



the Skyscraper

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

In this issue

- 2 President's Message
- 3 Astronomy Day Comes to Seagrave Memorial Observatory
- 3 Free Public Program:
 - 3 Planetary Geologist Dr. Peter Schultz to Speak at Seagrave Memorial Observatory
- 5 Mars Madness
- 6 Can You Say Camelopardalids?
- 7 Seeing into the Asteroid Belt
- 10 Review: Orion GrandView 16-48x65mm Spotting Scope
- 11 Seagrave Observatory Reports
- 16 Total Lunar Eclipse from Florida
- 16 Lyrid Meteors over Ladd Observatory
- 17 The Names Behind the Observatories: Part 2
- 18 Barred Spiral Galaxy in Ursa Major M108
- 19 A Note on the Passing of Two Lunar Exploration Pioneers
- 19 The Power of the Sun's Engines
- 20 Secretary & Treasurer

Friday, May 2, 7pm at Seagrave Memorial Observatory

Contact Kathy Siok (kathys5@cox.net) to report what dessert you plan to bring. (Beverages and paper goods will be provided) • Bring your Astronomical Photos to Display

Sketching Mars - Learning to be a Better Observer by Al Hall

Al Hall's talk will focus on some techniques and tips for getting good results.

Examination of the 1856 Edition of Burritt's Star Atlas by Steve Siok

This talk by Steve Siok will explore what can be learned about the state of astronomy in the mid 19th Century from this document.

Upcoming Meetings

- | | |
|---------------------|--|
| Saturday, June 7 | Members' Potluck Dinner & Steve Hubbard presents "What's on your bucket list?" |
| Saturday, July 12 | Members' Observing Night |
| Friday, August 1 | Dr. David Kipping from Harvard Smithsonian Center for Astrophysics |
| Friday, September 5 | Author Dava Sobel |
| October 3 & 4 | AstroAssembly |
| Friday, November 7 | "NASA helps Giordano Bruno find New Worlds" by Alan Powers |





President's Message

Bob Horton

I am very happy to have been elected President of Skyscrapers. On behalf of our society I would like to take this opportunity to thank outgoing President Ed Haskell for his dedication to our organization. I also wish to thank all of the many volunteers that have contributed their time to Skyscrapers.

When I agreed to run for President, I stated that among my goals is a desire to foster more amateur/professional astronomy collaboration, to apply for grants to improve our equipment and facilities, and to improve both member and public outreach activities. In the past few years some very dedicated people in Skyscrapers have con-

tributed to offering the membership activities outside of the monthly meetings. These have included various workshops, member's observing nights, and most recently, visiting the Springfield Science Museum and Wilder Observatory.

I would like to see us continue to offer and expand these types of activities. In fact, some are already in the planning stages. I strongly encourage all members to develop not only new ideas for programs, but also to consider taking a role in organizing activities that we can all enjoy.

Thanks again to all of you for your dedication to Skyscrapers.



The Skyscraper is published monthly by Skyscrapers, Inc. Meetings are held monthly, usually on the first or second Friday or 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 **May 23** 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.



Observers' Night: Friday May 30th

Please join us for a members night on the last Friday in May. There will be a 2 day old crescent in the sky to accompany us as we bid the late Spring objects adieu as they give way to the Summer Milky Way. Hope to see you there!



Astronomy Day Comes to Seagrave Memorial Observatory

Saturday, May 10, 2014, 3:00 – 6:00 P.M., Rain or Shine
Suggested donation: \$5.00 Pre-registration required.

Seagrave Memorial Observatory
47 Peeptoad Road, North Scituate, RI

To register, contact: Robert_Horton@brown.edu

If you ever wanted to look up and enjoy the beauty of the night, here is your chance to learn. Skyscrapers, Inc., the Amateur Astronomical Society of Rhode Island, will be opening its doors to introduce you to the basics of telescope observation. You will learn how telescopes work: how to use them, and the one that might just be the best fit for you. Then, once you have one, you will be shown some of the beautiful deep-sky and neighboring objects to

find with your new instrument, and then a primer on how to locate them in the night sky.

Do you already have a telescope, and are having a problem with it? Bring it along, and one of the Skyscraper members will give you one-on-one instruction on it.

Due to the size of the property, registration is limited to 40 people. Don't miss out on this chance to become familiar with the beautiful sky above!



FREE PUBLIC PROGRAM:

Planetary Geologist Dr. Peter Schultz to Speak at Seagrave Memorial Observatory

Saturday, May 10, 2014, 8:00 P.M. Rain or Shine
47 Peeptoad Road, North Scituate, RI

Space is limited, so please reserve your place by e-mailing Robert_Horton@Brown.Edu

The Moon has always been next to us. It has been an object of both beauty and mystery described in science fiction, movies, and even hoaxes. Before the Apollo program, everything seemed possible: from green cheese to colonies. Ever since the Apollo, the number of mysteries increased even more. Now we know that we can gaze back at ourselves: a surface dating back more than 4 billion years ago; large impact craters formed during the age of the dinosaurs; mini-mountain ridges created while the Moon shrunk; and a “face” that may have formed as the result of a giant basin on the other side.

Dr. Peter Schultz, of Brown University's Planetary Geology Department, has spent years studying the intricacies of our nearest neighbor, from the gigantic to the smallest

features. Come listen, as he takes you on “A Geologist's Guide to the Moon.” Designed for all ages, Dr. Schultz will take you to the surface of the Moon, and introduce you to the beauty and science of our only natural satellite.

Also, skies permitting, the telescopes on the grounds will be open for public observing. Thrill to the beauty of the waxing gibbous Moon, the planets Mars, Jupiter and Saturn, double stars, and all other nighttime sky objects, with the Society's historic 8-inch refracting telescope, the newer set of instruments, and portable telescopes that members set on the lawn. Enjoy your observing to the relaxing sound of the neighboring peeptoads. The Observatory opens at 8:00 P.M.





At the annual meeting on April 4, Skyscrapers, Inc. awarded longtime member Al Hall (left) with Lifetime Membership for his leading role in the Alvan Clark telescope restoration projects. Dick Parker (center) was awarded Honorary Membership for his role in the Clark telescope restoration project and for his amateur telescope making instruction over the years that many members and friends of Skyscrapers have benefited from. Francis O'Reilly (right) was presented with a Skyscrapers President's Award for his article in Sky & Telescope magazine about the 2010 restoration of the Clark telescope and subsequent donation.

Friday, May 9

Enjoy Powers of 10 at the URI Planetarium

University of Rhode Island Planetarium
Kingston Campus
Upper College Road

Friday, April 11th, 2014
6:00 or 7:00 P.M.

Contact: Francine Jackson 401-527-5558

Many of us have been delighted with the movie Powers of Ten, conceived by Charles and Ray Eames, where each 10-second interval increases our seeing tenfold. Now,

through the magic of the URI digital planetarium, and the creativity of Physics Laboratory Manager Steve Pellegrino, you will see Powers of Ten in a whole new light.

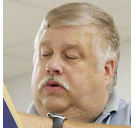
Also, we will have a short program on the Moon, and its beauty as captured by one of the recent space craft. Also, the ever-popular light pollution eye opener Losing the Night, as well as a live presentation on the Skies above campus. Admission, to benefit the URI Planetarium Fund, is only \$5.00.

Come for a fun night of short, eclectic



programming!

The University of Rhode Island Planetarium is available for programs of many varied topics of astronomical interest for all age groups. For more information, please call 401-527-5558.



Mars Madness

Dave Huestis

I couldn't resist using that title for this column. While stargazers do not have the fan base like the teams in the NCAA Basketball Championship, we do get excited when we can share views of a world that has stimulated mankind's imagination for well over a century. I'm referring to our second closest planetary neighbor, Mars. In recent months the Earth had been catching up to Mars, since the Earth orbits the Sun on the inside track (one year) in less time than Mars does (1.88 years). We effectively lapped Mars on April 14 when these two worlds were at their closest for this apparition, which occurs about every 26 months. On that date at 8:54 a.m. EDT, one could look across the 57,406,300 miles of space to observe this dry and barren world almost half the size of the Earth.

For this article I am not going to recount the history of Mars observations or spacecraft explorations other than to say the initial accounts of possible "canals" on Mars at the end of the 19th century captured our imagination and most assuredly hastened our spacecraft exploration of this desolate world. If you would like some historical background, visit Skyscrapers website at <http://www.theskyscrapers.org/> and look for an article titled "Mars History Highlights 2012."

Unfortunately not all Mars close encounters are favorable ones. That fact is due to the eccentricity of Mars' elliptical orbit and its distance from the Sun. For example, during the previous close encounter on March 5, 2012, Mars and the Earth were a distant 62,652,214 miles from each other. So on April 14 we were about five million miles closer. However, back on August 27, 2003, Earth and Mars were a mere 34,646,418 miles apart, their closest distance for nearly 60,000 years.

You'll want to begin observing Mars as soon as possible, as the distance between our two worlds will be increasing every day as the Earth pulls away. If you visit one of the local observatories, the volunteers at these facilities will know where to find Mars in the sky. And they will be happy to point it out so you will be able to locate it yourself if you have your own telescope. Should you be unable to take advantage of their guidance, the accompanying star map along with the following brief directions

will help you.

On May 1 at 9:00 p.m. EDT the skies will be dark enough to see Mars residing among the rather indistinct constellation of Virgo. While Virgo's brightest star Spica (15th brightest in the sky) can be a nice beacon, Mars will be much closer to Porrina which will be just above it. Mars will be the very distinct pumpkin orange colored object shining at about magnitude -1, 40 degrees above the southeast horizon. Do not confuse it with Boötes' bright orange giant star Arcturus to the left and also about 40 degrees above the eastern horizon. (Several Skyscrapers members have done so in the past, including yours truly!)

Once you focus in on Mars with a telescope, the planet will appear as a rust-colored beach ball. As you carefully scan this alien world, you should begin to notice several dark features on the Martian surface. These features are the underlying rock exposed by the shifting sands during intense dust storms. The relatively small image will make it somewhat of a challenge to identify much detail, and the dark surface features may be fleeting. Despite this handicap, a keen-eyed observer should be able to see a dark area like Syrtis Major or a bright one like Hellas Basin. An online utility called Mars Profiler, provided by Sky and Telescope magazine (<http://www.skyandtelescope.com/observing/objects/javascript/mars>), will help you to identify specific surface features.

While you won't see any hint of alleged canals, you can still ponder the excitement originally created by such assertions that intelligent Martians were busy irrigating their desert world. For some observers

it might be a challenge to observe much detail with a small telescope, but don't let that situation deter you from gazing at this planet that has stimulated our collective imagination for over a century. And of course the local observatories will be able to share even more Martian detail when steady seeing allows them to "crank up" the magnification on their larger instruments.

The next detail that will hopefully catch your eye will be the North Polar Cap (NPC). It's a bright white feature that can easily be seen because Mars' north pole is currently tilted about 21 degrees towards the Earth. It is mid-summer in Mars' northern hemisphere, so the NPC has had some time to melt. Wait for steady seeing conditions to observe as much detail as possible. The NPC will continue to shrink as the Martian summer progresses, while the Earth/Mars distance increases and the image size decreases.

Keep in mind that Mars rotates once in 24 hours and 38 minutes. That means if you observe a feature at a specific location at a specific time on a given night, you'll have to wait an additional 38 minutes each successive night for it to be at the same spot, since the Earth rotates once every 24 hours.

Though Mars is noted for producing global dust storms that can enshroud the planet, these storms are usually active when Mars is at perihelion (closest to Sun). The next Mars' perihelion is not until December, so major dust storms are unlikely during the next few months.

In conclusion, be patient during your observations and note as much detail as your telescope and local weather conditions allow. Take a knowledgeable glimpse of an alien world that inspired generations of astronomers and science fiction writers alike to ponder the existence of Martian life-forms. And don't forget to take advantage



Steve Hubbard captured this image of Mars on April 19 with a 14-inch SCT and ZWO imager.

of the marvelous views afforded by the local observatories.

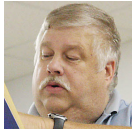
While there are no (intelligent) Martians, after decades of careful observations of the red planet, we Earthlings have sent an armada of spacecraft to invade “their” world! And perhaps one day in the not too distant future, your children or grandchildren may set foot upon this exciting land-

scape.

If you don’t own your own telescope or the view of Mars through the one you do own is too small to see much detail, plan on visiting Seagrave Observatory (<http://www.theskyscrapers.org>) on PeepToad Road in North Scituate on any clear Saturday night. Or visit Ladd Observatory (<http://www.brown.edu/Departments/Physics/Ladd/>)

located on Hope Street on Providence’s East Side on any clear Tuesday night. Also consider visiting Frosty Drew Observatory (<http://www.frostydrew.org/>) in Charlestown, which is open every clear Friday night. Visit the respective websites for observing schedules.

Keep your eyes to the skies.



Can You Say Camelopardalids?

Dave Huestis

A stream of debris from Comet 209P/LINEAR may produce a notable meteor shower on the morning of May 24.

The majority of the meteor showers we observe these days are centuries old. Some of the displays, like the Perseids and the Geminids, put on a good annual show. Then there are the minor showers that only produce ten or less meteors per hour at best. These particles, stripped off the comet’s surface by the solar wind, become a meteor stream spread out along the comet’s orbit.

In 2012, experts began to predict we would experience a “storm” of meteors during May 2014 from a tiny “dirty snowball” called Comet 209P Linear. However, as the date has neared, predictions have been downgraded. While a minor storm of shooting stars cannot be ruled out, there seems to be some agreement that we could

expect rates similar to those for the Perseids and Geminids (about 50-100 meteors per hour at peak) between 2:00 and 4:00 a.m. on May 24. Do not expect high rates like we observed during the Leonid meteor storm back in 2001. But be prepared just in case something spectacular happens.

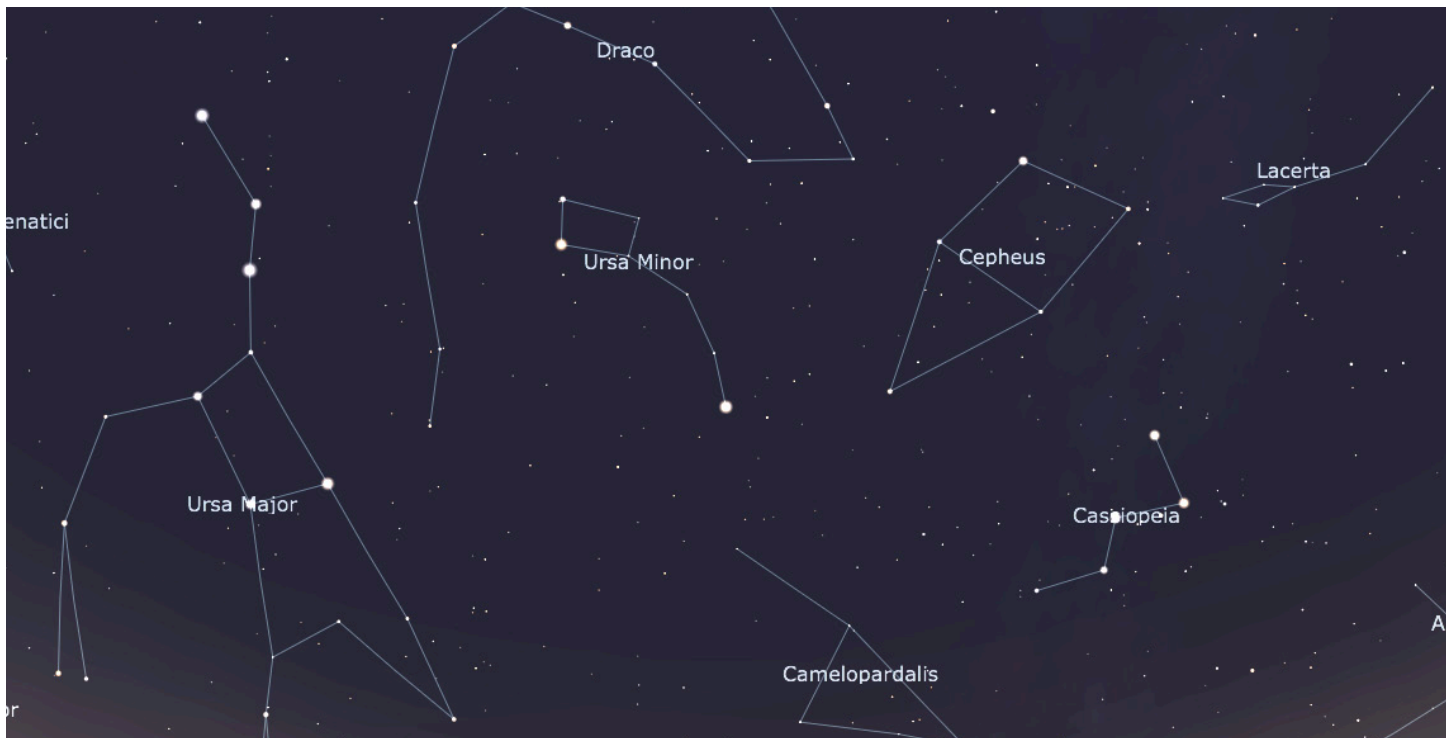
The radiant point, the area of sky from where the meteors appear to originate, is in the constellation of Camelopardalis, the giraffe. If you can find Polaris, you’ll be looking in the right direction— north. Camelopardalis is between Polaris and the northern horizon and between Ursa Major and Cassiopeia at 2:00 a.m. Camelopardalis is circumpolar, so it will be visible all night.

What can we expect here in southern

New England? Since the meteor stream of particles is expected to be very narrow, the Earth will sweep through it very quickly. However, we are in a good location on the Earth’s surface to see whatever transpires to best advantage. All the data indicates that the meteors will enter our atmosphere very slowly, at 40,000 miles per hour. Meteor experts predict that many of the meteors will be very bright fireballs.

The Moon phase will be a thin waning crescent, so it will not hamper observations.

Will the more conservative predictions come to fruition? Or will we experience a grand display of shooting stars during the early morning hours of May 24? I don’t know about you, but I’m going to pick a nice dark sky location to maximize my chances of observing whatever the Camelopardalids produce.



The series of accompanying images were taken by Jim Hendrickson using nothing more than a digital SLR camera on a tripod. All images were taken from Seagrave Observatory except April 16, which was taken from URI's W. Alton Jones campus in West Greenwich.



April 12



Seeing into the Asteroid Belt

Craig Cortis

For a few decades following the January, 1801 discovery of Ceres by G. Piazzi and the 1807 spotting of #4 Vesta by H. Olbers, such small bodies were thought of as minor planets in their own right. Their orbits showed them to be members of the Solar System at distances that coincided with a zone between the orbits of Mars and Jupiter, where earlier predictions of an undiscovered planet placed a hypothesized body at a certain radius of orbital progression outward from the Sun. Some thought that a planet in that zone had perhaps “exploded” in the distant past, leaving a gap between Mars and Jupiter. Some early 19th century writings, in fact, referred to Ceres, Pallas, Juno and Vesta as “planets”, along with Mercury, Venus, Mars, etc., out to Uranus. (The expansion of the Solar System’s frontier by the discovery of

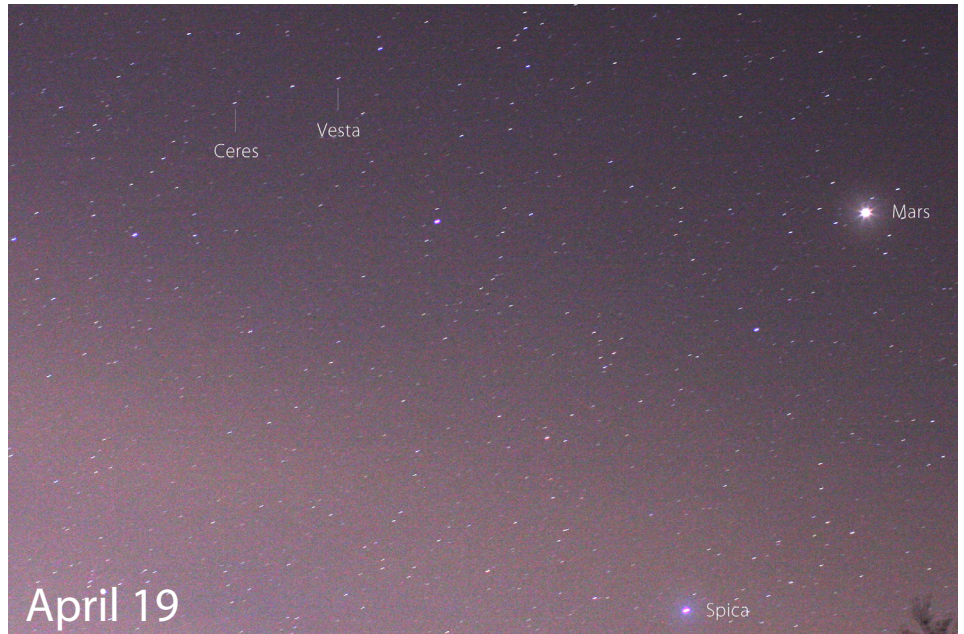
Neptune did not happen until 1846.) Although much too small in size to display visual discs in telescopes of that era, motion against background stars was obvious from one night to the next. Star-like objects that showed – through time and measurements – orbital motion but no visual features akin to comets had to be something else. Points of light having no apparent actual diameters that displayed such regular motion were interpreted, therefore, as minor planetary members within the Sun’s family. Many classes of asteroids are now identified, typified chiefly by the shapes and degrees of eccentricity of their orbits, their orbital periods and distances from the Sun, as well as their sizes, mass, presumed densities, compositions and spectral classes. Literally hundreds of thousands of asteroids – including many icy bodies and some with

comet-like features – are now catalogued in the archives of the Minor Planet Center at Cambridge, Mass., which is affiliated with the Center for Astrophysics (C.F.A.) at Harvard. Astronomers did not make the 5th asteroid discovery, following Vesta in order, until 1845: a small body named Astraea. By 1852, the count had risen to 20.

The large size of #1 Ceres (590 miles in diameter) coupled with its semi-spherical shape are characteristics which influenced the I.A.U. (International Astronomical Union) to reclassify it as a “dwarf planet” in 2006, at the now-infamous conclave that chose to demote Pluto from its traditional status as a planet to, basically, the same kind of object they consider Ceres to be. Vesta is about 330 miles in diameter, but is by far the brightest of all the asteroids, due to its relatively high albedo (reflectivity value),

which is thought to result from composition of surface materials unlike that of any other such bodies. Vesta actually seems to have a geologically “differentiated” interior and may have undergone partial melting – from impacts and internal radioactive decay heating – in the deep past. I wrote about viewing the 2nd asteroid to’ve been discovered, #2 Pallas, in the March issue of this newsletter. Despite its much higher apparent brightness, Vesta was 4th in line of discovery, following Ceres, Pallas (43 miles in diameter bigger than Vesta), and #3 Juno, which is 150 miles smaller in size than Vesta, as well as much darker. I’ve long been puzzled as to why the brightest asteroid was not noticed first! Here are averaged orbital distances from the Sun and periods of revolution for the first 4 asteroids, all of which reside in the “main belt” between Mars and Jupiter: #1 Ceres – 2.767 AUs, period 4.61 years; #2 Pallas – 2.773 AUs, period also about 4.61 years; #3 Juno – 2.669 AUs, period 4.36 years; #4 Vesta – 2.361 AUs, period 3.63 years. As a timeline recap, the years of discovery, in order from #1 Ceres to #4 Vesta, were 1801, 1802, 1804, and 1807.

The Moon was just 6 days old and skies to the southeast were clear when Tim and I began a star-hop to Vesta and Ceres at around 10:50 p.m. Both objects would come to their oppositions within a day apart in mid-April and both were located together in the same wide field of view in Virgo, a circumstance which was a first for me regarding observation of 2 asteroids simultaneously. The star Zeta Virginis, which shines at magnitude 3.4 just east of the main outline of the constellation Virgo, was my starting point and Mars was positioned just a few degrees to the northeast of Zeta Vir at that particular time on 4/5. The result was a star-hop beginning at Zeta, up and left to Mars (shining at about magnitude -1.5), and 7 degrees east-northeast from Zeta Vir to the magnitude 4.3 white star #93/Tau Virginis. Binoculars made this initial part of our star-hop easy. Tau Vir, at RA 14 hours, 01.6 mins. and Dec. +01 degrees, 33 mins., was key to spotting Vesta. The asteroid was 2.6 degrees west-northwest of Tau Vir and was seen not quite halfway along a line starting at magnitude 5.9 #92 Vir and extending northwest a short distance to the next semi-bright star in that directional line, magnitude 5.4 #84 Vir. Vesta was unmistakably identifiable at its magnitude of 5.8; no background stars anywhere close to its specific position were



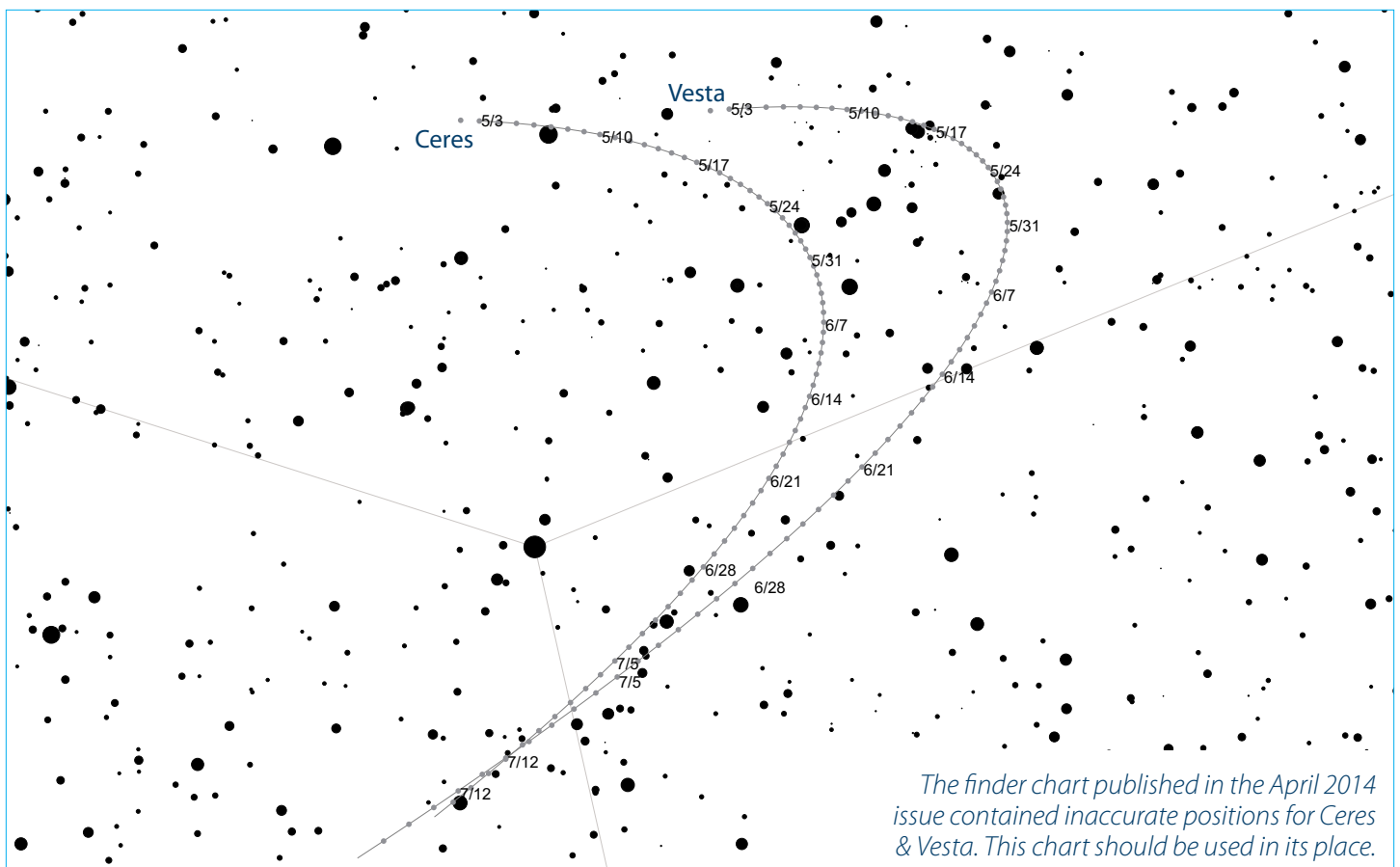
comparable in brightness.

I always study my Uranometria 2000 atlas thoroughly prior to doing a new star-hop so as to memorize the appearance of certain stars and helpful small asterisms in a given area, although I don't actually refer to charts most of the times while at the eyepiece. That may sound odd, but I'd rather look at charts indoors first and then not have to bother with them at a telescope, provided the observing site is only a few steps away from the door. Having accurate, current positions of moving objects enables you to plot them with high precision on a detailed chart when planning a star-hop and such information is readily available in numerous sources, particularly on the web. I'll admit that simply downloading a finder chart onto a single sheet is more easily done, but each to his own, as they say. Of course, handy finder charts with dated tick-marks showing changing positions of an object through time are printed in certain publications; this applies mainly to specific objects featured at a given time of year, considered as notable for viewing. Sure, a computerized go-to scope – if it's working properly – can slew automatically to certain objects, but what if your selection looks just like a star, as asteroids do? If you haven't familiarized yourself with a

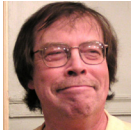
given starfield and a precise position for a moving object at a certain date and time in relation to background stars in the field, how will you know which point of light is which?

Ceres was spotted about 1.4 degrees north-northwest of #93/Tau Vir; it stood out as an extra point of light of comparable magnitude to at least 3 of 7 background stars which together comprised an asterism that could be recognized (after studying a chart) in the vicinity of both Tau Vir and the aforementioned #92 Vir. Although 1.2 magnitudes dimmer than Vesta, I could make a positive identification on Ceres because it constituted a point of light not where any stars of the same brightness level were printed on my charts, and it therefore appeared as an 8th "star" among my chosen grouping of 7. Asterisms are pretty much everywhere around the sky – pick any position at random on a chart showing stars to the 9th magnitude or fainter and you're almost bound to visually construct shapes, triangles, little zig-zag lines, etc. out of stars at or near to your position of choice. Doesn't matter if nobody else can see anything that makes any sense to them; if you imagine, say, a lopsided letter T somewhere close to what you want to plot a location on, that's all that matters!

Little did I know that our own Jim Hendrickson was taking pictures of Vesta and Ceres from Seagrave Observatory at the same time Tim Dube and I were viewing them in my 65 mm. at East Douglas, Mass. By the way, I may have unintentionally implied that asteroids could only be seen at (or close to) their dates of opposition, if you read the very end of my March article. I neglected to take into account the Full Moon of April 15th when I wrote that piece, suggesting viewing Vesta and Ceres within a day or two of their oppositions at mid-month. You'll be able to see them even weeks from now, if you know how to track them down. Just pick a clear night without a bright Moon anywhere close to Virgo. Even binoculars can show Vesta, owing to its brightness. Here's your chance to see a "minor planet" if you've never done so before. Check the web for information on space probe missions to asteroids. The "Dawn" probe, for example, orbited Vesta for a year, departing in July of 2012. The same probe is due to arrive at Ceres in February of 2015. Other probes have studied different asteroids and taken stunning pictures of some with small moonlets orbiting them.



The finder chart published in the April 2014 issue contained inaccurate positions for Ceres & Vesta. This chart should be used in its place.



Review: Orion GrandView 16-48x65mm Spotting Scope

Craig Cortis

On the night of Saturday, April 5th, I visited veteran amateur and good friend Tim Dube in East Douglas, Mass. to try out a new scope I'd recently acquired. Back in January of this year, I got interested in the idea of adding a small spotting (nature) scope to my collection. My requirements were compactness and short length, light weight and ready adaptness for mounting easily on a light, photo/visual tripod, and a 45-degree angled eyepiece yielding a "correct" image. I also wanted a fairly small aperture and variable power with a very low minimum magnification, decent eye relief, good optics with quality coatings, and any other good features I could find in an instrument having a price of \$150 to \$180. After weeks of comparison window shopping online and indecision over what I wanted most among a large selection available, I settled on Orion's "GrandView" 65 mm. model, with a zoom range of just 16 to 48 power, length of only 14.5 inches and weight of 2.7 pounds. The low price of just \$110 (including shipping!) was both attrac-

tive and a bit suspicious to me, but it was low enough that I decided to take a chance. This has been the best value in optical equipment that has come my way in over 20 years, fortunately.

The scope has fine lens coatings that Orion states are fully multi-coated; I won't quibble as to whether this is technically true or not, but images are pleasingly bright, clear and sharp right to the edge of the field, over the entire magnification range, to boot. The focus is smooth and positive and an adjustable ring around the body permits easy rotation of the eyepiece orientation to suit any mounting application. A retracting objective lens dew/glare shield works well and is built right into the scope. I'm especially pleased with the lens caps, which are some of the best I've seen on most telescopes – a nice surprise for a price of \$110, total. (The eyepiece cover actually threads into a secure position and won't fall off; the main lens cap has dual-opposed, spring-loaded locking tabs that snap into place nicely within the objective lens shield.) A

clever, zippered soft carry case that can be opened at both ends but remain in place to cover the scope body for a "dew jacket" is also standard. I've split 8 arc-second double stars with this little spotting scope and can easily make out contrasting detail in Jupiter's atmospheric belts, so I expect to have nice views of Mercury during its evening apparition in late May. Mercury actually is the biggest reason I bought the spotter. I wanted a 45-degree angled view of very low altitude objects without the bother of heavier scopes that require more substantial mountings, and I can't mount my Astroscan on a conventional tripod, although its ease of setup under different conditions is normally a great asset. Having the ability to see a true-orientation (correct image) view of certain celestial objects can be a big help when star-hopping by using an atlas or charts, although many telescope purists would say that the light loss inherent in the prism optical system employed in such spotting scopes is a liability. I won't argue such technical points here – all I can say is a small scope such as this 65 mm. that works as nicely as it does is more than satisfactory for some of what I do in visual astronomy, and it's great for low power enthusiasts like me.



Cherry blossoms and star trails at Ladd Observatory. Photo by Scott MacNeill

Seagrave Observatory Reports

Impressions of Bryant University Students Who Visited Seagrave Memorial Observatory on April 9, 2014

I continue to teach two astronomy labs at Bryant University. And during the semester I include a trip to either Ladd Observatory on a Tuesday night, or Seagrave Observatory on a Wednesday night. For the 2014 spring semester both labs were fortunate. While the Ladd visitors had to contend with clouds often interrupting their views of Jupiter and the waxing gibbous Moon, the Seagrave contingency had absolutely clear and transparent sky conditions.

Here are a few comments from the students. As usual it was a little colder than usual for the date, and at both facilities the students complained about the mid 40's temperatures.

"The Orion Nebula that was photographed (Matt White let the students capture the image. It follows) by one of the scopes (16-inch Meade) was particularly amazing to me because it was something that you would have no idea existed if it wasn't for the telescope. It really made me realize that there is so much more out in space than is even really comprehensible. Although I was beyond impressed with the technology in the advanced mead telescopes, I was even more impressed with the telescope housed in the dome. To see an instrument such as that and actually have an opportunity to look through its eyepiece is a once in a life-time experience. I couldn't

believe just how clear the image was using that telescope considering how old it is. It amazes me that the technology existed back then and that it can still compete with the technology of today. I found the history of the scope to be just as impressive as the picture you could see using it. The dome the scope was housed in I found to be really cool. The fact that the dome used to rotate on a series of old civil war cannon balls is awesome. The fact that the scope was a 16th birthday present and cost roughly 10 times as much as a house during that time period is crazy to think about. Although all of the equipment at the observatory was very, very impressive, I found that the experience of being at the observatory was equally as enjoyable...it was obvious that all of the people involved in the observatory have a true passion for astronomy and they are more than willing to share any and as much knowledge with you as they know themselves. I found the whole experience to be very relaxing and enjoyable and it has really peaked my curiosity in the astronomy field. And to top off the whole experience there were peep toads, which are a comfort of home for me."

"The first awe-inspiring moment was being able to see the perfect alignment of Jupiter and its moons...My favorite part of the field trip was the Orion's Nebula pic-

ture taken. To see Orion's belt is interesting by itself, but to capture that amazing picture of the nebula was incredible. The colors illuminating out of the nebula were beautiful and were something out of an astronomy magazine. Seeing the space station was also interesting in the fact that it moved so quickly across the sky. In addition, the fact that it was so bright from reflecting light was an amazing sight as it flew across the night sky.

"In our modern society we often fail to realize how much light pollution there is, and the effect it has on our ability to view the sky. Being that I have spent most of my life in the city, being from New York, it makes me more open to taking a trip into nature. Another impressive part of the trip was when we took the image of the Orion Nebula with the 16-inch telescope. In just sixty short seconds we were able to produce that image, one of breathtaking beauty. As stated, I have had little to no experience with telescopes or imaging of this nature in the past. As a senior in college it is relatively disappointing, as things of this nature should have been covered much earlier in my education. While I may not have pursued such a field, it is a definite flaw in our education system to limit the science curriculum to so little."

"The trip to the Seagrave Memorial Observatory was a very interesting and positive learning experience...The first thing I noticed was how clear the night sky was at the observatory...the constellations had so much more to them than I have ever been able to see at Bryant or many other locations. The second item which really caught my eye was the intricacy of the telescope located in the dome. There are so many different, complex parts that go into making the telescope as amazing as it is. One of the more astonishing facts about the telescope to me was the fact that it was built so long ago and still works and looks of such high quality. The views from looking through the telescope in the dome were also astounding. I could not believe how clear and detailed the images of the moon and Jupiter were when I looked into the telescope...The most memorable image that I saw in the sky at the Seagrave Memorial Observatory



was the open cluster of stars on one of the outdoor telescopes. The complexities in all of the different stars that could be seen in that one image were very fascinating.”

“The first thing you see as you get there is the tower of the first telescope they had. I did not expect the observatory to look like this, whenever I think of an observatory I think of a huge building with a giant telescope sticking out of the roof...the part on the telescope that spun that moved the telescope against the rotation of the earth was really interesting. I would have never even thought about the rotation of the earth being a problem until I actually would have looked through the telescope... We also got to see the ISS (International Space Station) that night, go across the sky. I was so surprised that you are able to see the ISS that well, and how fast it moved across the sky. I have lived for 20 years and never once saw that in the sky, so it was a really cool experience for me...Even though it was a bit cold out I really enjoyed the entire night and looking at the stars and the other objects in the sky. I also got to see a shooting star which was an added bonus at the end of the night.”

“Hearing the history behind the site was interesting me. The fact that a man a long time ago got this giant telescope for his birthday when he was just a kid. Also, that telescope back then was just a couple thousand dollars, and today, it is a couple million. (This student didn't get that info from me!) I learned you have to be rich to be in this type of profession. Just kidding... Looking into those telescopes when directed at the moon was a blinding experience, yet a great one. I had never seen something more beautiful with my own eyes. Yes, of course I have seen pictures like that from the internet but that is not the same. I love the sky, especially at night. It is fascinating and allows it's observers to have an imagination. The help there was great. Alex is a smart young kid with a lot going for him. Knowing what he wants to do at the age he is and to have already started working toward those goals and dreams is something we do not see every day. Jim and Matt were great. They knew a lot and were helpful and reminded me of my father...it was a great experience. I want to travel the world and see new things, but one thing I cannot do, is travel the universe. Therefore, I must settle for this. One day, I want to travel to a remote location and camp out where all the stars are visible and just gaze. The universe is a mystery, and keeps us humble. Some-

times things are meant to be unknown. It gives us an imagination, something we all need at times. Overall, Seagrave Memorial is the place to be.”

“The trip to the Seagrave Observatory was a very educational experience as an astronomy student...Seeing the interest in the amateur astronomers is was also encouraging because it shows that even though they are not being paid, they still have the passion for astronomy to show up and put in the time to help our class... I also expected it to be much quieter but those frogs made sure there was plenty of noise! Overall, I was very impressed with the facilities, especially the sliding roofs that the members made for the 12 inch Meade Schmidt-Cassegrain and 16 inch Meade Schmidt-Cassegrain. Even more impressive was the rotating roof on the silo containing the 8 inch Alvan Clark Refractor. The fact that shot puts are used to rotate the roof is completely unexpected. I found the backstory to the observatory fascinating too. Learning that the whole observatory can be traced back to when parents gave a telescope as a gift to their young over one hundred years ago. Seeing the progress of the observatory through the small museum area was a great touch to the property that made it more than just an observatory...One of the cooler experiences of the night was seeing the picture of the Orion (“O'Brien”) Nebula that was taken with a camera attached to the 16 inch Meade Schmidt-Cassegrain telescope. Still, the best experience of the night was being able to see the moon through the 8 inch Alvan Clark Refractor. This scope provided a stunning image of the moon that I have never seen before”

“The field trip to Seagraves Memorial Observatory was an amazing experience for me. One of my favorite memories from the Observatory was using photography to capture the pictures of sky that you cannot see with the naked eye or even just a telescope. We are able to take pictures that are seen in our textbooks with a simple Canon camera as well as using the 16 inch Meade Schmidt-Cassegrain telescope. I found it remarkable that such a small group of amateur astronomers could have such a lasting effect on astronomy in Rhode Island. When you go and visit a place like Seagrave you may take it for granted but as I was listening to what and how much work goes into up keeping a landmark of Rhode Island up and going, was truly humbling. I was aware that city lights affect how well

you're able to view the night sky but once you're out there it is very clear to me how much better viewing the nights sky was absent from city lights.”

“The first telescope out back I looked through was the 12 inch...I was able to look at the moon through the 12-inch telescope and it was pretty incredible to see the moon that close. I had only seen the surface of the moon through the internet and textbooks but to see it with your own eyes is a memorable experience. The surface and craters were extremely detailed...After observing the moon, we were able to see Jupiter as well as the moons around it from the push of a button. The telescope was able to pick up Jupiter's bands and I could actually see the color differential...After looking through the telescopes the final thing we did was wait to view the space station in the sky. The surrounding area was extremely dark compared to Bryant. It was very easy to see the space station with the naked eye and I was shocked at how fast it moved through the sky. It is pretty fascinating to think people are actually living on it...I was impressed with Seagrave Observatory. The array of telescopes showed how telescope technology has advanced throughout past years, while also allowing for great observation. We went from the old 8 inch Clark telescope to the modern computer powered telescopes.”

“At around 8:40 P.M. we were able to see the space station in the sky. It was moving very fast. It was bright and easy to see. We were able to see it for a few minutes. It was hard to believe that people are up there living and working. It seems normal when I watch a movie but to see it moving in front of me changed how I think about the space station...(The observatory) is a great tool for the community to have for people who have passion for the astronomy. It is clear that there are people who are willing to commit to the observatory and protect the nature of observing the stars. I enjoyed the equipment and the staff. It was a good time, unfortunately it started to get a little chilly. I am sure summer nights are great.”

“Our class trip last Wednesday was a great way for the class and I to better understand your passion for what you do and who you do it with. All of the people I met were extremely nice and passionate about what they were doing. Everyone was so close it really felt like a close nit family. I really liked the passion that the kid (Alex) we met showed...The passion this teenager showed was amazing, and what was more

amazing was the confidence you had in him. It was very nice to see that you took this teenager under your wing and have taught him everything you know. (Well, not everything! DAH)...My favorite telescope was the very old one, to me it was amazing to see a telescope that was so old in age but still provided an extremely clear picture...The weight system used to power the telescope was also really cool, cranking the weights every now and then was enough to power the very large telescope.”

“It was a cool, clear, Wednesday night at the Seagrave Memorial Observatory in Scituate RI. As the sun began to set, the magnificence of the night sky began to reveal itself, ready to be observed by a few curious minds. The waxing gibbous moon was shining brightly overhead. The planet Jupiter was at the zenith, making it a great target to observe. We began our tour in the historic building that houses the large 8-inch Alvan Clark Refractor telescope. We started with little bit of history and background of the site and telescope, just before it was dark enough to begin our observation...Through this telescope we observed the waxing gibbous moon as well as Jupiter, which sat in the constellation Gemini. The telescope provided rich details of the heavily cratered surface of the moon and allowed us to see the cloud bands of Jupiter. Also in sight were the Galilean moons that orbit the great planet...We made our way out back where two large Schmidt-Cassegrain telescopes awaited our arrival. Each telescope was housed in a roll-off roof observatory, which allowed for great panoramic views of the night sky. Here we observed M37, the open star cluster in the constellation Auriga, rich with bright young stars. The telescope was then pointed at the double star system of Alcor and Mizar, which reside in the handle of the Big Dipper. The stellar nursery of Orion was also observed and a demonstration of astrophotography was given...the visit to Seagrave Memorial Observatory was a great and intriguing experience. It has renewed my interest in observing the night sky. I hope to drag my telescope out once again when the chaos of the end of the semester is over. I hope to Visit Seagrave again in the future and I look forward to sharing my interest and knowledge with others.”

“On Wednesday April 9, 2014 we, as a lab, took a trip to the Seagrave Memorial Observatory...Prior to the trip out there I had never looked through a telescope... Another cool thing that was brought up

during the trip was that you could use your phone to take a picture through the telescope. The photo that was passed around of the moon was really good. (See Viktoria’s image at the end of this report.)...With this lab we were able to use what we have learned in Astronomy class and put it to use. We were able to look at things in the sky and determine what we were looking at. I had a great time and I wouldn’t mind going again...It’s great that a group of amateur astronomers who share the same love can come together to keep this observatory together for so many years...the picture I took of Jupiter and the moon were pretty solid, I showed them to my mom. She couldn’t believe I actually got a decent shot of it; I have it saved on my computer. I’ve been bragging about it a lot lately.”

“With the cold weather it was hard to really enjoy the entire experience outdoors. But the passing of the Space station provided some excitement even in the cold and made for great conversation. The entire history of the 8 inch refractor and the development of the observatory was interesting and it demonstrated the passion of the members as well as their knowledge of the heavens. I really had a great experience at the Seagrave Memorial Observatory, from the welcoming and knowledgeable members to the rich history. I really learned a lot about telescopes and the distant planets.”

“Our field trip to Seagrave Memorial Observatory was definitely a unique and impressive experience. Ever since I was young, I have taken a great interest in the sky and believe it or not, I thought I wanted to be an astronaut or at least thought it was cool to be one. This was something different than the traditional textbook education and it is the more interesting aspect of taking this class. I actually got to observe the sky first hand using advanced telescopes. When I was younger, I would look at the sky through binoculars, but that does not serve as good as the telescopes I used the other day. It is funny that you pointed out the space station passing by. To this day, my dad always tells me what time they are passing by the house and we go outside and watch. This experience made the class worthwhile because it applies everything we learn to reality. It provides more of an appreciation, I think not only for me but for the other students in the class as well. “

“I had never been to any observatory before, so this experience of mine was a unique and memorable one. Although I had previously seen craters and Maria on

the moon using my own amateur telescope, the fact that I could see the various moons of the gas giant Jupiter was really awesome.”

“Also to note: Alex is an incredibly talented boy with great potential. As an apprentice, professor’s innate quality is visible in the young lad’s works and way of doing things. Other two amateur astronomers whose name I forgot, were kind enough to show us Jupiter and its moons and our earth’s moon as well. Overall, it was an incredible trip and it will always be etched in my memory as one of many happy times.”

“This was the first time that I have ever visited an observatory in my life. I have to say that I expected for something bigger, like the ones that you can see in the movies. However I was not disappointed. First of all, I enjoyed the family atmosphere there. You can really tell that those people like to be there, and that they running the observatory because they love it, and not for profit. I would say that the best example for it, is that they have a 14 years old member, whose name is Alex. They are helping him to make his dream come true, and become an astronaut. I was very impressed by Alex, he is a very smart kid, and knows a lot about the skies. However, most importantly is that he loves what he is doing...I was really amazed by how accurate we can see the moon from those telescopes. I am glad that I was able to see it by myself, it was beautiful. Too bad that you cannot see the flag ;) ...I was able to take a good picture of the moon (with a little bit of help from Alex) compensated on it. “

Report by Dave Huestis and Bryand University students.



Picture of the Moon by Viktoria Nesterova.



Three Planet Night: Jupiter, Mars & Saturn April 12, 2014

I arrived at Seagrave Observatory around 19:45 to find John Leonelli setting up an 8-inch Celestron SCT on the back, Conrad Cardano aligning and calibrating the 16-inch Meade and the new 80mm guide scope, and Matt in the Clark, which was already pointed at Jupiter.

Conrad was excited to demonstrate wireless control of the 16-inch Meade using his iPad.

Matt thought it would be fun to take a quick look at the Orion Nebula as it was sinking toward the western horizon. We had a brief snafu as the bottom weight somehow became unthreaded and crashed to the floor. Clouds threatened to end the session early and a nice Moon halo became visible for some time.

Later in the evening the skies cleared and the seeing improved considerably. Mars was now well placed for observing. After a quick look at low power we decided to increase the magnification. The polar cap was visible and some of the dark markings showed a bit of detail during moments of steady seeing. John packed his scope away and Conrad concluded his observations at this point.

In all, about 15 guests joined us for views of Jupiter, the Moon and Mars.

After the last of the guests left, and we had been observing Mars for over an hour, we turned the scope to our first view of Saturn this season. Despite still being rather low, the seeing had improved further still and I inserted my 2.5mm eyepiece into the Clark. The amount of detail on Saturn was incredible. The first thing I noticed was how much the angle of the rings had widened since the end of last season. Cassini's Division was clearly visible all around the ring, and the shadows of the ring on the planet, and the planet on the ring were distinct. Slight banding of the cloud tops and limb darkening could also be seen during moments of steady seeing.

Another successful evening concluded with imaging of Mars, Ceres, and Vesta.

Report by Jim Hendrickson.

Moon, Mars & the Space Station April 5, 2014

Clear skies greeted us on the evening of Saturday, April 5. A beautiful, wide waxing crescent Moon hung in the sky just below the feet of Gemini and Jupiter shined prominently overhead in the deepening twilight.

Dave Huestis and Matt White were manning the Clark, Jim Brenek at the 12-inch Meade, and Conrad was testing remote observing procedures on the 16-inch Meade.

Jim Brenek approached me enthusiastically to report that the International Space Station was going to pass over in about an hour.

After darkness fell, Jim Moneghan arrived with some of his family and set up two small telescopes in the courtyard to take advantage of the transparent western sky, revealing what is perhaps the season's last view of the Orion Nebula.

We spent some time gazing at Jupiter through the Clark before turning to the Moon. New member Dr. Ellsworth Starring joined us in the dome for some time. I shot a couple of pictures of the Moon through the finder on the Clark. While this usually doesn't produce good results, it was better than what I was able to get with the lenses I had available.

I went back to see how Conrad was doing with the remote imaging setup when Jim reminded me that the Space Station

was due to fly over in three minutes. Fortunately I had my camera ready to take a wide-angle image sequence of it passing over the south, above the observatory.

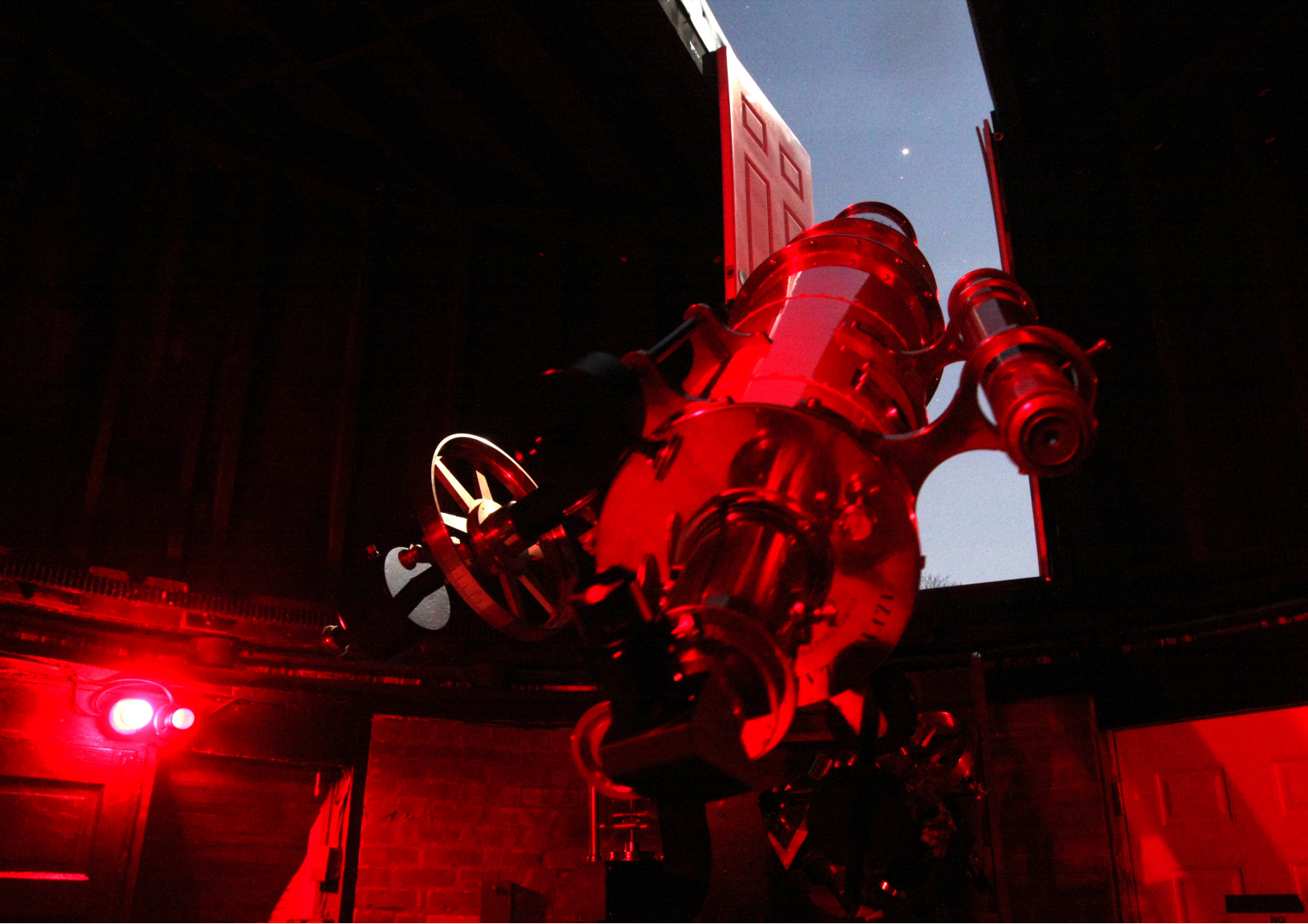
The seeing improved only slightly, as it was still a bit unstable in the southeast as we had begun to view Mars.

When everyone left except for Matt and I, and the seeing hadn't improved significantly, I turned the scope to one of my seasonal favorites, M104, the Sombrero Galaxy in Virgo.

We closed just before 23:00 and I stayed a bit longer to capture another wide-field image of Mars, Ceres and Vesta.

Report by Jim Hendrickson.

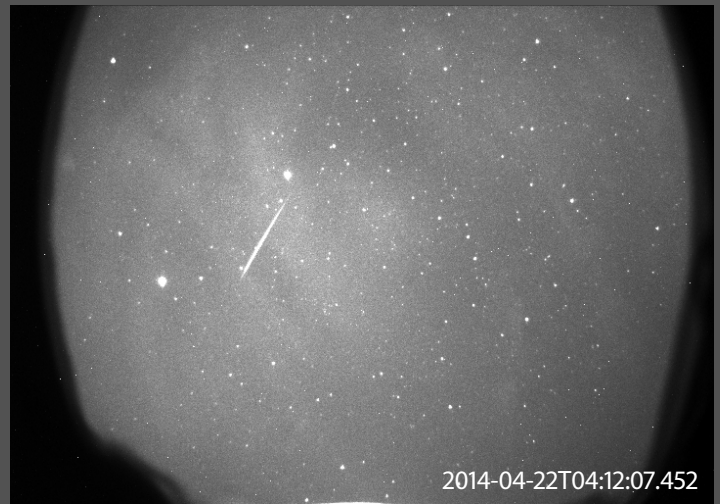
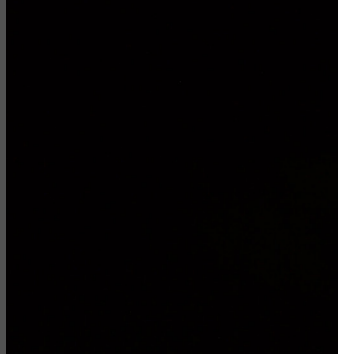
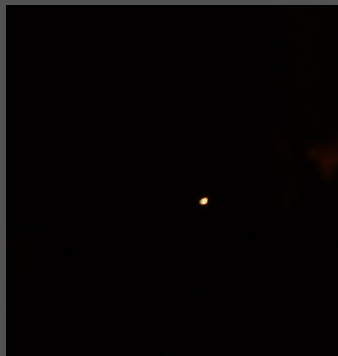




Total Lunar Eclipse from Florida

To all, fFrom what I heard, the weather didn't cooperate up north for observing the Lunar Eclipse. Attached are a few of the photo's I captured here in Florida. The large photo includes Mars above and Spica to the right of the Moon. All the photos were captured with a Sony point and shot camera.

Tom Thibault



Lyrid Meteors over Ladd Observatory

Mike Umbricht provided these images from the rooftop sky camera at Ladd showing meteors from the night of Apr. 21-22.

Each exposure is 10 seconds. North at right, west at bottom. The field of view is about 140 x 90 degrees. Times are UTC. The filter is red/near infrared.



The Names Behind the Observatories: Part 2

Mark Sweberg

Last month, we examined the names behind the two oldest observatories in Rhode Island: Ladd Observatory in Providence, and Seagrave Observatory in North Scituate.

Today, we'll turn our attention to two of the newer facilities for public viewing of the heavens: CCRI's Margaret M. Jacoby Observatory in Warwick, and Frosty Drew Observatory in Charlestown. We'll come to know the names behind these two outstanding facilities, and the contributions that were made to warrant the honor.

Located on the Knight campus of the Community College of Rhode Island, near the lights and traffic of two large shopping malls, is the Margaret M. Jacoby Observatory.

Opened in 1978, the observatory was named in 1995 to honor Professor Jacoby, who founded the CCRI physics department, and who secured the funds necessary for the construction of the observatory.

Margaret Jacoby was born in Fall River, Massachusetts. She did her undergraduate work in physics at Brown University, and earned her master's degree in physics from Brown, as well. While studying for her Ph.D. at Georgetown University, she was involved with a teaching fellowship.

Professor Jacoby came to CCRI in 1965, and served as the physics department chairwoman. She retired in 1995.

The observatory came about only because she decided, in 1969, that CCRI ought to have one. Were it not for her almost single-handed work in scouring the landscape over four years for the \$85,000

needed to build the observatory, it may never have been built.

Professor Jacoby is a member of the American Astronomical Society, and the author of "Astronomy: A Guide to the Basics." She has had a stellar 30-year career in science and teaching, eighteen of those in which hers was the gentle, enthusiastic, well-spoken voice emanating from the darkness, explaining the wonders of the Universe to an appreciative audience.

Countless students who have benefited from her knowledge and dedication, and the public, as well, owe a debt of gratitude to this accomplished leader in science education.

Located in Charlestown's Ninigret Park is Frosty Drew Nature Center and Observatory. The nature center dates to 1983, and the observatory to 1988. Both stand as a memorial to the dedication, enthusiasm, and hard work of a young man named Edwin "Frosty" Drew (1948-1976).

As a child, Frosty contracted polio, a scant one year before a vaccine was developed.

He attended Moses Brown School in Providence, and as a new Brown University graduate, started his career as a writer.

Shortly thereafter, he became actively involved in efforts to preserve and protect the natural landscape of Southern Rhode Island. Frosty's efforts at organizing and raising public awareness remain one reason why Rhode Islanders enjoy pristine Ninigret Pond and surrounding landscapes today.

Frosty was instrumental in prevent-

ing the construction of a nuclear power plant in Charlestown, and was active in many groups, including the Audubon Society of Rhode Island, and Concerned Citizens of Rhode Island. He served as chairperson of Rhode Island's Commission on Energy.

Employing gifts of leadership, public speaking and private persuasion, he was a spokesperson for many environmental organizations statewide.

He died in September, 1976, at the young age of 28.

In 1990, Frosty was inducted into the Rhode Island Heritage Hall of Fame for his many contributions to Rhode Island's environmental heritage.

Although Frosty Drew did not live long enough to enjoy the enduring fruits of his labor, he would have been pleased to see the thousands of people who have benefited from the organization's offerings, and who have come away with a new appreciation of the environment.

All told, Rhode Island's four observatories provide the public with unparalleled stargazing on clear nights, year-round. We are fortunate to be able to do so, and beholden to those individuals who made, and make, this possible, past and present.

Although Rhode Island is small in size, it is LARGE in spirit. Committed, enthusiastic, and dedicated people have graced us in many fields of endeavor, and have left legacies to be thankful for and to emulate.

As we peer into the heavens, and behold its wonder and beauty, let's remember the people behind the names of Rhode Island's four observatories, and be thankful for the organizations that make them available to the public.

As always, I wish you clear skies above, and happy stargazing!





Barred Spiral Galaxy in Ursa Major

M108

Glenn Chaple

Not far from the Big Dipper “bowl” star Merak (b Ursae Majoris) are two Messier objects - the edge-on spiral galaxy M108 and the planetary nebula M97. M108, discovered by Pierre Méchain in 1781, is nearer to Merak, lying just 1.5 degrees to its southeast.

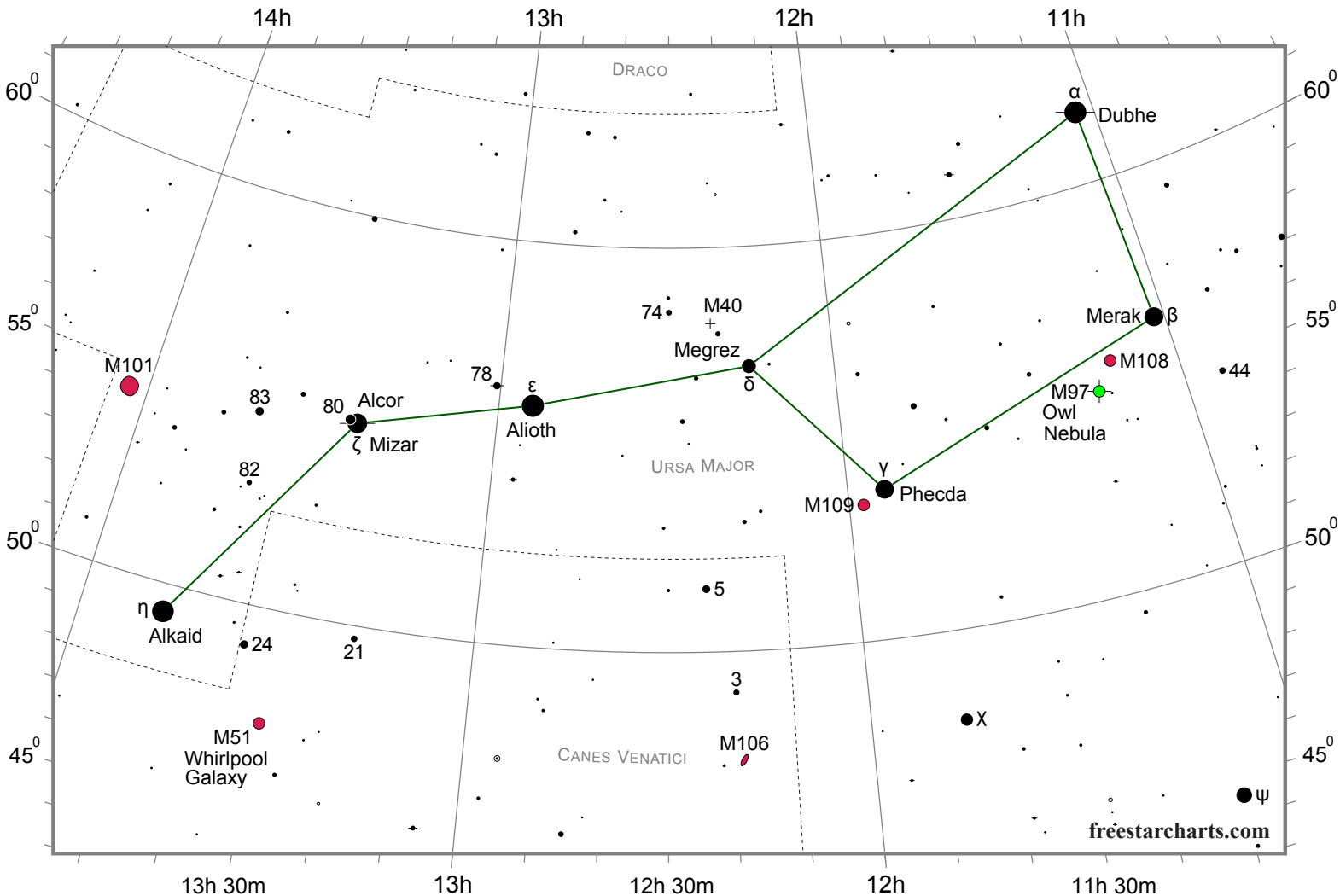
A 10th magnitude object with 8 by 2 arcminute dimensions, M108 has a low surface brightness. Nevertheless, the small-scope owner can capture it, provided he or she sets up in a dark-sky location on a clear, moonless night. I once captured M108 from the camping area at Stellafane in Springfield, VT, using a 4-inch f/4 rich-field reflector and magnification of 74X. It stood out as a surprisingly easy elongated glow.

Things got interesting when I revisited M108 this past spring with a 10-inch f/5 reflecting telescope and magnifying power of 139X. The increase in telescope aperture and magnification brought out detail not seen with the RFT. M108 had a noticeably blotchy appearance – a ghostly version of M82. Near its center was a 12th magnitude star - a foreground Milky Way star that could easily be mistaken for a supernova erupting inside M108.

Just 48 arcminutes southeast of M108 is M97. We’ll pay a visit to this interesting planetary nebula next month.



Photo by Mario Motta, MD





A Note on the Passing of Two Lunar Exploration Pioneers

Francine Jackson

The world lost two pioneers of lunar exploration in April.

The LADEE – Lunar Atmosphere and Dust Environment Explorer – after several successful months orbiting the Moon, LADEE crashed into the far side of the Moon April 18th. It is said that, because its orbital speed was about 3,600 miles per hour, it most likely vaporized on impact. Its primary mission was to gather information as to the structure and composition of the Moon's very thin atmosphere, and whether lunar dust is being raised above its surface.

This craft was especially close to some of us, as NASA gave us the opportunity to observe it very soon after its launch from Wallops Island September 7th. Its trajectory across the Eastern Seaboard had many of

us able to not only watch it pass, but also to witness the first stage cutoff and second stage ignition. Although its mission was only to last 100 days, it was given an extension of approximately an extra lunar day, resulting in its surviving the darkness and prolonged cold of the mid-April lunar eclipse.

Also, on April 15th, one of the major names in the original Apollo missions died at 95. John C. Houbolt was an engineer whose work was considered vital to the U.S. space program, to the point that he was largely credited with convincing NASA to focus on having a module land on the Moon instead of a rocket setting down directly from Earth. He firmly believed that an orbital element, plus a lander

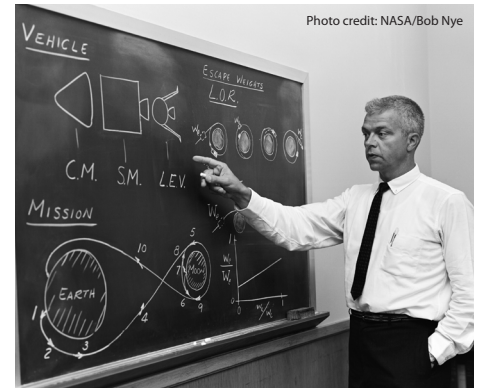


Photo credit: NASA/Bob Nye

mechanism, could be the only option to meet the challenge President John Kennedy had made of a Moon landing before the end of the '60s. He even went over the heads of many NASA managers, writing to the administrator to plead his case. He won, giving us the glory of the Apollo mission that many of us recall to this day as a proud time in the history of U.S. science.

The Moon is smaller because of the works of a man and a machine, both laid to rest within days of each other.



The Power of the Sun's Engines

By Dr. Ethan Siegel

Here on Earth, the sun provides us with the vast majority of our energy, striking the top of the atmosphere with up to 1,000 Watts of power per square meter, albeit highly dependent on the sunlight's angle-of-incidence. But remember that the sun is a whopping 150 million kilometers away, and sends an equal amount of radiation in all directions; the Earth-facing direction is nothing special. Even considering sunspots, solar flares, and long-and-short term variations in solar irradiance, the sun's energy output is always constant to about one-part-in-1,000. All told, our parent star consistently outputs an estimated 4×10^{26} Watts of power; one second of the sun's emissions could power all the world's energy needs for over 700,000 years.

That's a literally astronomical amount of energy, and it comes about thanks to the hugeness of the sun. With a radius of 700,000 kilometers, it would take 109 Earths, lined up from end-to-end, just to go across the diameter of the sun once. Unlike our Earth, however, the sun is made up of around 70% hydrogen by mass, and it's the individual protons — or the nuclei of hydrogen atoms — that fuse together, eventually becoming helium-4 and releas-

ing a tremendous amount of energy. All told, for every four protons that wind up becoming helium-4, a tiny bit of mass — just 0.7% of the original amount — gets converted into energy by $E=mc^2$, and that's where the sun's power originates.

You'd be correct in thinking that fusing $\sim 4 \times 10^{38}$ protons-per-second gives off a tremendous amount of energy, but remember that nuclear fusion occurs in a huge region of the sun: about the innermost quarter (in radius) is where 99% of it is actively taking place. So there might be 4×10^{26} Watts of power put out, but that's spread out over 2.2×10^{25} cubic meters, meaning the sun's energy output per-unit-volume is just 18 W / m³. Compare this to the average human being, whose basal metabolic rate is equivalent to around 100 Watts, yet takes up just 0.06 cubic meters of space. In other words, you emit 100 times as much energy-per-unit-volume as the sun! It's only because the sun is so large and massive that its power is so great.

It's this slow process, releasing huge amounts of energy per reaction over an incredibly large volume, that has powered life on our world throughout its entire history. It may not appear so impressive if you look

at just a tiny region, but — at least for our sun — that huge size really adds up!

Check out these "10 Need-to-Know Things About the Sun": <http://solarsystem.nasa.gov/planets/profile.cfm?Object=Sun>.

Kids can learn more about an intriguing solar mystery at NASA's Space Place: <http://spaceplace.nasa.gov/sun-corona>.

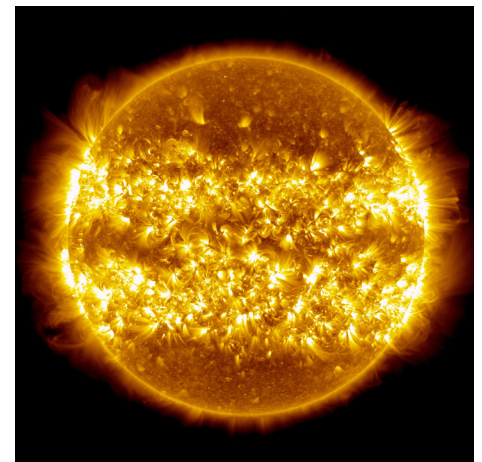


Image credit: composite of 25 images of the sun, showing solar outburst/activity over a 365 day period; NASA / Solar Dynamics Observatory / Atmospheric Imaging Assembly / S. Wiessinger; post-processing by E. Siegel.

APRIL REPORTS



Secretary

Tom Thibault

Skyscrapers March Meeting Minutes – 4/4/14

President Ed Haskell called for the continuation of Skyscrapers March Members Meeting to Order at 7:26PM.

President, Ed Haskell: Ed explained the procedural reason for the continuation of the March Meeting.

2nd Vice President, Bob Horton: Bob, speaking on behalf of the Board of Directors, nominated Richard Parker for Honorary Membership noting Richard's role in the restoration of the Clark, many years of contribution to Skyscrapers and other Amateur Astronomical Societies through his mirror maker's workshops.

President, Ed Haskell: Ed called for the adjournment of the March Meeting at 7:32PM.

Skyscrapers April Meeting Minutes – 4/4/14

President Ed Haskell called the Skyscrapers April Members Meeting to Order at 7:33PM. • Ed informed the membership of the generous donation made by Kermit Schoenholtz and Elvira Pratsch on behalf of the DiClemente Family to honor the recent passing of lifelong Providence resident, Marie DiClemente. • Ed requested Officer's Reports

1st Vice President, Kathy Siok: May 2nd Meeting will feature Member presentations by Al Hall and Steve Siok. • June 7th Meeting will be a Pot Luck event and will feature Steve Hubbard presenting his recent trip to observe Auroras in Alaska. • Our July and August Meetings will be held on Saturdays.

2nd Vice President, Bob Horton: Bob noted several dozen Skyscrapers visited the Springfield Science Museum and Wilder Observatory on March 22nd and all enjoyed the day.

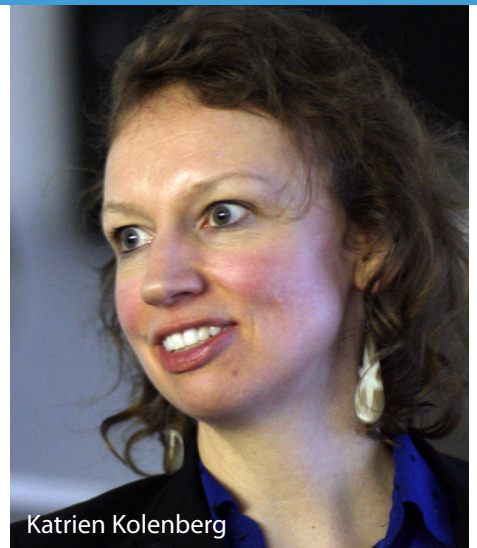
Treasurer, Linda Bergemann: Linda noted a few more entries will be completed and our financial books will be closed for last year's budget. • Linda introduce the following individuals for membership: William Kraimer, Dr. Ellsworth Starring, and John Minot • The following individuals were voted into membership: Connie

Cameron, and Michael Fuller

Trustee, Steve Siok: Steve noted our Public viewing has begun and the Observing Committee is open for any members interested in becoming certified on our telescopes and joining in on the fun. • The Porta-John has arrived and is open for business. • Steve is working on a possible visit to Harvard Observatory and Antique Telescope Collection in June.

Trustee, Conrad Cardano: Announce the May 10th RI. Astronomy Day event at Seagrave geared towards the amateur level astronomer, full details are will be forthcoming. • Facility audit will be conducted by Jim Crawford and Pat Landers. • Conrad noted a 80mm refractor was purchased and will be piggybacked on the 16" Meade. This telescope will be utilized for projecting views to the meeting hall during Public Nights. The purchase of the telescope was made possible by the recent donation received and noted by Ed Haskell.

President, Ed Haskell: Ed presented Al Hall his Lifetime Membership and Al expressed his appreciation to the membership and organization. • Ed presented Francis O'Reilly his Presidents Award for his wonderful Sky and Telescope article of the Clark restoration and subsequent generous donation. • Ed asked for and received unanimous approval to present an Honorary Membership to Richard Parker. • Ed presented the 2014/2015 Budget for vote and was approved by the membership.



Katrien Kolenberg

1st Vice President, Kathy Siok: Kathy introduced our featured speaker for the evening, Dr. Katrien Kolenberg.

Speakers: Dr. Katrien Kolenberg: Katrien's presentation, "Stellar Sounds for Human Ears" was entertaining and informative. The rhythmic sounds of our stellar neighbors were fascinating.

Election Committee Chairman: The Election Committee announced the results of the 2014 Election. The following candidates were all elected and received unanimous votes: President – Bob Horton • 1st VP. – Kathy Siok • 2nd VP. – Steve Siok • Secretary – Tina Huestis • Treasurer – Linda Bergemann • Member at Large 1 – Pat Landers • Member at Large 2 – Matt White • Trustee – Tom Thibault • Meeting adjourned at 9:26PM

Website I made with some soundfiles:

<http://www.univie.ac.at/tops/blazhko/stellarmusic/>

More sounds and movies:

<http://www.konkoly.hu/stellarmusic/>



Questions welcome!

kkolenberg@cfa.harvard.edu

Katrien Kolenberg

THANK YOU!



Treasurer

Linda Bergemann

**YEAR-END REPORT – Fiscal Year 2013
(4/1/13 through 3/31/14)**

INFLOWS

AstroAssembly	
Banquet	\$1,220.00
Grill	\$421.50
Misc	\$30.00
Raffle	\$506.00
Registration	\$1,540.00
TOTAL AstroAssembly	\$3,717.50
Centennial Calendar	
Donation	\$700.00
Donation	
Misc Donation	\$263.00
Refreshment Donation	\$172.20
TOTAL Donation	\$435.20
Dues	
Contributing	\$169.05
Family	\$601.84
Junior	\$30.00
Regular	\$2,377.45
Senior	\$998.97
TOTAL Dues	\$4,177.31
Misc Income	
Interest Inc	\$37
Sale of Items	\$630.00
TOTAL Misc Income	\$666.97
Star Party Donations	\$140.00
Subscription Income	
Astronomy	\$494.00
Sky & Telescope	\$230.65
TOTAL Subscription Income	\$724.65
TOTAL INFLOWS	

OUTFLOWS

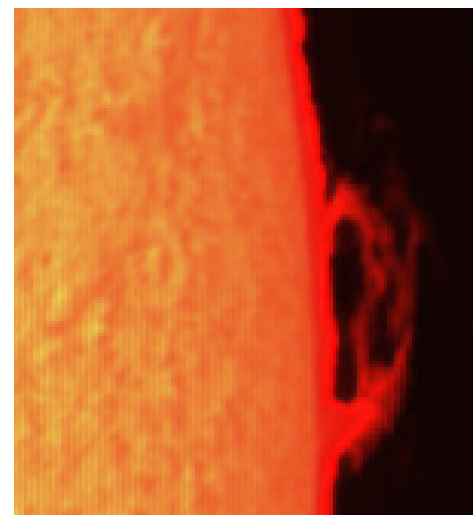
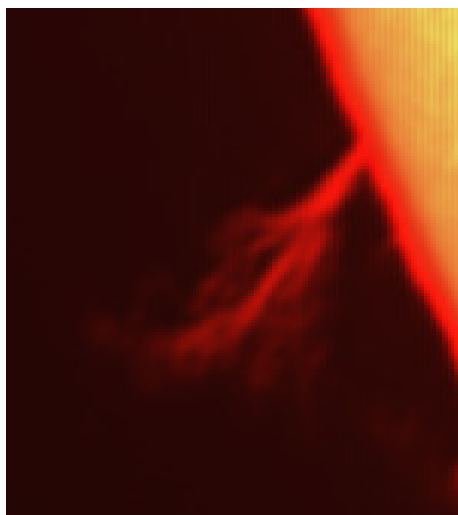
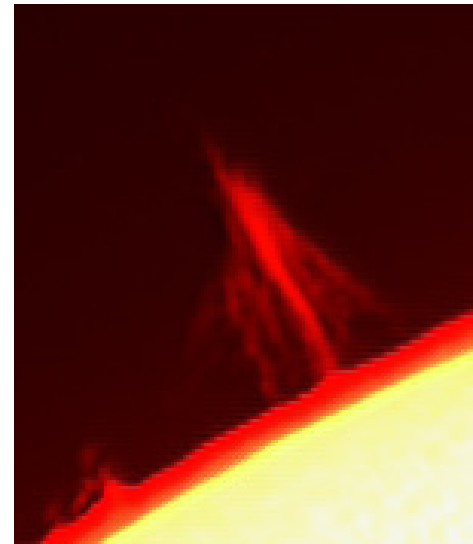
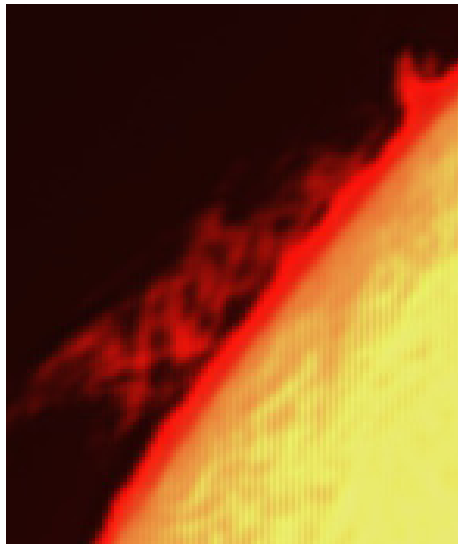
Astro Assem Exp	
Caterer	\$1,000.00
Grill	\$244.13
Misc	\$68.90
Raffle	\$5.00
Reception	\$138.31
Tent Rental	\$670.00
TOTAL Astro Assem Exp	\$2,126.34
Centennial Calendar Production	\$304.64
Corporation, State Fee	\$30.00
Postage and Delivery	\$78.99
Presidential Fund	\$243.23
Printing and Reproduction	\$10.27
Property Insurance	\$2,566.00
Refreshment Expense	\$181.46
Subscription Payments	
Astronomy	\$528.00
Sky & Telescope	\$230.65
TOTAL Subscription Payments	\$758.65
Trustee Expense	\$1,589.79
Utilities	
Electric	\$178.33
Porta-John	\$792.00
Propane	\$80.25
TOTAL Utilities	\$1,050.58
TO Preservation Fund (See note below)	\$96.30
TOTAL OUTFLOWS	\$9,036.25
OVERALL TOTAL (Net Income)	\$1,525.38

Cash and Bank Accounts

Capital One Bank	\$12,301.50
Checking	\$10,761.39
PayPal	\$0.00
TOTAL Bank Accounts as of 4/1/13	
ADD Net Income for FY2013	\$1,525.38
TOTAL Bank Accounts as of 3/31/14	
Capital One Bank	\$12,338.47
Checking	\$12,143.59
PayPal	\$106.21

Next Board Meeting
Thursday, May 22, 7pm
Seagrave Observatory

Solar prominences on April 20.
Photos by Steve Hubbard.



Note: Designated Preservation Fund monies used to digitize photos for archive.

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