



Event Horizon



**Volume 23, Number 7
May 2016**



From The Editor

Lots of articles were submitted by club members this month. Thanks very much to all who have contributed articles and images. Keep 'em coming!

Clear Skies,

*Bob Christmas,
Editor
editor 'AT'
amateurastronomy.org*



Chair's Report by Bernie Venasse

Welcome to SPRING..... I hope!!!

I would like to extend a special welcome to our new members. The resources of the club including the loaner scope program are at your disposal. Astronomy 101 is on the verge of forming. If you are interested in joining this workshop let us know.

I attended the awards dinner and presentation ceremony at BASEF was entertaining and educational. Congratulations go out to Joseph Penman and Matthew Frulling, the winners of our sponsored prize. They are students at Maple Grove Public School.

A number of presentations have been made this past month at various locations in the area. I made my first library presentation in Stoney Creek with the aid of Les Webb and Jim Wamsley. It was a very interesting undertaking - not at all difficult - and one that I would encourage other members to experience.

The public outreach event at McQuesten Park was a great success. We had at least a dozen member telescopes set up for the 75 or so visitors.

Paul Delaney is our scheduled speaker for the May 13th meeting. Paul will be discussing 'Transits Near and Far'.

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Chair's Report (continued)

Our first survey of the membership is underway. It is important to understand the reasoning behind the survey and its questions.

Why did you join the HAA? Why have you not joined?

* What are / were you looking for? Have we met your expectations?

How did you hear about the HAA?

* It is important that we use our resources effectively.

Do you have any suggestions for topics or speakers? Please provide contact info for speakers...

* What are the things you would like to hear about?

* What level of sophistication?

Do you observe at the Binbrook CA site? Why not?

* Transportation issues? Shy? Not interested? No scope?

Are there any courses that you would like the club to offer?

* We do offer Cosmology, and Astronomy 101 programs.

* Math for amateur astronomers?

Are there any special interest groups that you would like to see developed?

* Lunar, Solar, Shallow sky, Deep sky, telescope making, techie groups

Are there any activities you would likely be willing to get involved with or participate in?

* Tours, trips, star parties, observing projects, award programs

What? Where? How? Convoys or bus?

We need your help! Would you be willing to assist occasionally? In which ways?

* Meetings, Outreach, Perseid event, Astronomy week, Open house/ Scope clinic. Without you, it won't get done...

OPTIONAL Additional information, comments and suggestions

* Your favorite aspect of astronomy, favorite equipment that you use, regular viewing site, favorite astro website.

Take part in the survey at www.amateurastronomy.org/survey.



HAA Helps Hamilton

To support our community, we collect non-perishable food items and cash for local food banks at our general meetings. Please bring a non-perishable food item to the meeting or a donation of cash and help us help others.



Our donations go to Hamilton Food Share, which delivers them to various food banks around the Hamilton area.

If you would like to help or have any questions about this initiative, please contact the H.A.A.

Masthead Photo: *Orion setting in the West, by Dane Anderson.*

Taken from Ancaster, Ontario, with his Sony A7S and a Sony FE F2.8 35mm Zeiss Lens on a tripod.



The Sky This Month for May 2016 by Matthew Mannering

This has been a busy month for the club and May looks to be equally busy. April included a very successful Public night at McQuesten Park. We had at least ten scopes set up and over 80 people stopped by for views of Mercury, Jupiter, the Moon and some double stars. Later in the month we had our first Saturday afternoon scope clinic. This is an opportunity for club members to show off their scopes and ask questions about other peoples equipment and observing technique. We also encourage members and the general public to bring along scopes for which they need help with setup and use. In this case we had people show up with two scopes including one couple with an 8" Newtonian from the early 80's.

On May 14th we'll be set up for the public at Bayfront Park in Hamilton for Astronomy Day. There will be solar viewing from 2-5pm and stargazing from 8-11pm.

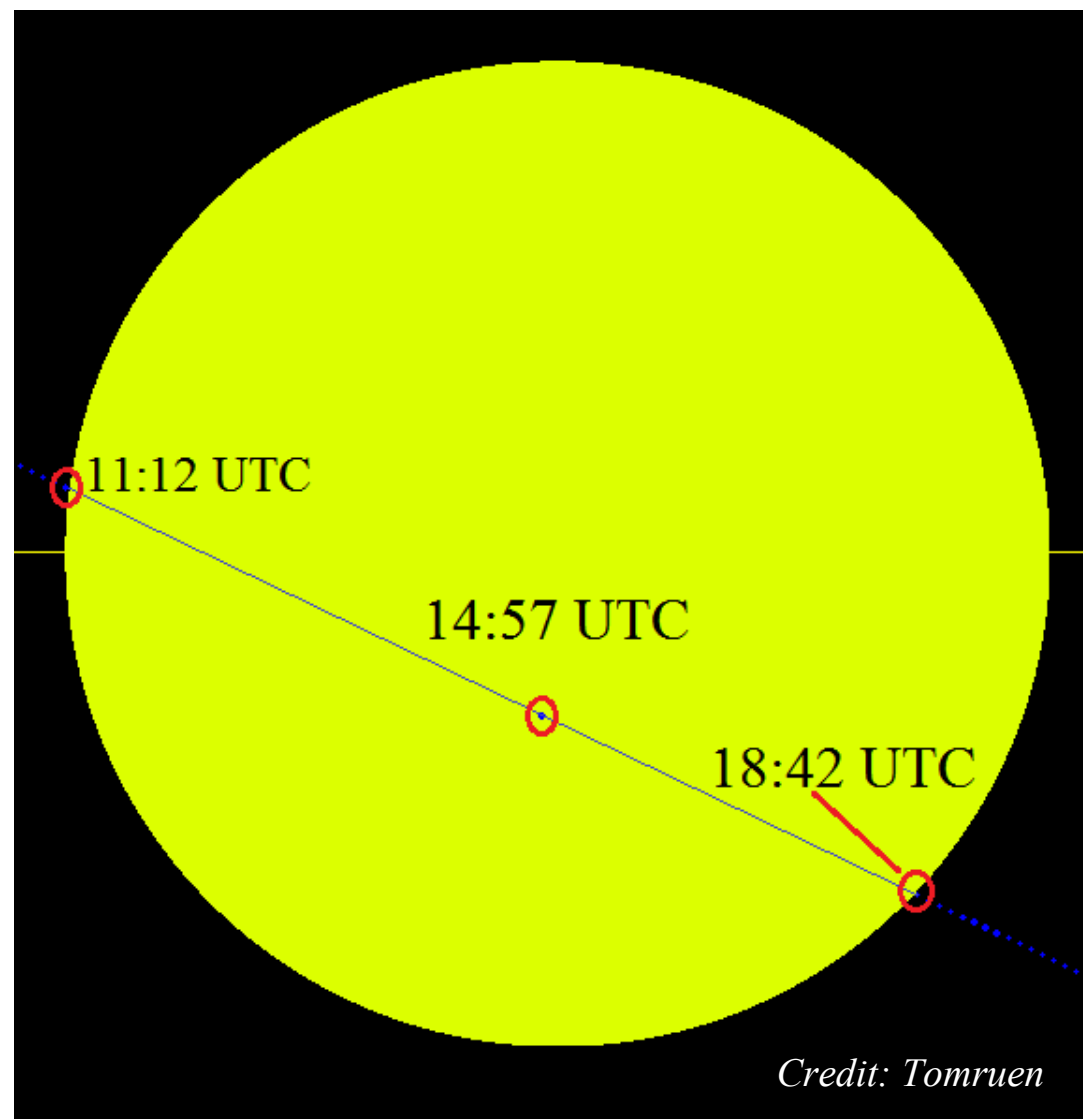
Bob Christmas filled in for me as the April "Sky this Month" presenter at the monthly meeting. He did a fine job up at the podium. Bob is our Event Horizon editor so he had a very busy month indeed covering both jobs. In fact the last two meetings have seen a club member as the guest speaker with Denise White covering the history of light pollution in March and Don Pullen speaking on the subject of gravity waves in April. They also did a great job and their efforts are very much appreciated by all those in attendance.

I would have to say that my personal observing highlight from April was a short session on the evening of the 22nd. I happened to notice in my Sky Safari app that the Great Red Spot (GRS) and Io's shadow were both near the center line of Jupiter's disk. So within a couple of minutes I was outside in the wind and cold with my 12" Dob. The scope didn't have a chance to cool down to ambient temperature so the best view I could manage was at a medium magnification of 115x. Even so, the shadow of Io was sharp and the GRS showed up clearly against the southern equatorial cloud belt. The GRS wasn't as dark as a month ago but it still appears as a reddish oval against the brown of the belt. Another observation of Jupiter in April occurred when the GRS was on the far side of the planet. I noticed that the southern belt appeared to be split laterally with a cream coloured stripe running the

length of the belt. I was able to verify that a few days later when a picture was posted on the web by an imager.

On May 9th we will be treated to a transit of Mercury across the face of the Sun. Viewing this event requires a telescope as Mercury is too small to be seen without magnification. Only attempt to observe this if you have the proper equipment for viewing the Sun! **Any solar observing without the correct equipment will lead to permanent blindness!** The event starts with first contact at about 7:13:30am Hamilton time with the Sun only 12 degrees above the horizon. Last contact occurs 7.5 hours later at 2:41:27pm. Here is an image showing the path of Mercury across the face of the Sun.

The times are listed as Universal Time Coordinated so 4 hours must be subtracted to arrive at Daylight Saving Time. As you can see, the times vary (Continued on [page 4](#))



The Sky This Month (continued)

slightly from the times I've listed. I'm using the values given in Sky News magazine for Toronto. A transit of Mercury won't occur again until November 11, 2019 so try not to miss this one.

The other major event for May is the opposition of Mars. May and June are the best months for viewing Mars as it will be at its closest to Earth. In fact Mars hasn't been this close to us since 2005. Sky News has a good article on viewing Mars in the May/June edition. In May, Mars and Saturn are only 13 degrees apart so it's a great time to compare their apparent sizes. Mars has a diameter of 18.6 arc seconds while Saturn's is 18.4 arc seconds (not including the rings). But at this time, Saturn is 18 times further away so with roughly the same apparent diameter you would expect that Saturn must have an actual diameter around 18 times greater than Mars. The diameter of Saturn at 120,500km is in fact 17.7 times that of Mars at 6,800km.

Another thing to consider is that one day on Mars is roughly 40 minutes longer than a day on Earth. For this reason you will see the surface features move slowly across the face of Mars over a period of nights. Draw what you see so that you can compare your drawings to actual photos and track Mars' rotation.

The Moon

Libration this month is as follows: The Northern limb will be most exposed on the 9th, while the Southern limb will be most exposed on the 23rd. The Eastern limb will be most exposed on the 12th and the Western limb on the 28th.

The Planets

(Rise and set times are given for when the planet reaches 5 degrees above the horizon)

- **Mercury** appears very low in the eastern morning sky all month. Transits the Sun on May 9th.
- **Venus** is very close to the Sun this month.
- **Mars** will reach opposition on May 22nd but don't wait till then to observe it. Rise times vary substantially over the month. On the first it rises at 11pm, on the 15th at 9:50pm and on the 31st at 8:25pm.
- **Jupiter** is already high in the sky after sunset. Look for it at 9:30pm due south on the 1st, then at 10pm on the 15th in the SSW and at month's end at 10pm in the SW.
- **Saturn** rises about 30 minutes after Mars. The rings are wide open at this time so it's a great time to observe. Saturn is just less than half the apparent diameter of Jupiter and details are much more muted. Take your time observing the soft colours of the cloud belts.
- **Uranus** is low and close to the Sun in the morning sky all month.
- **Neptune** will be most easily seen in May at the end of the month when it can be seen in the SE morning sky.

(Continued on [page 5](#))

The Sky This Month (continued)

Events

- May 5th/6th: — Eta Aquariid meteor shower both mornings before dawn in the east-southeast.
- May 6th: — New Moon.
- May 7th: — A double shadow transit begins on Jupiter at 00:40am. Io's shadow will join Callisto's which has been visible on the disk since 11:18pm on the 6th. The double transit ends at 1:42am.
- May 9th: — Mercury transits the Sun.
- May 12th/13th: — Ganymede's shadow crosses Jupiter's disk from just before midnight of the 12th and ends its transit at 2:50am of the 13th.
— First Quarter Moon.
- May 15th: — Jupiter and the Moon a couple of degrees apart just before they set in the morning.
- May 22nd: — Mars at opposition.
- May 29th: — Last Quarter Moon.



H.A.A.'s Loner Scope Program

We at the HAA are proud of our Loner Scope Program.

If you don't have a telescope of your own and want to make use of one for a month or so, you can borrow one of our fine loaner scopes.

Please contact Jim Wamsley, at 905-627-4323, or e-mail Jim at: secretary@amateurastronomy.org, and we'll gladly get one signed out for you.



Treasurer's Report by Steve Germann

Treasurer's Report for April 2016 (unaudited)

Opening balance:	\$8,348.96
Revenue:	\$127.00
Expenses:	\$0.00
Closing Balance:	\$8,475.96

Revenue for 50/50 was \$47 and for new memberships \$80.



The Beginnings of Life on Earth by Mike Jefferson

The Origins Institute

April 11/2016.

“Assembling the MOLECULES OF LIFE: How do we study the ORIGIN OF LIFE in the LABORATORY?”

At 8:00 PM on Monday, April 11, 2016 in the COUNCIL CHAMBERS, G111, GILMOUR HALL of McMASTER UNIVERSITY, the Origins Institute conducted a public lecture on the beginnings of life on this planet and in space, as well.

Abstract

Up until very recently, the popular and academic thinking has been that life on Earth began near volcanic thermal vents under the oceans, in places like Iceland. Further, it has also been assumed that such warm, underwater conditions have been necessary for life to begin elsewhere in the solar system. However, new research suggests that life actually begins to emerge in thermal fields of ponds, ponding areas and other similar wet places.

Lecture

The speakers for this topic were *David Deamer* and *Bruce Damer* of the University of California, Santa Cruz and *Maikel Rheinstadter* of McMaster University. Before this public talk, they had also spoken to an academic audience at McMaster earlier that day.

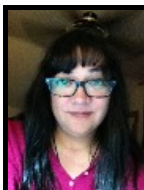
Dr. Deamer began the talk with a discussion of terms, definitions and background in bio-chemistry (his field of study). This included DNA, RNA, polymers and monomers and their roles in the development of what we regard as life forms. All speakers had a plethora of slides and information that had to be glossed over because of the 1 ½ hours time factor that they were constrained with.

Dr. Damer has been studying stromatolites in Shark Bay, Australia, a warm-water, salt 'pond', that gives rise to these life forms. These, similar to coral life forms are constructed in layers and 'ladders' with a soft, spongy gel on their outer surfaces. This gel hardens to a kind of 'leather' in the absence of water (a kind of hibernation, perhaps?), making these creatures very primitive, indeed. Dr. Damer has also been writing a great deal of computer programming to simulate and to research the origins of life, not only on Earth, but out in space as well.

Dr. Rheinstadter concluded the presentation with his work on the proposed Origins of Life Laboratory. There is a prototype of this ~\$1 million project which will hopefully be capable of generating the closed conditions necessary for the formation of life anywhere on Earth, on any other planet in the Solar System or elsewhere in the universe. It is somewhat similar to the Miller and Urey experiments of the 1950's.

The topics of Mars, Venus, comets and asteroids were also explored for what they might have to offer for this study. Venus was seen as far too hot, any ocean having long ago been boiled into its atmosphere and creating a runaway greenhouse effect. Comets and asteroids are a possibility for 'seeding' Earth in times past. Mars, the most Earth-like, is still the most promising spot for future probes to focus their research. It is cool enough, with ice and water in some form and may have been warm enough for long enough for primitive life to have developed in eons past. However, much of this is pure speculation. In the not-too-distant past, some academics have even proposed clay as a starter for this 3½ billion year-old evolution.

(Continued on [page 7](#))



Hamilton Amateur Astronomers in the Community by Kimberly Andrus



*Public Outreach at McQuesten Park
Pictured: Bernie Venasse at his scope
Credit: Kim Andrus*

Many programs are provided by the HAA to reach out to our community to support the hobby of astronomy and scientific education to the public. HAA members participate in judging the BASEF science and engineering fair; public outreach nights around the Hamilton area; scope clinic; and educational talks at various Hamilton area library locations. The next public education event, on April 23rd, is at the Dundas Branch of the Hamilton Public Library presented by John Gauvreau, Education Director and Jim Wamsley, Secretary.

On April 18th, members presented Our Solar System and New Discoveries, to a group at Saltfleet Library in Stoney Creek. This provided an interested group of people a broad overview of the solar system and basic features of the sun, planets, and moons. Members of the public were interested in astronomy and a couple people had observed the sky at some point in their lives.

“Is the sun solid at the core?”, “Is there some area in the North that is good for sky watching?”, “Can you define what is meant by satellites?”, and “How much can I expect to pay for a telescope?” are some of the questions that were generated by the public during the talk. Presenter and Chair of the HAA, Bernie Venasse, discussed basic features of the sun and planets including a discussion on the demotion of Pluto and the existence of a new planet, Planet 9. Members Leslie Webb, Membership Director and Jim Wamsley were also in attendance to provide information about meteorites, the constellations, and the club. Members of the public were invited to examine samples of meteorites, guided in their understanding of the constellations, and provided information about the HAA. Planet spheres were provided and a stimulating evening pondering our solar neighborhood was had by all.

The Beginnings of Life on Earth (continued)

The audience was quite large (probably about 100 people) and asked some very interesting questions during the generous question period. One of those inquiries asked 'what is life' and the speakers had to conclude that we still do not know.

Some people who showed up for this presentation, from HAA and RASC Hamilton past were Barb Wight, Larry Greenhalgh, and John Wallace (RASC- HC). We had some chit-chat and catching up on old times and new. It was good to see them all again.

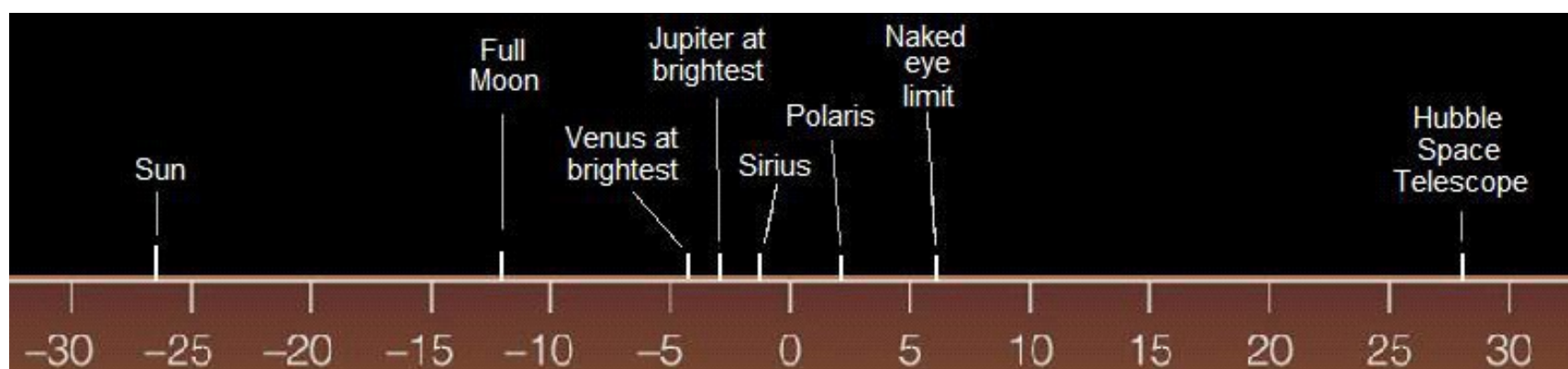
Note

In the 1950's people became quite fascinated with new von Braun interplanetary spaceship designs, as portrayed by the likes of the Disney Studios. Today, the headlines are made by research on the origin of life on Earth and in the universe with Solar System studies and hunts much farther out, for exoplanets.



How Many Stars are There?

Way out in the country on a dark, clear, moonless night you look up and can see hundreds of thousands of stars right? Nope! Well it must be at least tens of thousands. Well, with unaided eyes we can only see objects of a magnitude of 6.5 or brighter. The Sun is Magnitude -26.7, Full Moon -12.7, Venus -4.4, Jupiter -2.5, Sirius (brightest star -1.4).



The Yale Bright Star catalogue compiled by Dorrit Hoffleit of Yale University tabulates every visible star from Earth to magnitude 6.5. Amazingly, there are only 9,096 stars brighter than magnitude 6.5 for both hemispheres. Since for any particular location we can only see half the celestial sphere, dividing this in half we are left with a maximum of 4,548 stars that one could possibly see without optical aid in the night sky. From the suburbs the magnitude limit is around +4 so only about 450 stars could be visible. With the light pollution of a larger city with a magnitude limit of +2 only 35 stars would potentially be visible.

Okay so how many stars are in the Observable Universe?

First we need to know the number of galaxies. The number of galaxies has been estimated by the use of images by the Hubble Space Telescope - Project XDF (eXtreme Deep Field). The XDF includes all the data taken by the Hubble in a small, seemingly empty patch of sky in the constellation Fornax over a 10-year time span. The XDF is comprised of 2963 separate exposures with a 2 million second exposure



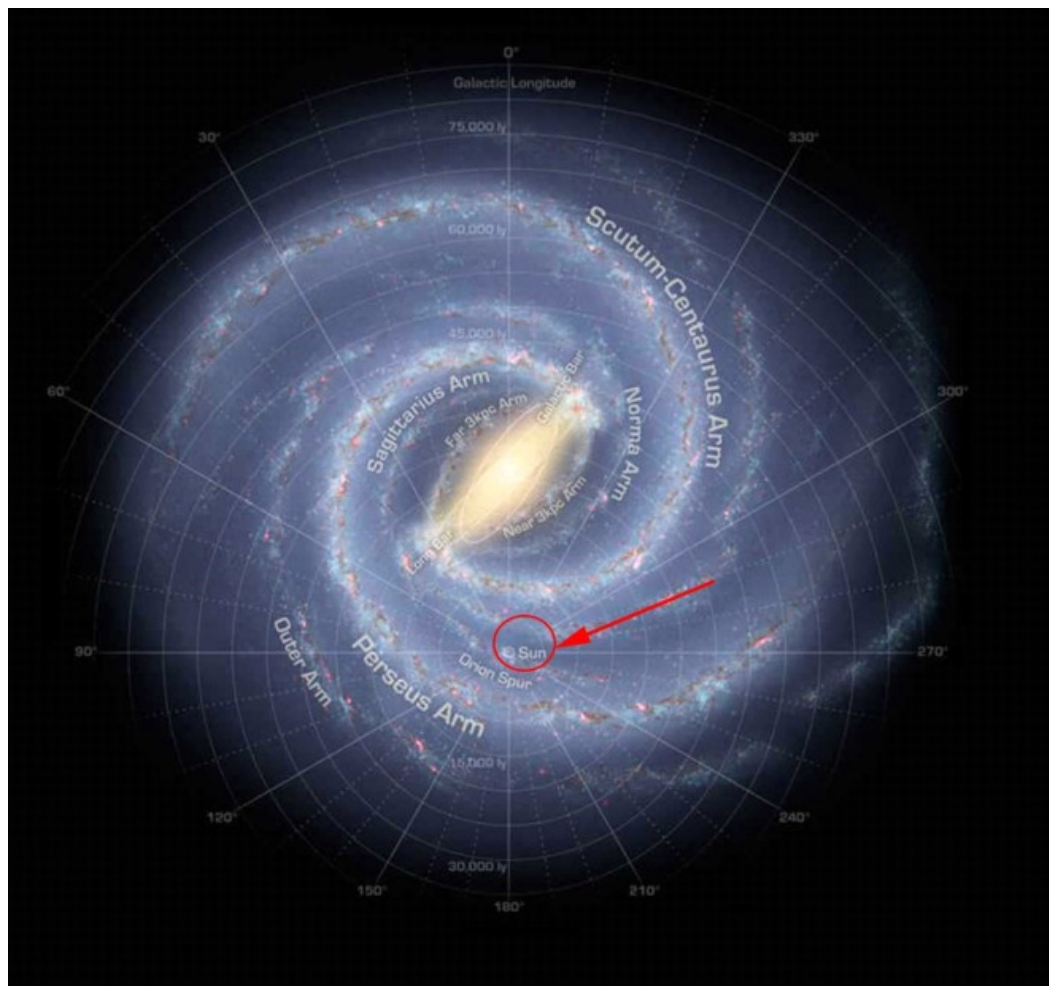
time. The image includes galaxies that are so faint they are about one ten-billionth of what the eye can see. The image contains 5,500 galaxies and it would take about 32 million XDFs to fill the entire night sky, so there are about 200 billion galaxies in the Observable Universe. Pretty much every dot in the photo is a galaxy. (It is quite likely when the James Webb Telescope comes online in 2018 the number galaxies we can detect will increase significantly). The light from the furthest galaxies captured in the image was emitted 13.2 billion years ago when the galaxies were formed just ~450 million years after the big bang.

It is estimated that the Milky Way has somewhere between 100 to 400 billion stars. There are smaller galaxies with less and giant

(Continued on [page 9](#))

Space Stuff (continued)

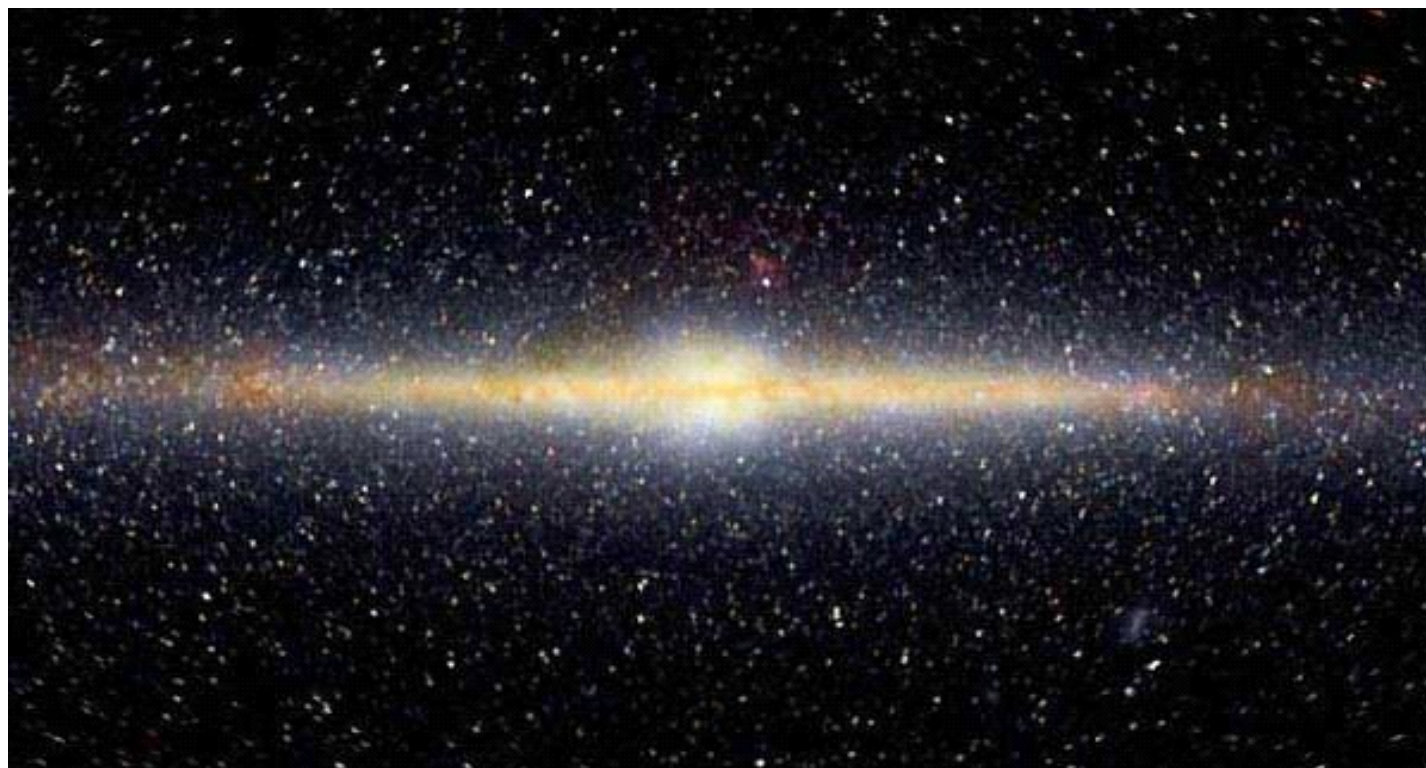
elliptical galaxies that could have a trillion or more stars. So if we estimate that the Milky Way is an average galaxy the number of stars could be around 20 to 80 billion-trillion (sextillion).....or more.



The Milky Way is a spiral galaxy that is about 100,000 light-years across, 10,000 light-years thick in the galactic center and 3000 light-years thick away from the center. Our Sun is located just off a minor arm called the Orion spur that is located between the Sagittarius and Perseus Arms. Lucky for us it is a less dense, quiet area of the galaxy. The Orion arm is about 3,500 light years across and 10,000 ly in length. We are located about halfway along its length and are about 26,000 ly from the galactic centre.

The Orion arm is named after the constellation Orion the Hunter. Orion is easily recognized by the row of 3 stars making up Orion's belt, the red giant Betelgeuse, the bright star Rigel and the Orion Nebula. We see many relatively bright objects when we look at Orion because we are looking into our own spiral arm.

Since we are in the Milky Way and not likely to have any way of actually imaging it from the outside anytime soon we don't really know its exact structure. We know it is a spiral galaxy because of observations that have been made. It is generally considered to be a "barred" spiral galaxy but this is debated. A barred spiral galaxy has a "central bar-shaped structure composed of stars". Two-thirds of spiral galaxies are barred. Messier 74 is often used as a proxy galaxy for the Milky Way because it is thought to be



*COBE Image
of the Galactic
Core of the
Milky Way*

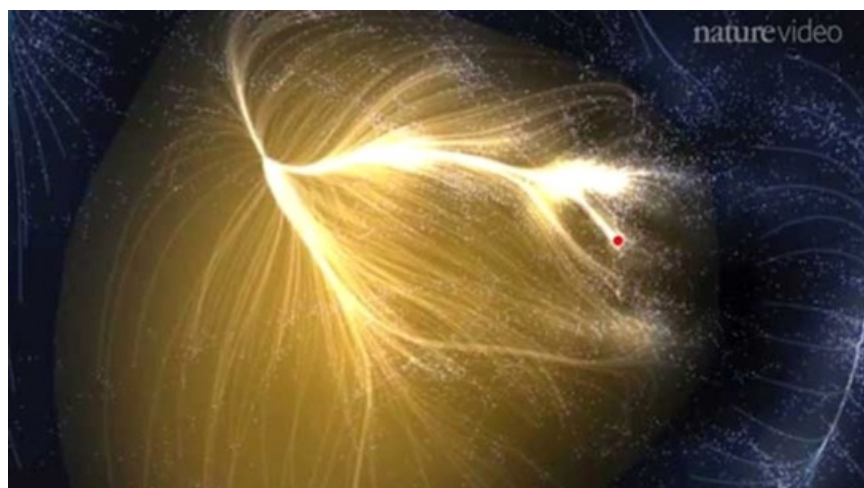
(Continued on [page 10](#))

Space Stuff (continued)

similar. Or, as on the previous page, artist depictions are also used. The COBE space probe (first space probe to map the Cosmic Microwave Background) imaged the galactic centre of the Milky Way (see bottom of previous page). I believe it is the only actual image of the Milky Way that looks like a galaxy.

Where is the Milky Way?

In a 2014 study a team of scientists published a letter in *Nature* that defines a new way of defining galaxy super clusters based on their relative velocities. “Galaxies congregate in clusters and along filaments, and are missing from large regions referred to as voids.” Traditionally, superclusters were considered regions with high concentrations of galaxies. The Milky Way along with Andromeda and ~100 other galaxy groups were considered to be part of the Virgo Supercluster. According to this new definition the Virgo Supercluster is just small part of something much larger.

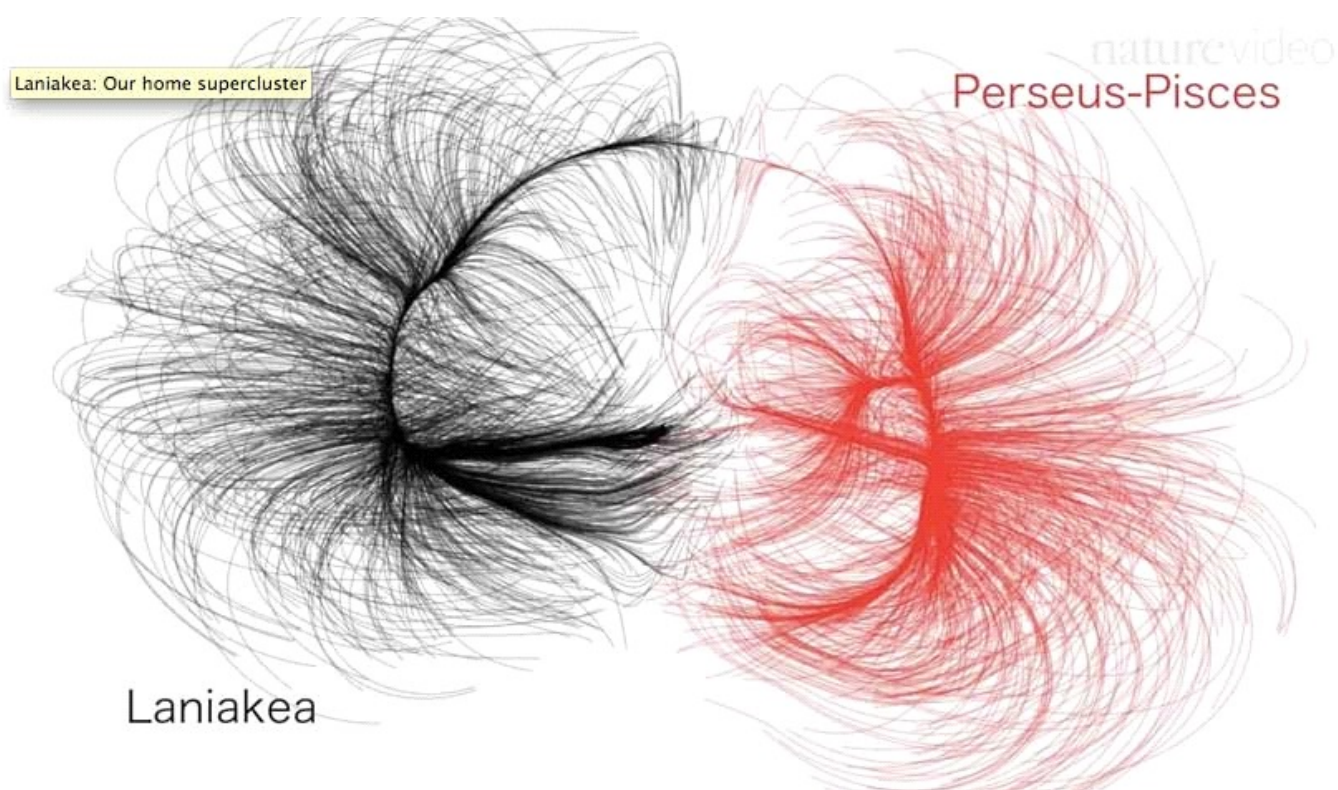


Their method involved measuring the distance to earth of 8,000 galaxies and determining their “peculiar velocity” (in astronomy, the motion of an object relative to a local standard of rest). The average rate of cosmic expansion is subtracted so the deviations in motion are related to gravitational influences. The motions of the galaxies reflect the entire distribution of matter including dark matter. “The researchers used an algorithm to translate these velocities into a 3D field of galaxy flow and density”.

The areas with the motion of galaxies inward were defined as superclusters. The team named the supercluster that the Milky Way belongs to “Laniakea” (Hawaiian for “Immeasurable Heaven”). The gravitational focal point for Laniakea is called the “Great Attractor”. The whole of Laniakea is not gravitationally bound and is expanding due to the influence of dark energy. The Laniakea Supercluster includes 100,000 galaxies and is about 520 million light years across. The yellow area in the above image is Laniakea; the red dot is the Milky Way.

In the image below, the black represents Laniakea and the red represents the neighbouring supercluster “Perseus-Pisces”.

The boundaries between the two were determined by how the flows diverge. It is noted that not everyone agrees with this new definition, especially since not all of the constituents are gravitationally bound. Regardless, it provides insight and perspective on our area of the cosmos.





Hubble Shatters The Cosmic Record For Most Distant Galaxy

By Ethan Siegel

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!



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- α 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!

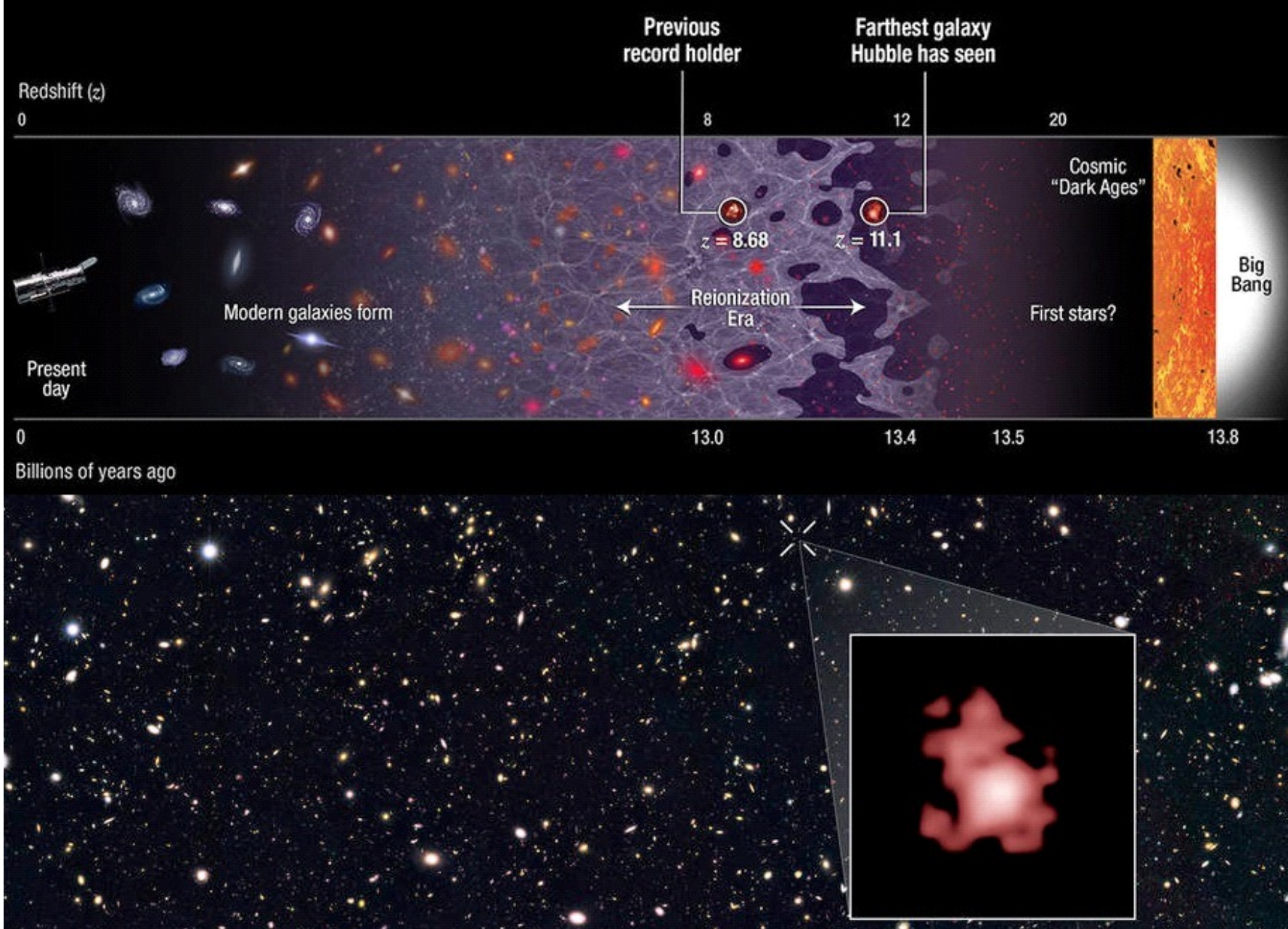
Hubble itself did the follow-up spectroscopic observations to confirm the existence of this galaxy, but it also got lucky: the only reason this light was visible is because the region of space between this galaxy and our eyes is mostly ionized, which *isn't true* of most locations in the universe at 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

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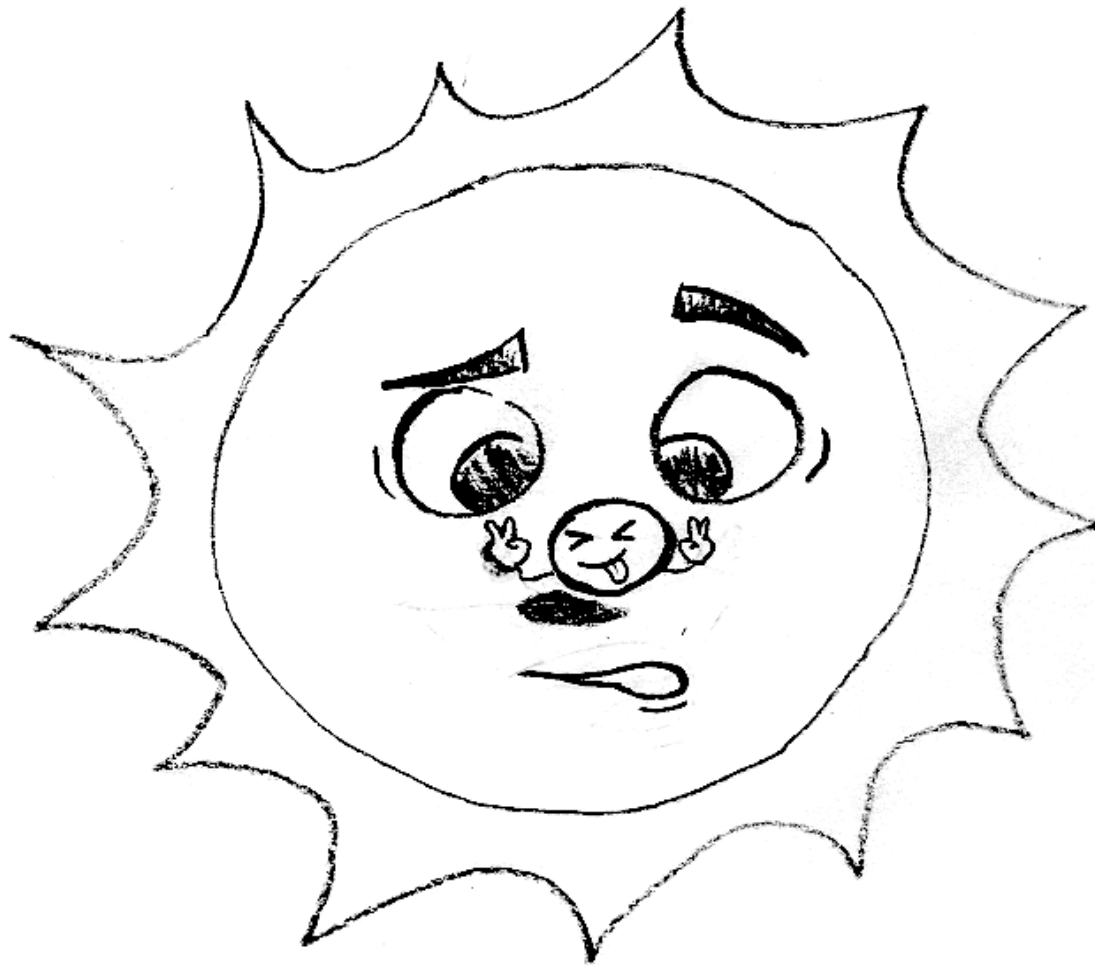
NASA's Space Place (continued)

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.



Mercury, the ultimate photo-bomber

Eye Candy



The Sun through a Solar Filter, by Kim Andrus

Taken through an Orion APO 110mm refractor with a solar filter and her iPhone6.

Note sunspot near bottom.



The International Space Station passing The Big Dipper on April 13, 2016,
by Ann Tekatch



The Setting Moon, the Hyades and the Pleiades, by Dane Anderson

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- Tickets \$7 per person; private group bookings \$150
- Different shows every week
- Upcoming shows include:
 - **May 4: Introductory Astronomy for Kids (1st Wed of every month)**
 - **May 11: Rust and Stardust: the lives of the stars and the origin of the elements**
 - **May 18: The Celestial Bear: The Six Nations' Night Sky**
 - **May 25: Death from the Skies!**
- For more details, visit
www.physics.mcmaster.ca/planetarium

UPCOMING EVENTS

May 13, 2016 - 7:30 pm – *HAA Meeting* at the Hamilton Spectator Auditorium. Our main speaker will be **Paul Delaney** of York University. His talk will be “Transits Near and Far”.

May 14, 2016 - 2:00 pm - 5:00 pm, then 8:00 pm - 11:00 pm – *Public Stargazing Day & Night* at Bayfront Park in Hamilton, for Astronomy Day.

June 10, 2016 - 7:30 pm – *HAA Meeting* at the Hamilton Spectator Auditorium.

2015-2016 Council

Check out the H.A.A. Website

www.amateurastronomy.org

Chair	Bernie Venasse
Second Chair	Mike Jefferson
Treasurer	Steve Germann
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Observing site for the HAA provided with the generous support of the

Binbrook Conservation Area

Come observing with the HAA and see what a great location this is for stargazing, a family day or an outdoor function.

Please consider purchasing a season's pass for \$79 to help support the park.

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