The Spectrogram

Newsletter for the Society of Telescopy, Astronomy, and Radio

October 2013
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December 2013 Meeting

The next meeting of S*T*A*R will be held on Thursday, December 5th at 8 p.m. at Monmouth Museum on the campus of Brookdale Community College in Lincroft, NJ.

Dr. Arturo Cisneros presents "Nova's and Supernovas."

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

December 6, 2013 – Dorbrook Observing Session (weather permitting)

December 21, 2013 – Winter Solstice 2013

January 2, 2013 – Club Social

January 10, 2013 – Monmouth County Winter Parks Program
Wonders of the Night Sky, Manasquan Reservoir Environmental Center,

February 6, 2013 – Prof. Spergel from Princeton presents the shape of the Universe.

February 7, 2013 – Monmouth County Winter Parks Program Wonders of the Night Sky, Thompson Park

President's Corner

By Kevin Gallagher

As we get ready to meet for our December Meeting, it looks like Comet ISON finally "bit the dust" or maybe "turned into dust" would be more accurate. In the end analysis, it appeared from all accounts that Comet Lovejoy was the better show. Unfortunately, we'll not be the recipients of interest in Astronomy or additional club members as the result of this version of the "Comet of the Century".

The good news is that we did receive several requests for Dave Britz to reprise his "Comets & Asteroids" talk. The presentation that he gave at the Monmouth County Library drew about 40 attendees, with a handful that wanted more information about the club. Our thanks go out to Russ Drum and Steve Seigel, who also attended to support Dave and the club. Our "RockS*T*A*R" of the month award goes to Dave Britz for turning his talk into an engaging outreach opportunity for the club.

Congratulations to those club members who got up early and were able to spot Comet ISON or Comet Lovejoy or both. My two attempts were both solo, so the fact that I failed in my attempts to see ISON were not even tempered by the good company of other astronomers.

Steve Seigel had arranged for us to do a solar observing session on the very attractive campus of Georgian Court College. We got a very strong club turnout that might have been due to the venue and the expectations of attractive surroundings. This turned out to be a grade 1 through 3 event for their Science and Mathematics Educational Fair. Although we were clouded out from solar observing, we had a good time talking about astronomy. Our thanks go out to Steve, Russ Drum, Dave Britz, Ken Legal, Mike Kozic and George Zanetakos for their support for this and most other observing events !!

Many of these same stalwarts have also agreed to volunteer for our "Wonders of the Night Sky" observing program with the Monmouth County Parks Department on the Friday Nights Jan 10th and February 7th

Discussions at our Dorbrook Observing Sessions with Gordon Waite have revealed an opportunity for Gordon to convert the club 25" into one of his new generation of super-fast scopes and enable the club to make the $ 4,500 that we had hoped to realize in a sale of the scope. This opportunity will be discussed at our December Monthly Meeting.

Our thanks also go out to Mike Lindner for his ongoing support of the website, our S*T*A*R Board, including Dave Britz, Arturo Cisneros (who graciously agreed to step in when we had a cancellation of our originally scheduled December speaker) and Rob Nunn and Michelle Paci who have been working together on The Spectrogram – our club newsletter.

Please accept the best wishes from everyone at S*T*A*R Astronomy for a happy and healthy Holiday Season and a wonderful New Year. We'll look forward to seeing you at the Yearly Club Social on Thursday Night, January 2nd. Thanks again in advance to all our volunteers for your help with keeping S*T*A*R vibrant.

November Meeting Minutes

By Michelle Paci

President Kevin Gallagher chaired the S*T*A*R Astronomy Society club meeting. He began at 8:10 pm by presenting the agenda and asking if there were first-time attendees. Twenty-five people attended the meeting. Kevin chaired the meeting and began by presenting the agenda, noting to see our treasurer, Arturo, about membership dues, 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. Kevin introduced Mr. Dave Britz an accomplished member of our club with many talents.

Dave captivated the group with his presentation "Comets, Asteroids, And Meteors". His presentation paired stunning visuals with fluidly explained particulars of comets, meteors, and asteroids. He began by explaining the scientific significance of Comet Ison, named after the International Scientific Optical Network. He explained the Comet's 4.5 billion year life, journey from the Oort cloud and it's upcoming perihelion passage, the critical moment when the comet comes closest to the sun. Comets are like time capsules, telling us what conditions around the Sun were like when the Earth was first forming. Experts are excited at the opportunity to study a new comet fresh from the Oort cloud, a zone of deep-frozen objects orbiting in the dark outlands of our solar system. Comet ISON revealing s pure “sampling of the stuff we’re made of.” Planetary scientists study comets because they are rich in organic molecules -- those primitive particles composed of the light elements carbon, hydrogen, oxygen, and nitrogen. Understanding the components of comets helps us to analyze the possibilities on the beginnings of life in the universe- from panspermia to microbial life formed extra-terrestrially delivered here by comets. Or perhaps comets deposited the raw materials, the organics that led to higher order organics, from which life arose. For example, a substantial fraction of our oceans may have formed from the ice of comets that bombarded the Earth during it’s formation. Dave lightheartedly revealed that when you drink a glass of water, you’re consuming “a glass of comet juice.”

He went on to explain comet structures in general from the nucleus, coma, and tail. A comet’s tail gets pushed away from the sun by the pressure of sunlight. Dave also conveyed how comets may have a second, ion tail, which also gets blown away by the Solar wind, and always points directly away from the Sun. Astronomers believe that comets formed in both the Oort Cloud and the Kuiper Belt. The Oort Cloud is a vast, spherical shell of icy bodies left over from the cloud of gas and dust that formed the Sun, which surrounds the Solar System at a distance between 5,000 and 100,000 astronomical units (AU) away. Next Dave discussed asteroids: are small, airless rocky worlds revolving around the sun that are too small to be called planets. There are millions of asteroids orbiting the sun, some 750,000 of which are found in the main asteroid belt, a vast ring of asteroids located between the orbits of Mars and Jupiter. Dave expounded that additionally, there is the Apollo Belt which is a group of “near-Earth” asteroids. Because of their orbit they have the alarming potential to be Earth-crossers. Ceres, once thought of only as an asteroid, is now also considered a dwarf planet and it is made up of more comet than asteroid but it has a circular orbit. Another asteroid that has the minor planet designation is 4 Vesta, is one of the largest asteroids in the Solar System, with a mean diameter of 525 kilometers (326 mi). It is especially interested because it has many components of planets and may have even been a planet in the primordial era during the early bombardment. Vesta is made up of a metallic iron–nickel core, an overlying rocky olivine mantle, with a surface crust. In 2001, after NASA's Near Earth Asteroid Rendezvous (NEAR) mission intensely studied the near-earth asteroid Eros for more than a year from orbit, mission controllers decided to try and land the spacecraft. Although it wasn't designed for landing, NEAR successfully touched down, setting the record as the first to successfully land on an asteroid. A huge amount of information about this object was discovered.
Then the presentation went on to explain meteors and meteorites and their characterizations. A meteor is

designated as an asteroid or other object that burns and vaporizes upon entry into the Earth's atmosphere; they are also commonly referred to "shooting stars." If a meteor survives the plunge through the atmosphere and falls to the ground, then it's known as a meteorite. Meteorites are usually categorized as iron or stony. As the name implies, iron meteorites are composed of about 90 percent iron; stony meteorites are made up of oxygen, iron, silicon, magnesium and other elements.
And there’s meteoroids- a general term describing small particles of comets or asteroids that are in orbit around the sun that produce atmospheric phenomena

called a meteor. . There's no universally accepted, hard-and-fast definition (based on size or any other characteristic) that distinguishes a meteoroid from an asteroid — they're simply smaller than asteroids. . Interestingly, Dave explained that about 3000 tons of meteoroid dust falls to Earth. Further thought-provoking, Dave elaborated that about 30% of the dust on the floor comes from meteors. Dave's talk was very well received, and he addressed many questions through the talk and through the break.

Following a 25-minute break, Ken Legal then presented Sky Happenings for November. Some of the objects that Ken presented were: the Sombrero Galaxy, Mercury, Saturn, and the Moon occulting Spica.

After Ken's talk, Kevin wrapped up the meeting with final business notes announcing our upcoming involvement at Georgian Court University and the Monmouth County Winter Parks Program Wonders of the Night Sky. Noting that our regularly scheduled observing nights will be replaced with those two events for the months of January and February. Russ announced an upcoming STAR party on 3/6/2014. Another member mentioned that the American Museum of Natural History has launched a new space show at the Rose Center for Earth and Space, and the Hayden Planetarium entitled Dark Universe. Coming soon, just in time for the holiday season are STAR Membership gift certificates. The winning ticket for the 50/50 drawing was held by Dave Britz. The meeting officially concluded at about 10:30 p.m. Members took advantage of the clear skies and held a brief, informal observing session outside where we saw Jupiter and Orion's Nebula.

In Dark Universe, See the Milky Way as Never Before

by AMNH on 10/29/2013 02:43 pm

The spectacular new Hayden Planetarium Space Show *Dark Universe*, narrated by astrophysicist Neil deGrasse Tyson, details pivotal discoveries that have

The Milky Way Galaxy as it appears in Dark Universe (2013)

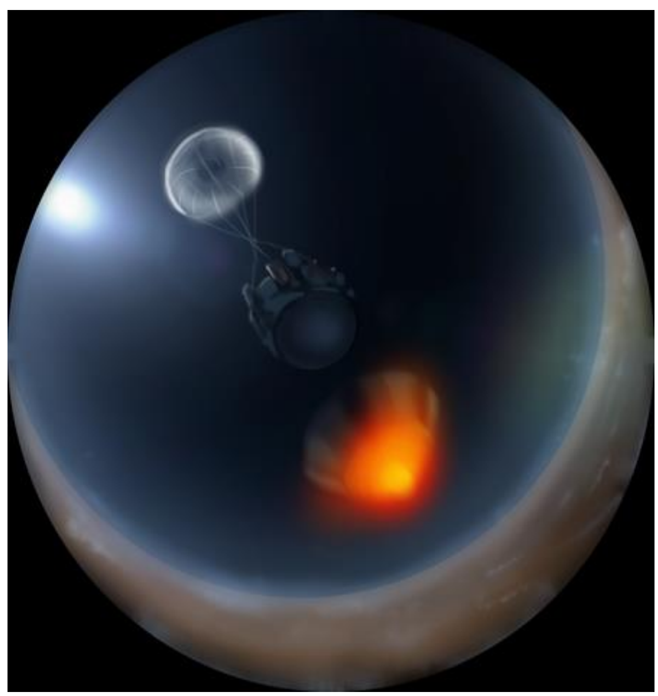
given today's astronomers' unprecedented knowledge of the universe.

How do you see and understand that of which you are only an infinitesimal part? For centuries, astronomers have been grappling with this challenge as they try and visualize our home galaxy. Luckily for viewers of the Museum's Hayden Planetarium Space Shows, in the past few decades new instruments that capture and display galactic images with unprecedented detail, combined with new modeling approaches have made it possible to see and understand the Milky Way Galaxy as never before.

Each of the five Space Shows produced at the Museum's Hayden Planetarium since the opening of the Rose Center for Earth and Space in 2000 has showcased the Milky Way Galaxy with ever-greater precision, thanks to close collaboration between scientists and visualizers — artists who interpret the latest data to produce accurate and detailed visualizations for the Hayden Planetarium dome.

The previous Space Show, Journey to the Stars (2009), used the same visualization of the Milky Way as Cosmic Collisions. However, an upgrade to the Hayden Planetarium projection system in 2011 allowed audiences to see the galaxy in extraordinary new detail. The new projectors have a contrast ratio of 500,000: 1, compared to 2,000:1 in most movie theaters, and show "true black" in addition to thousands of known stars that were too faint to display in the old system.

The final version, which will appear in the upcoming Dark Universe, uses a three-dimensional simulation constrained to agree with the latest observations in radio, infrared, and optical wavelengths of the structure of our own galaxy. This allows scientists to examine not just the structure, but also the history of the Milky Way. The supercomputer simulation was performed at the National Astrophysical Observatory of Japan. Visualizers and scientists at the Museum worked together to show the full detail contained in the simulation in the dome.



Galileo probe descending into Jupiter's atmosphere, a scene from the Space Show, Dark Universe.

Skyscope – The Telescope that Revolutionized Amateur Astronomy

By Edward Collett

PART III - Skyscope – the Beginning of a Revolution

With the solution for using an aluminized the mirror all that was necessary now was to build the telescope. But the Skyscope overcame this problem because it was perfect for young people who had no optical skills and if you lived in a city apartment; it was not very feasible to grind and polish a mirror let alone constructing a reflecting telescope. Fortunately, the Hayden planetarium, which was part of the American Museum of Natural History on Central Park West, in New York City sponsored a junior astronomy club. As soon as I found out that the club existed I joined it in 1948. When I joined the club I learned of the existence of new reflecting telescope called the Skyscope that many of the members had bought. The cost of the telescope was, for me, an astronomical amount of $25! That was, to put it nicely, beyond my 14 year old financial means.

Photograph of the Skyscope.

It is worthwhile to tell you what $25 meant in 1948. The cost of a planetarium show, which lasted for a solid hour and was delivered by a professional lecturer, was 25 cents – and a new sky show was presented every month! My favorite show was "Beneath the Southern Skies" which I believe attracted many World War II veterans. The show was especially spectacular because it included a tropical rainstorm with the lightning simulated by popping flashbulbs, booming thunder, and all of this to the background of the William Tell overture – wow!

Sky and Telescope magazine also cost 25 cents. So the telescope cost was 100 times more than a planetarium show. $25 was really a lot of money at the time. Luckily, there were a number of teenagers who were club members who lived on the west side of Manhattan along Columbus Avenue; their parents could easily afford to pay the $25 for their wunderkinder. The teenage members of the club were very generous and hospitable and were always glad to share looking through their Skyscopes. This sharing is one of the nicest aspects and still is of astronomy clubs. The club met in the basement of the Hayden planetarium every Saturday afternoon and in the evening we would cross the street to Central Park and stargaze with the Skyscope telescope. Fortunately for me a friend on my block in Brooklyn who had served in the Army lent me a pair of World War II 6×30 Zeiss binoculars *in perpetuum*, a gift as he told me "from the German Army to the American Army". Incidentally, it was with these binoculars that I learned my way around the night sky.

The Technical Parameters for the Skyscope

In order to appreciate the Skyscope it is worthwhile to consider its optical performance in terms of light gathering. The limiting stellar magnitude of a star that can be seen with the naked eye is 6th magnitude. It is of interest to determine the limiting visual stellar magnitude of the Zeiss 6 × 30 binoculars and the Skyscope. The equation for the limiting magnitude for an eye with a pupil diameter of 7 mm is given by the following equation

$$m = 6 + 5\log_{10}\left(\frac{D}{7\text{mm}}\right)$$

where D is the diameter of the mirror (or refracting objective lens) and the units of D are in mm. From the above equation the limiting magnitude for the Zeiss binoculars is then

$$m_Z = 6 + 5\log_{10}\left(\frac{30 \text{ mm}}{7 \text{ mm}}\right) = 9.2$$

Similarly, for the Skyscope the limiting magnification (3.5 inches = 89 mm) is

$$m_S = 6 + 5\log_{10}\left(\frac{89 \text{ mm}}{7 \text{ mm}}\right) = 11.5$$

The ability to be able to see down to a stellar magnitude 11.5 showed that this was really a very serious astronomical telescope.

Now for some further facts about the Skyscope telescope. It was a Newtonian design, the mirror was 3.5 inches in diameter, and the focal length was about 38 inches. The f# was approximately f# 11. The eyepiece was a simple Ramsden design that gave a magnification of 60×. Finally, it had a simple alt-azimuth mount and the telescope and mount were supported by three metal legs (a tripod arrangement): see the photograph shown in Figure 1. The telescope images were excellent.

It may come as a surprise that the Skyscope mirror was not parabolic but spherical. In fact, for relatively long focal lengths spherical mirrors yield very satisfactory images. If the focal length F of the mirror is large enough, i.e., if the mirror is relatively shallow, the difference between a parabola and a sphere is very small. In this case the uncorrected spherical mirror satisfies the so-called Rayleigh's quarter-wavelength rule so that a practically perfect diffraction limited star image can be observed. A formula has been derived for the minimum required focal length F of any mirror of a given diameter D that allows a spherical mirror to be used which is:

$$F^3 = 88.6D^4$$

where the units for F and D are in inches. For the Skyscope with a mirror diameter D = 3.5 inches the focal length is calculated from the above formula to be F = 23.7 inches which is well below the focal length of the Skyscope which is F = 38.0 inches to obtain a satisfactory image. Thus, not having to parabolize the mirror and using a spherical mirror made the telescope financially feasible.

The above equation can also be expressed in terms of the f# which is defined as f# = F/D so we have:

$$f\# = \left(88.6D^4\right)^{\frac{1}{3}}$$

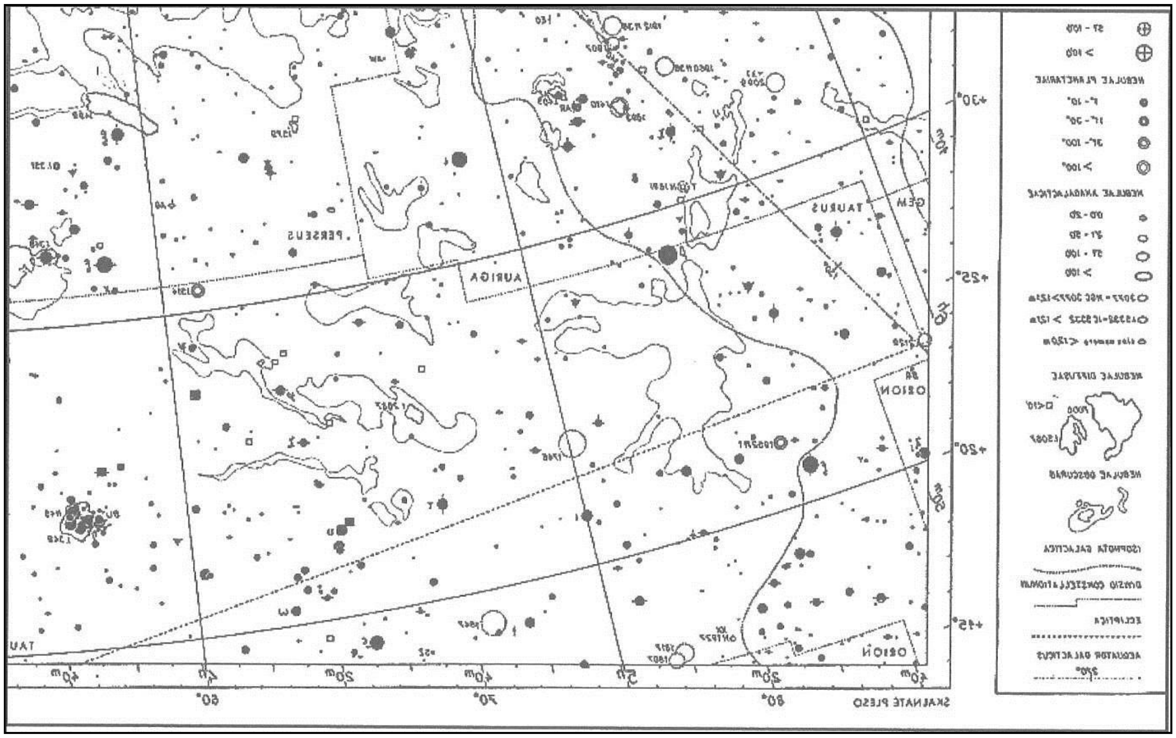
Using this equation the lowest acceptable f# for a 3.5 inch diameter mirror is f# = 6.7. For the Skyscope telescope the f# = FL/D = 38″/3.5″ = 10.9 which is more than satisfactory to obtain an acceptable image.

Another important telescope parameter is the relation between the angular magnification, M, the apparent field of the eyepiece (AF), and the true field (TF) which are related by the following equation:

$$M = \frac{AF}{TF}$$

The magnification M of the telescope is 60× and the apparent field (AF) of the Ramsden eyepiece is AF = 30^0 so the true field is TF = $(1/2)^0$ = 30' of arc. This is the angle subtended by a full moon and so represents a very small field of view (FOV); at this point you try to explain to your loving and understanding spouse why you need a new and bigger telescope (translates immediately to a more expensive telescope so that you can really (and seriously) explore the universe.)

You are now also ready to use your 60× Skyscope under the dome of night. You can easily find without a finder (and a bit of searching with the telescope) the moon (spectacular sight), Jupiter with its 4 moons, Mars, and Saturn. Then on a moonless night and with a pair of binoculars to guide you, the most prominent Messier objects can be found which are the Pleides (M45), the Andromeda nebula (M31), the Orion Nebula (M42), the globular cluster in Hercules (M13), and other relatively easy Messier objects, especially, the all-time planetary nebula favorite (the Ring Nebula) in Lyra (M57). Viewing these objects for the first time with the Skyscope and seeing that they really existed was a never to be forgotten experience.



One of the maps from Becvar's *Atlas Coeli.*

After seeing these objects you realized that in order to find other celestial objects you needed a star atlas (sky maps). When the Skyscope appeared in 1948 there was only a single star atlas available, hard to believe but true, which was Norton's Star Atlas (6th ed.) made in Great Britain (now called the UK). Because of the war it only began to arrive again in the United States around 1947-1948, the same year as the appearance of the Skyscope. But Norton's was very limited in its use. It was a very beautiful and descriptive book on numerous astronomical subjects but the major reason for purchasing the book was its sky maps that consisted of 16 charts showing stars down to 6th magnitude and it covered the entire sky. But the sky maps had a very serious drawback because all the nebula were designated using Herschel's 18th century notation and these did not indicate the Messier objects. For Skyscope users a major objective was to find the Messier objects and to do this we needed a star atlas that showed the Messier objects and one which used the New General Catalog notation (NGC) notation. This was the way celestial objects were listed and described in, say, Sky and Telescope and modern astronomical textbooks. The simple fact was that Norton's sky maps had been made in the first edition in 1910 and had changed very little over the years. Moreover, because the atlas was in book form the charts were very "crowded" with objects.

Thus, for all intents and purposes the Skyscope allowed one to see objects down to 11th magnitude and to find these objects it was necessary to use guide stars ranging from 5th to 7th magnitudes. For the moment we only had Norton's star maps that could not really be used effectively with the Skyscope to find 9 and 10th magnitude objects such as faint nebula ang globular clusters.

Amazingly, in 1948 a new professional bound star atlas suddenly appeared literally out of nowhere and was sold in the Hayden planetarium. The atlas was from Czechoslovakia, had the name Atlas Coeli (Latin, Atlas of the Heavens) and the new atlas was produced by the Skalnate Pleso Observatory in Prague, Czechoslovakia directed by Antonin Becvar. The term "amazing" is used because the atlas was made in a country that was in 1948 now behind the "Iron Curtain" and all trade between east and west had ceased because in 1947 the Cold War had begun. We were all very puzzled how this had happened and never found a satisfactory answer (One can speculate that the communist government wanted American dollars.) The creator of the atlas was Becvar, a genius if there was ever was one, who with his colleagues including his talented wife had made the atlas in one year (according to his biographer)! The cost of the atlas was $5.00! It listed all stars down to magnitude 7.75, all the Messier objects, and all the nebula were designated with NGC numbers. We now had a fantastic atlas to use with the Skyscope. Armed with this atlas we could now all become real amateur astronomers. Hundreds of Skyscopes and atlases were sold throughout the country and within a decade the number of amateur astronomers grew significantly as witnessed by the explosion of people attending Stellafane in Vermont.

The Skyscope and the atlas had truly revolutionized amateur astronomy. And these users would now be ready supporters for the space program that began with the Soviet Sputnik (1957). It should be noted that the Sputnik which beeped its presence (stick it into your face, imperial capitalists!) as it made its way around the earth was an incredible shock to the American public in at the time.

On a personal note in 1959 I was stationed at White Sands Missile range (courtesy of my uncle in Washington who thought I would look well in a khaki uniform) and I was able to live off-base in Las Cruces, New Mexico. One evening I planned to find as many Messier objects that I could in one observing session lasting from sunset to sunrise using my Skyscope. At the time the skies in New Mexico were spectacular (the Milky Way could be seen every night). Using my Skyscope and Becvar's atlas I was able to find and see nearly 70 Messier objects during the entire night in my backyard! On the flip side this was a bit dangerous because there were lots of tarantulas, rattlesnakes, and scorpions who made their living at night but fortunately we had no meetings or transactions that night.

At this point one may ask what was the revolution? It was simply this. For $25 you could purchase a professional grade telescope and for an additional $5 you could purchase a professional atlas. Amateur astronomy was no longer the province of wealthy astronomers or people capable of making their own telescopes. The barrier to becoming an amateur astronomer had been broken!

Finally, a copy of a photograph of the Skyscope telescope and one of the pages from the original 1948 edition of the Atlas Coeli is shown in the following figures. The Atlas which is the "grandfather" of all the atlases that followed is, to my mind, as beautiful today as when it appeared more than sixty years ago.

References

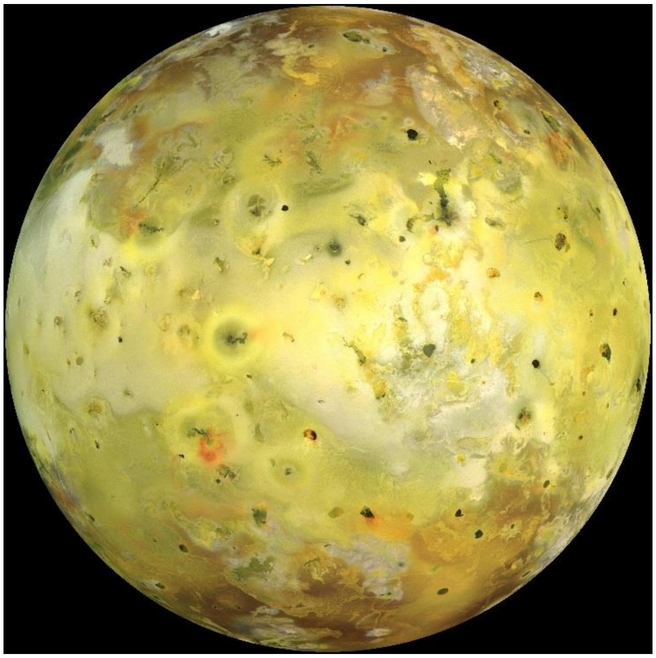
1. Strong, J., *Procedures in Applied Optics*. Marcel Dekker, New York (1988).
2. Texereau, J., *How to Make a Telescope*, Interscience Publishers, New York (1957).

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.

The most volcanically active place is out-of-this-world! *By Dr. Ethan Siegel*

Volcanoes are some of the most powerful and destructive natural phenomena, yet they're a vital part of shaping the planetary landscape of worlds small and large. Here on Earth, the largest of the rocky bodies in our Solar System, there's a tremendous source of heat coming from our planet's interior, from a mix of gravitational contraction and heavy, radioactive elements decaying. Our planet consistently outputs a tremendous amount of energy from this process, nearly three times the global power production from all sources of fuel. Because the surface-area-to-mass ratio of our planet (like all large rocky worlds) is small, that energy has a hard time escaping, building-up and releasing sporadically in catastrophic events: volcanoes and earthquakes!

Yet volcanoes occur on worlds that you might never expect, like the tiny moon Io, orbiting Jupiter. With just 1.5% the mass of Earth despite being more than one quarter of the Earth's diameter, Io seems like an unlikely candidate for volcanoes, as 4.5 billion years



is more than enough time for it to have cooled and become stable. Yet Io is anything but stable, as an abundance of volcanic eruptions were predicted before we ever got a chance to view it up close. When the Voyager 1 spacecraft visited, it found no impact craters on Io, but instead hundreds of volcanic calderas, including actual eruptions with plumes 300 kilometers high! Subsequently, Voyager 2, Galileo, and a myriad of telescope observations found that these eruptions change rapidly on Io's surface.

Where does the energy for all this come from? From the combined tidal forces exerted by Jupiter and the outer Jovian moons. On Earth, the gravity from the Sun and Moon causes the ocean tides to raise-and-lower by one-to-two meters, on average, far too small to cause any heating. Io has no oceans, yet the tidal forces acting on it cause the world itself to stretch and bend by an astonishing **100 meters** at a time! This causes not only cracking and fissures, but also heats up the interior of the planet, the same way that rapidly bending a piece of metal back-and-forth causes it to heat up internally. When a path to the surface opens up, that

Io. Image credit: NASA / JPL-Caltech, via the Galileo spacecraft.

internal heat escapes through quiescent lava flows and catastrophic volcanic eruptions! The hottest spots on Io's surface reach 1,200 °C (2,000 °F); compared to the average surface temperature of 110 Kelvin (-163 °C / -261 °F), Io is home to the most extreme temperature differences from location-to-location outside of the Sun.

Just by orbiting where it does, Io gets distorted, heats up, and erupts, making it the most volcanically active world in the entire Solar System! Other moons around gas giants have spectacular eruptions, too (like Enceladus around Saturn), but no world has its surface shaped by volcanic activity quite like Jupiter's innermost moon, Io!

Download photo here:
http://photojournal.jpl.nasa.gov/catalog/PIA02308

Learn more about Galileo's mission to Jupiter: http://solarsystem.nasa.gov/galileo/.

Kids can explore the many volcanoes of our solar system using the Space Place's Space Volcano Explorer: http://spaceplace.nasa.gov/volcanoes.

ESA's New Vision To Study The Invisible Universe *Phys.org November 29 2013*

The hot and energetic Universe and the search for elusive gravitational waves will be the focus of ESA's next two large science missions, it was announced today.

Both topics will bridge fundamental astrophysics and cosmology themes by studying in detail the processes that are crucial to the large-scale evolution of the Universe and its underlying physics. The science theme "the hot and energetic Universe" was selected for L2 – the second Large-class mission in ESA's Cosmic Vision science programme – and is expected to be pursued with an advanced X-ray observatory. This mission, with a launch date foreseen for 2028, will address two key questions. How and why does ordinary matter assemble into the galaxies and galactic clusters that we see today, and how do black holes grow and influence their surroundings? Black holes, which lurk unseen at the centres of almost all galaxies, are regarded as one of the keys to understanding galaxy formation and evolution.

The L3 mission will study the gravitational Universe, searching for ripples in the very fabric of space–time created by celestial objects with very strong gravity, such as pairs of merging black holes. Predicted by Einstein's theory of general relativity but yet to be detected directly, gravitational waves promise to open a completely new window on the Universe.

Planned for launch in 2034, it will require the development of a space borne gravitational wave observatory, or extreme precision 'gravitometer', an ambitious enterprise that will push the boundaries of current technology. "ESA has an outstanding record for developing state-of-the art space observatories that have revolutionized our knowledge of how stars and galaxies were born and evolved," says Alvaro Gimenez, ESA's Director of Science and Robotic Exploration. "By pursuing these two new themes, we will continue to push back the scientific boundaries and unveil the mysteries of the invisible Universe." The selection process for L2 and L3 began in March 2013, when ESA issued a call to the European science community to suggest the next scientific themes that should be pursued by the Cosmic Vision programme's Large missions. Thirty-two proposals were received and assessed by a Senior Survey Committee, and following an extensive interaction with the scientific community two major themes were recommended to the Director of Science and Robotic Exploration.

"We had a difficult task in deciding which scientific themes to choose from all of the excellent candidates, But we believe that missions to study the hot, energetic Universe and gravitational waves will result in discoveries of the greatest importance to cosmology, astrophysics, and physics in general," says Catherine Cesarsky, chair of the Senior Survey Committee.

Although the launch dates for the L2 and L3 missions are more than a decade away, activities to prepare the missions will start very soon. Early in 2014, a call for L2 mission concepts will be announced to solicit proposals for a next-generation X-ray observatory. A similar procedure will be followed at a later date for the L3 mission.

"We have opened up a new scientific roadmap for Europe today that will establish our leadership in this field for the next two decades while we develop and implement new technologies for these exciting missions," adds Prof. Gimenez.

Artist's impression of a galaxy that is releasing material via two strong jets (shown in red/orange) as well as via wide-angle outflows (shown in gray/blue). Both jets and outflows are being driven by the black hole located at the galaxy's centre. Black holes, which lurk unseen at the centres of almost all galaxies, are regarded as one of the keys to understanding galaxy formation and evolution. Credit: ESA/AOES Medialab

Provided by European Space Agency

A Fiery Drama Of Star Birth And Death *Phys.org Oct 29, 2013*

The Large Magellanic Cloud is one of the closest galaxies to our own. Astronomers have now used the power of ESO's Very Large Telescope to explore one of its lesser known regions. This new image shows clouds of gas and dust where hot new stars are being born and are sculpting their surroundings into odd shapes. But the image also shows the effects of stellar death—filaments created by a supernova explosion. Located only about 160 000 light-years from us in the constellation of Dorado (The Swordfish), the Large Magellanic Cloud is one of our closest galactic neighbors. It is actively forming new stars in regions that are so bright that some can even be seen from Earth with the naked eye, such as the Tarantula Nebula. This new image, taken by ESO's Very Large Telescope at the Paranal Observatory in Chile, explores an area called NGC 2035 (right), sometimes nicknamed the Dragon's Head Nebula. NGC 2035 is an HII region, or emission nebula, consisting of clouds of gas that glow due to the energetic radiation given off by young stars. This radiation strips electrons from atoms within the gas, which eventually recombine with other atoms and release light. Mixed in with the gas are dark clumps of dust that absorb rather than emit light, creating weaving lanes and dark shapes across the nebula.

The filamentary shapes to the left in the image are the not the results of starbirth, but rather stellar death. It was created by one of the most violent events that can happen in the Universe—a supernova explosion. These explosions are so bright that they often briefly outshine their entire host galaxy, before fading from

The Large Magellanic Cloud is one of the closest galaxies to our own. Astronomers have now used the power of the ESO's Very Large Telescope to explore NGC 2035, one of its lesser known regions, in great detail. This new image shows clouds of gas and dust where hot new stars are being born and are sculpting their surroundings into odd shapes. But the image also shows the effects of stellar death -- filaments created by a supernova explosion (left).

view over several weeks or months.

From looking at this image, it may be difficult to grasp the sheer size of these clouds—they are several hundred light-years across. And they are not in our galaxy, but far beyond. The Large Magellanic Cloud is enormous, but when compared to our own galaxy it is very modest in extent, spanning just 14 000 light-years—about ten times smaller than the Milky Way. This image was acquired using the FOcal Reducer and low dispersion Spectrograph instrument attached to ESO's Very Large Telescope, which is located at the Paranal Observatory in Chile, as part of the ESO Cosmic Gems programme. *Provided by ESO*

Murphy's Law

By Steve

Most people think Murphy's Law is "If anything can go wrong, it will." Actually what Edward A. Murphy, Jr. said was "If there is a wrong way to do something, then someone will do it."[1] What he meant was anyone working with or designing equipment or machinery should try to figure out every possible way in which someone could misuse it, human errir and not proclaiming a fatalistic slogan.

Almost a quote from Logic and Contemporary Rhetoric; The Use of Reason in Everyday Life, Fourth Edition by Howard Kahane copyright 1984 page 27.

[1]Science 83, Jan/ Feb 83.

More Of Murphy's Laws For Astronomers
By Steven Seigel

1. A Supernova occurs in the galaxy you last visited.
2. You verify the existence of black holes when you drop a battery or worse, a piece of equipment.
3. Finding out that innocently cleaning a small smudge ruins your mirror.
4. A group of young novices are really astrophysics students in disguise.
5. Seeing is not believing when a youngster is holding the "Atlas Picture Book of the Heavens."
6. During the summer, to your audience, lightening bugs, glow worms, and other nightly creatures are far better to look at than the night sky.
7. Meteor showers occur on the days of inclement weather.
8. DST and astronomical events do not mix.
9. "Once in a blue moon" occurrences happens all the time to astronomers.
10. If clouds do not ruin your "seeing" the light pollution will.

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.

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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.
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President Kevin Gallagher ♦**Vice President** Rob Nunn♦ **Treasurer** Arturo Cisneros
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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
NGC 1501	Planetary Nebula	Camelopardus	04h06m59.4s	+60°55'14"	13.3
Cleopatra's Eye	Planetary Nebula	Eridanus	04h14m15.8s	-12°44'21"	9.6
The California Nebula	Diffuse Nebula	Perseus	04h03m12.0s	+36°22'00"	5.0
NGC 1664	Open Cluster	Auriga	04h51m04.4s	+43°42'04"	7.2
MSH 04-12	Quasar	Eridanus	04h07m48.4s	-12°11'36"	14.8
NGC 1360	Planetary Nebula	Fornax	03h33m14.6s	-25°52'18"	9.6
Crystal Ball	Planetary Nebula	Taurus	04h09m17.0s	+30°46'33"	10.0
Palomar 2	Globular Cluster	Auriga	04h46m06.0s	+31°22'54"	13.0
K 2-1	Planetary Nebula	Auriga	05h07m07.1s	+30°49'18"	13.8
NGC 1624	Open Cluster	Perseus	04h40m25.4s	+50°26'49"	11.8