The Spectrum

The Newsletter for the Buffalo Astronomical Association

July/August Volume 18, Issue 4

Inside this issue:

Election 2016 Results

Election 2016 is complete and the winners have been chosen

President Elect: Mike Anzalone

Vice President Elect: Mike Humphrey

Secretary Elect: Neal Ginsberg

Treasurer Elect: DaRand Land

At Large Director Elect: Taylor Cramer

Congratulations to All!

BAA Schedule of Astronomy Fun for 2016

Public Nights and Events

Public Nights - First Saturday of the Month

March through October.

2016 Tentative Schedule of Events:

July 9 Wilson Star Search

July 30 BAA annual star party at BMO

Aug 6 Public Night BMO 5pm Wild Festival, followed by Bring a dish to pass picnic then Public Night BMO

Aug 13 Wilson Star Search- think meteors!

Sep 2/3/4 Black Forest (Rain Fest) Star Party Cherry Springs Pa.

Sep 3 Public Night BMO

Sep 9 BAA Meeting

Sept 10 Wilson Star Search

Oct 1 Public Night BMO

Oct 8 Wilson Star Search

Oct 14 BAA meeting

Nov 11 BAA meeting

Dec 9 BAA Holiday party

Observatory Report

Ah Summer is here. The nights are short, HOT and buggy. But have no fear! Dennis B is here. He has donated a window air conditioner. Now we can enjoy cool bug free imaging at the Observatory. Life is good once again :-) The new cooling fans for the C-14 are installed and seem to be working. Now that my life has quieted down to its usual dull roar we will be having Tues Nights back on the schedule. If you do not get a notification of when we go out, and want to be on the email list, send me an email at DMa3141551@msn.com and I will get you on the list. We have been having WAY tooo much fun as usual. Mike P donated a USB3 extension, and Gene installed a USB3 port on the telescope computer. We have been using Mike P's USB3 camera to image the planets and Moon from the comfort of the climate controlled warming room at 120 FPS. It is really fun to go searching for Lunar craters using cameras on the C-14 and NP101. Does away with needing a pointer eyepiece, and the general confusion as to which crater you are looking at. Another advantage of coming for the Tues night sessions is you can get help setting up, tearing down heavy equipment, and help getting it all working. Much easier to do when others are around. If we get enough people wanting to image Planets, we may want to invest in a motorized filter wheel. When you open the door to the telescope, there is a disturbance in the "force" that ruins seeing for a minute or so making it hard to image quickly using a manual filter wheel. It may be time to consider getting one for the Observatory.

Need Help:

Saturday August 6- Beaver Meadow will be having a "Wild Summer Festival" from 11am to 5pm. I could use someone there by 10am to open the place up, and people to bring solar telescopes. Figure on bringing a dish to pass at 5pm to be followed by Public Night. Should be a fun day. Please let me know if you are helping out as Beaver Meadow is charging for this event, and I will pass your names on to them so they will let you in for free, and we all know how I like free.

Saturday Sept 3 - Public Night - I will be at the Black Forest Star Party (Black Cloud Rain Fest) and need someone to man Public Night! Please let Dan Marcus know if you can help out.

Tues Night Imaging group: The nights have not been the greatest, but we are backed up in the processing department - was really hard to get all those big SER video files off the computer before going home. Taking them at 120fps you can get a LOT of frames in a hurry! So now we have several nights' worth of

Observatory Report (cont.)

images on the computer drives at the Observatory that still need processing. I did get a chance to image the Supernova in NGC4125. The Moon was interfering as usual, but we took 1 min subs unguided and took 6 minutes worth using the ST-9 and the C-14. Also tried for the one in M66 but we were getting a weird internal reflection, and still needed a longer exposure than 1 min subs to really pick up the supernova. You all will have to wait till the September BAA meeting to see any planetary images.

NGC 4125 Supernova
Beaver Meadow Observatory 2016-06-14
ST-9, focal reducer, C-14
1min subs, 6min total
"Tues Night Group"

Star Parties: What are they? Where are they? When are they? Do I need to know lots about astronomy? What to bring?

Star parties happen when a group of astronomers get together to do astronomy. They can be at a park, the Observatory, a person's backyard. Can be just for daytime viewing, nighttime viewing, or just to hang out. They can be barbeques, bring a dish to pass dinners, or just come and view with friends. But

Observatory Report (cont.)

mostly they are where we go to have fun sharing our astro passion and equipment. Where else can you find an Ethos eyepiece to stick on you department store 60mm refractor to see how it works. We all come and bring all the astro gear we like to use, or want to learn how to use. No experience needed! There is always someone there who can help you with your astro gear or astronomy questions. Having someone there who can assist you can save you hours of frustration, and make astronomy enjoyable. We old timers need you young folks to teach us the new tricks. You can learn how to use astronomy programs, and equipment from someone who has already mastered it, or we can all learn how to do new things together. These events can be rain or shine, or if clear only. No matter what we always have major amounts of FUN. Those of you who know me and my rules for Astronomy - Rule #1 have FUN doing astronomy, Rule #2 see rule #1. We have some serious fun at the Beaver Meadow Observatory. Dennis Bartkowiak has offered to have an occasional impromptu barbeque /Star Party at the Obs. Mike Anzalone will send out one of his club wide email when they happen, so stay tuned.

Club Star Party - Saturday July 30, **RAIN OR SHINE** at the Beaver Meadow Observatory starting around 5pm. Dennis Bartowiak is hosting, this is a bring a dish to pass, and bring a telescope/astrogear if you have any, if not there is plenty of stuff at the Observatory. The club will supply the hotdogs and hamburgers. We have a gas grill at the Observatory that we can cook with, also a microwave, and a refrigerator to keep things cold.

See you at the Observatory
Daniel Marcus

Night Sky Network

Astronomy clubs bringing the wonders of the universe to the public

2016 NSN Pin Recipients

Dennis	Bartkowiak
Larry	Carlino
Christopher	Elliott
Gary	Flagg
Alan	Friedman
Tom	Heyer
Robert	Hughes
Michael	Humphrey
Jim	Lehmann
Dan	Marcus
Michael	Plotar
Jill	Rohring
Timothy	Gene
Scott	Smith
Stephen	Smith

Remember: NSN pins are given to those individuals who promote astronomy to the public. The only criteria for the NSN Pins is to participate in three BAA public events throughout the year and to let me know (email to :jetpac@iname.com).

Creativity Day
at the
Casey Middle School in Williamsville

On Friday, April 22, Casey Middle School in Williamsville held it's first "Creativity Day." Instead of conducting their regular classes, teachers were encouraged to share with students something they were passionate about that was outside of their normal subject area. In addition to watching two assemblies, students were allowed to pick five classes from an extensive list of choices. I decided to teach an introduction to telescopes and astronomy.

In the telescope class, students learned about refractors, reflectors, and catadioptrics, the light path used by each, as well as the importance of aperture and focal length. Then came the fun part. Students got to look through the telescopes playing a game I called "Planet Hunter." I printed actual photographs of the planets sizing them so that their apparent angular diameter when viewed at 110 yards (the longest hallway in Casey Middle) would be the same as that of the planet itself when viewed from earth. Then the class split into two groups. Each group took a large telescope to one end of the hallway and aimed it at the group on the far side. Students then took turns using their knowledge of the planets to correctly identify the pictures that were attached to the name cards of their classmates. Through the scopes they recognized the gas bands of Jupiter, the orange color of Mars, the rings of Saturn, the phases of Venus and Mercury, etc.

By the fourth time I had taught the class, identifying the planets was beginning to seem too easy. Students were getting the answers right every time. The group at the far end radioed down that they wanted a challenge, so a challenge we gave them. The picture I then put on the target name card was little more than white pinprick on a black background. The entire opposing team did their best, but even after boosting the magnification with a barlow, they were forced to give up. When the answer was radioed back to them, their cries of consternation could clearly be heard from the far end of the hallway. "Pluto is not a planet!"
I had a great time teaching the class, but the best moment came when I overheard two seventh grade boys talking on their way out. "I'm going to ask my dad for a telescope for my birthday" said the first. "Me too!" replied his friend.

Dark Skies and Clear Nights Everyone!
Jim Taylor

A few views from Creativity Day

Fred Hoyle

The Overshadowed Cosmologist

By

Randy Boswell

The English cosmologist Fred Hoyle (1915-2001) is known in the popular mind as the proponent in 1948, together with colleagues Hermann Bondi and Thomas Gold, of the steady-state universe. According to this model, the universe had no beginning and no end and was continuously creating new matter, which drove its observed expansion and accounted for its uniform density. [1,2] Also, and more known to the general public was Hoyle's outspoken opposition to what later became known as the big bang theory. In fact, it was Hoyle himself who coined the term, "big bang." It was on a 1949 BBC radio broadcast entitled, *The Third Programme*, in which Hoyle gave one of his lectures that he introduced the term. Contrary to popular belief, Hoyle did not use the term in a derogatory manner and, instead, was simply attempting to describe a mental picture of the theory in terms that the general listener would understand. [3] Ironically, Hoyle's term became popular and became the accepted name for the theory. The discovery of the Cosmic Background Radiation (CBR) in 1965 by Arno Penzias and Robert Wilson was considered confirmation of the big bang theory by most cosmologists. This spelled the end of Hoyle's steady-state universe, with the result that the new big bang model and the concepts associated with it overshadowed Fred Hoyle and his ideas in the eyes of the public.

However, what is not widely known is that Hoyle is responsible for a number of important discoveries-his hallmark achievement being the theory of stellar nucleosynthesis, i.e., the heavier elements were forged in the interiors of stars.

Fred Hoyle was born to a father who was a wool and textile merchant and a mother who was a talented pianist. He excelled in grammar school, which won him entrance to Emmanuel College, Cambridge in 1933, where he studied mathematics. There, Hoyle mastered his studies, which resulted in him skipping the second-year curriculum and studying graduate-level courses during his third year. Upon graduation in 1936, he was accorded the top-ranked applied mathematician of his year. [4] During his graduate years he

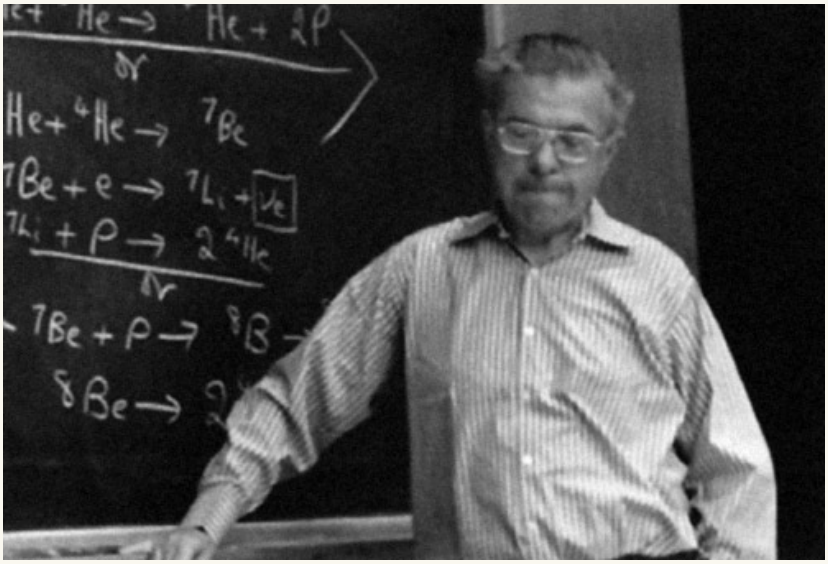
worked as a research student at the famous Cavendish Laboratory. Hoyle registered as a doctoral student and one of his supervisor's in this regard was Paul Dirac, one of the founders of quantum theory. Hoyle did not complete a Ph.D, the reason being according to Hoyle that doctoral work would take away from the time he needed to pursue his own research projects and the real reason he registered as a doctoral candidate was that it afforded him tax breaks, since he was receiving an income.

This notwithstanding, in 1939 Hoyle was awarded a fellowship at St. John's College, Cambridge as the result of two papers he wrote on quantum electrodynamics. Also, during that same year Hoyle said that Dirac confessed the following to him: *"In 1926 it was possible for people who were not very good to solve important problems, but now people who are very good cannot find important problems to solve."* [3] This prompted Hoyle to change his focus from theoretical nuclear physics to the study of the dynamics of stars.

At the start of World War II in 1940 Hoyle was drafted into defense work. Working for the Admiralty, Hoyle perfected radar systems to enable ships to detect the precise position of enemy aircraft. The problem was that radar aboard ships could determine the direction and distance of hostile aircraft, but not their height. Hoyle solved this problem by analyzing the way in which the radar signal strengthened and faded as the enemy aircraft approached and thereby devised a method by which the altitude of attacking aircraft could be deduced. Hoyle's solution greatly aided the Royal Navy in battle in the Eastern Mediterranean. This was considered a significant contribution to England's wartime defense but Hoyle was never given public recognition because the project was long shrouded in secrecy.

It was also during the war that the seeds were planted that would later produce his most enduring contribution. In 1944 Hoyle visited Washington D.C. to attend a conference on radar. While there Hoyle had the time and opportunity to travel to Princeton, New Jersey to visit Henry Norris Russell, a pioneer on the structure and evolution of stars. Hoyle was also scheduled to visit the naval base in San Diego, California as part of his wartime itinerary. Accordingly, Russell arranged for Hoyle to visit the Mount Wilson Observatory in Pasadena. There Hoyle conferred with the noted German astronomer Walter Baade who informed Hoyle of his studies regarding the extremely high temperatures in exploding stars, i.e., supernovae. Hoyle's return trip to England was no less enlightening. En route back to England Hoyle flew to Chalk River just outside of Montreal, Canada where he visited Maurice Pryce, a theoretical physicist who was his former Ph.D. supervisor. Pryce was involved in the Manhattan Project as part of a joint British and

Canadian team. Pryce and his fellow scientists were working on the problem of how to trigger nuclear reactions to cause a nuclear explosion. The solution was thought to be an implosion. E.g., if a heavy radioactive shell of plutonium were made to collapse in on itself with sufficient force this could trigger a chain reaction whereby the plutonium nuclei would disintegrate and blast the leftover particles into other nuclei, which in-turn would repeat the process. If the process were sustained for a long enough period of time a nuclear explosion was predicted to occur. Hoyle (who held a security clearance) thought the great heat and pressure of the nuclear explosion scenario was not unlike the situation inside a star. [5] This caused Hoyle to ponder whether the proposed dynamics of a nuclear explosion acted in a similar fashion inside the interiors of stars. I.e., just as the great temperatures and pressures involved in nuclear reactions were said to transform the elements could not the cores of stars do the same? This question set in motion set in motion his most profound work.



At the end of the war in 1945, having served six years in the Admiralty, Hoyle returned to Emmanuel College, Cambridge where he was appointed a Junior Lecturer in Mathematics. He soon published a significant paper that same year dealing with the structure of stars that involved a new method for solving the equations that determined the structure and stability of stars (i.e., stellar equilibrium). This was followed in 1946 by another important work on the creation of elements and the synthesis of elements from hydrogen in the cores of stars, which was built on an earlier work in the 1930's by the astronomer Hans Bethe. [6] Hoyle's paper formalized the concept of nucleosynthesis, mentioned earlier, whereby the heavier elements are built up from lighter elements. Yet it would be another decade before Hoyle's most famous and seminal work on the subject would be published.

He was promoted to a Lecturer at Cambridge in 1948 and received tenure (a Ph.D. degree was not a requirement in those days under the English system). It was during this time the immediate years following that Hoyle, along with colleagues Thomas Gold and Hermann Bondi, promoted a steady-state cosmology mentioned previously.

Throughout the 1950's Hoyle continued to study the dynamics of stars. He pioneered the use of digital computers for the modeling or simulations of the workings of stars. In 1954, he and astrophysicist Martin

Schwarzschild visited Princeton University in the United States and gave the first complete account of the evolution of a low-mass star once it has exhausted the hydrogen fuel in the nuclear core. [7] Previous to this Hoyle discovered the temperature needed to transform the elements from carbon to iron in the cores of red giant stars was 3 billion degrees Kelvin. The problem was that Hoyle was unable to offer an explanation for the synthesis of carbon from the lighter elements. In 1953 on a visit to the Kellogg Laboratory at the California Institute of Technology (Caltech) he solved the problem and which in-turn led to his greatest achievement not long afterwards. While at Caltech Hoyle discovered the physical mechanism that would allow three helium nuclei to coalesce and form a stable carbon nucleus. [7] Shortly thereafter on his other visits to Caltech he began working with the husband and wife astrophysicists Margaret and Geoffrey Burbidge and the experimental nuclear physicist William Fowler on the origin of the elements. Their collaboration led to a lengthy joint paper entitled, "Synthesis of the Elements in Stars" that was published in 1957 in the journal *Reviews of Modern Physics*.

Named after the initials of its authors, the paper became known in the scientific community as the B2FH paper. Although the paper did no account for the origin and abundance of the three lightest elements hydrogen, helium and lithium the paper solidified support for the theory of stellar nucleosynthesis. [8] Hoyle's contribution was that he carried out most of the mathematical calculations and it marked his major achievement and the highlight of his career.

In 1983 the Nobel Prize for Physics was awarded to William Fowler and Subrahmanyan Chandrasekhar for their contributions to nucleosynthesis and the structure of stars. Many in the scientific community thought that Hoyle should have been awarded a Nobel Prize including Geoffrey Burbidge who considered Hoyle to be largely responsible for the theory of stellar nucleosynthesis. Burbidge believed that a major reason for Hoyle's exclusion was the misconception that Fowler was the leader who directed the writing of the B2FH paper when in reality according to Burbidge there was no single leader. [8] Moreover, some contended that Hoyle's rejection of big bang cosmology, which he maintained throughout his career, played a role in him not being awarded a Nobel Prize. [8]

In the years following the publication of the B2FH paper Hoyle continued to make important contributions to scientific knowledge, if not as well known. E.g., three decades before others considered the idea, Hoyle conjectured that hydrogen molecules act as a significant cooling factor in interstellar clouds of dust and gas. Also, his work on accretion theory (i.e., how dust and gas coalesce to form celestial bodies) led him in the 1950's to propose models of how gas clouds formed into galaxies and stars - models that today are widely accepted. Moreover, in 1960 together with his research student N. Chandra Wickramasinghe, Hoyle studied the composition of interstellar grains of dust. Hoyle and Wickramasinghe proposed that carbon was a ma-

jor component of them. Along with this they suggested that complex organic substances are present in comets and interstellar dust and gas. Today, these ideas have gained acceptance from researchers. [7]

Hoyle became Plumian Professor of Astrophysics and Natural Philosophy at Cambridge until his resignation in 1972. His career involved numerous facets. In 1957 he was elected to the prestigious Royal Society of London. In 1966 he gathered together a team of the uppermost theorists and established the Institute of Theoretical Astronomy at Cambridge, which became a top-notch center in Europe.

Hoyle's life involved controversy as well. During the 1980's, along with now colleague N. Chandra Wickramasinghe, he promoted the idea that life on Earth was seeded from bacteria carried by comets - an idea that has been largely rejected by molecular biologists.

In summation, what is not in dispute is that Hoyle had a profound influence on modern cosmology. Hoyle's theory of stellar nucleosynthesis led to the field of nuclear astrophysics and became standard teaching. There is a common expression in astronomy, which says that we are made from the stuff of stars - i.e., due to the mineral content in our make-up such as calcium and iron. And for this we are indebted to Hoyle for his groundbreaking insights. Fred Hoyle - overshadowed but not forgotten. End.

Notes

Herbert Friedman, *The Astronomer's Universe. Stars, Galaxies, and Cosmos* (New York, NY: W.W. Norton & Co., Inc., 1999).

Stephen W. Hawking, *The Illustrated Theory Of Everything. The Origin And Fate Of The Universe* (Beverly Hills, CA.: Phoenix Books, Inc., 2009).

Mario Livio, *Brilliant Blunders. From Darwin To Einstein - Colossal Mistakes by Great Scientists That Changed Our Understanding of Life an the Universe* (New York: Simon & Schuster, 2013).

"Fred Hoyle," *Encyclopedia.com*, 2008, http://www.encyclopedia.com/doc/1G2-2830905769.html

Jane Gregory, *Fred Hoyle's Universe* (New York: Oxford University Press, Inc., 2005).

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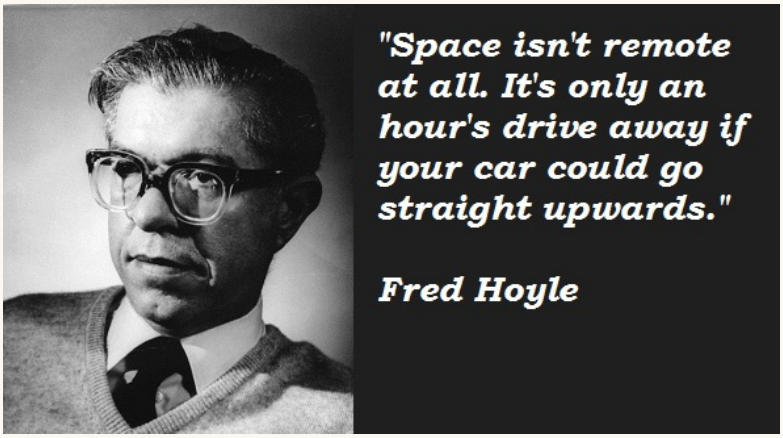
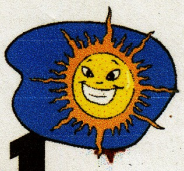


2016 Wilson Star Search



Second Saturday of the month,
May through October

Calvin E Krueger Park
350 Ontario Street (Route 18)
Village of Wilson
Telescope viewing starts at dusk

New this year, theme nights, with extra activities geared toward the theme for that night.

May 14 - *All About Telescopes*

June 11 - Watch Wilson Grow Kite Day - Sun Viewing during the day, Discover the Moon that evening

July 9 - Our Solar System

August 13 - Meteor Showers and Asteroids

September 10 - Comets

October 8 - *Star Categories*, Celestial Treasure Hunt

Join local astronomer Steve Smith and fellow members of the Buffalo Astronomical Association as they spend summer evenings observing the celestial sights with their telecopes. Have a telescope of your own? Bring it with you and they will help you learn how to use it. Activities are weather dependent and it does get cool by the *lake, so bring a sweater.*

For more information (716)870-3115

BUFFALO ASTRONOMICAL ASSOCIATION
Buffalo, N.Y.

BUFFALOASTRONOMY.COM

The Astronomical Events for July August 2016

Universe Today (Complete list in January/February Issue)

July

01- Comet C/2013 X1 PanSTARRS may reach a maximum brightness of +6th magnitude.

02- The 5% illuminated Moon occults Aldebaran for north Africa at 4:20 UT.

09- The 27% illuminated Moon occults the planet Jupiter for the southern Indian Ocean at ~10:11 UT.

16- Mercury passes 30' from Venus at 23:00 UT/7:00 PM EDT.

27- The farthest lunar perigee of 2016 occurs 11:26 UT/7:26 AM EDT, at 369,658 km distant.

29- The 22% illuminated Moon occults Aldebaran for Central America at ~11:16 UT.

30- Mercury passes 17' from Regulus at 19:00 UT/3:00 PM EDT.

August

04- The 3% illuminated Moon occults Mercury for South America at ~22:11 UT.

06- The 14% illuminated Moon occults the planet Jupiter for the southern Pacific at ~3:30 UT.

06- Asteroid 120 Lachesis occults a +7.1 magnitude star for New Guiana and Eastern Australia at ~14:23 UT.

07- Double shadow transit (Io-Ganymede) occurs from 5:31-6:31 UT.

10- Closest lunar apogee of 2016 occurs at 00:06 UT, at 404,265 km distant.

12- The Perseid meteors peak at 15:30 UT/11:30 AM EST, with an estimated ZHR of 150, favoring the central Pacific.

14- Double shadow transit (Io-Ganymede) occurs from 7:30-9:38 UT.

16- Mercury reaches 27.4 degrees eastern elongation at 18:00 UT/2:00 PM EDT.

20- Asteroid 164 Eva occults a +5.3 magnitude star for northeastern Brazil at 22:41 UT.

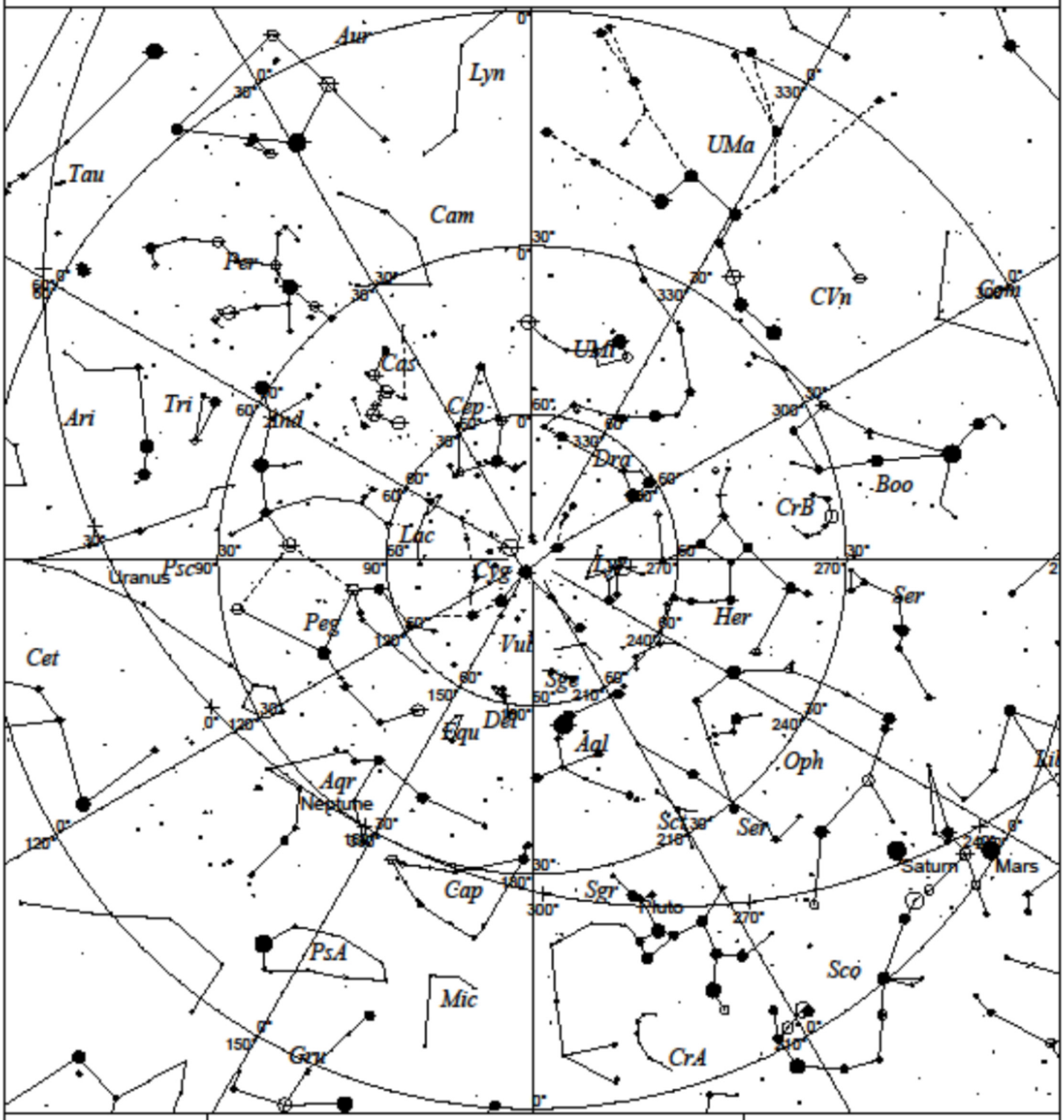
21- Double shadow transit (Io-Ganymede) occurs from 11:29-11:34 UT.

25- The 45% illuminated Moon occults Aldebaran for the western Pacific at ~16:44 UT.

27- Asteroid 85 Io occults a +7.5 magnitude star for North America at 4:38 UT.

27- Venus passes 4' from Jupiter at 22:00 UT/6:00 PM EDT. **The closest conjunction of two naked eye planets for 2016.**

Aug 2,2016 23:00

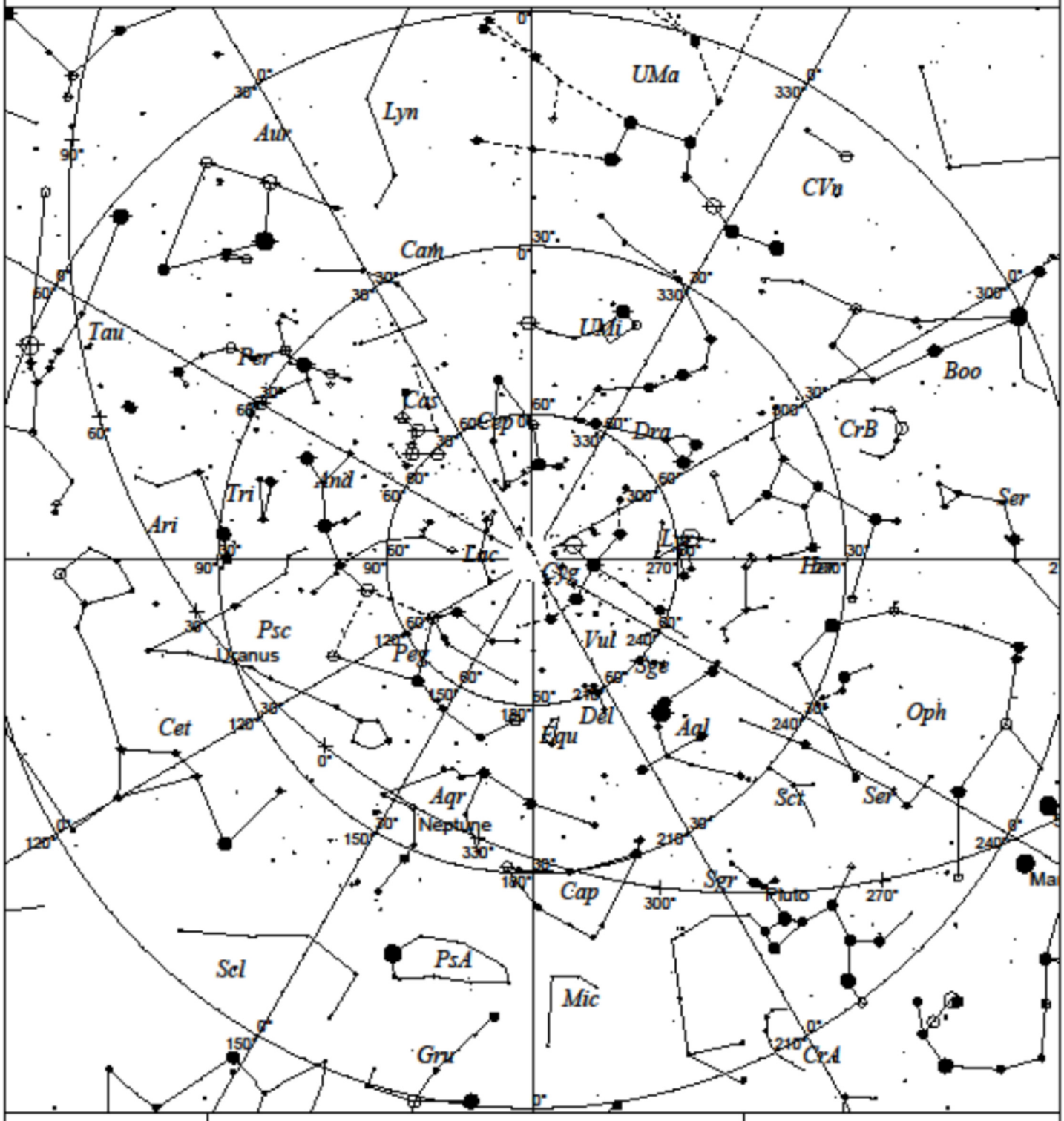


STARS	SYMBOLS		
<1	Multiple star	Dark nebula	Radio source
1.5	Variable star	Globular cluster	X-ray source
2	Comet	Open cluster	Other object
2.5	Galaxy	Planetary nebula	
3	Bright nebula	Quasar	
3.5			
4			
4.5			
>5			

Local Time: 23:42:37 2-Aug-2016 UTC: 04:42:37 3-Aug-2016 Sidereal Time: 20:15:55

Location: 42° 52' 48" N 78° 52' 12" WRA: 20h15m56s Dec: +42° 52' Field: 182.0° Julian Day: 2457603.6963

September 1,2016 23:00



STARS	SYMBOLS		
<1	Multiple star	Dark nebula	Radio source
1.5	Variable star	Globular cluster	X-ray source
2	Comet	Open cluster	Other object
2.5	Galaxy	Planetary nebula	
3	Bright nebula	Quasar	
3.5			
4			
4.5			
>5			

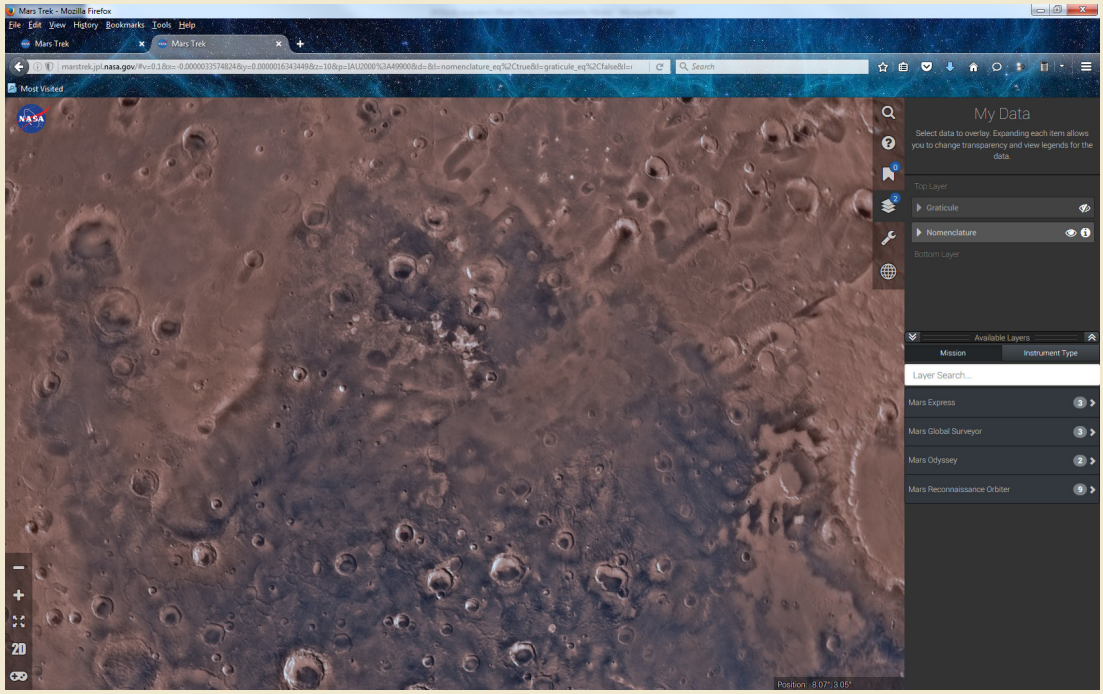
Local Time: 23:00:00 1-Sep-2016 UTC: 04:00:00 2-Sep-2016 Sidereal Time: 21:31:28

Location: 42° 52' 48" N 78° 52' 12" WRA: 21h31m28s Dec: +42° 52' Field: 182.0° Julian Day: 2457633.6667

Mars Trek Website

http://marstrek.jpl.nasa.gov/#

NASA's Mars Trek web portal provides a powerful new way to visualize and analyze data returned from Mars by a range of instruments aboard a number of spacecraft. Mars Trek's wealth of data, advanced capabilities, and easy to use interface make it useful for mission planners, planetary scientists, students, and the general public. You can use Mars Trek to engage the public in exploring the spectacular landforms of Mars, examine current and past sites of robotic exploration, and look ahead to proposed sites for human missions to Mars now being planned. You can also generate custom 3D prints of the Martian surface



Jet Propulsion Laboratory
California Institute of Technology

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Website:

www.buffaloastronomy.com

Location / Time of Meetings: BAA meetings are held on the 2nd Friday of the month from September to June starting at 7:30pm. Our meetings are held in room C122 of the Classroom Building at the Buffalo State Campus. See map below, building 35.