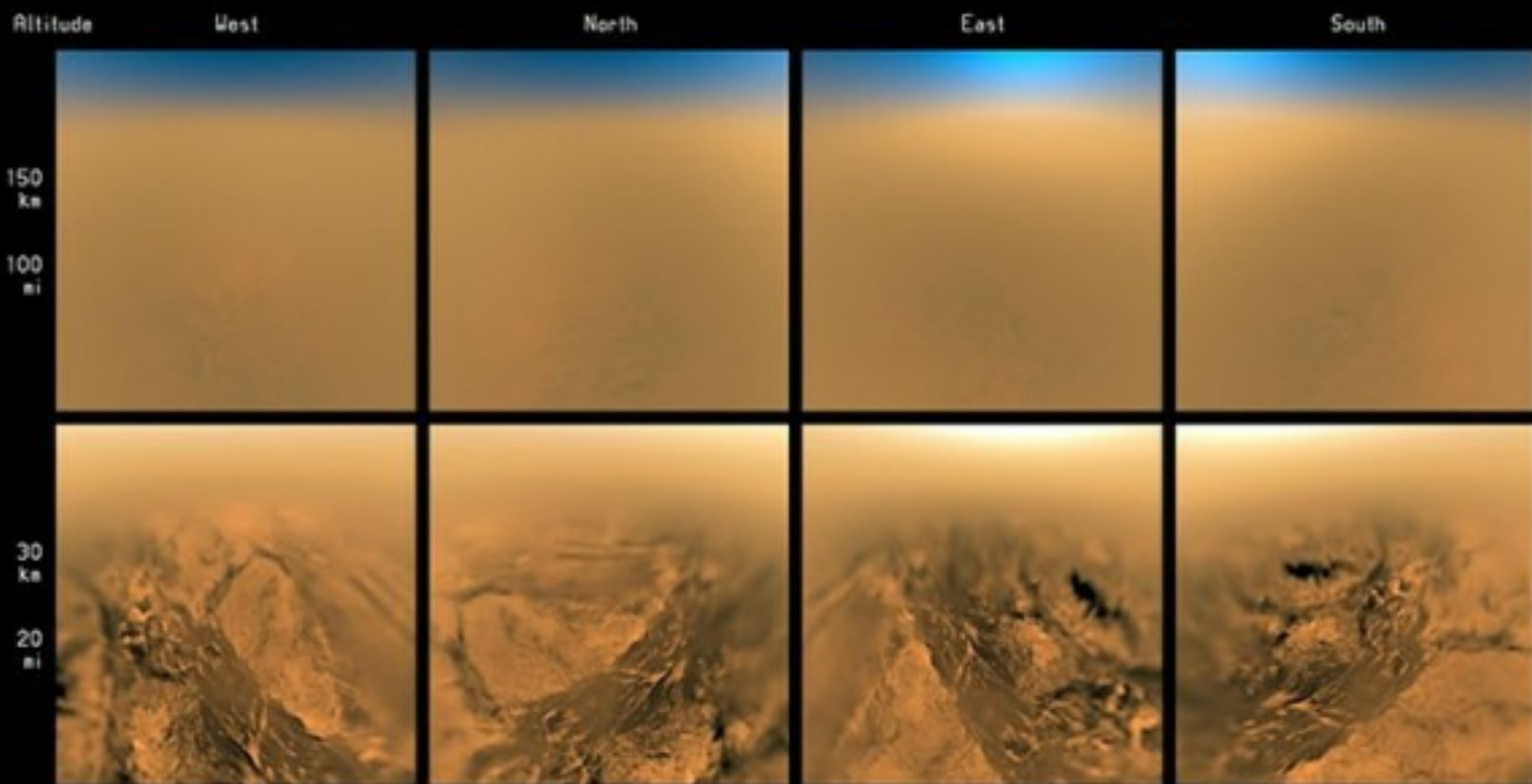
For years, scientists have understood that on Titan,

methane is analogous to water. It exists in liquid form (especially around the north pole where several large methane lakes exist), and in gaseous form in the atmosphere. However, what they did not know was whether or not there was an active cycle, where liquid methane on the surface was replenished through evaporation, condensation, and rain.

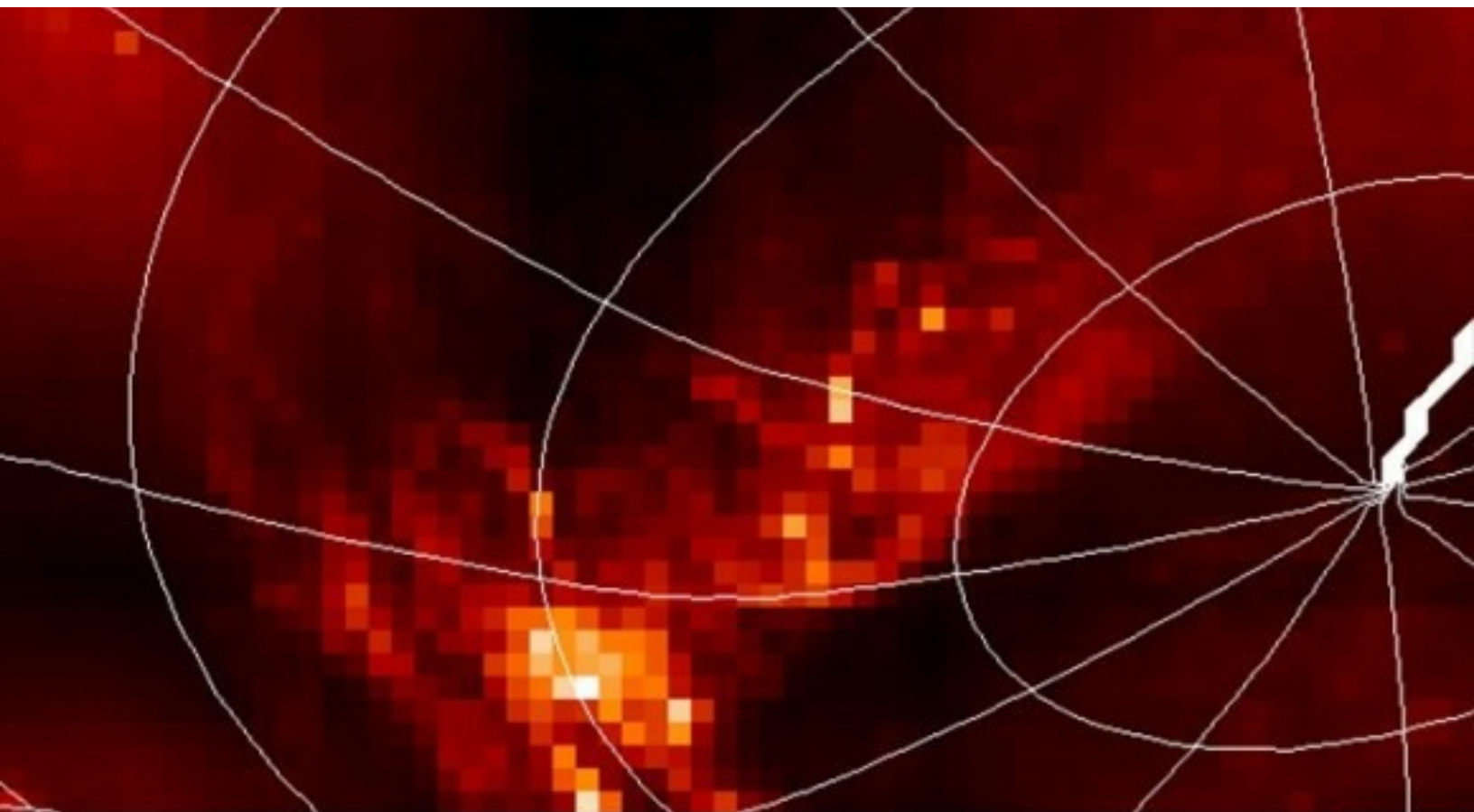
But this evidence, combined with the Cassini probe data, shows that on Titan, there is an active

transfer process between the liquid methane and the atmospheric methane. And where atmospheric humidity reaches 100%, methane fogs will form. Just the latest in a long line of fascinating discoveries to emerge from this mysterious moon!

# Aerial Views of Titan Around the Huygens Landing Site



*Pictures of fog on Titan, taken by the Huygens probe as it descended towards the surface. Credit: ESA/NASA/JPL/University of Arizona.  
Below: Cassini data showing fog around Titan's southern polar region in 2009. Credit: Mike*





# Observatory Update: SN2016bau in NGC 3184

Rick Johnson

Last update was my last 2015 image. Rather than moving on to the first 2016 update I'm going for an image taken April 5 of a recent supernova in a galaxy I did in 2014. Since a second SN is in another major galaxy I've imaged I tried for it as well. If processable it will be in the next update then it will be back to taking them in date order again.

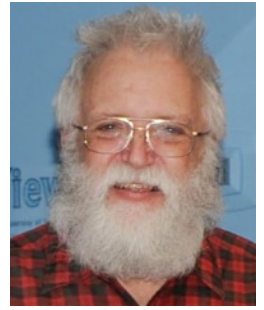
A supernova was discovered by Koichi Itagaki in NGC 3184 on March 21, 2016. It is officially Supernova 2016bkv. I've wanted

to take it ever since along with 2016bau discovered March 13 as it is in Arp 27. The first sucker holes didn't open until April 5 UT -- and sucker holes they were! More on that in a bit.

The galaxy NGC 3184 is about 40 million light-years distant so the star actually exploded 40 million years ago; its light just now reaching us. In the thumbnail image it is the lower right of two stars to the upper left of the galaxy's core. See the [animated link](#) to see a before and after image. The star may

be one of many in a small blue star cluster seen in the before image as a blue object. It appears to be on the upper right edge of this little blue blob of stars. This galaxy hosted other supernovae in 1999, 1937 and 1921. That's far more often than in most galaxies, ours included.

Conditions here were awful on



the night of April 5 UT when this was taken. As a result I was able to only get two luminance, red and blue images with one green. The color frames were hit hard by clouds. The result was bright halos around the brightest stars as well as the entire image being fainter than I'd like. I'd taken an image of this galaxy in March of 2014 that was far better. To make this image I used that image and overlaid the new image after alignment. I cut out the stars with halos due to the clouds and combined using lighten mode. I was surprised to see nothing change but for the supernova. That's the full image with this post. I then cropped both and

made an animated GIF to show the before and after views. This shows the supernova may have been on the edge of that blue star cluster seen in the original. The alignment was done by RegiStar so should be dead on.

It is hard to estimate a star's magnitude when it is seen against a galactic background. I'm getting 14.8 so it should be visible in good skies for those of you with large aperture scopes. Though the "bright" galactic background will make it harder to see than a similar magnitude star against dark sky.

I just noticed as I went to post this that a field star to the left

edge of the galaxy is brighter. I assume it is a variable star in our galaxy.

The original post of this galaxy from 2014 can be seen in update #14-146 10-20-14 for those saving these. If not saved or you are new to the list much of it is [here](#).

If the similar sucker hole try that same night for Arp 27 can be processed I'll try and have it next. Conditions only had gotten worse by the time I moved to it however and I've not looked at the data. It is a bit fainter so I went with the easier one first.

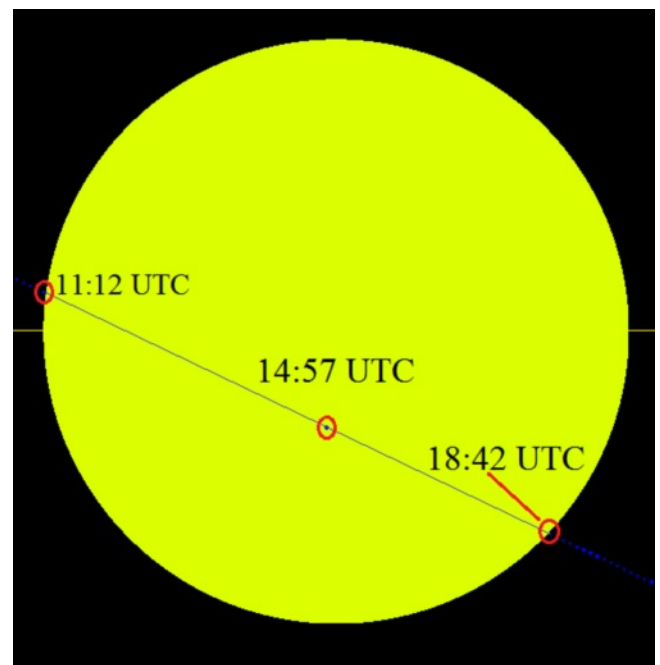
## Mercury Transit: May 9, 2016

Transits of Mercury can happen in May or November with May transits being about half as frequent as November transits. They currently occur within a few days either side of May 8 and November 10. The interval between one November transit and the next November transit may be 7, 13, or 33 years; the interval between one May transit and the next May transit may be 13 or 33 years. May transits are less frequent than November transits because during a May transit, Mercury is near aphelion whereas during a November transit, it is near perihelion. Perihelion transits occur more frequently due to two effects: firstly, Mercury moves faster in its orbit at perihelion and can

reach the transit node more quickly, and secondly at perihelion Mercury is closer to the Sun and so has less parallax.

During May transits Mercury has an angular diameter of 12" and these transits take place at the descending node of Mercury's orbit. During November transits Mercury has an angular diameter of 10" and these transits occur at the ascending node.

Transits of Mercury are gradually drifting later in the year; before 1585 they occurred in April and October.



Credit: Tomruen, Wikipedia.

# **Astrophotography- By Beth Jenckes**

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Upper left: Starry sky with me sitting by Zion entrance

Upper right: Orion in Utah sky

Lower right: Starry sky over the Watchman mountain at Zion National Park

Lower left: The Watchman over glow of Zion campsite



# May Observing: What to View

Jim Kvasnicka

## Planets

**Jupiter:** Shines at magnitude -2.1 with a disk 37" wide.

**Mars:** Starts the month at magnitude -1.5 and increases to -2.1.

**Saturn:** Shines at magnitude 0.0 with its rings tilted 26° from edge on.

**Venus / Mercury / Uranus / Neptune:** All are not visible in May.

**Transit of Mercury:** May 9<sup>th</sup> starting at 6:12 am and ending at 1:42 pm.

## Messier List

**M49:** Galaxy in Virgo.

**M51:** The Whirlpool Galaxy in Canes Venatici.

**M61:** Galaxy in Virgo.

**M63:** The Sunflower Galaxy in Canes Venatici.

**M64:** The Black Eye Galaxy in Coma Berenices.

**M85:** Galaxy in Coma Berenices.

**M94:** Galaxy in Canes Venatici.

**M101:** The Pinwheel Galaxy in Ursa Major.

**M102:** Galaxy in Draco.

**M104:** The Sombrero Galaxy in Virgo.

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

**Next Month:** M58, M59, M60, M84, M86, M87, M88, M89, M90, M91, M98, M99, M100

## NGC and other Deep Sky Objects

**NGC 4244:** The Silver Needle Galaxy in Canes Venatici.

**NGC 4449:** Irregular galaxy in Canes Venatici.

**NGC 4565:** The Needle Galaxy in Coma Berenices.

**NGC 4631:** The Whale Galaxy in Canes Venatici.

**NGC 4725:** Galaxy in Coma Berenices.

**NGC 5053:** Globular cluster in Coma Berenices

## Double Star Program List

**Kappa Bootis:** Yellow and blue stars.

**Iota Bootis:** Yellow primary with a dim blue secondary.

**Pi Bootis:** Pair of white stars.

**Epsilon Bootis:** Yellow and greenish yellow stars.

**Xi Bootis:** Pair of yellow stars.

**Delta Bootis:** Yellow primary with a blue-white secondary.

**Mu Bootis:** Yellow pair.

**Zeta Corona Borealis:** Light blue and greenish yellow stars.

## Challenge Object

**Markarian's Chain:** A string of eight galaxies in the Virgo Galaxy Cluster. M84, M86, NGC 4435, NGC 4438, NGC 4458, NGC 4461, NGC 4473, NGC 4477.



# Focus on Constellations: Canes Venatici

Jim Kvasnicka

## Canes Venatici

Canes Venatici, the Hunting Dogs, is a constellation with few stars but rich in galaxies. Almost all of the galaxies in Canes Venatici are visible in a small telescope. Looking towards Canes Venatici we seem to be looking through three layers of galaxy groups. The closest group the Canes Venatici I Cloud is an average of 20 million light years distant. It includes M94 and M106. The next group the Canes Venatici II Cloud is centered 35-40 million light years away and includes M51 and M63. The third layer of galaxies in Canes Venatici is 70-80 million light years distant. Besides the four Messier galaxies, M51, M63, M94, and M106, Canes Venatici contains one of the three brightest globular clusters in the northern hemisphere in M3. The constellation Leo is best seen in May.

## Showpiece Objects

**Galaxies:** M51, M63, M94, M106, NGC 4244, NGC 4449, NGC 4631, NGC 5005

**Globular Clusters:** M3

**Multiple Stars:** Alpha Canes Venatici (Cor Caroli), 2 Canes Venatici

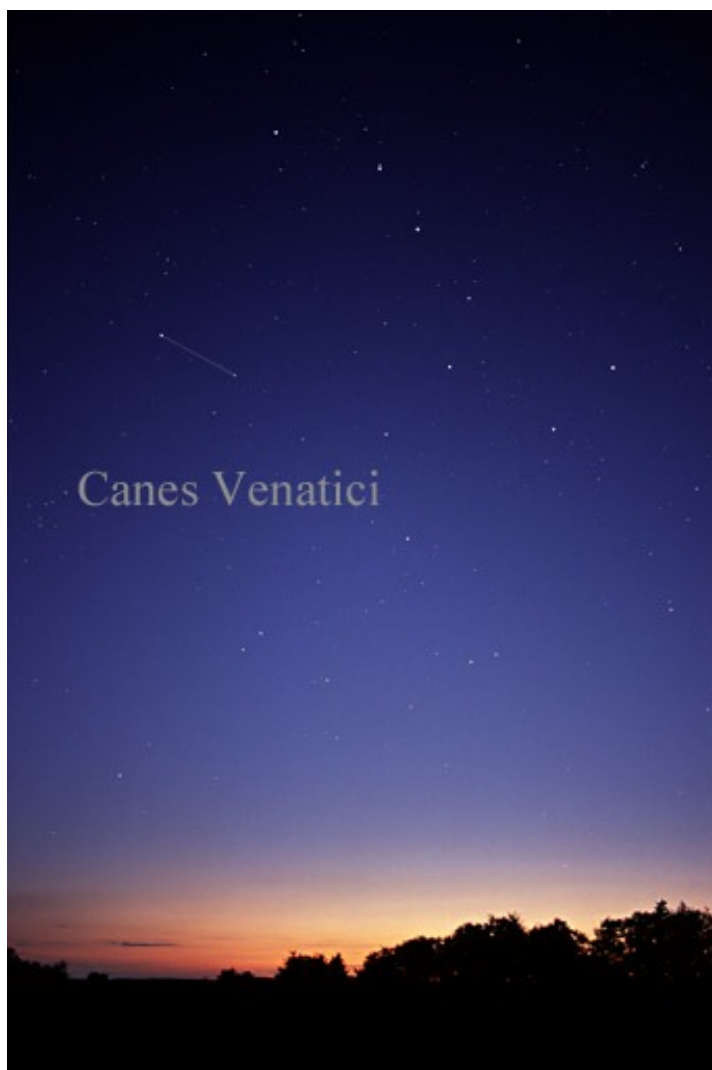
## Mythology

Canes Venatici was introduced by the Polish astronomer Johannes Hevelius in 1690. It represents the two dogs Asterion and Chara, both held on a leash by Bootes as they chase the Great Bear around the North Pole.

## Number of Objects Magnitude 12.0 and Brighter

**Galaxies:** 44

**Globular Clusters:** 1



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

## From the Archives: May, 1976

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### Behlen Public Night, Gateway Sky Show Highlight Month's Club Activities

(Earl Moser was caught up in committees, graduations, and astronomy programs when we called for this month's President's Report, so Vice President Larry Stepp has filled in for Earl. --Ed.)

Eight telescopes and about twenty people from the Prairie Astronomy Club assisted at the Behlen Observatory Public Night on Friday, May 7.

The Omaha Astronomical Society provided nine telescopes and about the same number of people as the Lincoln club.

Visitors to the observatory's 30-inch telescope were given the opportunity to take extended looks through a variety of instruments, including Roger Besch's 12 1/2-inch Cave, Rick Johnson's 10-inch f/8, Bill Besch's Criterion RV8, Merton Sprengel's Celestron 8, Earl Moser's Dynamax 8, Brad Bender's 6-inch custom, Jeff Mallatt's Criterion RV6, and Dr. Robert Manthey's 3 1/2-inch Questar.

The Boiler & Chivens 30 was trained on Saturn several times during the session, along with M82 and M31. Saturn was crisp and detailed early in the evening, but as the night progressed seeing deteriorated to the point where it was as well seen through some of the amateur instruments.

Films and slides were shown inside the observatory. Dr. Manthey and his daughters provided popcorn for the crowd, and both clubs handed out material on their programs to prospective new members.

The night of May 6 saw three telescopes on the mall at Gateway Shopping Center for the monthly sky show.

Bill Besch brought out his Criterion RV8, Rick Johnson was on hand with his 10-inch f/8, and Earl provided his Dynamax 8. Everyone agreed it was the best seeing in many a quarter moon for a Gateway sky show. The atmosphere was steady enough to allow high powers on the moon, and elusive features such as pair of small craters on the floor of Plato were easily seen.

Although daylight saving time cut into the length of the show, crowds were good with people waiting at the telescopes during the entire show.

It's always interesting to give a first-time skygazer his maiden glimpse through a telescope. It has been my experience that 15-20% of first-timers think they're looking at a picture, not the real thing. And another 15-20%, when shown the moon for the first time, want a good look at the footprints, launch stand, lunar rover, etc., that the astronauts left behind!

We are getting much better turnouts from the club at these

affairs, and we want to encourage more members to bring out their telescopes. Believe me, it is anything but a dull experience--giving people what may be a once-in-a-lifetime look through a good astronomical instrument, and sharing their excitement at discovery is worth the little time it takes to unpack and set up.

And... you never can tell who might wander by. Earl had an interesting chat with Walter Behlen (yes, that Behlen), who happened upon our little group, and talked telescopes for awhile.

The next Gateway show will be Thursday night, June 3. Make plans now to be there.

A reminder about two conventions coming up: The Mid-States Regional--University of Missouri- Rolla campus June 18, 19 and 20. Cost is \$20.25 for 2 nights lodging and six meals, including the Saturday night banquet. The banquet speaker will be Dr. John Dickel of the University of Illinois, whose interests are supernova remnants and late stellar evolution. Check with Earl Moser for further details and registration forms. Advance registration is desirable, though not mandatory.

Astronomical League-ALPO National Convention--Kutztown, Pennsylvania, August 18-22. Highlights include a tour of the Franklin Institute, Franklin Arsenal Optics Lab, a speaker

from the Smithsonian Institution on the convention theme, "Two Hundred Years of Amateur Astronomy", a speech by Dr. Charles Price, Benjamin Franklin Professor of Chemistry, about 'Stellar Evolution and the Origin of Life", and a real coup: a NASA

report of the Viking landing on Mars by project leaders via "telelecture."

The cost of approximately \$47 will cover registration, housing for four days, banquet, and meals for three highlight days of the convention. Pre-registration

forms can be found in the center of the February issue of The Reflector. It would be nice to have the club well represented at both of these important amateur conventions.

-Larry Stepp



*A solar eclipse at Gateway's flagpole, March 7, 1970. This is about where Aereopostale and Applebee's are located now. PAC held star parties at Gateway starting in the early 1960s up until Hyde Observatory was built. In this photo, John Johnson is just left of the flag pole and Rick Johnson is on the right side of the pole.*

## Hubble Shatters The Cosmic Record For Most Distant Galaxy

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



The farther away you look in the distant universe, the harder it is to see what's out there. This isn't simply because more distant objects appear fainter, although that's true. It isn't because the universe is expanding, and so the light has farther to go before it reaches you, although that's true, too. The reality is that if you built the largest optical telescope you could imagine -- even one that was the size of an entire planet -- you still wouldn't see the new cosmic record-holder that Hubble just discovered: galaxy GN-z11, whose light traveled for 13.4 billion years, or 97% the age of the universe, before finally reaching our eyes.

There were two special coincidences that had to line up for Hubble to find this: one was a remarkable technical achievement, while the other was pure luck. By extending Hubble's vision away from the ultraviolet and optical and into the infrared, past 800 nanometers all the way out to 1.6 microns, Hubble became sensitive to light that was severely stretched and redshifted by the expansion of the universe. The most

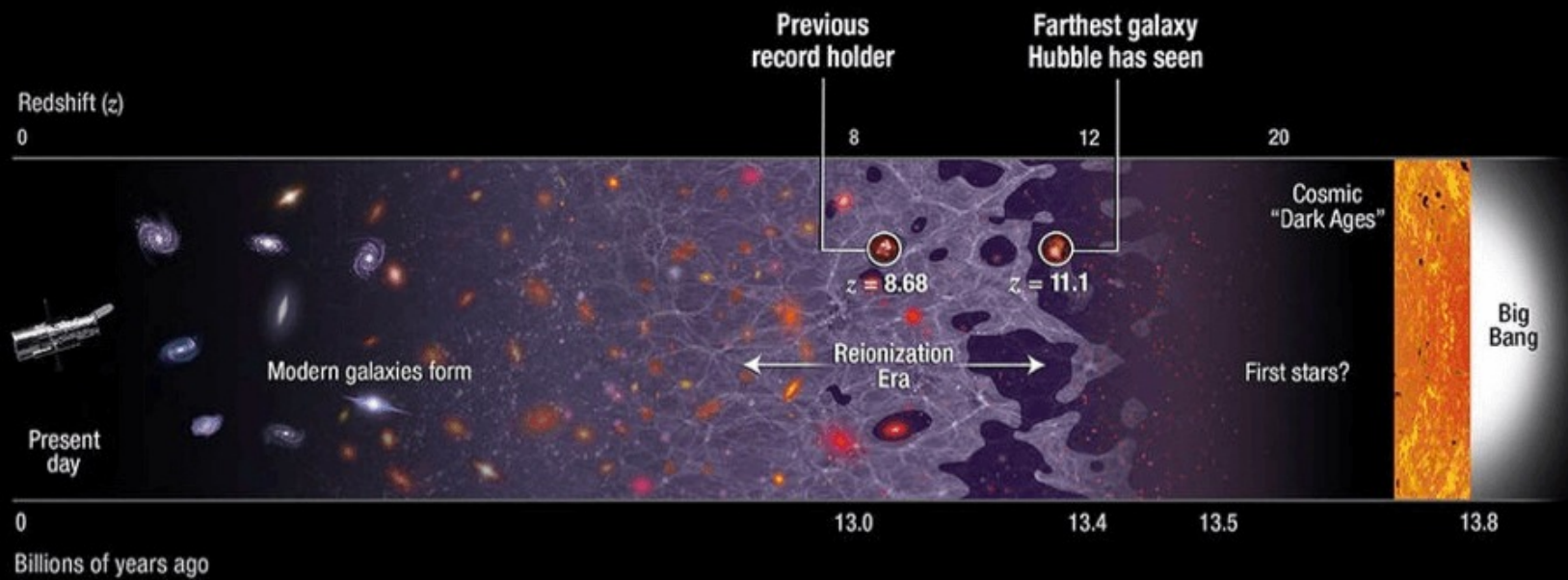
energetic light that hot, young, newly forming stars produce is the Lyman- $\alpha$  line, which is produced at an ultraviolet wavelength of just 121.567 nanometers. But at high redshifts, that line passed not just into the visible but all the way through to the infrared, and for the newly discovered galaxy, GN-z11, its whopping redshift of **11.1** pushed that line all the way out to 1471 nanometers, more than double the limit of visible light!

Hubble itself did the follow-up spectroscopic observations to confirm the existence of this galaxy, but it also got lucky: the only reason this light was visible is because the region of space between this galaxy and our eyes is mostly ionized, which *isn't true* of most locations in the universe at this early time! A redshift of 11.1 corresponds to just 400 million years after the Big Bang, and the hot radiation from young stars doesn't ionize the majority of the universe until 550 million years have passed. In most directions, this galaxy would be invisible, as the neutral gas would block this light, the same way the light from the center of

our galaxy is blocked by the dust lanes in the galactic plane. To see farther back, to the universe's first true galaxies, it will take the James Webb Space Telescope. Webb's infrared eyes are much less sensitive to the light-extinction caused by neutral gas than instruments like Hubble. Webb may reach back to a redshift of 15 or even 20 or more, and discover the true answer to one of the universe's greatest mysteries: when the first galaxies came into existence!



# Hubble spectroscopically confirms farthest galaxy to date



Images credit: (top); NASA, ESA, P. Oesch (Yale University), G. Brammer (STScI), P. van Dokkum (Yale University), and G. Illingworth (University of California, Santa Cruz) (bottom), of the galaxy GN-z11, the most distant and highest-redshifted galaxy ever discovered and spectroscopically confirmed thus far.



*Expedition 47 Flight Engineer Tim Peake of the European Space Agency took this striking photograph of the moon from his vantage point aboard the International Space Station on March 28, 2016. Peake (@astro\_timpeake) shared the image on March 30 and wrote to his social media followers, "I was looking for #Antarctica – hard to spot from our orbit. Settled for a moonset instead."*

*Image Credit: ESA/NASA*

# Astronomy Day 2016



*Annalisa Holmgren and Jim Atkins at the PAC/Hyde table*



*Bill Lohrberg*



*Jack Northrup and Brett Boller demonstrating their 3D printers*



*Jim Kvasnicka*



*Dave Churilla*



*Lee Taylor*

# Star Party Report: April 8

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Dan Delzell

Prospective member Josh Manske joined Bob Kacvinsky, Jim Kvasnicka and me at The Farm for the club star party on April 8<sup>th</sup>.

The Clear Sky Chart predicted that the seeing would be terrible and that we'd lose transparency around 11:00pm that night. The Clear Sky Chart was wrong! It turned out to be very clear and steady. One of the best nights for viewing that I've gotten to enjoy in a long time.

We were set up by 8:00. Bob had his 16" Lightbridge, Jim and I had our 16" Teeters and Josh brought a very beefy equatorial mount and a digital camera to do some photography.

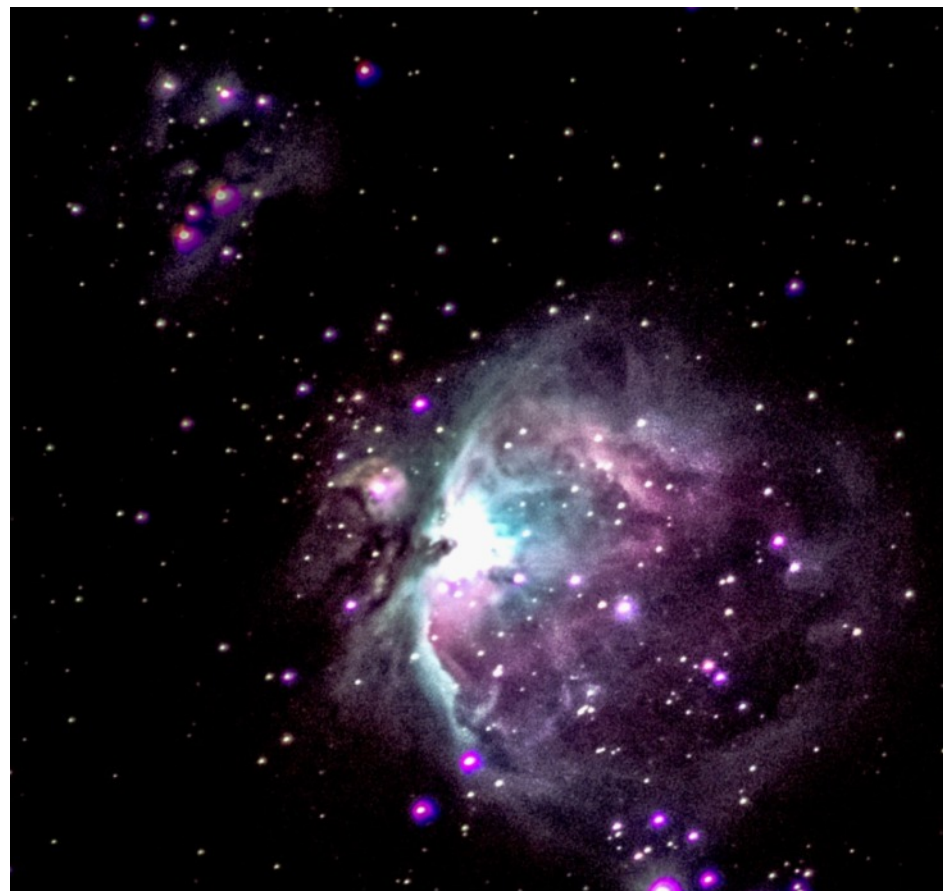
Bob was able to complete the Two in a View Program where your targets have more than one object in the field of view. Sounds like a fun program to do!

<https://www.astroleague.org/programs/two-view>. Jim viewed his 16<sup>th</sup> comet so he's over half way to completing the Comet Observing Program. I worked on the late winter Herschels, finding all the little open clusters in Canis Major, Taurus, Gemini and Aruiga and a good share of the galaxies in Leo.

Josh had a great night at his first club star party. He was able to take beautiful pictures of Orion, the Orion Nebula, the Whirlpool and the Milky Way star fields.

It was a great night to observe, but it got a little chilly. We packed up at 1:00 am and made the trip home.

I hope we get many similar great nights this summer!





## 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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