S*T*A*R ASTRONOMY CLUB
http://www.starastronomy.org

The Spectrogram

Newsletter for the Society of Telescopy, Astronomy, and Radio

October 2013
Edited by Rob Nunn
Compiled by M. Paci

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October Meeting

The next meeting of S*T*A*R will be held on Thursday, October 3 at 8 p.m. at Monmouth Museum on the campus of Brookdale Community College in Lincroft, NJ.

Our guest speaker will be Dr. Ken Kremer who will present "Curiosity, MAVEN and the Search for Life on Mars, in 3-D". Dr. Kremer is author of numerous articles and presentations and is a sought after speaker and a regular contributor to "Universe Today".

The meeting will begin at 8:00pm at Monmouth Museum on the campus of Brookdale Community College in Lincroft, NJ. As always, we welcome visitors and those who may be new to Astronomy. If you are a visitor, please come at 7:30 PM so that we can get a chance to meet you and understand your interests before the regular meeting begins at 8 PM. You do not need a scope to attend, but if you have one and need help setting it up, please join us.

Calendar

October 3, 2013 – S*T*A*R Meeting

October 10, 2013 - Middletown Library Star Party

October 11, 2013 - Dorbrook Observing Session

October 12, 2013 - International Observe the Moon Night

November 7, 2013 - S*T*A*R Meeting Dave Britz "Comets and Asteroids"

November 13, 2013 - Dorbrook Observing Session

November 23, 2013- Georgian Court University Library, Solar observing

President's Corner

By Kevin Gallagher

This has been an active summer for the club, as we have taken a number of steps to try and improve the quality of our Outreach and Communications to attract and maintain members. This has been a collaborative effort, but like all collaborations, it is only through the dedication of individuals that we are able to produce results. We're hoping that these actions result in greater enjoyment of the skies for our members new and old.

Please join with me in offering our sincere thanks to the following club members;

- The S*T*A*R Board: including Rob Nunn (VP), Arturo Cisneros (Treasurer), Michelle Paci (Secretary) and Dave Britz (Member at Large).
- Russ Drum (Observing Chairman) and Steve Siegel (Outreach Chairman) for their stalwart support for all our observing sessions and outreach events; including the Dorbrook Park Observing Sessions and the Monmouth Museum Family Day.
- In addition to Russ and Steve, Ken Legal, George Zanetakos, Mike Kozic, Michelle Paci, Rich Gaynor and Dave Britz all gave of their time and energy to be part of the "New Membership Task Force" that worked on lots of suggestions to make a better club. Although Ed Collett and Rob Nunn could not attend the meeting, they have continued to provide input and guidance, based on their experience.
- This group has also been responsible for establishing our regular monthly observing program at Dorbrook Park, as well as our participation in the NASA/JPL Night Sky Network (NSN), and a variety of great ideas we hope to implement this year.
- Jay Respler (Picnic Head Honcho) made sure that we had an enjoyable picnic this year, despite the challenge of the late scheduling. Jay also handles the refreshments at our meetings, with the help of Anne Silverman.
- Michelle Paci and Michael Lindner have rolled up their sleeves and come up with some great ideas to update our website and improve the experience, especially for first-time visitors. Michelle is also taking over "The Spectrogram" with Rob Nunn's help.
- Russ Drum was instrumental in helping to establish our first-time participation (at least in recent memory) of being part of a Monmouth County Parks Program for night sky observing (scheduled for this winter).

Please accept my apologies for any names that I have left out. While that fear is a real one, I did not think it could stand in the way of the importance of thanking all of the members above.

-Kevin

September Meeting Minutes

By Michelle Paci

President Kevin Gallagher promptly started the S*T*A*R Astronomy Society club meeting at 8:05pm. Twenty-five people attended the meeting. Kevin chaired the meeting and began by presenting the agenda, stating that we'd have a presentation followed by sky events of the month, upcoming star parties, club business matters and then promptly introduced the evening's speaker. He also noted for members to see our treasurer, Arturo, about membership dues.

Kevin introduced our guest speaker, Mr. Allen Malsbury as an accomplished former member of our club with many talents. He went on to note that Allen is a dedicated visual observer, completer of the Astro-League double star program, a sky sketching pro (as can be seen on our discussion board), a skilled telescope maker, and an accomplished imager.

Allen shared with us his experiences in building, observing and imaging with his telescopes. His presentation, "Not Just Telescope Making" detailed his inspiration to build telescopes and how he currently uses his magnificent hand-made telescopes. Allen shared that Gene Russo was his initial mentor in the realm of Amateur Telescope Making (ATM) and that he went on to learn 99% of what he knows from S*T*A*R club members.

Our organization has a strong tradition of ATM going back to the days at Andy Zangle's house. Allen talked about how ATM not only has a strong national interest, as can be seen at Stellafane in Springfield, VT, but that it is international as well – as he lightheartedly shared that his website gets the most hits from Athens. Allen was inspired by seeing our club members projects, including Gavin Warnes's traveling 6" scope, and Mike Lindner's Boy Scout "fixer upper" scopes. Mike Lindner's and Dave Nelson's Sidereal Tracking Platform that helps track a star just like an equatorial mount inspired Allen to build one.

He displayed the CAD diagrams and designs for these magnificent instruments. Allen also brought examples of his 4" f/28 Schiefspiegler and his 6" f/12 Newtonian.

Mr. Malsbury talked about how a whole new world was opened up for him when he began his venture into astrophotography. Allen explained how he changes his mount to set up for astrophotography with an Equatorial Mount with sidereal tracking. Allen also showed breath taking images of M95, M63, the Leo Trio and Comet 168P, M31, M32, & M110.

Allen also displayed an image of a variable star. He described how he uses a comparative method of the magnitude of the stable stars around it to determine the current magnitude of the variable. He then went on to discuss his passion for observing and recording Double Stars. Double star imaging can also be done using a webcam. Furthermore, he uses the video data he collects to determine the double star's position angle and separation. Allen's research was recently published by the University of South Alabama's Journal of Double Star Observations titled "Measurement of Double Stars Using Webcams 2011 and 2012" (July 1, 2013, Volume 9 Number 3). Double stars as faint as magnitude 8 could be imaged using a 6" f/5.6 Newtonian.

Allen then went on to describe how he has made Mirrors by hand. He showed a wearisome video demonstrating laborious process of hand grinding the mirror with a mirror grinding tool. Repeatedly following a "1/3 Center over Center" stroke. Starting with a coarse grit, working your way through 6 grits to finer and finer, followed by a tutorial on the polishing lap. He said to make a 6" mirror you have to work it for about 12 hours, usually in 1 hour intervals. He also showed us video of a mirror making machine that uses an off axis spinning motion of turn tables that are oscillating and rotating. In order to make your own mirrors, you also need to learn to test the mirror quality.

A photograph of M31, M32, & M110 taken by Mr. Allen Malsbury through one of his ATM telescopes.

He showed us pictures of his completed projects. He displayed his 6" Newtonian which is also known as Dobsonian because of its altitude azimuth mount (originally developed by John Dobson). An Engineer by trade, Allen showed how he always makes detailed to scale CAD diagrams. The 6" telescope was made using a typical sono tube design, Plywood Construction, Made from (2) ¼" sheets. He showed a JMI Focuser, OTA Parts, top and bottom rings, pivot box, Mirror Cell, Secondary Support, Trial Fit, and Finishing. He explained that he had completed a 13" Newtonian that weighed less than 50 lbs. for Gene. He also showed how he's designed a sidereal tracking platform that works like an equatorial mount.

Mr. Allen Malsbury's 16"Newtonian, one of his many ATM Telescopes.

Allen's Useful Links
http://www.clearskyobserver.com/ (Allen's website)
http://stellafane.org/
http://www.jdso.org/

Ken Legal then presented Events of the Month.
Ken reviewed September's Sky Events as well as Upcoming:
•November/ December Comet ISON appears.
•December 1st crescent moon, mercury, and the comet
•December 10th – 17th best predicted viewing dates

Meeting Announcements
Observing Night Volunteers:
Russ Drum & Steve Seigel volunteered for 9/13, 10/11, 11/8, 12/6. Also, Russ offered to be the "weatherman" for 9/13 will be posted on our website. Ken Legal and Al Wright volunteered for 9/13. Michelle Paci for 10/11.

Upcoming:
Monmouth County Park's Program, Winter Series Outreach targeted for families upcoming January 10th & Feb 7th from 6:30 – 9.

S*T*A*R Club T-shirts are now available for purchase.

Annual S*T*A*R Picnic

A great time was had by all who attended our S*T*A*R Picnic. The Club Picnic took place on Saturday September 21st at Bucks Mill Recreation Area. Many thanks for all the S*T*A*R members and guests who came out to support us, especially including our picnic "Head Honcho" Jay Respler, without whom the picnic would not have happened. Thanks to Jeff for bringing his Lunt H-alpha scope and George for bringing his Vixen 4" refractor. We got great views (between the clouds) of the closest star in white light and H-alpha. There were very large prominences between 5 and 6 O'clock and a very large sunspot grouping near 7.

Thanks also to Mike K. and George for their great grilling and all our other members and guests for contributing some delicious food for the feast. We may have been only about 20, but it was a lively group with a lot of Astro conversation!!!

Murphy's Law for Astronomers

By Steven Seigel

1. The most cloudy or rainiest day always appears when the moon or the planets are supposed to be at their best!
2. Clearest of nights in a month occur on and around the full moon.
3. Go to a once and a lifetime event with a truckload of equipment but forget the power supply to run them.
4. Go to an evening school event, only to be "fenced-in" after everyone left.
5. Show off the sky to a group of youngsters only to find out that their only interest was in your "cool" looking telescope and/or your green laser pointer!
6. Looking at the moon through your moon filter and search for fuzzy faint objects with filter intact.
7. Travelling a good distance to a school astronomy event, but on arrival, realize it was the wrong day!
8. You received your new equipment on the day there is a massive storm front.
9. After set-up, the clouds roll in.
10. After take-down and in the car, the clouds roll out.

For comments and suggestions for this or other future articles, please email: astronomerm31@hotmail.com

Skyscope – The Telescope that Revolutionized Amateur Astronomy

By Edward Collett

Part I of III – In the Beginning

"For it is true that astronomy, from a popular standpoint, is handicapped by the inability of the average workman to own an expensive astronomical telescope."
-Russell W. Porter, Founder of Stellafane, March 1923

Before the Second World War there were relatively few amateur astronomers and still fewer astronomy clubs in the United States (My local astronomy club, STAR, located in Monmouth, New Jersey, for example, began in 1957.) The most notable astronomy club in the country was the Springfield, VT club that was started in 1923. The club has continued to be famous because it holds an annual star party known as Stellafane.

Before the Second World War nearly all amateur telescopes were refractors. If you were a (relatively) wealthy amateur astronomer and were fortunate to have the money (there was very little money to be had during the nineteen thirties since the country was *really* in a terrible economic depression) it usually had an objective lens that was between 3 and 4 inches in diameter.

There were very few reflecting telescopes and there were good reasons for this. First, while it was relatively easy to grind, polish and figure a mirror (a single surface) there was the final step. This step was the application of a thin coat of silver (a highly reflective metal) on to the polished surface of the glass. Unfortunately, within a few years the silver coating became tarnished so the mirror had to be recoated, that is, "resilvered". The great American optical physicist John Strong (1905-1992) at Johns Hopkins University wrote a book entitled "Procedures in Applied Optics" and reprinted in 1989 that described the silvering process. Strong shows how the silvering was done using the so-called Brashear chemical-solution method of silvering (see Figure 14 on page 252 of Strong's book). One quickly discovers after reading Strong's description of silvering that the first step was to get the wife and kids out of the house when the silvering was to be done! If not done carefully the silvering process could lead to a violent and very dangerous explosion! After an amateur astronomer tried the process and, in particular, if it failed as Strong described, the refractor with a glass objective lens looked like a far more attractive route to take and to obtain much needed spousal approval! This final step in mirror making discouraged many amateur astronomers from building a reflecting telescope. The great advantage, of course, to making a reflecting telescope was that the cost to make, say, a 6 inch diameter telescope mirror was far less than making a 6 inch diameter refracting objective lens. And the cost of a 10 inch refracting lens compared to the cost of 10 inch mirror was, well, astronomical. Furthermore, because of the very risky silvering processing as well as the problem of tarnishing there was not a single commercial optical company in the United States that manufactured reflecting telescopes. Thus, for the most part the only "low cost" optics available to most amateur astronomers were low power binoculars (6X and 7X) and two or three inch refractors.

But towards the end of the nineteen thirties a technological development appeared which would allow amateur astronomers to safely coat their mirror blanks.

Next month's issue to feature Part II of III.

S*T*A*R member, Dr. Edward Collett is an Optical Physicist and Engineering Consultant. He has authored nearly 30 journal articles, holds one U.S. patent, and is a member of the Optical Society of America. He has been actively working in the field of polarized light since he received his Ph.D. degree. He has authored four books on polarized light and his latest book is **Polarized Light for Scientists and Engineers** (2012) in addition to an earlier book **Polarized Light in Fiber Optics** (2003). Dr. Collett received his Ph.D. degree in physics from the Catholic University of America, Washington, DC.

How to hunt for your very own supernova!

By Dr. Ethan Siegel

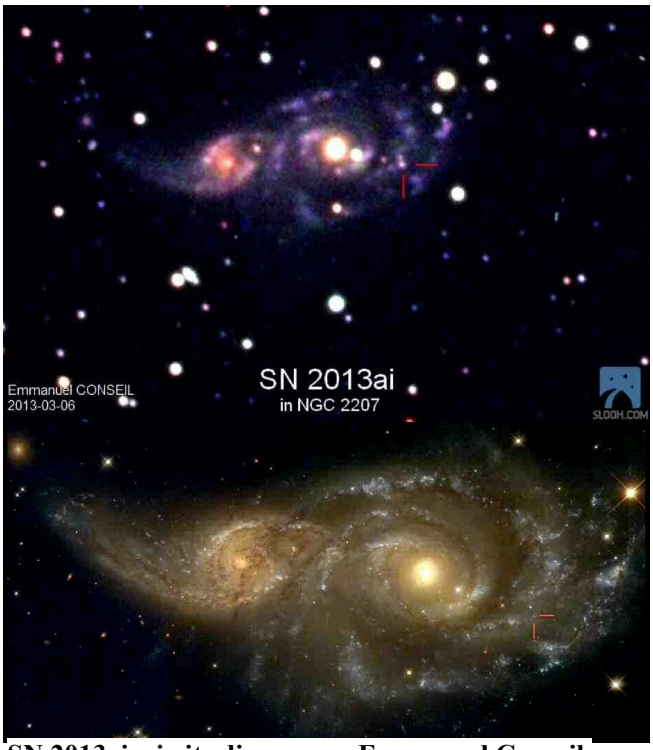
In our day-to-day lives, stars seem like the most fixed and unchanging of all the night sky objects. Shining relentlessly and constantly for billions of years, it's only the long-term motion of these individual nuclear furnaces and our own motion through the cosmos that results in the most minute, barely-perceptible changes.

Unless, that is, you're talking about a star reaching the end of its life. A star like our Sun will burn through all the hydrogen in its core after approximately 10 billion years, after which the core contracts and heats up, and the heavier element helium begins to fuse. About a quarter of all stars are massive enough that they'll reach this giant stage, but the *most* massive ones -- only about 0.1% of all stars -- will continue to fuse leaner elements past carbon, oxygen, neon, magnesium, silicon, sulphur and all the way up to iron, cobalt, and, nickel in their core. For the rare ultra-massive stars that make it this far, their cores become so massive that they're unstable against gravitational collapse. When they run out of fuel, the core implodes.

The inrushing matter approaches the center of the star, then rebounds and bounces outwards, creating a shockwave that eventually causes what we see as a core-collapse supernova, the most common type of supernova in the Universe! These occur only a few times a century in most galaxies, but because it's the most massive, hottest, shortest-lived stars that create these core-collapse supernovae, we can increase our odds of finding one by watching the most actively star-forming galaxies very closely. Want to maximize your chances of finding one for yourself? Here's how.

Pick a galaxy in the process of a major merger, and get to know it. Learn where the foreground stars are, where the apparent bright spots are, what its distinctive features are. If a supernova occurs, it will appear first as a barely perceptible bright spot that wasn't there before, and it will quickly brighten over a few nights. If you find what appears to be a "new star" in one of these galaxies and it checks out, report it *immediately*; you just might have discovered a new supernova!

This is one of the few cutting-edge astronomical discoveries well-suited to amateurs; Australian Robert Evans holds the all-time record with 42 (and counting) original supernova discoveries. If you ever find one for yourself, you'll have seen an exploding star whose light traveled millions of light-years across the Universe right to you, and you'll be the *very first* person who's ever seen it!



SN 2013ai, via its discoverer, Emmanuel Conseil, taken with the Slooh.com robotic telescope just a few days after its emergence in NGC 2207 (top); NASA, ESA and the Hubble Heritage Team (STScI) of the same interacting galaxies prior to the supernova (bottom).

Read more about the evolution and ultimate fate of the stars in our universe: http://science.nasa.gov/astrophysics/focus-areas/how-do-stars-form-and-evolve/.
While you are out looking for supernovas, kids can have a blast finding constellations using the Space Place star finder: http://spaceplace.nasa.gov/starfinder/.

Jekyll & Hyde' star morphs from radio to X-ray pulsar & back again

Neutron star and its companion during a period of accretion when the neutron star emits powerful X-rays. Credit: Bill Saxton; NRAO/AUI/NSF

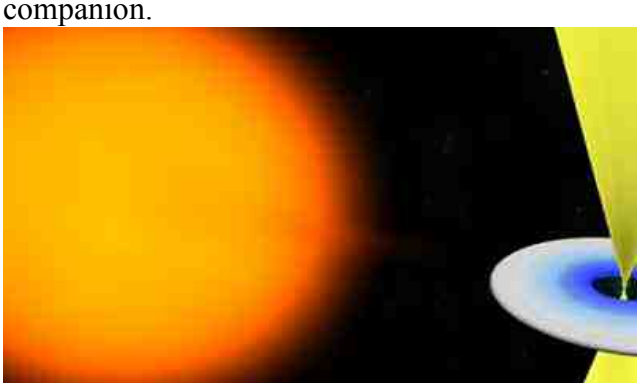
(Phys.org) Astronomers have uncovered the strange case of a neutron star with the peculiar ability to transform from a radio pulsar into an X-ray pulsar and back again. This star's capricious behavior appears to be fueled by a nearby companion star and may give new insights into the birth of millisecond pulsars.

"What we're seeing is a star that is the cosmic equivalent of 'Dr. Jekyll and Mr. Hyde,' with the ability to change from one form to its more intense counterpart with startling speed," said Scott Ransom, an astronomer at the National Radio Astronomy Observatory (NRAO) in Charlottesville, Va. "Though we have known that X-ray binaries—some of which are observed as X-ray pulsars—can evolve over millions of years to become rapidly spinning radio pulsars, we were surprised to find one that seemed to swing so quickly between the two."

Neutron stars are the superdense remains of massive stars that have exploded as supernovas. This particular neutron star, dubbed IGR J18245-2452, is located about 18,000 light-years from Earth in the constellation Sagittarius in a cluster of stars known as M28. It was first identified as a millisecond radio pulsar in 2005 with the National Science Foundation's Robert C. Byrd Green Bank Telescope (GBT) and then later rediscovered as an X-ray pulsar by another team of astronomers in 2013. The two teams eventually realized they were observing the same object, even though it was behaving very differently depending on when it was observed. Additional observations and archival data from other telescopes confirmed the on-again, off-again cycle of X-ray and radio pulsations.

"Various observations of one particular star over the years and with different telescopes have revealed vastly different things—at one time a pulsar and the other an X-ray binary," said Alessandro Papitto of the Institute of Space Sciences (Consejo Superior de Investigaciones Cientificas—Institut d'Estudis Espacials de Catalunya) in Barcelona, Spain, and lead author of a paper published in the journal Nature. "This was particularly intriguing because radio pulses don't come from an X-ray binary and the X-ray source has to be long gone before radio signals can emerge."

The answer to this puzzle was found in the complex interplay between the neutron star and its nearby companion.



Neutron star and its companion shown when the accretion has stopped and the neutron star is emitting radio pulses. Credit: Bill Saxton; NRAO/AUI/NSF

X-ray binaries, as their name implies, occur in a two-star system in which a neutron star is accompanied by a more normal, low-mass star. The smaller but considerably more massive neutron star can draw off material from its companion, forming a flattened disk of gas around the neutron star. Gradually, as this material swirls down to the surface of the neutron star, it becomes superheated and generates intense X-rays.

Evidence for densest galaxy in nearby universe

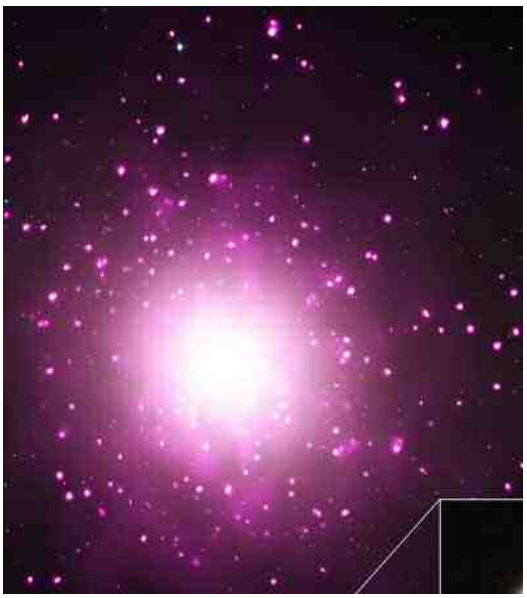
Phys.org, Sep 24, 2013

The densest galaxy in the nearby Universe may have been found. The galaxy, known as M60-UCD1, is located near a massive elliptical galaxy NGC 4649, also called M60. This composite image of M60 and the region around it presents X-rays from Chandra (pink) and optical data from Hubble (red, green, and blue).

Astronomers using NASA's Hubble Space Telescope and Chandra X-ray Observatory and telescopes on the ground may have found the most crowded galaxy in our part of the universe.

The ultra-compact dwarf galaxy, known as M60-UCD1, may be the densest galaxy near to Earth, packed with an extraordinary number of stars. This galaxy is providing astronomers with clues to its intriguing past and its role in the galactic evolutionary chain.

M60-UCD1, estimated to be about 10 billion years old, is near the massive elliptical galaxy NGC 4649, also called



The Chandra image shows hot gas and double stars containing black holes and neutron stars, and the HST image reveals stars in M60 and neighboring galaxies including M60-UCD1. The inset is a close-up view of M60-UCD1 in an HST image. The density of stars in M60-UDC1 is about 15,000 times greater than found in Earth's neighborhood in the Milky Way, meaning that the stars are about 25 times closer. Credit: X-rav:

M60, about 54 million light years from Earth. It is the most luminous known galaxy of its type and one of the most massive, weighing 200 million times more than our sun, based on observations with the Keck 10-meter telescope in Hawaii.

What makes M60-UCD1 so remarkable is that about half of this mass is found within a radius of only about 80 light years. The density of stars is about 15,000 times greater—meaning the stars are about 25 times closer to each other—than in Earth's neighborhood in the Milky Way galaxy.

"Traveling from one star to another would be a lot easier in M60-UCD1 than it is in our galaxy, but it would still take hundreds of years using present technology," said Jay Strader of Michigan State University in Lansing. Strader is the lead author of a paper about the research, which was published Sept. 20 in The Astrophysical Journal Letters.

The 6.5-meter Multiple Mirror Telescope in Arizona was used to study the amount of elements heavier than hydrogen and helium in stars in M60-UCD1. The values were found to be similar to our sun.

"The abundance of heavy elements in this galaxy makes it a fertile environment for planets and, potentially, for life to form," said co-author Anil Seth of the University of Utah.

Another intriguing aspect of M60-UCD1 is the presence of a bright X-ray source in its center, revealed in Chandra data. One explanation for this source is a giant black hole weighing in at about 10 million times the mass of our sun.

Astronomers want to find out whether M60-UCD1 was born as a jam-packed star clusters or become more compact as stars were ripped away from it. Large black holes are not found in star clusters, so if the X-ray source is in fact due to a massive black hole, it was likely produced by collisions between M60-UCD1 and one or more nearby galaxies. M60-UCD1's great mass and the abundances of elements heavier than hydrogen and helium are also arguments for the theory it is the remnant of a much larger galaxy.

"We think nearly all of the stars have been pulled away from the exterior of what once was a much bigger galaxy," said co-author Duncan Forbes of Swinburne University in Australia. "This leaves behind just the very dense nucleus of the former galaxy, and an overly massive black hole."

If this stripping did occur, then the galaxy originally was 50 to 200 times more massive than it is now, and the mass of its black hole relative to the original mass of the galaxy would be more like that of the Milky Way and many other galaxies. The stripping could have taken place long ago and M60-UCD1 may have been stalled at its current size for several billion years.

Are you a S*T*A*R Member?

S*T*A*R meets the first Thursday of each month, except July and August, at 8:00 p.m. at Monmouth Museum on the campus of Brookdale Community College in Lincroft, NJ. Meetings usually include a presentation of about one hour by a guest speaker, a break for refreshments and socializing, a description of interesting objects to view, and a discussion of club business.

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____

E-mail: _____

Preferred method of contact: □ Phone □ E-mail □ Text, Cell Carrier & # _____

Membership Type: □ Individual ….. $35 □ Family ….. $45 □ Student ….. $15

Please note: membership fees are collected on an annual basis, at the start of every fiscal year, which runs September through August.

Please send me information about subscribing at the discounted club rate to:
□ Sky & Telescope Magazine □ Astronomy Magazine

Do you have a telescope? □ Yes □ No □ Looking to purchase one

Interests:

□ Astronomy 101	□ Astrophotography	□ Cosmology/ Astrophysics
□ Astronomy for Kids	□ Cosmic Events	□ Amateur Telescope Making
□ Observing	□ Star Parties	□ Equipment Recommendations

Other:

How did you hear about S*T*A*R? □ Friend □ Newspaper □ Radio □ Poster □ Web □ Other:

Please mail your completed application, along with a check or money order
(made payable to STAR Astronomy, Society, Inc) for the above total amount to:
STAR Astronomy Society, Inc PO Box 863 Red Bank, NJ 07701

The club owns 8" f/8, 13" f/4.5 and 25" f/5 Dobsonian telescopes which are available for use by members. Because of its large size use of the 25" requires the supervision of two qualified operators. To borrow a telescope or become a qualified operator of the 25", please contact the Vice President.
For more information please visit: www.starastronomy.org

S*T*A*R Officers

President Kevin Gallagher ♦**Vice President** Rob Nunn♦ **Treasurer** Arturo Cisneros
Secretary Michelle Paci ♦ **Member at Large** Dave Britz

In the Eyepiece

Here is a list of objects for this month. This is reproduced from www.skyhound.com with the kind permission of its creator and author of SkyTools Greg Crinklaw.

Object(s)	Class	Con	RA	Dec	Mag
Andromeda Galaxy	Galaxy	Andromeda	00h42m44.3s	+41°16'09"	4.3
The Sculptor Galaxy -- NGC 253	Galaxy	Sculptor	00h47m33.1s	-25°17'18"	8.2
NGC 7789	Open Cluster	Cassiopeia	23h57m01.9s	+56°43'42"	7.5
NGC 278	Galaxy	Cassiopeia	00h52m04.4s	+47°33'01"	11.5
NGC 288	Globular Cluster	Sculptor	00h52m38.2s	-26°35'43"	8.9
NGC 247	Galaxy	Cetus	00h47m08.7s	-20°45'38"	9.7
IC 10	Galaxy	Cassiopeia	00h20m23.1s	+59°17'35"	11.8
The Bubble Nebula	Diffuse Nebula	Cassiopeia	23h20m42.0s	+61°12'00"	--
NGC 40	Planetary Nebula	Cepheus	00h13m01.0s	+72°31'19"	10.7
The Blue Snowball	Planetary Nebula	Andromeda	23h25m53.9s	+42°32'06"	9.2
NGC 246	Planetary Nebula	Cetus	00h47m03.3s	-11°52'19"	8.0
NGC 7640	Galaxy	Andromeda	23h22m06.5s	+40°50'45"	11.8
NGC 7606	Galaxy	Aquarius	23h19m04.8s	-08°29'08"	11.7
NGC 128	Galaxy	Pisces	00h29m15.1s	+02°51'51"	12.7
Jn 1	Planetary Nebula	Pegasus	23h35m53.4s	+30°27'36"	15.1
NGC 281	Open Cluster	Cassiopeia	00h52m50.1s	+56°37'17"	7.4
NGC 381	Open Cluster	Cassiopeia	01h08m21.0s	+61°35'00"	9.3
I C 289	Galaxy	Sculptor	00h52m42.4s	-31°12'22"	11.8
Gamma Cassiopeia Nebula	Diffuse Nebula	Cassiopeia	00h57m30.0s	+61°09'00"	--
Hu 1-1	Planetary Nebula	Cassiopeia	00h28m15.0s	+55°57'54"	13.3
M 2-55	Planetary Nebula	Cepheus	23h31m51.3s	+70°22'11"	--
NGC 7492	Globular Cluster	Aquarius	23h08m28.7s	-15°36'28"	11.2
Hickson 94	Galaxy Group	Pegasus	23h17m18.2s	+18°43'31"	13.1
Gyulbudaghian's Nebula	Variable Reflection Nebula	Cepheus	20h45m54.2s	+67°57'51"	14