

The ECLIPSE

April
2018

The Newsletter of the Barnard-Seyfert Astronomical Society

Next Membership Meeting:

April 18, 2018, 7:30 pm

Cumberland Valley
Girl Scout Council Building
4522 Granny White Pike

Topic: Telescope Workshop
Details on page 9.

In this Issue:

Happy Birthday Harold Urey by Robin Byrne	3
Deep Sky Daze by Mike Benson	4
Board Meeting Minutes March 7, 2018	13
Membership Meeting Minutes March 21, 2018	14
Membership Information	17

From the President

Greetings,

Thanks for being part of BSAS as we await the end of the monsoon season here in middle Tennessee. While our telescopes have not been getting much use, at least there have been some very interesting astronomy and space related news stories to keep us occupied. Here are a few of my favorites, along with some BSAS news of our own:

China's Tiangong-1 space lab is set to fall uncontrollably into the atmosphere and may have actually done so by the time you read this article. Many of our members have been able to spot it recently and some have photographed it. [\[link\]](#)

This idea has been around for a couple of years but has received more attention of late. A Japanese company (ALE, Inc.) is offering to provide an artificial meteor shower on demand by firing pellets from a satellite, displaying light in any color desired. As though astronomers don't have enough light pollution to contend with, right? [\[link\]](#)

Have you been following news about Oumuamua, the first interstellar object ever seen in our solar system? There have been interesting studies about its origin and implications for planet formation models. [\[link\]](#)

Early this week a Dragon spacecraft is scheduled to launch into orbit atop a Falcon 9 rocket from Cape Canaveral. It is yet another SpaceX commercial resupply mission to the International Space Station for NASA. [\[link\]](#)

Bells Bend Park, one of our regular star party locations is holding its 8th annual Nashville Outdoor and Recreation Festival and Expo on Saturday April 14th from 9:00 AM-3:30 PM. BSAS will have a booth, along with dozens of other organizations and companies. If you want to help us out that



Officers

Gary Eaton
President
gceaton@comcast.net

Keith Rainey
Vice President
Keith.Rainey@gmail.com

Tom Guss
Treasurer
t_guss@bellsouth.net

Bud Hamblen
Secretary
wrhamblen@comcast.net

Theo Wellington
Ex-officio
tmwellington@comcast.net

Directors at Large

Mike Benson
ocentaurus@aol.com

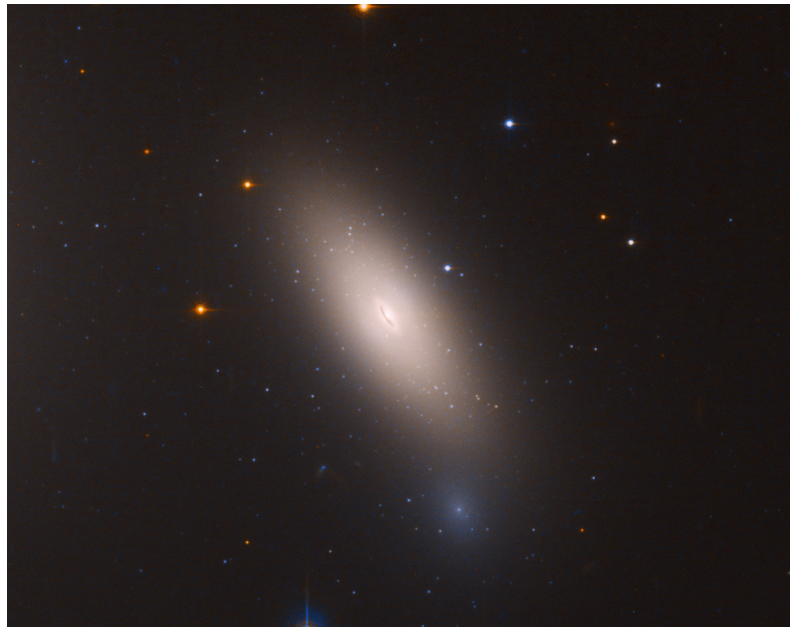
Spencer Buckner
BucknerS@apsu.edu

Drew Gilmore
eclipse@bsasnashville.com

K.C. Katalbas
hazeykc@gmail.com

Johana Keohane
jorkeohane@gmail.com

Todd Nannie
toddn_us@yahoo.com



This is a Hubble Space Telescope image of galaxy NGC 1277. The galaxy is unique in that it is considered a relic of what galaxies were like in the early universe. The galaxy is composed exclusively of aging stars that were born 10 billion years ago. But unlike other galaxies in the local universe, it has not undergone any further star formation. Astronomers nickname such galaxies as “red and dead,” because the stars are aging and there aren’t any successive generations of younger stars. [NASA](#), [ESA](#), and [M. Beasley \(Instituto de Astrofísica de Canarias\)](#)

Upcoming Star Parties

Saturday 4/14	Private Star Party: Messier Marathon SPOT Observatory
Friday 4/20 8:30 pm to 10:30 pm	Public Star Party Bowie Nature Park (Fairview)
Friday 5/11 8:30 pm to 10:30 pm	Public Star Party Bells Bend Outdoor Center
Saturday 5/12	Private Star Party Natchez Trace Parkway mile marker 435.3



Apr 15
May 15



Apr 22
April 21



Apr 29
May 29



Apr 8
May 7

Happy Birthday Harold Urey by Robin Byrne

This month we celebrate the life of a man whose name may not be familiar, but whose contributions to science are well known. Harold Clayton Urey was born April 29, 1893 in the small town of Walkerton, Indiana. Both of Harold's parents had college degrees in teaching, though by the time he was born, his father, Samuel, was working primarily as a farmer and lay preacher, while his mother, Cora, was a full-time mother and farmer. In 1899, when Harold was six years old, his father died of tuberculosis. With few resources, his mother and her three children were forced to move in with Harold's paternal grandmother in Corunna, Indiana. Five years later, his grandmother died, and the family moved again, making ends meet by growing and selling onions. Harold was raised in the Church of the Brethren, which was a pacifist Christian denomination and would influence his later life. He attended a one-room Amish school for his elementary school years, and then went to high school in Kendallville, Indiana, which was paid for by his father's life insurance that specified the money be used solely for the children's education. Harold excelled in high school, taking biology and physics, plus joining the debate team. Looking back on the opportunity to attend high school, Harold said, "If it hadn't been for that, I'd still be in Indiana, working as an unsuccessful farmer – I just can't see me being a successful farmer."



Harold Urey

In 1911, Urey graduated from high school and went to Earlham College in Richmond, Indiana. Here he earned a teaching certificate. He taught in a few small rural schools for a few years, first in Indiana, then in Montana, where his mother was now living. In 1914, Urey, who had been teaching in a mining camp, decided to attend the University of Montana in Missoula, where he majored in Zoology, with a second major in Chemistry. Urey graduated in 1917 with a BS in Zoology. The United States had now entered World War I, and Urey's chemistry background was in high demand. He began working at an explosives manufacturing plant in Philadelphia called Barrett Chemical Company, where he helped make TNT. This was when Urey realized that chemistry was his life's calling. When the war ended, Urey returned to the University of Montana to work as a Chemistry instructor for the next two years.

Since Urey was interested in an academic career, he knew he would need a doctorate degree. In 1921, Urey entered the University of California at Berkeley to begin his work toward a PhD in Chemistry. Working under Gilbert Lewis, who was known for his work in the area of chemical bonding, Urey spent two years on his research. His dissertation was on electron energy distributions in a hydrogen atom. Urey graduated in 1923.

While in graduate school, Urey became interested in quantum chemistry. After graduation, he was fortunate to receive a fellowship from the American-Scandinavian Foundation to further study at the Niels Bohr Institute

Harold Urey, continued

in Copenhagen, Denmark for one year. Just the previous year, Bohr had received the Nobel Prize in Physics for his discovery of the quantum energy levels in an atom. While at the Institute, Urey had the opportunity to meet and work with not only Bohr, but other notables like Heisenberg and Pauli. At the end of his year, Urey spent some time in Germany, where he met Albert Einstein.^Z

Returning to the United States in 1924, Urey had two job offers, one from Harvard and one from Johns Hopkins; he chose Johns Hopkins. But first, he went to Seattle, Washington to see his mother. While visiting a friend in Everett, Washington, Urey was introduced to Frieda Daum, a bacteriologist. They were quickly engaged and married in 1926. They would have four children, three girls and a boy.

While at Johns Hopkins, Urey was a research associate. Here he continued his interest in quantum mechanics, and wrote a book with Arthur Ruark titled "Atoms, Quanta and Molecules" published in 1930, which was the first English text book about quantum mechanics. Urey's research involved studying the spectra of molecules, but he was not happy with his progress. So, in 1929, before his book came out, Urey moved to Columbia University in New York City, where he was an associate professor of Chemistry. By 1934, he was a full Professor. It was here that Urey made his first major discovery. The idea of isotopes of atoms, atoms of the same element but different masses, had been discovered by J. J. Thomson in 1913, but the reason was not discovered until 1932 when James Chadwick discovered neutrons. So isotopes are atoms with different numbers of neutrons in the nucleus. In 1931, before the discovery of the neutron, Urey knew that hydrogen could have an isotope that was double the mass, known as "heavy hydrogen." Urey found that the boiling point of the heavy hydrogen should be higher than that of regular hydrogen. His plan was to get four liters of liquid hydrogen, and slowly raise the temperature to boil off the lighter hydrogen. The relative abundance of hydrogen to heavy hydrogen had been determined to be about 1 atom of heavy hydrogen for every 4500 hydrogen atoms, but if 4 liters of liquid hydrogen was boiled down to one milliliter, Urey determined that the abundance of heavy hydrogen would be over 100x greater. Urey was also able to calculate what the spectrum of heavy hydrogen would look like compared to regular hydrogen. On Thanksgiving Day, 1931, Urey and his assistant took a spectrum of the distilled hydrogen and saw exactly the spectral lines Urey had predicted. Urey named the new element Deuterium. Urey, along with George Murphy (his assistant), and Ferdinand Brickwedde (who performed the distillation), published their discovery in 1932.

During most of the 1930's, Urey concentrated on processes for distilling elements to create a sample enriched in their isotopes. This ended up having a biochemical use. If a lab animal were fed food containing a traceable isotope, you could follow the path the nutrients take in the animal's body. In 1932, Urey founded the Journal of Chemical Physics, acting as the editor for the next eight years.

In 1934, Urey was awarded the Nobel Prize in Chemistry for his discovery of Deuterium. However, instead of attending the ceremony, Urey stayed home for the birth of his daughter, Mary Alice. Urey was known for his generosity. Despite being named the sole recipient of the Nobel Prize, he shared the prize money with Murphy and Brickwedde. As part of the honors he received, Urey was asked to write the entry on Deuterium for the 1936 edition of the Encyclopedia Britannica.

While Urey's opportunities seemed to expand, he became increasingly concerned about his colleagues in Europe during the 1930's. Urey chaired the University Federation for Democracy and Intellectual Freedom at Columbia University. Urey opposed Nazism and did what he could to help Jewish and other persecuted

continued on next page

Harold Urey, continued

scientists escape to America, including Enrico Fermi.

By the time the United States entered World War II, people were already concerned about Germany developing an atomic bomb. The atomic bomb required an isotope of Uranium, Uranium 235. As one of the premier chemists involved with separating out element isotopes, Urey naturally was sought after to help with the Manhattan Project. From 1940 - 1945, Urey was Director of War Research, Atomic Bomb Project at Columbia University. Seven months before America was even in the war, Urey had been appointed to the S-1 Executive Committee, which was also known as the Uranium Committee of the National Defense Research Committee. This group represented the beginnings of the Manhattan Project. By 1943, Urey was in charge of 700 people working on separating the uranium isotope by the gaseous diffusion method. Other methods, such as centrifugal separation and thermal diffusion, were also being explored at other locations. The gaseous diffusion technique later became the only one used, especially after the war, due to its efficiency. Urey also worked on production of "heavy water," which is water made with deuterium instead of hydrogen, to be used in nuclear reactors to control the chain reaction. However, the stress of the job got to Urey, and he left the program in 1945. Urey was opposed to dropping the bomb on Japan and tried to convince President Truman to explore other alternatives. He was awarded the Medal for Merit in recognition of his efforts in producing the Uranium isotopes. After the war, Urey championed for atomic weapons to be under civilian, rather than military, control, and proposed a ban on the production and stockpiling of atomic weapons. He went on lecture tours promoting a pacifist agenda, among other things. His political endeavors ultimately led to Urey being brought before the House Un-American Activities Committee, though he was not found guilty of anything.

In 1945, Urey moved to the University of Chicago to work in the Institute for Nuclear Studies as a Distinguished Professor of Chemistry. Here he explored how temperatures would affect certain isotopes. By the ratio of isotopes present in a sample, he could determine the temperature the sample had been exposed to. He applied this techniques to a 100 million year old fossilized shellfish to determine the summer and winter temperatures it had been exposed to. This was one of the first experiments in paleoclimatology, and Urey was awarded the Arthur L. Day Medal by the Geological Society of America for this work.

By the early 1950's, Urey became interested in the chemistry of space and the origin of life. After hearing about the idea of life coming from a "primordial soup" of carbon compounds, Urey suggested that lightening could trigger the chemical reactions necessary to produce the amino acids needed as the building blocks of life. He proposed that the original atmosphere of Earth would have been composed of hydrogen, ammonia, methane, and water. One of his graduate students, Stanley Miller, wanted to test this idea experimentally for his dissertation. The experiment, now known as the Miller-Urey experiment, involved a gaseous mixture of hydrogen, ammonia, methane, and water exposed to electrical sparks. Within a few days, a sludge of amino acids was present. This proved that organic molecules could be produced under naturally occurring conditions. When Miller went to publish the results, he wanted Urey's name on the paper, but Urey refused, afraid that his notoriety as a Nobel Prize winner would overshadow Miller's work and prevent Miller from getting the recognition he deserved.

After spending 1956-1957 in England as a visiting professor at Oxford, Urey retired from the University of Chicago and moved to the University of California San Diego as a Professor-at-Large. Here he helped build up the science faculty and created the school of chemistry in 1960. Urey was very politically active and served as a science advisor to President Kennedy. Despite being "retired," Urey wasn't done exploring new areas of

continued on next page

Harold Urey, continued

research. He believed that the moon had formed prior to the Earth and was captured by Earth. As such, he was a strong proponent of the Apollo Moon landing to bring back lunar samples that would, as he thought, represent early samples of the solar system. Urey even approached Apollo 17 astronaut and geologist Harrison Schmidt, to offer going on a one-way trip to the moon. After Apollo 11 brought back the first samples, Urey was one of only six people who had the first opportunity to study them. Because the samples showed that the Earth and Moon had a common origin, Urey threw out his original hypothesis and, in the spirit of the scientific method, revised his ideas.

Urey continued working hard at his research most of his life. When asked why, he said, “Well, you know I’m not on tenure anymore.” After retiring in 1970, Urey kept busy by gardening, not farming, and raised orchids. His later life was plagued by Parkinson’s Disease and cardiac issues. Harold Urey died January 5, 1981 in La Jolla, California and was buried in DeKalb County, Indiana.

Harold Urey made so many contributions to the scientific world, yet his name is barely known, and that’s a shame. From the discovery of deuterium to his work on the Manhattan Project to showing the chemical origins of life to the origin of our moon, Harold Urey continued to do exemplary and astounding work. The next time you glance up at the Moon, take a moment to remember the man who not only helped us understand its origins, but so much more.

References:

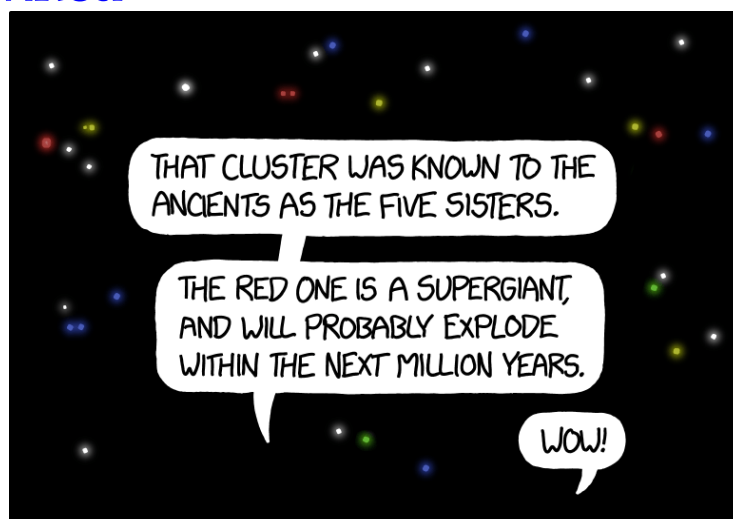
[Wikipedia: Harold Urey](#)

[Nobel Prize Harold C. Urey - Biographical](#)

[Brittanica - Harold C. Urey American Chemist by Richard E. Rice](#)

[Famous Scientists - Harold Urey](#)

xkcd



THERE ARE TOO MANY STATUS LEDs IN MY ROOM.

DEEP SKY DAZE by Mike Benson

April--and back on Daylight Saving Time once again, we have time to get supper and relax at home a bit before trekking out to our favorite observing spots. Leo's graceful sickle asterism is near zenith as the skies darken; and Hydra commands a full 90° in azimuth, a base upon which the southern sky rests. It may be possible to find Omega Centauri around midnight on one of the rare nights without haze or clouds on the southern horizon. Venus will set about 8PM as the month begins and around 9:30 at month's end. Mercury has left the evening skies until mid-June to mid-July. Jupiter rises around 9:30 early in April and an hour and a half earlier on the 30th. Saturn is still an early AM object. An Algol minimum will occur about 10:30 CDT on the **8th**.

Prime viewing areas near the meridian are becoming very busy as we move into the Realm of Galaxies, so there are really two star hops this month. By 9 or 10 PM, Orion has moved well west of the meridian, leaving the southern view to Monoceros, Gemini, Lynx, and Canis Minor--all somewhat subdued. In the east, Spring's immanent arrival is announced by Leo's sickle. Between Leo and Gemini is faint Cancer, near the meridian, and just south of this member of the Zodiac the head of Hydra, the water serpent, rises to view the terrestrial realm. It is here that we begin this month's journey.

So what's to see? Three open clusters and two galaxies constitute the Messier offerings, and we'll just see what else turns up in a leisurely jaunt from nearly 6° below the celestial equator to a northerly high near +70°.

Hydra is an interesting constellation. It's the largest, stretching across a quarter of the sky, roughly paralleling the ecliptic. Its brightest star is 2nd magnitude Alphard (α *Hydrae*), "the lonely one." This is not an inapt description; between Procyon (α *Canis Minoris*) and Spica (α *Virginis*), south of the ecliptic there is no brighter star which can commonly be viewed from the continental United States. Hydra contains relatively few bright deep sky objects, but marks the boundary south of which we, in the Northern Hemisphere, seldom venture. We'll start here and will return to it in the months to come.

M-48 (NGC 2548), until recently, was a blank spot in the sky. The location of the object, as recorded by Messier, shows nothing remotely out of the ordinary. Recent research, however, turned up a brilliant galactic cluster



M-48

DEEP SKY DAZE, continued

some 4° south of the recorded location--and it fit Messier's description to a "T". I guess everyone can err occasionally! Finding this cluster is relatively easy. Roughly halfway between Procyon and Regulus (α Leonis) you'll find a fairly tight little group of 3rd and 4th magnitude stars that mark the head of Hydra. Using binoculars or a wide angle finder, drop 11-12° southwest. M-48 is large and bright, bordering on naked eye visibility. It's over 3/4° in diameter--loose, roughly triangular in shape, and dominated by about a dozen 8th and 9th magnitude stars and a couple of dozen fainter ones. Just how many you see will depend on the darkness of the skies and the size of your observing instrument. There are a couple of nice double stars near the center of the cluster.

Now let's move about 25° almost due north, to Cancer, another faint constellation which probably wouldn't be there, except that it's on the ecliptic and a constellation was needed between Gemini and Leo. Using just your eyes you should have no trouble finding **M-44 (NGC 2632)** in a moderately dark sky. It's a 3rd magnitude open cluster, three times the diameter of the full moon, almost directly in the center of Cancer. Only very low power (35X or less) will let you see the entire cluster in one view. I am always quite content to see **Praesepe**, or the "**Beehive**" as it is usually called, through my finder. This cluster is just over 500 light years away and contains a total of over 100 stars, though not all will be visible in even a larger amateur telescope.

Now follow a straight line SSE about 2° from the center of the Beehive to *Delta Cancrri*; continue another 7° in the same direction to Alpha. Both are about 4th magnitude. About 2° due west is our third galactic cluster, **M-67 (NGC 2682)**. This one is about 0.5° in diameter and 7th magnitude. There are over 500 stars packed into this space, about half of which can be viewed through the average amateur instrument. It's reminiscent of M-46 without the planetary nebula--a bit fainter, but denser. M-67 is old as open clusters go, with a stellar color distribution more like a globular cluster, implying an age of about 10 billion years. It is also unusual in that it is located some 1500 light years above the plane of the Milky Way. Most open clusters are found within the central plane of a galaxy.



M-67

As long as we're in this section of the sky, let's take a look at **NGC 2775**, a fairly tightly wound spiral galaxy (Sa). It is listed at 11.5 magnitude and is slightly elongated, about 2' in diameter. The faint haze of the disc grows gradually brighter until it flares into a very bright, non-stellar core.

One of the objects on the Herschel 400 list, it is quite easy to find. From M-67, drop south about 6°

DEEP SKY DAZE, continued

to the head of Hydra. Find Zeta, the easternmost star in the serpent's head. Set the telescope a degree north of the star. Pan east 3° past a distinctive trapezoid of 6-8 magnitude stars. The galaxy is just east of that asterism.

Next we move to the most northerly point of our journey-- 50° north and 15° east of M-67--to two of my all-time favorite objects. Because of 1993's supernova in **M-81 (NGC 3031)**, nearly everyone with access to a telescope has had a look at this part of the sky. M-81 is huge, and has a crowd of hangers-on. Several of these companion galaxies are on the Herschel 400 list and one (**M-82**) is a Messier object in its own right. The latter is an irregular galaxy, gravitationally bound to M-81, and is being mightily



M-81 and M-82

disrupted by tidal forces from the dominant galaxy. Often called the "Exploding Galaxy," M-82 (**NGC 3034**) is really undergoing a major burst of star formation brought on, apparently, by the gravitational disruption brought on by the proximity of M-81. Both objects are bright and M-82 shows a lot of detail, even at moderate power: lumps of brightness; dark, dust lanes. I can just get both in a single field of view at 50X. They are located about 10° NW of Dubhe (α *Ursae Majoris*) just east of a relatively

continued on next page

**Next BSAS meeting
April 18, 2018, 7:30 pm**

**Cumberland Valley
Girl Scout Council Building
4522 Granny White Pike**

The April meeting of the Barnard-Seyfert Astronomical Society will focus on how to use a telescope and other astronomical gadgets. Whether you received a telescope last Christmas or have one gathering dust in the closet, bring it to the meeting for some one on one instruction! Be sure to bring the manual and other parts that came with your telescope, if they're available. If you plan on bringing a telescope to the meeting, let us know beforehand by emailing your name along with the brand and model of the telescope to info@bsasnashville.com. This way, we'll be prepared to assist you.

DEEP SKY DAZE, continued

prominent L-shaped asterism which you will learn to recognize in your finder after a couple of searches for the galaxies.

On the same Uranometria 2000.0 chart there are five other galaxies on the Herschel 400 list. **NGC 3077** and **2976** are SE and SW, respectively, of M-81. 2976 was particularly fun to observe because there is a 14 magnitude star on the SE side of the ellipse which is often only visible in peripheral vision so that as the eye wanders around the field, the star keeps blinking on and off. **NGC 2787** is a bright spiral about 3-4 degrees due west, while **NGC 2742** and **2768** are about 9° SW of M-81.

Between 12h and 14h RA there are 27 Messier objects. Two of them (**M-40** and **M-91**) are spurious, according to many sources. However, each will be dealt with in its proper place.

This month we'll look at a baker's dozen of galaxies which can be found in an area barely 4° X 7°. Called the Realm of the Galaxies by many, this is a very special region of the sky. Our Local Group of galaxies is an outlying member of a supercluster of galaxies known as the Virgo Supercluster. At the center of the supercluster is the Coma-Virgo Cluster. The group of galaxies we will encounter tonight are the brightest members at the center of this cluster.

This little area can be seen on a very small portion of two charts in Uranometria 2000.0 (193 and 194), and includes parts of two constellations (Virgo and Coma Berenices). An additional Messier galaxy (**M-49**) is to be found on the same chart, so it will be included, as well.

While we have observed the above describes objects, stars in the east will have risen toward zenith. Let's move in that direction for the remainder of this session.

Find Denebola (β Leonis), the tip of the lion's tail. From there swing 6° east to a NE-SW line of three 5-6 magnitude stars. The brightest of these, 6 Comae Berenices, is nearly the same declination as Denebola and is barely half a degree due east of our first object, **M-98 (NGC 4192)**. This edge-on spiral is fairly large and has a center that is bright and non-stellar. The nebulosity defining the disc of the galaxy is pretty faint.

Next drop south half a degree and east a degree to **M-99 (NGC 4254)**. This spiral is like a smaller sized **M-33** and is sometimes referred to as the "Pinwheel", a name usually reserved for the latter galaxy.



M-99

DEEP SKY DAZE, continued

In fact, **M-99** probably has a diameter 25% wider than M-33 and is around 45 million light years away; M-33 is only about 2.4 million l.y. distant. Careful observation of M-99 will pay off, with some mottling and a slightly brighter core.

Back at your finder scope, you should see a NE-SW line of just north of M-99. Continue that line toward the NE about a half degree and you have **M-100 (NGC 4321)**, the largest spiral galaxy in the Coma-Virgo Cluster. This spiral is about 5' in diameter and is just slightly oblong; it's a class "C" spiral, meaning that the arms are very open. This results in a low surface brightness, making for a moderately difficult find. There is a gradual brightening toward the core of the galaxy which is fuzzy, but small.

Drop south a little over a degree and shift east about a degree to a 7th magnitude star. You'll find **M-88 (NGC 4501)** about a half degree SE of the star. Appearing about twice as long as it is wide, this spiral is oriented NW-SE on its long axis. Continue due east just less than 1° and you come to **NGC 4548** which Wil Tirion lists as M-91 on his star charts. Burnham agrees with this assessment, but others feel that M-91 may have actually been a comet that got away, a duplicate observation of M-58 (which has a very similar appearance), or an observation of nearby **NGC 4571** which received erroneous coordinates. In any case, at first glance it looks like a fuzzy star, but care will show you a faint halo around the core of this barred spiral. While in the area, you may as well make a stab at **NGC 4571** which is about a half degree SE of M-91, just south of a 9th magnitude star. About 2.5' X 2', this spiral gradually increases brightness toward a stellar core; overall brightness is about 12th magnitude.

M-90 (NGC 4569) is the next stop, 1° due south of **NGC 4571**. The move takes us barely over the constellation border, into Virgo.

(I need to emphasize here, that it is absolutely essential to have a good star atlas at hand. We're in the center of the cluster; there are literally dozens of galaxies about, and you really need to watch star patterns to be sure you know where you are--and where you are going. My descriptions will be confusing, at best, without an atlas.)

M-90 is large and about 3 times as long as it is wide. It is quite bright with a very bright center, a stellar core, and a NNE-SSW orientation. **M-89 (NGC 4552)** is a small elliptical a bit over a half degree SSW of M-90, quite round and brighter toward the center. About a quarter degree south are **NGC 4550** and **4551**. I was not able to find the latter in my 8" SCT on a good night, but the N-S slash of the former was seen in peripheral vision as a faint, featureless fuzz.

Now, let's meet the leader of the pack, **M-87 (NGC 4486)**, the great elliptical which sits at the center of the Coma-Virgo Cluster, which, in turn, sits at the center of the Virgo Supercluster. It's a bit over a degree West and a tad North of NGC 4550-51. Nearly round, this 9th Mag galaxy has too large and bright a center to ever be called "stellar". An 8" scope will not reveal the jet, but a larger instrument at a very dark site on an exceptional evening, might. There are several close companions, but most require

DEEP SKY DAZE, continued

a sizable light bucket. **NGC 4478**, about 7' SSW of the center of **M-87** is on the Herschel 400 list, and should be visible in the same field of view.

A little over a degree west and a half degree north are **M-84 (NGC 4374)** and **M-86 (NGC 4406)**, about a quarter of a degree apart. This is one of those amazing spots where it is possible to see nine galaxies in a 1° field of view centered on these two Messier objects. Take your time with this group and use your atlas to verify their designations; then return to M-87.

M-58 (NGC 4579) is a bit less than 2° SE of M-87, just east of an 8th magnitude star. It's a face-on spiral and has a bright center with a stellar core. A little more than a degree east and a tad south brings you to **M-59 (NGC 4621)** and **M-60 (NGC 4649)** about a quarter degree apart. M-60 is about 1.5 magnitude brighter than M-59. There are several faint companions in the area as well.

We have only touched the surface of this area to view the brightest of the group. You could spend a month of clear evenings just grazing contentedly through this small pasture to see what juicy tidbits turn up.

We do have one more object to go: **M-49 (NGC 4472)**. It's a bit over 4° almost due south from M-87, located halfway between a NW-SE oriented pair of 6 magnitude stars. It's a round, bright elliptical with a very bright, non-stellar core, about 8' in diameter.

I hope you enjoyed this excursion to the center of the supercluster of which our Local Group is only an outrider. None of these objects appears particularly bright in amateur scopes, but remember, it was the 40 or 50 million light years from here to there that dimmed their luster.



M-49

What a marvelous place this universe is! ENJOY!

continued on next page

**Barnard-Seyfert Astronomical Society
Minutes of a Regular Meeting of the Board of Directors
Held On Wednesday, March 7, 2018.**

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held March 7, 2018, in the City Center at the Girl Scouts Center, 4522 Granny White Pike, Nashville, TN 37204. Present were board members Mike Benson, Gary Eaton, Drew Gilmore, Bud Hamblen, Johanna Keohane and Theo Wellington, and guest Meghan Keohane. A quorum being present, Gary called the meeting to order at 7:30 PM. Gary asked for a motion to approve the minutes of the February 7, 2018, meeting. Theo so moved, Mike seconded and the minutes were approved by voice vote. Bud reported that there was \$4,261.06 in the checking account and \$4,156.77 in the savings account. Mike reported that he had sent a list of 165 members to the Astronomical League.

The results of the silent auction were discussed. The less-than-usual result of \$94 was attributed to the disruption caused by the lock-out at the Girl Scout Center and the resulting postponement of the auction.

Johanna Keohane reported that there had been 42 responses to the survey monkey. Favorable responses were received to having a club tee-shirt and a club windbreaker/hoodie. Suggestions received through the survey monkey included gloves, coffee mugs, “thermos” bottles, bumper or car window stickers, name tags (free), calendars with members’ astrophotos, pens, red lights, polo shirts, tote bags, and planispheres. Rather than having the club keep an inventory, using an on-line create on demand service such as Cafe Press was discussed.

Respectfully submitted,

Bud Hamblen

Secretary

DEEP SKY DAZE, continued

Image Credits

[M48](#), [M67](#) Atlas Image obtained as part of the Two Micron All Sky Survey (2MASS), a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation.

[M81 and M82](#) Markus Schopfer 8-inch SC-Telescope, Digital SLR

[M-99](#) Hewholooks

[M-49](#) Ole Nielsen

**Barnard-Seyfert Astronomical Society
Minutes of the Monthly Membership Meeting
Held On Wednesday, March 21, 2018.**

The Barnard-Seyfert Astronomical Society held its annual pot-luck dinner and monthly meeting in the City Center of the Girl Scout Center, Nashville, Tennessee, on Wednesday, March 21, 2018. Twenty-two members signed in. Gary Eaton called the meeting to order at 7:30 PM. Gary asked for a motion to approve the minutes of the February 21, 2018, meeting. Spencer Buckner so moved, Ralph Chumbley seconded, and the minutes were approved by unanimous voice vote. Bud Hamblen reported that there was \$4,286.06 in the checking account and \$4,156.77 in the savings account. Dr Billy Teets, Vanderbilt University, was visiting.

Gary announced upcoming public star parties:

Saturday, 3/24/2018 from 8 to 10 PM at Shelby Bottoms Nature Center, with a indoor presentation by Lonnie Puterbaugh and Theo Wellington in case of clouds and rain.

Friday, 4/20/2018 from 8:30 to 10:30 PM at Bowie Nature Park.

Gary also announced the club messier marathon and pot luck on 4/14-15/2018 from dusk to dawn at Mark Manner's Spot Observatory. Bring plenty of food and something to drink.

Johanna Keohane brought club loaner telescopes to the meeting.

Dr. J. Robert Schweikert made a presentation, "Sundials: What Time Is It?", describing both ancient and modern sundials and showing many working examples. Meeting attendees received a sundial customized for Nashville, Tennessee.

There being no further business Gary asked for a motion to adjourn. Theo Wellington so moved, Spencer Buckner seconded and the meeting was adjourned at about 9:00 PM.

Respectfully submitted,

Bud Hamblen
Secretary



(March 26, 2018) --- Expedition 55 Flight Engineer and astronaut Scott Tingle is pictured conducting the Transparent Alloys experiment inside the Destiny lab module's Microgravity Science Glovebox. The Transparent Alloys study is a set of five experiments that seeks to improve the understanding of melting-solidification processes in plastics without the interference of Earth's gravity environment. Results may impact the development of new light-weight, high-performance structural materials for space applications. Observations may also impact fuel efficiency, consumption and recycling of materials on Earth potentially reducing costs and increasing industrial competitiveness.

Credit: [NASA Johnson Space Center](#)

From the President, continued

day, please let me know. Here is a link with event details: [\[link\]](#)

Later that evening (Saturday, April 14th) we will have our Messier Marathon make-up event at Spot Observatory. More details to follow as we get closer.

Nashville's Earth Day Festival will be held in Centennial Park on Saturday April 21st from 11:00 am to 6:00 pm. BSAS will be there. [\[link\]](#)

Even though the planned public star party at Shelby Bottoms was rained out Friday night, we did manage to draw 15-20 to hear Theo Wellington and Lonnie Puterbaugh . Thanks to both of them for being there and helping educate the enthusiastic group about the night sky, meteorites and Mars.

A special thanks to Dr. Bob Schweikert on his outstanding program on sundials at our March member meeting. We learned a lot about the science and history of sundials from a true expert.

There is a "good" chance of rain the next 7 days. Not even news worthy any more, is it? Oh well.

Gary Eaton

LINKS

Tiangong-1:

<https://www.space.com/40154-chinese-space-station-crash-pacific-ocean-prediction.html>

ALE, Inc.:

<http://star-ale.com/en/>

Oumuamua:

<https://www.nasa.gov/feature/goddard/2018/new-study-shows-what-interstellar-visitor-oumuamua-can-teach-us>

Dragon Launch

https://www.nasa.gov/mission_pages/station/research/SpX-14_research_launch_feature

Nashville Outdoor and Recreation Festival and Expo

https://www.facebook.com/events/1293642667446504/?active_tab=about

Nashville Earth Day:

<http://www.nashvilleearthday.org/>



Become a Member of BSAS!
Visit bsasnashville.com to join online.

All memberships have a vote in BSAS elections and other membership votes. Also included are subscriptions to the BSAS and Astronomical League newsletters.

Annual dues:

Regular: \$25
Family: \$35
Senior/Senior family: \$20
Student:* \$15

* To qualify as a student, you must be enrolled full time in an accredited institution or home schooled.

About BSAS

Organized in 1928, the Barnard-Seyfert Astronomical Society is an association of amateur and professional astronomers who have joined to share our knowledge and our love of the sky.

The BSAS meets on the third Wednesday of each month at the Cumberland Valley Girl Scout Building at the intersection of Granny White Pike and Harding Place in Nashville. Experienced members or guest speakers talk about some aspect of astronomy or observing. Subjects range from how the universe first formed to how to build your own telescope. The meetings are informal and time is allotted for fellowship. You do not have to be a member to attend the meetings.

Membership entitles you to subscriptions to *Astronomy and Sky & Telescope* at reduced rates; the club's newsletter, the *Eclipse*, is sent to members monthly. BSAS members also receive membership in the Astronomical League, receiving their quarterly newsletter, the *Reflector*, discounts on all astronomical books, and many other benefits.

In addition to the meetings, BSAS also sponsors many public events, such as star parties and Astronomy Day; we go into the schools on occasion to hold star parties for the children and their parents. Often the public star parties are centered on a special astronomical event, such as a lunar eclipse or a planetary opposition.

Most information about BSAS and our activities may be found at bsasnashville.com. If you need more information, write to us at info@bsasnashville.com.

Free Telescope Offer!

Did someone say free telescope? Yes, you did read that correctly. The BSAS Equipment & Facilities Committee has free telescopes ranging in size from 2.6" to 8" that current members can actually have to use for up to 60 days at a time. We also have some other items in the loaner program such as a photometer, H-alpha solar telescope, educational CDs, tapes, DVDs, and books. Some restrictions apply. A waiting list is applicable in some cases. The BSAS Equipment Committee will not be held responsible for lost sleep or other problems arising from use of this excellent astronomy gear. For information on what equipment is currently available, contact info@bsasnashville.com.