



the Skyscraper

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AMATEUR ASTRONOMICAL SOCIETY OF RHODE ISLAND * 47 PEEPTOAD ROAD * NORTH SCITUATE, RHODE ISLAND 02857 * WWW.THESKYSCRAPERS.ORG

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Upcoming Meetings

Friday November 2

November Meeting at Seagrave Memorial Observatory

Professor Brad Marston presents "Quantum mechanics plays a crucial role in determining the Earth's climate"

Saturday December 1

Holiday Party Meeting at North Scituate Community Center

Meteorologist Steve Cascione presents "Thirty-four Years of Forecasting in Southern New England and Most Memorable Storms." Members astrophotography gallery.

Friday January 4

January Meeting at North Scituate Community Center

Josh Lake from Pomfret School will demonstrate astronomical image processing techniques.

Friday February 1

February Meeting at North Scituate Community Center

Prof. Ralph Milliken works on the Mars Science Laboratory mission at JPL and will give a presentation about the mission.

Friday March 1

March Meeting at North Scituate Community Center

Dr. Kim Arcand will be presenting.

Friday April 5

April Meeting at Seagrave Memorial Observatory

Glenn Chaple will present "Double Stars are Twice the Fun!"



AstroAssembly
60th Anniversary
Special Edition
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President's Message

Ed Haskell

I am composing this letter a couple of days after the close of our 60th AstroAssembly so it is appropriate for me to open with that topic.

An event such as AstroAssembly doesn't just happen, it requires the coordinated effort of many volunteers. The 2nd vice president is tasked with planning and executing the convention. This year that position is occupied by Kathy Siok. Kathy is such a skilled organizer that she makes a very difficult task appear easy. Backing up Kathy was a brigade of volunteers, whom I will leave it to Kathy to thank in her report. I hope each of you will join me in congratulating the entire team on a job very well done.

What's that you say? You weren't there so why should you congratulate them? All members benefit from AstroAssembly because it produces a profit which is a source of operating funds for the Society. For those of us who attended, this was an exceptional convention. The theme, citizen science, was an excellent choice and the presenters could not have been better. We all learned of multiple ways that amateur astronomers can do real science to the substantial, and sometimes, essential benefit of important professional astronomical research. Just one example is in the search for extra solar planets, where the work of 700,000 amateurs has had a crucial impact on discoveries.

Several times I have alluded to volunteers and the rest of this letter is devoted to that subject. Skyscrapers, Inc. does not have a paid staff. All the work of the Society is performed by volunteer effort. The officers and Board members are volunteers. The Trustees are volunteers. The lawn at the Observatory is cut by volunteers. The refreshments are managed by volunteers. Star parties are put on by volunteers. Member presentations are done by volunteers. And so on. If it were not for volunteers none of the work of the Society would be performed and there would be no Skyscrapers.

The key to a successful organization such as ours is to spread the work across a large enough number of people that making the organization function is not a burden on any one individual. We are failing at that.

I overheard someone say "the same people are always in charge ...". That's right. The reason is that it is very, very difficult to get qualified people to run for Board or Trustees positions, hence the uncontested elections. There are too few volunteers for these positions. This president and the last are exceptions in that we were both members for a relatively brief time before being elected. So it is not impossible, or even difficult, to get involved.

Most people quite legitimately cannot devote the time to the major management positions of the organization. This is not unique to Skyscrapers. But there are lots of jobs that require very little time or effort. Here is an example: publicizing AstroAssembly has always been a shortcoming of the convention. It would have been wonderful if we had a member with some professional experience in public relations who could have advised the committee on how best to get the word out. Not someone to take on the task, but just to consult. There may be a member like this but none of us know of one (see an earlier President's Letter about the failure of most of us to return Dave Huestis' Skills Inventory).

I could cite dozens of other examples but let's just say that there are jobs as easy as the one just described, or ones that may be harder but only for a few weeks duration, or jobs that are easy but span months or years, etc. Won't you please consider whether you could help out in one of these forms or another? As with most societies, what you get out of Skyscrapers is directly proportional to what you put in. Ask any of the volunteers if you don't believe that.

Thanks for all that you do for Skyscrapers.



The Skyscraper is published monthly by Skyscrapers, Inc. Meetings are held monthly, usually on the first or second Saturday of the month. Seagrave Memorial Observatory is open every Saturday night, weather permitting.

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Directions

Directions to Seagrave Memorial Observatory are located on the back page of this newsletter.

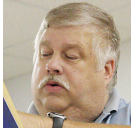
Submissions

Submissions to *The Skyscraper* are always welcome. Please submit items for the newsletter no later than **October 19** to Jim Hendrickson, 1 Sunflower Circle, North Providence, RI 02911 or e-mail to jim@distantgalaxy.com.

E-mail subscriptions

To receive *The Skyscraper* by e-mail, send e-mail with your name and address to jim@distantgalaxy.com. Note that you will no longer receive the newsletter by postal mail.





Perseid Meteor Shower Report and October Meteor Shower Prospects

Dave Huestis

I can't tell you how discouraged I am when I've written about an upcoming astronomical event, only to have it spoiled by cloudy skies. The latest event to suffer this fate was the 2012 Perseids, scheduled to peak during the early morning hours of Sunday, August 12.

While some folks may take the "been there, done that" attitude when it comes to observing meteor showers, I for one never tire of sitting out under a clear and dark sky to watch shooting stars blaze across the heavens. I have the same passion for observing the magnificent Saturn and his rings, as well as for watching the Galilean moons perform their celestial dance around Jupiter.

The observing prospects for the 2012 Perseids were good. Almost perfect, except for a waning crescent Moon rising around 1:30 am in the northeastern sky. The low center causing our adverse weather was not moving off very quickly. We got skunked once again.

What made matters worse is that through a variety of sources I learned that locations elsewhere around the globe were experiencing about 90 Perseids per hour at peak under much better circumstances.

Well, the storm system finally cleared southern New England and Sunday afternoon turned out to be a good day. Still a little humid, but mostly clear. Though the Perseid peak had past, one can usually see about one-quarter of the peak rates the night after.

I ventured out onto my back porch at 3:10 am on that following Monday morning. The temperature had dropped to the mid-60s, and the humidity had diminished somewhat. To the east was brilliant Jupiter, not far from Aldebaran, the bright star in the Hyades asterism of Taurus. Also visible was the Pleiades star cluster. (Seeing the stars of Taurus reminds one that winter is not really that far away.) Cassiopeia and Perseus were to the northeast, and the Great Square of Pegasus was prominent high to the south. Almost at zenith I could easily make out the Andromeda galaxy with the naked-eye. I could also see the crescent Moon behind the trees.

I sat down on a porch chair and began to scan the sky. Immediately I saw a sat-

ellite moving from north to south. Then a faint Perseid. Then another satellite. In just over one hour of observing I saw a total of 14 Perseids. Four of them left brief one- to two-second dust trails. One Perseid, at least as bright as Jupiter, left a dust trail that lasted 17 seconds. That meteor made the whole experience worthwhile.

As the Moon rose higher into the sky, its light illuminated the remaining humidity in the air. The eastern sky became much brighter due to this light scattering, but I don't believe it drastically affected my observing session. The Moon was still below my tree-line, so the trees blocked it from direct view. I could also see Venus through openings between branches. When I called it quits around 4:20 am, the beautiful crescent Moon had finally cleared the trees.

Though I did not experience 90 Perseids per hour, the 14 meteors I did observe helped to rekindle my passion for sharing the beauty of the universe with others.

And all I had to do was to keep my eyes to the skies. (And stay awake of course!)

Stargazers will have two opportunities to scan the skies for meteors during October. The first shooting star display is a minor one called the Draconids. These particles, which were stripped off short-period (6.6 year orbit) comet 21P/Giacobini-Zinner, will hit the Earth's atmosphere at a mere 12.5 miles per second—fairly slow for a meteor shower. The Draconids will reach their peak rate of about ten or less yellowish meteors per hour on the night of October 7-8.

Because the radiant is at its highest point in the northern sky early in the evening on the 7th, you can observe these occasional meteors before midnight. The almost Last Quarter Moon (on the 8th) will somewhat brighten the sky when it rises just before midnight.

To locate Draco, face north and you'll see Ursa Major (Big Bear) and the Big Dipper asterism. Draco stretches between Ursa Major and Polaris, the pole star, which is the end star in Ursa Minor (Little Bear), the Little Dipper asterism handle. Draco descends towards the northern horizon to the left of Polaris as the night progresses. It would be best to scan this entire region of sky for Draconids. By morning twilight,

Draco's head will be sitting due north about 20 degrees above the horizon.

Conditions will be extremely favorable for our second meteor shower of the month—the Orionids (need I say, weather permitting of course). This major shooting star display will peak on the night of October 20-21, with the best activity occurring between midnight and dawn. The particles we will see disintegrating in our atmosphere at around 41.6 miles per second are the remnants of Halley's Comet. The shower gets its name because the meteors appear to radiate out of the sky just above Orion's head and not far from his bright red supergiant star Betelgeuse, which marks his right shoulder.

Orion can easily be found. At 3:30 am this giant of a constellation will be due south of your location and about halfway up above the horizon. A waxing crescent Moon will set around 10:36 pm on the 20th, so it will not brighten the sky whatsoever. With observing conditions about as good as it can get, an observer can expect to see 20 or so yellow and green meteors per hour at peak. The Orionids are also noted for producing fireballs that create persistent dust trains high in the atmosphere.

Let's hope the weather will cooperate so we can all enjoy a good display of shooting stars.

Keep your eyes to the skies.



Moon of the Falling Leaves

Francine Jackson

Traditionally, the October Full Moon is considered the Hunter's Moon, because, after the beautiful Harvest Moon allowed our ancestors to stay out later in the evenings and gather their crops, only the stubble remained, making the cute little woodland creatures easier to kill for the long winter that was to come. They have now eaten their fill, and are plump, ready for the hunt. Fox, rabbit, deer, and others are very easy to find in the harvested land.

And speaking of rabbit, many of us, in looking up at the Moon, often see more than just the Man: some of us are known to find an ant, a crab, a woman reading a book, or even "an old hag." But it's usually the rabbit whose image is second to the face in most people's imagination. And, there are many cultures that created rabbit myths, most often to the detriment of the bunny. However, one of the nicest stories comes from India, where Hare was friends with Otter, Jackal and Monkey. All made a pact to find food for both themselves and

any hungry persons they might find. Otter, Jackal and Monkey did find food for themselves and to give away, but Rabbit could only find grass to eat, which he realized wasn't eaten by humans. So, he decided to sacrifice himself. Luckily, just as he was about to jump into the fire, he was stopped by Indra, god of the sky, who rewarded Rabbit for his selflessness by etching a rabbit on the Moon.

But, many of the American Indian tribes, including the Ojibway, Lakota (Sioux), Chippewa, Arapaho and Cree, considered this Full Moon the Moon of the Falling Leaves, obviously because at this time the leaves are falling everywhere, splashing their beautiful colors all over the ground. So, late this month, on October 29th, be sure to look, not only up at the beautiful Moon, but downward at the resultant experiences here on Earth: The leftover stumps of the crops in the fields, and the carpet of leaves beautifying the land.



NGC 6934: Globular Cluster in Delphinus

Glenn Chaple

October sees the demise of the summer Milky Way and its swarm of globular clusters centered on the constellation Sagittarius. A few, notably M15 in Pegasus, lag behind to grace our autumn skies. Another of these stragglers is NGC 6934 in Delphinus. This small 9th magnitude globular was discovered by William Herschel in 1785. In early star atlases and in modern-day "Herschel 400" guides, it bears the designation H1031 - the 103rd entry in Category I (bright nebulae) of Herschel's deep sky catalog.

NGC 6934 may be glimpsed in small scopes. In fact, my only encounter with this globular was with a 3-inch f/10 reflector through which it appeared as a "faint patch of light, but definitely identified." The circular smudge was only a few arc-minutes across and lay just east of a 9th magnitude star. My observing guides, including Kepple

and Sanner's *The Night Sky Observer's Guide*, indicate that resolution will require more substantial instruments - 8 to 12 inches for partial resolution of the outer halo, 14 inches or more combined with high magnification for a more definitive view. To that end, my October "to-do" list includes a study of NGC 6934 with medium and large-aperture telescopes. Anybody have an 18-inch Dob handy?

The finder chart, from the *Touring the Universe with Binoculars Atlas* (TUBA) by Phil Harrington shows the location of NGC 6934. Owners of GoTo scopes or traditional equatorially-mounted instruments can lock it in using the coordinates 20h 34.2m, +07°24.2'. Star hoppers will want to try the 4 degree trek southward from epsilon (ϵ) Delphini. Harrington 9 (Hrr 9) is an asterism he found that surrounds and includes the star theta (θ) Delphini.

In the ongoing series
Backyard Observatories

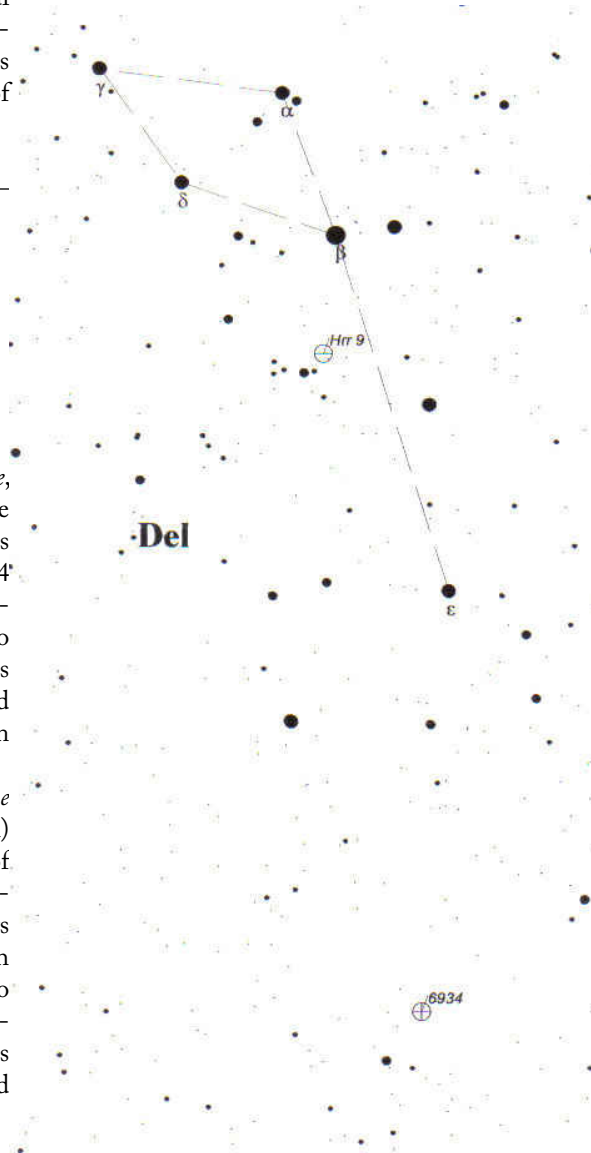
Tom Thibault and Gerry

Dyck have shared

their experiences in
building and using their
observatories.

Please share your backyard
observatory story:

jim@distantgalaxy.com





International Observe the Moon Night

on Saturday, September 22 provided mostly clear skies for 10 members and about 30 guests to enjoy views of the Moon and other objects through eight telescopes at Seagrave Memorial observatory.

Senior Trustee Steve Siok uses the Mogeey refractor to view the Moon. Member **Francine Jackson**, also Director of Frosty Drew Observatory, presented lunar and meteorite samples that were on temporary loan from NASA during Friday and Saturday nights for International Observe the Moon Nights at Frosty Drew Observatory in Charlestown. **Francine has invited Skyscrapers to have a future meeting hosted at Frosty Drew.** Photos by Jim Hendrickson.



from: [John W Briggs](#)

date: Tue, 18 Sep 2012 09:48:03 -0700 (PDT)

subject: **The 1868 Rutherford telescope presently observing the Sun at Kitt Peak National Observatory**

The 15-foot-long, 13-inch-diameter telescope first used by Lewis M. Rutherford in 1868 is presently mounted in a vertical sunbeam at the giant McMath-Pierce Solar Telescope at Kitt Peak National Observatory near Tucson, Arizona. Solar astronomer Dr. John W. Harvey and astronomer-historian John W. Briggs have successfully recorded the solar granulation, a fine texture on the surface of the Sun, in a reenactment of Lewis M. Rutherford's 1871 first photographic record of the phenomenon. A webcam in the observing room of the McMath-Pierce facility presently shows the astronomers at work, with images updated about once per minute: <http://nsokp.nso.edu/webcam>



Only the eye end of the Rutherford telescope is seen, hanging down as a dark, tapered tube from the ceiling. The lens end, with its

13-inch glass, is at a level above and is illuminated by large moving mirrors that track the motion of the Sun. Each tiny granule presently being photographed is a bubble of hot gas rising to the surface of the Sun in a process that has a turn-over time of about 10 minutes. In actuality, the granules are each about the size of Texas. The great distance of the Sun, and the special photographic technique involved, made photography of the solar convection impossible until L. M. Rutherford's work in 1871. Rutherford's results were reported to the Royal Astronomical Society in England, but only after another astronomer in France had produced similar images. The Rutherford project at Kitt Peak National Observatory will continue through Friday, September 21.

from: [John W Briggs](#)

date: September 22, 2012 15:57 EDT

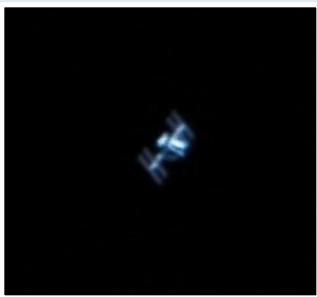
subject: **Image: Briggs and Harvey ending their run with the Rutherford at KPNO**

Dear Friends: I am smiling with solar astronomer Dr. Jack Harvey of National Solar Observatory, because we had just de-installed the antique 13-inch f/13.9 Rutherford telescope from inside the huge McMath-Pierce solar facility, without breaking anything! Our goal had been to reenact Lewis M. Rutherford's 1871 photographic observation of solar granulation. The observing run was successful in that granulation was obvious with Jack's CCD imaging equipment on our mornings of good seeing. Experiments with high-contrast 8x10 sheet film were less obviously successful because of bad luck with clouds and poor seeing toward the end of our run. We also used a Lumenera SKYnyx2 camera from HUT Observatory to make video recordings of sunspots, pores, granulation, and faculae, and night targets including the Moon and double stars. We'll be writing-up the project, which was supported both by HUT Observatory and National Optical Astronomy Observatory Education and Public Outreach.

--John. (Now travelling home from Tucson.)



The Moon meets Jupiter on the morning of Saturday, September 8th. Jim Hendrickson, while at the Newfangled fall retreat in Marshall, North Carolina (35°47'1.12"N 82°35'59.12"W) took this image (note that the Moon is overexposed to show the moons of Jupiter) using a Canon 40D on a 71mm f/5.6 mini-Borg telescope.

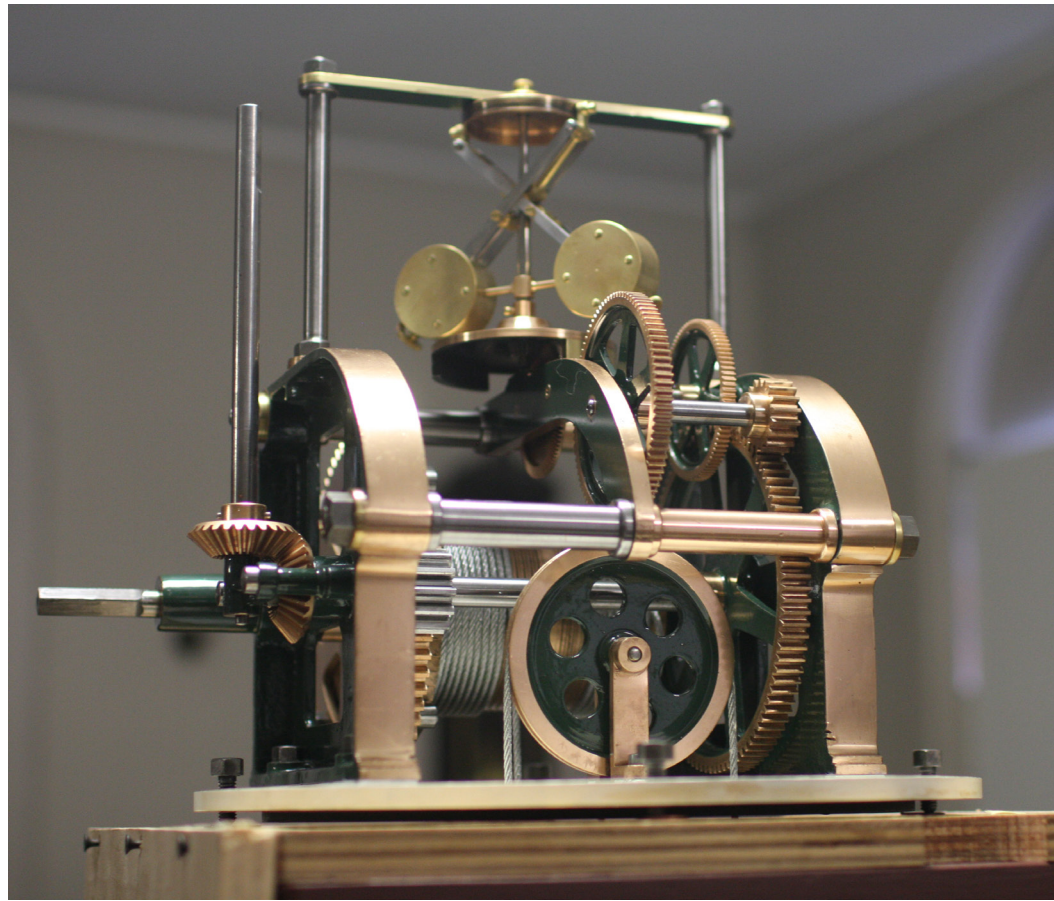


International Space Station passed over Seagrave Observatory during a star party on Friday, October 12. Inset: Bob Horton shot this image of the International Space Station on October 14 through his 12.5" telescope with a Nikon D70.



Ladd Observatory

reopened on Tuesday, September 25 after being closed for 16 weeks during which the weight drive and governor (right) of the 1891 Brashear telescope was dismantled and completely restored--the first overhaul it has had in over 100 years.



Kathy Siok



AstroAssembly Update

More than a week has passed since our 60th AstroAssembly, our annual event that brings together amateurs from all over New England to reconnect with old friends, learn something new and just have a great time.

While the weather forecast predicted clouds and rain, the showers never dampened our spirits as more than 80 people turned up at Seagrave for a wonderful day and two evenings.

Despite the pouring rain on Friday night, 25 people showed up to hear excellent talks from three amateur astronomers: Conrad Cardano describing his success experimenting with low resolution spectroscopy, Steve Hubbard sharing his trip to Mt. Wilson Observatory and Tony Costanzo showing us how he restored an 1871 Alvan Clark Refractor that was almost discarded at an old school.

The theme this year was “Citizen Science”, non specialists helping the professionals to make observations and carry on investigations of scientific projects. We were able to interest some excellent speakers to explore this topic. Three young female astronomers working at different Universities on the East Coast shared their passion for science and their important work unraveling the mysteries of the universe. Dr. Carie Cardamone, of Brown University who was also instrumental in helping to obtain the other speakers, gave an overview about the many projects that have evolved in Citizen Science from the original Zooniverse and gave details about the discoveries of citizens in “Green Pea Galaxies”. (See the information about various projects included in this newsletter.) Dr. Meg Schwamb, from the Yale Center for Astronomy and Astro-



physics, described her work with “Planet Hunters”. The main speaker at our evening program was Dr. Bethany Cobb Kung, of George Washington University, who described her work with Gamma Ray Bursts, Supernovae and Cataclysmic Variables. Skyscraper Gerry Dyck shared his research into Frank Seagrave’s work on variable star observations. Gerry also created an inspiring presentation of his original music derived from the light curve of SS Cygni (and other variable stars) accompanied by his original poetry, called “The Ancient Face of Night” prior to the evening program. We had planned an early afternoon presentation by long-time member, Ed Turco, describing the equipment used by amateurs in 1961. Unfortunately Ed became ill on Fri-

day and could not attend this year. He was missed by all. A thank you to Gerry, who was kind enough to provide a multimedia presentation at the last minute.

This year’s AstroAssembly also included a couple of ‘old time’ competitions – the astrobakeoff and the astrophoto contest. These were quite a success. Julie Kaufman of ATMoB created a very delicious and creative rendition of the HR Diagram with star cookies and then personally served them to all of us. Winners of the Astrophoto contest included: John Kocur, Bill Guca and Steve Hubbard, who produced excellent views of the sky. Our annual raffle also proved quite popular and the winners enjoyed all their prizes. Contributors included: Astronomy Shoppe (Tony Costan-

zo), Televue Optics, Orion Telescopes and Binoculars, Skyhound Software, Oceanside Photo and Telescope, Cotton Expressions, Edmund Scientific and Ken Dore of Skyscrapers.

While I coordinated this event, it was successful because of the help of many volunteers who worked with me behind the scenes to make everything seamless. I always hesitate to mention names, since it is so easy to forget one or two individuals. However, I will try to include all who helped. My thanks to: Tom Barbish, Pam Beck, Linda and Alex Bergemann, Jim Brenek, Conrad Cardano, Jim Crawford and his son, Bob Forgiel, Ed Haskell, Bob Horton, Steve and Sue Hubbard, Dave and Tina Huestis, Ray Kenison, Pat Landers, John Leonelli, Lloyd Merrill, Charlie Mszczenski, Steve Siok, Tom Thibault, Scott Tracy, Special thanks to Jim Hendrickson, who set up our beautiful program, and to non-Skyscrapers, Dave Kelly and his son, who helped because they feel so at home at AstroAssembly. If I left anyone out of this list, please accept my sincere thanks and understanding. Thank you to all!



**AstroAssembly
Friday Night
Ed Haskell**

AstroAssembly occurs on two dates, Friday evening and all day Saturday. This article is a report on the presentations made Friday evening. My purpose in writing is ostensibly to preserve a record of what happened that evening. More to the point, however, it is to ensure that members who stayed away from the convention know how much they missed by their absence.

Conrad Cardano: Star Analyzer: Low Resolution Spectroscopy

Conrad began with an explanation of spectroscopy, the study of the interaction between matter and radiated energy, i.e., light. There followed an illustration of the electromagnetic spectrum identifying the tiny part occupied by visible light. Then was covered the types of spectra, continuous, absorption and emission, the latter two of which may contain lines which are characteristic of the various chemical elements present in the source of the spectra.

These concepts were demonstrated by the use of a Ronchi grating which was then elucidated further to show how modern astronomical spectroscopes, including the Star Analyzer, spread the light from a

single star into a spectrum. Research grade spectrometers are quite expensive while the Star Analyzer trades off some of the more esoteric functions against cost to produce a device that meets most of the needs of amateur astronomy at a manageable price.

In addition to the spectroscope several other devices are needed. A digital camera of the sort many of us already own and a fairly typical telescope such as a Celestron C5 provide a good platform to support the Star Analyzer. With this setup, useful results may be obtained with exposures in the range of four to ten seconds.

As you might imagine, software to process the output of the Star Analyzer is a requirement which is met by the *Sky & Telescope* Hot Product for 2011 known as RSPEC. More information on RSPEC is available at <http://www.rspec-astro.com/>.

Conrad showed several analysis runs which made it obvious that the use of both the hardware and software were within the ability of amateurs of average ability. After the scope is polar aligned it is easy to do a half a dozen exposures within the hour.

There followed a comprehensive presentation of the ways one uses the information provided by this hardware/software combination. Sadly it is beyond the scope of a short article to go into these matters but they are of considerable interest and Conrad covered them with all of the aplomb we have come to expect from the better professional presentations at our regular meetings. I urge you to borrow the video of this presentation made by Jim Crawford if you are interested in furthering your understanding of this topic.

Steve Hubbard: Bigger Really Can Be Better: Visit to Mount Wilson Observatory

Steve reported on a visit to Mount Wilson which a group of amateurs took to that location as well as Mount Palomar and the Griffith Observatory last spring in a tour arranged by Dan Lorraine. Unlike most trips this one featured two all night observing sessions using the famed 60" telescope on which Edwin Hubble did most of his work leading to the theory of the expanding universe.

Many photographs of Mount Wilson and its environs were taken by Steve and others and illuminated effectively the verbal report in such a manner that listeners were able to feel the same excitement experienced by those on the trip.

Mount Wilson Observatories include a number of instruments in addition to the

60": the 100" Hooker Telescope, the Snow Solar Telescope and several other solar instruments, etc. Both the 60" and the 100" were at one time the largest telescopes in the world.

Tony Costanzo: Restoring an 1871 4" Clark Refractor

Tony reported on his delight at locating a derelict 4" Clark refractor and the work required to restore it to its original splendor. Along the way he also made side trips to two other telescopes his shop restored this year, a 4" Photo Equatorial Unitron and a 1967 Celestron C-10.

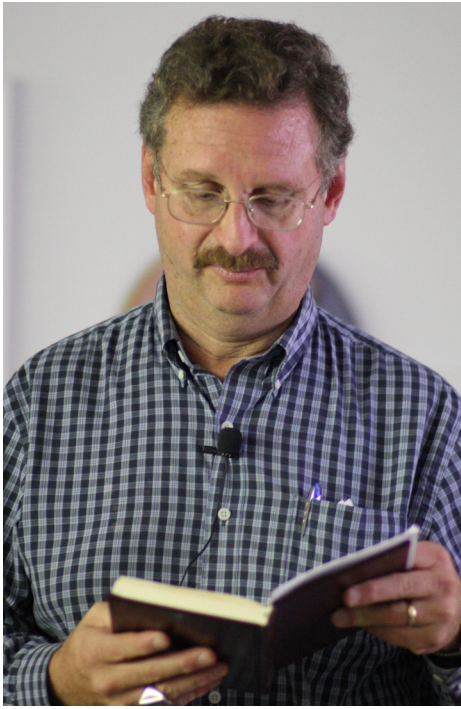
The Clark was located at the Pynchard School in Andover MA, where it was stored under the kitchen. As might be expected the instrument had a lot of water damage and was being thrown away. A science teacher rescued it and Tony bought the instrument. Fortunately the focuser, the finder, and the lens cell had been stored elsewhere and were in almost pristine condition. The rest of the instrument looked like a hundred and forty years of hard use. The tripod and case were covered by green mold and the optical tube assembly was heavily tarnished.

Tony covered in detail how he removes mold, mildew, tarnish, etc., and many members of the audience were seen to be furiously scribbling notes in the dark. Fortunately the optics were in quite good condition so none of these substances were required for the glass elements. The OTA needed more than eight hours of cleaning and polishing, and the tripod considerably more effort before being finished off with bowling alley wax.

After a detailed discussion of the processes involved in the restoration Tony went on to mention briefly how he had reworked the Celestron C-10 f/13 which had been in a yard sale for 100 dollars. The only trouble of consequence was with the mechanism used for focusing; a triangular device for moving the mirror forward and back to accomplish focus.

He then went on to discuss the 4" Unitron refractor and mechanical clock drive. The instrument had been left out in the rain and all the metal surfaces were a dingy grey and the mount was frozen. After cleaning and polishing the metal surfaces the telescope was fine.

These three member presentations exemplify how really good an amateur presentation can be if the story is interesting and modern presentation technology is used to good advantage.

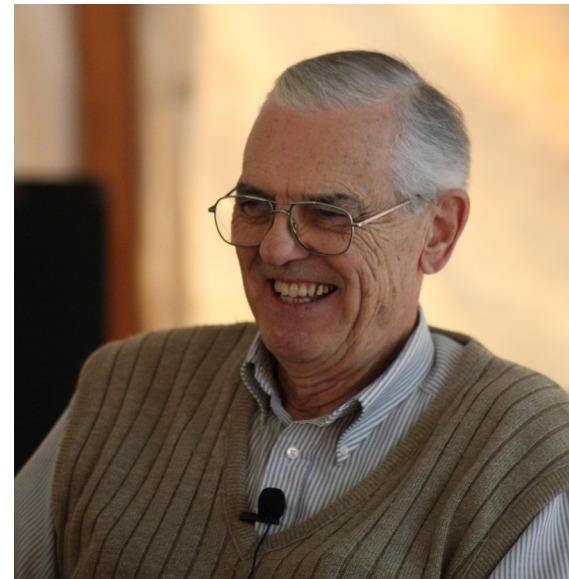


AstroAssembly Friday Night Talks **Steve Hubbard** (top left)

reads from his logbook from an April 21st observing session with the 60-inch Hale telescope at Mount Wilson.

Conrad Cardano (top right) demonstrates a diffraction grating during a presentation on low-resolution spectroscopy. **Scott Tracy**, our traditional AstroAssembly Master of Ceremonies, sets Conrad up with the

microphone. **Tony Costanzo** gives a presentation on his recent restoration of an 1871 Clark refractor.



Linda Bergemann and Sue Hubbard (top left) handled the registration table while **Gerry Dyck** (top right) gave a series of short presentations to fill in for **Ed Turco** who was unable to attend..

Julie Kaufman from Amateur Telescope Makers of Boston brought a tray of Hertzprung-Russel-themed cookies for all to enjoy. Inset: **Richard Sanderson** and **Dave Huestis** use spectral class B8 and K3 cookies to simulate the well-known double star Albireo in Cygnus.

Dick Parker & Al Hall present Pollux & Castor

the fully functioning weight-driven mounts for their twin 3/4 scale replicas of the Seagrave Memorial Observatory 8-inch Clark telescope. Both telescope mounts were displayed in the meeting hall throughout Saturday with the miniature flyball governors spinning away as members and guests were invited to wind up the weights periodically.





AstroAssembly citizen science presenters

Meg Schwamb, Bethany Cobb Kung, and Carie Cardamone get a tour of Seagrave

Memorial Observatory by **Historian Dave Huestis**. Below: Dr. Bethany Cobb

Kung views the Alvan Clark telescope with Steve Siok and Steve Hubbard.





At the AstroAssembly grill

Conrad Cardano prepares burgers, veggie burgers and hotdogs during lunch break.



AstroAssembly raffle

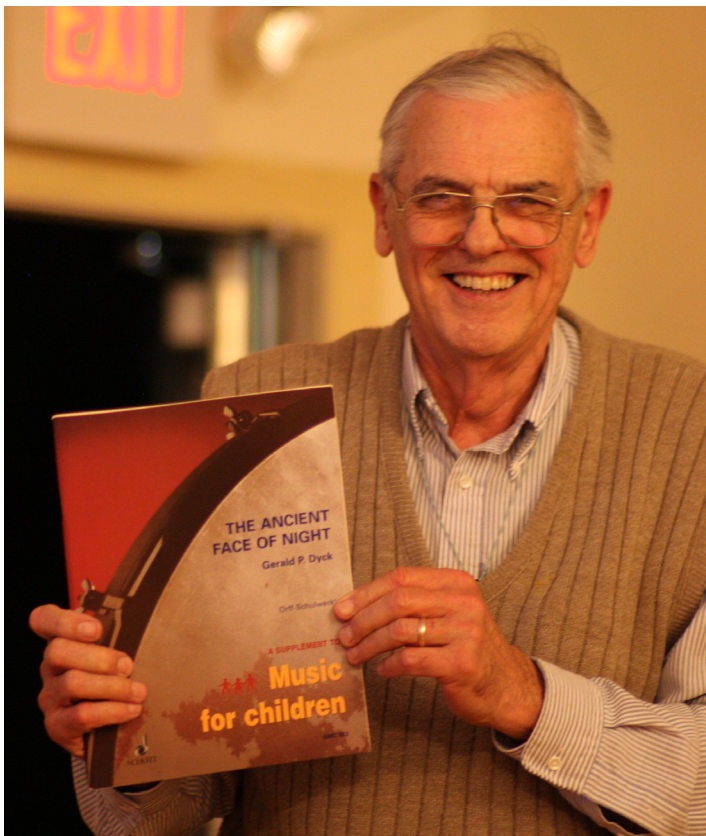
is always a big hit, with many great prizes donated this year. **Alex Bergemann** handled the tickets and drawing, and **Jack Szelka** won the grand prize Tele Vue eyepiece.



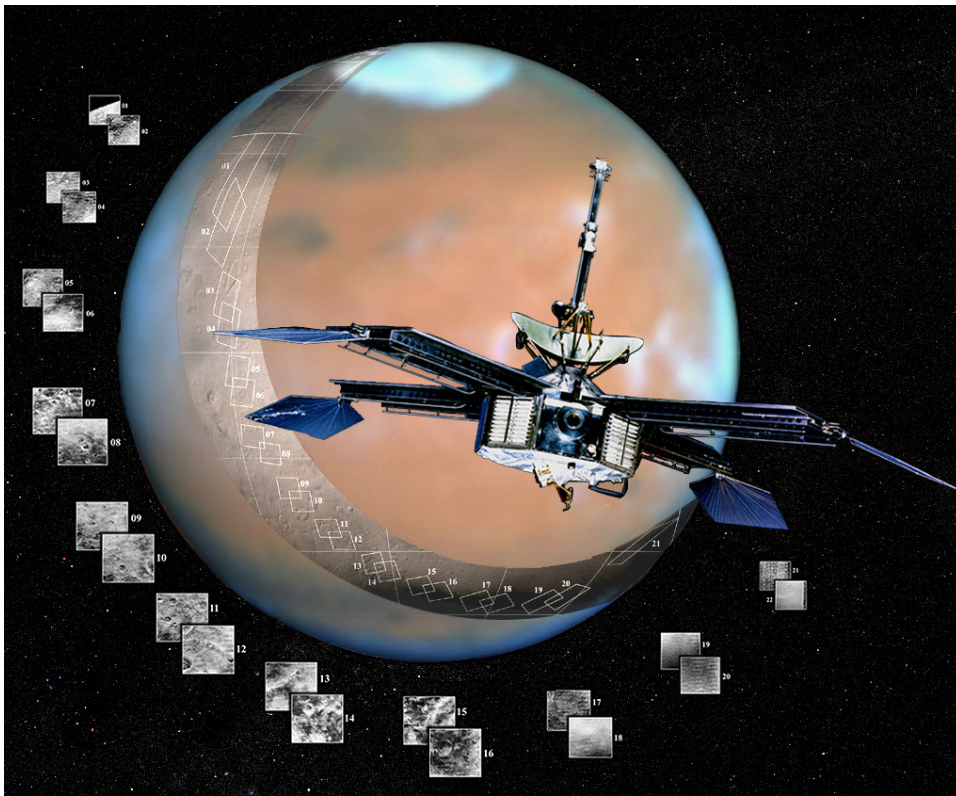
AstroAssembly chairperson **Kathy Siok** and Skyscrapers president **Ed Haskell**.



John Kocur talks about his winning entry in the AstroAssembly astrophoto competition.



The Saturday evening keynote featured **Gerry Dyck's** musical presentation of "The Ancient Face of Night" followed by **Dr. Bethany Cobb Kung's** excellent presentation on extreme variables.



In this poster art of Mariner 4, you can see the parabolic reflector atop the spacecraft bus. Like the reflector inside a flashlight, it sends a beam of electromagnetic energy in a particular direction. Credit: NASA/JPL/Corby Waste.

have been conducted at every planet and many large moons. And another one is on schedule to investigate Pluto and its companion Charon, when the New Horizons spacecraft flies by in July 2015. Also, during that flyby, a different kind of radio science experiment will investigate the gravitational field.

The most recent radio science occultation experiment took place September 2, 2012, when the Cassini spacecraft carried its three transmitters behind Saturn. These three different frequencies are all kept precisely “in tune” with one another, based on a reference frequency sent from Earth. Compared to observations of the free space for calibration just before ingress to occultation, the experiment makes it possible to tease out a wide variety of components in Saturn’s ionosphere and atmosphere.

Occultation experiments comprise only one of many categories of radio science experiments. Others include tests of General Relativity, studying the solar corona, mapping gravity fields, determining mass, and more. They all rely on NASA’s Deep Space Network to capture the signals, which are then archived and studied.

Find out more about spacecraft science experiments in “Basics of Space Flight,” a website and book by this author, <http://www2.jpl.nasa.gov/basics>. Kids can learn all about NASA’s Deep Space Network by playing the “Uplink-Downlink” game at <http://spaceplace.nasa.gov/dsn-game>.



Doing Science with a Spacecraft’s Signal

David Doody

Mariner 2 to Venus, the first interplanetary flight, was launched August 27 fifty years ago. This was a time when scientists were first learning that Venus might not harbor jungles under its thick atmosphere after all. A Russian scientist had discovered that atmosphere during the rare Venus transit of 1761, because of the effects of sunlight from behind.

Mariner 2 proved interplanetary flight was possible, and our ability to take close-up images of other planets would be richly rewarding in scientific return. But it also

meant we could use the spacecraft itself as a “light” source, planting it behind an object of our choosing and making direct measurements.

Mariner 4 did the first occultation experiment of this sort when it passed behind Mars as seen from Earth in July 1965. But, instead of visible light from the Sun, this occultation experiment used the spacecraft’s approximately 2-GHz radio signal.

The Mariner 4 experiment revealed Mars’ thin atmosphere. Since then, successful radio science occultation experiments

Directions to Seagrave Memorial Observatory

From the Providence area:

Take Rt. 6 West to Interstate 295 in Johnston and proceed west on Rt. 6 to Scituate. In Scituate bear right off Rt. 6 onto Rt. 101. Turn right onto Rt. 116 North. Peeptoad Road is the first left off Rt. 116.

From Coventry/West Warwick area:

Take Rt. 116 North. Peeptoad Road is the first left after crossing Rt. 101.

From Southern Rhode Island:

Take Interstate 95 North. Exit onto Interstate 295 North in Warwick (left exit.) Exit to Rt. 6 West in Johnston. Bear right off Rt. 6 onto Rt. 101. Turn right on Rt. 116. Peeptoad Road is the first left off Rt. 116.

From Northern Rhode Island:

Take Rt. 116 South. Follow Rt. 116 thru Greenville. Turn left at Knight's Farm intersection (Rt. 116 turns left) and follow Rt. 116. Watch for Peeptoad Road on the right.

From Connecticut:

- Take Rt. 44 East to Greenville and turn right on Rt. 116 South. Turn left at Knight's Farm intersection (Rt. 116 turn left) and follow Rt. 116. Watch for Peeptoad Road on the right.
- or • Take Rt. 6 East toward Rhode Island; bear left on Rt. 101 East and continue to intersection with Rt. 116. Turn left; Peeptoad Road is the first left off Rt. 116.

From Massachusetts:

Take Interstate 295 South (off Interstate 95 in Attleboro). Exit onto Rt. 6 West in Johnston. Bear right off Rt. 6 onto Rt. 101. Turn right on Rt. 116. Peeptoad Road is the first left off Rt. 116.



47 Peeptoad Road
North Scituate, Rhode Island 02857