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

The Spectrogram

Newsletter for the Society of Telescopy, Astronomy, and Radio

November 2013
Edited by Rob Nunn
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November 2013 Meeting

The next meeting of S*T*A*R will be held on Thursday, November 7 at 8 p.m. at Monmouth Museum on the campus of Brookdale Community College in Lincroft, NJ.

Our speaker will be S*T*A*R Member-at Large, Dave Britz who will share with us his knowledge of comets and asteroids, including Comet ISON (which could be the "Comet of the Century.

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

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

December 5, 2013 - Rob Teeter "The Evolution of the Dobsonian"

December 6, 2013 - Dorbrook Observing Session

January 2, 2013 – Club Social

January 10, 2013 – Monmouth County Winter Parks Program

President's Corner

By Kevin Gallagher

Observing is the activity that best characterizes amateur astronomy and we're fortunate to have a core of dedicated observers who have helped make this a regular activity for S*T*A*R Astronomy. This regular observing has also allowed us to better pursue our primary mission: public outreach.

If you haven't been able to join us recently, then please consider coming out and joining us for our monthly Friday Night Dorbrook Park Observing: Nov 8th and Dec 6th, weather permitting with the "rain date" being the following evening. These are 1st quarter moon evenings based around public outreach. We also may do some new moon observing, so please remember to check out the Observing Plans Forum on: www.starastronomy.org.

There are a number of star parties on the calendar and these will be listed here in The Spectrogram, so if you do have a scope, please come out and help support these public outreach activities. We continue to try and build connections with other community organizations, and our own David Britz will be giving a talk on Comet ISON on November 21st at the Middletown Township Public Library. Hopefully, these connections to other community organizations, including our upcoming events with the Monmouth County Parks Department, will help bring us some much needed new members.

Whether Comet ISON is the comet of the century or the flop of the century, many of us will be anxious to see for ourselves. We should have a pretty good idea within the next two weeks. It's now about as bright as M-95 (one of the galaxies in Leo) and the predictions are still varying widely from a spectacular show to a dud. It's a fairly large comet that will pass very close to the sun, so the potential is definitely there.

I'd like to take this opportunity to thank all our renewing members who have paid their membership and our new members who have joined us in our enthusiasm for the night sky. If you haven't already done so, please make out your check and renew. We need and very much appreciate your support. This year we're also making S*T*A*R Astronomy Membership gift certificates available for your holiday giving. What could be a better gift, then giving that person with an interest in astronomy a yearly membership to S*T*A*R. It's the gift that will keep on giving the whole year long!!!

Thanks to all of you, whether members, volunteers or officers for your continued energy, enthusiasm and dedication. It's the thing that makes S*T*A*R Astronomy go . . . and grow!!!

-Kevin

October Meeting Minutes

By Michelle Paci

President Kevin Gallagher promptly started the S*T*A*R Astronomy Society club meeting at 7:55pm. Forty-one members were in attendance along with a few guests. . Kevin welcomed our newest official member, Professor Sarbmeet Kanwal. Then, in preparation for the evening's "The Search for Life on Mars in 3D"presentation he distributed 3D glasses to all who were in attendance. Kevin introduced Dr. Ken Kremer: speaker, freelance science journalist, scientist and photographer whose articles and space exploration images have appeared on TV, magazines, books and on websites. Dr. Ken Kremer has been inside all three space shuttles and has had thousands of Scientific Publications over the past twenty years.

Photo by Anthony Paci

In his introduction, Dr. Kremer talked about the importance of NASA and the space shuttle program as many of NASA's space projects were supported by American shuttles. For example he detailed the Hubble Telescope is endangered "No Shuttle, no Hubble". He showed a Hubble image of Mars that displayed the Martian polar ice caps. He regretfully shared that we had just lost communication with NASA's comet investigator, Deep Impact 2-3 weeks prior. Dr. Kremer described the controversy from the late 1800s when Schiaparelli and Lowell's drawings first showed straight-line canals on Mars. He explained how we're still searching for signs of life. He described the Phoenix Mission (2008), Spirit & Opportunity (2004). He emphasized the negative impacts of government shutdown on NASA and upcoming NASA projects. Dr. Kremer talked about launches (including the LADEE launch which he was there for) from NASA's Wallops Island Flight Facility in Virginia. The upcoming Nov. 18 blastoff of the MAVEN orbiter, NASA's next mission to Mars. Maven will launch from Florida on November 18.

Dr. Kremer defined the "Habitable Zone" and how now we have a broader definition of where life can be found. Water in a liquid state is a prerequisite for life. Newly revealed news that Ethane and Methane are found on Mars, is exciting because life sustaining molecules could potentially be built upon them.

Dr. Kremer gave an overview about the previous Mars rovers and their missions before going in depth about Curiosity. The Curiosity Robot is a third generation NASA Mars rover, weighs 2,000lbs and has the dimension of 10ft x 9ft x 7ft, roughly the same size as an SUV—it is a Geologist and Chemist in one. Curiosity carries the most advanced payload of scientific gear ever used on Mars' surface with a payload more than 10 times as massive as those of earlier Mars rovers including a 7ft arm and 66lb tool turret. A Mast Camera, Chemical Camera, drill, sieves, brush, scoop, Spectrometers, Radiation Detectors, Environmental Sensors, and Atmospheric Sensors are equipped on the Curiosity. Designed for a mission to last over two years, Curiosity has traveled 1.9 miles so far and with its 17 cameras, Curiosity has taken over 88,000 pictures in its search for life on Mars. Its goal is to search for Organics and Habitats.
Launched from an Atlas V launch vehicle at Cape Canaveral on November 26, 2011 on an eight and a half month journey to Mars for its two year mission, The Mars Science Laboratory (MSL) mission has four scientific goals: Determine the landing site's habitability including the role of water, study of the climate and the geology of Mars. It is also useful preparation for a future manned mission to Mars.
As part of its exploration, it also measured the radiation exposure in the interior of the spacecraft as it traveled to Mars, and it is continuing radiation measurements as it explores the surface of Mars.

During a video of the landing portion of the mission called "Seven Minutes of Terror"— Dr. Kremer shared what a truly remarkable engineering marvel the Rover is. Upon entering Mars' atmosphere the rover, had about seven minutes, to slow down from 13,000 miles per hour to a dead stop, without being destroyed in the process. It would deploy a supersonic parachute, eject its heat shield(biggest heat shield ever and wider than Apollo heat shield), and deploy a hovercraft-like descent stage 100 meters above the surface that would hang in the air as it carefully lowered the rover using cables(Hope on a rope). The cables were then be severed and the descent stage would propel itself off into the distance to avoid falling and crushing the rover. 80% of the crater is mountain and targeted landing site is 10-20 miles wide requiring pinpoint landing.

Currently at Yellowknife Bay, Curiosity landed safely on Mars at 1:31am 06 August, 2012 at Bradbury Landing in the Gale Crater with its destination being Mount Sharp. Mount Sharp is 3.4 miles high and ten miles around, bigger than anything in the US and taller than Mount Rainier. Glenelg is the first targeted scientific location where three types of terrain intersect, which is attractive as the first drilling target. The rover has recently explored, sedimentary layers with the remnants of an ancient stream bed found in the Hottah Outcrop September, 2012. In the Link Outcrop there were rounded rocks, cemented together, stream bed evidence, sedimentary conglomerate.

Dr. Kremer presented his mosaic pictures taken from Curiosity and photos of the Maven orbiter in the Clean Room at Kennedy Space Center.

George Zanetakos then presented Events of the Month on behalf of Ken Legal.

George reviewed October's Sky Events including an Uncommon Triple Shadow transit of Jupiter's Moons as well as upcoming events:

•November/ December Comet ISON appears.

- nucleus is expected to reach 4,900 degrees F

•December 1st crescent moon, mercury, and the comet

December 10th – 17th best predicted ISON viewing dates

Skyscope – The Telescope that Revolutionized Amateur Astronomy

By Edward Collett

PART II – A 200 Inch Giant for Mount Palomar

In 1908 and 1917 the 60 inch (Hale) and the 100 inch (Hooker) reflecting (mirror) telescopes were erected, respectively, on Mount Wilson in California; at the time these two telescopes were the largest in the world. Both mirrors were coated with silver. Mount Wilson is nearly 6,000 ft. above sea level and the astronomers soon discovered that even at this high altitude the silver coatings became tarnished very quickly. The result was that the mirrors had to be recoated (manually) each year or so with the result that both telescopes could not be used for several weeks which was very objectionable. Another highly reflecting metal had to be found that did not tarnish. Aluminum appeared to be the right choice since it had a very unusual property. When aluminum is exposed to oxygen a very thin film of aluminum oxide (Al_2O_3) whose thickness is approximately 4 nm appears and prevents the aluminum from corroding. Furthermore, the aluminum oxide is optically transparent in the visible region of the optical spectrum. For the sake of comparison, at the wavelength of 6199.0Å the reflectivity of silver is R = 91.5% and for aluminum 94.4%, respectively. Clearly, aluminum is better reflector than silver. Unfortunately, aluminum cannot be deposited on to the glass substrate in the same manner as silver. A different deposition method had to be found.

In the late 1920s John Strong was able to develop a new deposition method using an electrolytic process to deposit aluminum on to glass. He first was able to accomplish this successfully in 1929 by aluminizing a 12 inch glass substrate in a vacuum bell jar. By 1933 he had improved the method significantly and he was able to aluminize the 60 inch mirror of the Hale telescope. The astronomers were startled when they found that the aluminized mirror performed better that the silvered mirror of the 100 inch Hooker telescope so that, not to be outdone by its little brother, in 1935 the 100 inch mirror was as also aluminized. With this step both telescopes could now be used continuously and there was no downtime.

The great motivation for Strong's work was that in the late nineteen twenties a new, gigantic telescope was going to be built that would have a mirror with a mirror diameter of 200 inch. Clearly, the deposition of a uniform coating of silver would be very difficult. The success of the aluminized coatings on the 60 and 100 inch telescope showed that it could also be applied to the 200 inch telescope mirror. It was expected that the new 200 inch telescope would become operational in 1941 (later it was found that depositing silicon oxide over the aluminum film (coating) further reduced any deterioration). Most importantly, it was now relatively easy and inexpensive to aluminize small mirrors and this would allow amateur astronomers to have their mirrors aluminized commercially. Unfortunately, this next step had to be postponed because World War II started in September, 1939 and did not end until September, 1945. All commercial optical work was turned to winning the war! Amateur astronomy would have to wait.

At this point you may wonder how all this fits into the saga of the Skyscope telescope. With the end of the Second World War, and the technology developed for the giant telescopes in the 1930s for replacing silvered mirrors with aluminized mirrors, it was now relatively easy to aluminize a pyrex glass of any size. But, in 1947 a company located in Brooklyn, New York went further than just making aluminized mirrors. The company produced a small, low cost, aluminized reflecting telescope called Skyscope. It was complete telescope of a classic Newtonian design. It had a 3.5 inch (aluminized) spherical mirror with a focal length of 38", an eyepiece with a 60× magnification and was mounted on a simple alt-azimuth tripod mount. The tube was a flat black plastic and the complete telescope weighed around 10 pounds so it was very portable. The telescope was mounted on to a simple alt-azimuth mount using a tripod leg configuration and could be easily set up in in less than five minutes. With the Skyscope you could instantly become an amateur astronomer for the cost of $25. Amateur astronomy was about to take off. And in the most unexpected way.

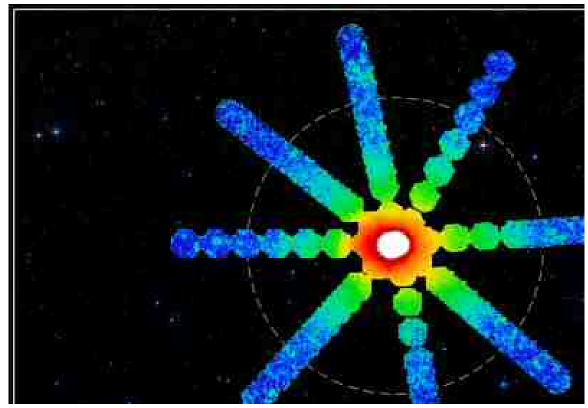
Next month's issue to feature Part III of III.

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.

Suzaku study points to early cosmic 'seeding'

Phys.org October 31 by Francis Reddy

Suzaku explored faint X-ray emission along eight different directions in the Perseus Galaxy Cluster, shown here in false color. Bluer colors indicate fainter X-ray emission. The dashed circle marks the cluster's effective boundary, where new gas is now entering, and is 2.7 degrees wide. Credit: NASA/ISAS/DSS/O. Urban et al., MNRAS



—Most of the universe's heavy elements, including the iron central to life itself, formed early in cosmic history and spread throughout the universe, according to a new study of the Perseus Galaxy Cluster using Japan's Suzaku satellite.

Between 2009 and 2011, researchers from the Kavli Institute for Particle Astrophysics and Cosmology (KIPAC), jointly run by Stanford University and the Department of Energy's SLAC National Accelerator Laboratory in California, used Suzaku's unique capabilities to map the distribution of iron throughout the Perseus Galaxy Cluster.

What they found is remarkable: Across the cluster, which spans more than 11 million light-years of space, the concentration of X-ray-emitting iron is essentially uniform in all directions.

"This tells us that the iron—and by extension other heavy elements—already was widely dispersed throughout the universe when the cluster began to form," said KIPAC astrophysicist Norbert Werner, the study's lead researcher. "We conclude that any explanation of how this happened demands lead roles for supernova explosions and active black holes."

The most profligate iron producers are type Ia supernovae, which occur either when white dwarf stars merge or otherwise acquire so much mass that they become unstable and explode. According to the Suzaku observations, the total amount of iron contained in the gas filling the cluster amounts to 50 billion times the mass of our sun, with about 60 percent of that found in the cluster's outer half.

The team estimates that at least 40 billion type Ia supernovae contributed to the chemical "seeding" of the space that later became the Perseus Galaxy Cluster.

Making the iron is one thing, while distributing it evenly throughout the region where the cluster formed is quite another. The researchers suggest that everything came together during one specific period of cosmic history.

Between about 10 and 12 billion years ago, the universe was forming stars as fast as it ever has. Abundant supernovae accompany periods of intense star formation, and the rapid-fire explosions drove galaxy-scale outflows. At the same time, supermassive black holes at the centers of galaxies were at their most active, rapidly accreting gas and releasing large amounts of energy, some of which drove powerful jets. Together, these galactic "winds" blew the chemical products of supernovae out of their host galaxies and into the wider cosmos.

Sometime later, in the regions of space with the largest matter densities, galaxy clusters formed, scooping up and mixing together the cosmic debris from regions millions of light-years across.

"If our scenario is correct, then essentially all galaxy clusters with masses similar to the Perseus Cluster should show similar iron concentrations and smooth distributions far from the center," said co-author Ondrej Urban, also at KIPAC.

Galaxy clusters contain hundreds to thousands of galaxies, as well as enormous quantities of diffuse gas and dark matter, bound together by their collective gravitational pull.

New gas entering the cluster falls toward its center, eventually moving fast enough to generate shock waves that heat the infalling gas. In the Perseus Cluster, gas temperatures reach as high as 180 million degrees Fahrenheit (100 million C), so hot that the atoms are almost completely stripped of their electrons and emit X-rays.

The Perseus Galaxy Cluster, which is located about 250 million light-years away and named for its host constellation, is the brightest extended X-ray source beyond our own galaxy, and the brightest and closest cluster for which Suzaku has attempted to map outlying gas.

The team used Suzaku's X-ray telescopes to make 84 observations of the Perseus Cluster, resulting in radial maps along eight different directions. Thanks to the sensitivity of the spacecraft's instruments, the researchers could measure the iron distribution of faint gas in the cluster's outermost reaches, where new gas continues to fall into it.

The findings will be published in the Oct. 31 issue of the journal Nature.

Suzaku (Japanese for "red bird of the south") was launched as Astro-E2 on July 10, 2005, and renamed in orbit. The observatory was developed by the Japan Aerospace Exploration Agency's Institute of Space and Astronautical Science in collaboration with NASA and other Japanese and U.S. institutions. NASA Goddard supplied Suzaku's X-ray telescopes and data-processing software and continues to operate a facility that supports U.S. astronomers who use the spacecraft.

South Pole Telescope Helps Argonne Scientists Study Earliest Ages Of The Universe

Phys.org Oct 29, 2013 by Louise Lerner

At the South Pole Telescope, scientists measure cosmic radiation still traveling across space from the early days of the universe. Credit: Daniel Luong-Van, National Science Foundation

—For physicist Clarence Chang at the U.S. Department of Energy's (DOE) Argonne National Laboratory, looking backward in time to the earliest ages of the universe is all in a day's work.

Chang helped design and operate part of the South Pole Telescope, a project that aims a giant telescope at the night sky to track tiny bits of radiation that are still traveling across the universe from the period just after it was born.
"Basically, what we're looking at is the afterglow light of the Big Bang," Chang said.

In the wake of the Big Bang, all the matter in the universe was just hot, dense particles and light. As the universe got older, it began to spread out and cool down over time, and the intense light from that period traveled across space. It's still traveling, hitting us all the time, and it has a very distinct radiation signature. "We call this the Cosmic Microwave Background, and it is essentially a snapshot of the universe as it looked about 400,000 years after the Big Bang," Chang said.

There's still a lot we don't know about the makeup of the early universe. Particularly mysterious are the dark matter and dark energy that appear to make up 95% of the universe, but about which we know very little. Mapping the Cosmic Microwave Background can shed some light on these dark forms.

"The Cosmic Microwave Background photons have traveled so far in time that some of them bumped into the early galaxy clusters along the way," Chang said. "You can detect this because they get kicked around a bit, which changes the radiation signature."

This is useful because one of the things we do know about dark energy is that it affects how galaxy clusters form. Being able to compare the distribution of distant galaxy clusters with the distribution we observe nearby helps physicists decode the role dark energy played – and continues to play – in the universe.

The majority of the Cosmic Microwave Background radiation has wavelengths of just one to two millimeters. These photons are absorbed by water, so in order to catch them, you need a very dry, flat and preferably cold space, which narrows it down to just two locations on Earth. One is the Chilean mountains, where we have a different sky mapping project underway, and the other is the South Pole.

The South Pole telescope is more than 30 feet across; Chang and colleagues at Argonne helped build its camera. ("We had to build the camera ourselves, because no sane person needs a camera that sees down to wavelengths at millimeter length," he said.) He is part of a rotation that travels to the Pole for weeks at a time to check how the camera is functioning and perform maintenance.
Developing and designing the detectors for the camera required expertise from multiple Argonne facilities and research divisions, including the Center for Nanoscale Materials.

At the core of the detector technology is an extremely thin superconducting film. Although superconductors can carry an electrical charge perfectly, they are extremely sensitive to changes in temperature. When thermal radiation from the Cosmic Microwave Background hits the camera, it heats the material up slightly, which changes the conductivity of the film. This lets physicists record the energy coming from that particular part of the sky.

"So far we've mapped about 2,500 square degrees of the sky," he said, "so there's just 37,500 to go."

The South Pole telescope is funded through the National Science Foundation and the DOE's Office of Science. The other institutions in the partnership are the University of Chicago, the University of California at Berkeley, Case Western Reserve University, and the Harvard-Smithsonian Center for Astrophysics, McGill University, and the University of Colorado at Boulder and the University of California at Davis.

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: ______________________________

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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
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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
Iota Cas	Multiple Star	Cassiopeia	02h29m04.0s	+67°24'09"	4.5
6 Tri	Multiple Star	Triangulum	02h12m22.3s	+30°18'11"	4.9
Almaak	Multiple Star	Andromeda	02h03m53.9s	+42°19'47"	2.1
h and Chi Perseus	Open Clusters	Perseus	02h19m01.8s	+57°08'47"	4.3
NGC 1097	Galaxy	Fornax	02h46m18.9s	-30°16'21"	10.2
M 103	Open Cluster	Cassiopeia	01h33m13.8s	+60°42'23"	6.9
Little Dumbbell (M76)	Planetary Nebula	Perseus	01h42m19.3s	+51°34'30"	12.2
NGC 891	Galaxy	Andromeda	02h22m32.9s	+42°20'46"	10.8
NGC 1023	Galaxy	Perseus	02h40m27.7s	+39°04'04"	10.2
AGC 347	Galaxy Group	Andromeda	02h25m48.0s	+41°52'00"	--
IC 1747	Planetary Nebula	Cassiopeia	01h57m35.8s	+63°19'19"	13.6
NGC 470 & 474	Interacting Galaxy Pair	Pisces	01h19m44.9s	+03°24'35"	12.6
NGC 925	Galaxy	Triangulum	02h27m16.8s	+33°34'45"	10.9
NGC 784	Galaxy	Triangulum	02h01m16.8s	+28°50'14"	12.5

Coordinates are epoch 2000.0