SKYSCRAPERS INC.

the Skyscraper

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December 2015

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

In This Issue:

Phases of the Moon

Last Quarter Moon
December 3 07:40

New Moon
December 11 10:29

First Quarter Moon
December 18 15:14

Full Cold Moon
December 25 11:11

Friday, December 4, 7:00pm

at Seagrave Memorial Observatory

Searching for the Oldest Stars by Anna Frebel

Take a walk on a moonless night. Watch the Milky Way above, made from a myriad of stars. Did you know that some of them have been shining for more than 13 billion years? These are the oldest, still surviving, objects in our 13.8 billion years old universe. "Stellar archaeology" identifies these extremely rare relics. Analysis of their chemical composition shows that they contain only trace amounts of heavy elements (e.g. calcium, iron) because these stars formed at a time when little of these elements existed. This offers the extraordinary opportunity to use local Milky Way stars for exploring the earliest times in the universe. This work has revealed tantalizing details about the short-lived very first stars which cannot be studied otherwise. When they exploded as supernovae they left behind individual element signatures in the surrounding gas clouds. These "chemical fingerprints" were incorporated into the next generation long-lived stars that we still observe today. Having access to these fingerprints also provides exclusive information about element nucleosynthesis, chemical evolution, early star and galaxy formation processes, and even the formation of the Milky Way. Being at the forefront of this field, the author offers an intriguing account of the latest research results paired with a unique insight look into the life as an astronomer. Having discovered several of the oldest and most primitive stars using the world's largest telescopes she tells fascinating discovery stories that allow the audience to witness what it means to be a scientist in this day and age. Spectacular video clips about observing with the 6.5m optical Magellan telescopes in the Atacama desert in Chile will be shown.

Anna Frebel is Assistant Professor of Physics at the Massachusetts Institute of Technology (MIT). She has received numerous international honors and awards for her discoveries and subsequent chemical abundance analyses of the oldest stars and how these stars can be employed to uncover information about the early Universe some 13 billion years ago. Prof. Frebel has authored more than 70 papers in various refereed journals, including Nature, and enjoys communicating science to the public through public lectures, magazine articles, interviews as well as her popular science book "Searching for the Oldest Stars" (in book stores Dec 2 2015, by Princeton University Press).

Skyscraper Meetings 2015-2016

Contact Steve Siok for more information: ssiok@cox.net

December 4 at Seagrave Observatory
Searching for the Oldest Stars by Anna Frebel (MIT)

January 15 at North Scituate Community Center
Holiday Party & An Astronomical Vacation in Chile by Steve Hubbard (Skyscrapers, Inc.)

February 5 at North Scituate Community Center
Cosmic Rays by Dr. Wallace Arthur (Farleigh Dickinson University)

March 4 at North Scituate Community Center
Cosmology and the Decay of Dark Matter by Gordon Blackadder (Brown University)

April 1 at North Scituate Community Center (if needed)

May 6 at Seagrave Observatory

June 3 at Seagrave Observatory

AstroAssembly: September 30/October 1 at Seagrave Observatory/North Scituate Community Center Reserved

Visit the Ladd Observatory blog at http://blogs.brown.edu/ladd/

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.

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 **December 18** 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.

Saturday, December 5: Astronomy Workshop Week 5: A Telescope for the Holidays?

47 Peeptoad Road , North Scituate, RI
Contact: Robert Horton, President: ShootingSta98@gmail.com

Once again, it's the holiday season, and thoughts turn to gift giving. Often, people who have developed an interest in astronomy might wonder about buying a telescope, either as a gift for someone else, or maybe for themselves. But, with the myriad array of instruments being offered at this time of year, which one might be best? What might fit within my budget? Is it good enough to see what I want to observe? Do I want one that zooms across the sky, or one that causes me to learn the constellations and find the objects myself?

Bob Horton, President of Skyscrapers, Inc., has been observing the sky for over 40 years. In that time, he has used telescopes of all kinds, including several he has crafted himself. In this workshop, he will share his observing history, and help you determine what might be the best observing equipment for you.

Also, weather permitting, Seagrave observatory will be open to the public after the workshop is over. You might want to stay and enjoy the sky with others who love looking up.

This program is just $5.00 per person, free to Skyscrapers, Inc., members. For more information, please contact President Bob Horton, at ShootingSta98@gmail.com

Friday, December 11: Stars of the Pharaohs at the University of Rhode Island Planetarium

University of Rhode Island Planetarium
Upper College Road, Kingston, RI
Friday, December 11, 2015
6:00 P.M.
Contact: Francine Jackson: 401-527-5558

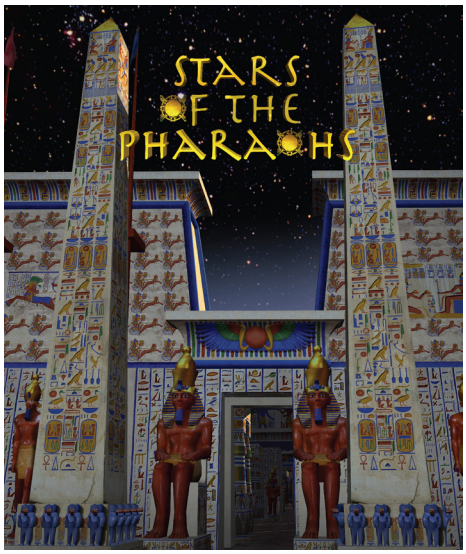
Travel to ancient Egypt to see how science was used to tell time, make a workable calendar, and align huge buildings.

You'll learn about the connection the ancient Egyptians felt with the stars and various astronomical phenomena, and experience some of the most spectacular temples and tombs of the ancient world recreated in all of their original splendor.

In addition to the featured presentation, Losing the Dark, a short introduction to light and its problems in our society will be given, as well as a tour of The Skies above the URI campus.

Admission to this presentation is $5.00, to benefit the URI Planetarium Fund. The URI Planetarium is on Upper College Road, at the end of Engineering Row and across the parking lot from East Hall.

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



A Gem of a Meteor Shower and Maybe a Naked-eye Comet

by Dave Huestis

Usually I'm complaining about the weather and how it affects our astronomical observations in southern New England. However, local stargazers were more fortunate during the second half of this year.

The annual Perseid meteor shower back in August performed reasonably well. It wasn't spectacular, but clear skies during most of peak night on August 12-13 provided shooting star watchers with dozens of bright meteors blazing across the sky.

And the best event was the total lunar eclipse on the night of September 27-28. A low pressure weather system was slowly moving up the Atlantic coast, but high pressure to our northwest strengthened and kept the clouds from encroaching upon our little corner of the universe. We were able to watch this beautiful eclipse in its entirety.

I hosted an eclipse party at Bryant University for my astronomy lab students as well as the entire campus community. Three Skyscrapers members (Jim Brenek, Alex Bergemann and yours truly), along with my brother Glen Huestis and Rebecca Rowley from the Greenville Public Library, shared our love of astronomy with more than 100 students. Collectively we provided five telescopes of various designs and apertures, along with several binoculars, for students to observe this eclipse.

One of my lab students, Justin Dauley, in his observing report said in part, "… I preferred to just turn my eyes to the sky and observe the old fashioned way. By totality, the moon looked like something from a science fiction movie, and I couldn't help but wonder what ancient civilizations would think when an event like this occurred. This thought lead me to the realization that events like this were probably the reason that many ancient peoples worshipped and highly respected the skies and heavens because of how powerful they are to watch. Even though we know what is happening, an event like a total lunar eclipse is still so majestic."

I'm hoping our good luck will continue for the month of December, for there are several notable sky events that will lure us out to enjoy under the sky dome.

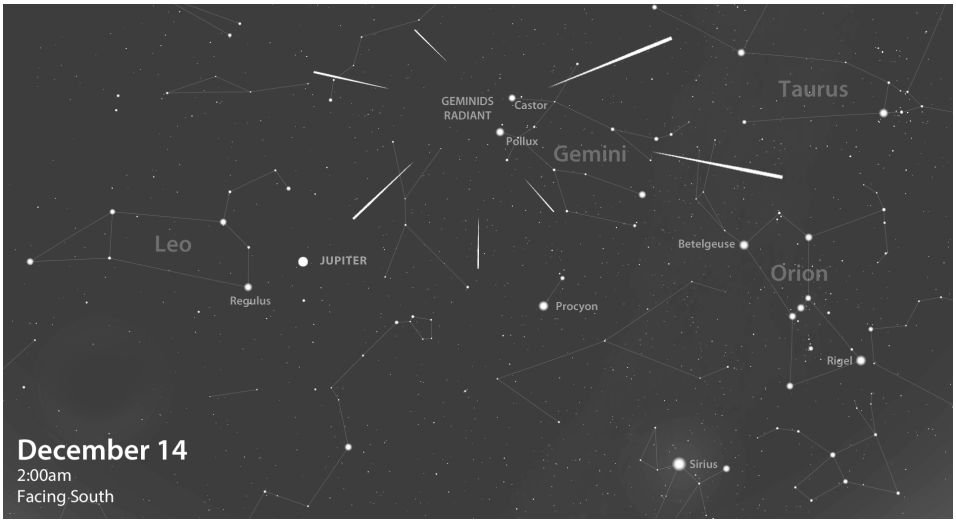
Last month I mentioned there was a comet making its first journey through the inner solar system. Prior to November 15, Comet Catalina (C/2013 US10) had been only been seen from the southern hemisphere. Since I am writing this column before that date, I will provide updates to the local news media so you may share in its beauty should this comet become a naked-eye object as it emerges from the solar glare in the pre-dawn sky.

Meanwhile, December's pre-dawn sky still showcases three planets. Venus is the brightest one closer to the horizon. Jupiter is the second brightest object above the southeastern horizon. Dim red Mars is between them. Comet Catalina (should it attain naked-eye visibility) will be 13 degrees to the lower left of Venus on December 1st. If you can't locate it, try using a pair of binoculars. Each morning the comet will rise higher above the horizon and towards the left, becoming dimmer each morning. On the 4th the waning crescent Moon will be approximately three degrees to the lower right of Jupiter. Then on the 7th Comet Catalina will be approximately four degrees, about eight full Moon diameters, to the left of Venus. At that time a very thin crescent Moon will be just above and to the right of Venus. This alignment is one of those astronomical photo opportunities that shouldn't be missed. A good horizon with a low tree-line will be a necessity.

Later that same day, during the early afternoon, the Moon will occult (pass in front of) Venus. Since the occultation occurs during broad daylight, you'll need to locate them in binoculars or by using a computerized telescope. Venus will disappear along the Moon's sunlit limb (edge) at about 12:43 p.m. approximately 14 degrees above the west-southwest horizon. Venus will reappear along the Moon's dark limb at about 1:49 p.m. when it is just three degrees above the horizon. The key to observing this event is selecting an observing location with an unobstructed view towards the west.

As we move into the second week of December, Mercury will pull out of the solar glare in the southwest sky after sunset. Each night it will be farther from the sun and higher above the horizon. If you have difficulty trying to spot it, on the 12th Mercury will be below and to the left of the waxing crescent Moon. The planet will continue to climb higher into the evening sky until just after month's end when it will begin to set earlier each night as it swings back towards the Sun from our perspective.

Furthermore, as the title of this column suggests, stargazers of every experience level will be treated to a gem of a meteor shower this month. On the night of December 13-14, the annual Geminid shooting star display will grace our skies. And since a very thin waxing crescent Moon will set early at around 6:45 p.m., interfering moonlight will not compromise the number of meteors to be seen. This situation is ideal because Gemini is well above the east-northeast horizon by 8:00 p.m., thereby allowing for a good number of meteors to be seen during the early evening hours. So if you



have to work the next morning (peak is on a Sunday night to Monday morning), you can still catch a decent number of shooting stars before retiring for the night.

To see this meteor display to best advantage you should choose an observing location as far from interfering light pollution as possible. Do not remain standing too long to observe this display. Either sit or recline in a comfortable chair. Dress in layers. Climb into a sleeping bag if possible. Wear a hat to keep heat from escaping through your head. Wear warm mittens, not gloves. Mittens keep your fingers together for added warmth. You can also use a few of those pocket warmers to keep extremities toasty.

While the Geminids appear to emanate from Gemini near its brightest stars, Castor and Pollux, scan around the sky as much as possible. As the night progresses and Gemini moves across the sky towards the west, your scan should move as well. At around 2:30 a.m. Gemini will be on your meridian, just south of zenith. With clear and dark skies a keen-eyed observer should see 60+ meteors per hour during the peak activity between midnight and dawn. If you care to conduct an accurate count, you should notice the number of meteors per hour increase as the night progresses, and then begin to decrease as dawn approaches.

The Geminids are fairly bright and moderate in speed, hitting our atmosphere at 21.75 miles per second. They are characterized by their multicolored display (65% being white, 26% yellow, and the remaining 9% blue, red and green). Geminids also have a reputation for producing exploding meteors called fireballs.

I can't believe how quickly 2015 has passed. Another important astronomical event, the Winter Solstice, occurs on December 21 at 11:48 p.m. EST. The Sun reaches its southernmost position in our northern hemisphere sky on this date. Take note of the low arc it traverses across the sky. After the solstice the sun will then begin its daily migration northward and the daylight hours will lengthen as we head towards the Vernal Equinox (Spring) on March 20, 2016, at 12:30 a.m. EDT.

Despite the cold and snowy season that is almost upon us, as long as the local Rhode Island observatories' grounds are accessible, the telescopes will be available for you to explore the heavens. Knowledgeable sky interpreters will be on hand to introduce you to a variety of celestial wonders. Be sure to visit each website prior to setting out for a field trip to these facilities, as wintry conditions can force unexpected closures.

Seagrave Memorial Observatory (http://www.theskyscrapers.org) in North Scituate is open to the public every clear Saturday night. Ladd Observatory (http://www.brown.edu/Departments/Physics/Ladd/) in Providence is open every clear Tuesday night. The Margaret M. Jacoby Observatory at the CCRI Knight Campus in Warwick (http://www.ccri.edu/physics/observatory.htm) is open every clear Wednesday night. Frosty Drew Observatory (http://www.frostydrew.org/) in Charlestown is open every clear Friday night year-round.

Happy holidays and clear skies to all.

Dave Huestis is Skyscrapers Historian and has been contributing monthly columns to local newspapers for nearly 40 years. See more at http://theskyscrapers.org/dave-huestis

Sunlight reflected off of Earth illuminates the dark portion of the Moon during the crescent phase. This phenomenon is known as Earthshine. Photo by Jim Hendrickson on November 14 using a C90 telescope and Canon SLR camera.

Open Cluster in Cassiopeia

Messier 52

by Glenn Chaple

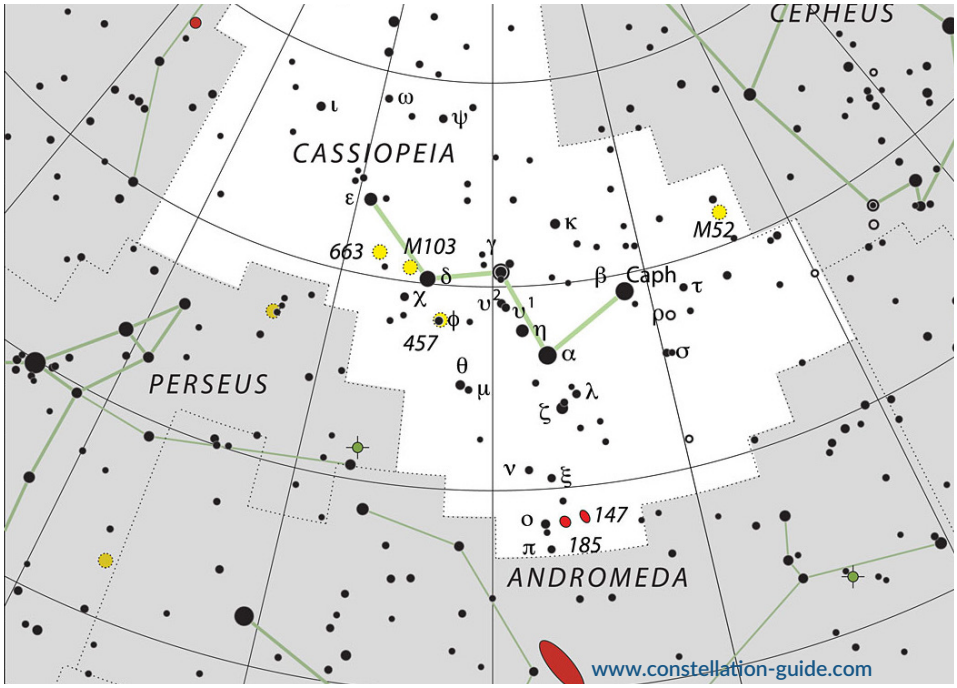
If you're a fancier of open star clusters, Cassiopeia is the place to be. Among the best of the Queen's numerous open cluster offerings of is Messier 52.

In binoculars and finderscopes, M52 appears as a fuzzy patch and remains mostly nebulous when viewed with small-aperture telescopes. My 3-inch f/10 reflector at 30X shows a triangular haze about 10 arc-minutes across and interspersed with a handful of tiny stellar specks. An 8th magnitude star located at the westernmost apex of the triangle gives M52 an appearance not unlike that of the "Wild Duck" Cluster, M11. The similarity isn't coincidental. Like M11, M52 is extremely rich and densely packed. Many dozens of stars, from magnitudes 9 to 13, greet the eye of anyone viewing M52 with a large scope and moderately high magnification. In all, the cluster contains about 200 stars.

You can find M52 by tracing an imaginary line from Shedir (alpha [α] Cassiopeiae) to Caph (beta [β] Cassiopeia) and extending it about 6 degrees beyond. M52 lies less than a degree south of the 5th magnitude star 4 Cassiopeiae and appears in the same low-power field.

M52 was discovered by Charles Messier on September 7, 1774. Its exact distance is uncertain, but a commonly-stated value of 5000 light years yields a true diameter of about 19 light years.

Glenn Chaple is a member of the Amateur Telescope Makers of Boston, American Association of Variable Star Observers, and contributes the monthly "Observing Basics" column for Astronomy Magazine. See more at http://theskyscrapers.org/glenn-chaple



A Look Inside Venus

by Francine Jackson

We all hope you've been enjoying waking up at 5:00 in the morning to see the incredible array of planets the past several weeks. Giant Jupiter is now leading the lineup in the southeast, just below Regulus, followed by dimmer, ruddy Mars, and trailing behind is Venus, the third brightest object in our sky.

For much of my young life, Venus, named after the goddess of beauty and love, was this real enigmatic object that defied explanation. Its clouds were so thick, no light could pass through; Venus was truly also the goddess of mystery. But, then came modern science, leading us to realize that the most beautiful object to grace our sky was also akin to Hades, with a carbon dioxide atmosphere creating a runaway greenhouse surface temperature of over 900 degrees F, and having virtually no difference between day and night temperatures. Plus, any rain that occurs there comes from sulfuric acid, which, because of the fast cloud motion surrounding the planet, never strikes the ground. Also, the atmosphere around Venus is over 90 times ours, making any landing thoughts impossible.

For those of us who are left-handed, so is Venus. It actually rotates clockwise, from the perspective of someone looking from above the solar system, or, in other words, it is inclined 177 degrees from the vertical. No other planet is so unique. And, not only is its rotation the slowest of all the planets – 243 of our days – this is slower than its revolution period, about 225 days, the only planet that does this.

It wasn't until the Magellan mission, with its synthetic aperture radar, allowed us to "map" features on this planet. Suddenly, we were aware of actual craters – all very large because of the sizes of the space rocks that had to survive the atmosphere to crash onto the surface – geyser-like mushroom-looking features, and very large volcanoes, one of which actually has two caldera at the top, which, when this was first identified was called – after a popular television show of that day – Twin Peaks.

Its incredible number of volcanoes dotting the surface has scientists believing that Venus might have undergone a cleansing of its surface about ¾ of a billion years ago, meaning the surface we are aware of is fairly recent. Why this happened is rather unknown, including the possibility that something could be happening now. The European Space Agency's Venus Express, which had been traveling around our neighbor for several years, recently ended its life by racing through the Venusian atmosphere, but not before it appeared to reveal the possibility of active volcanism happening today, meaning that, if true, there appear to be three volcanically active bodies in our solar system: The Earth, Jupiter's innermost Galilean satellite Io, and now our closest planetary neighbor.

In the meantime, though, keep watching Venus as it slowly travels closer toward the Sun within the next few weeks. Venus will soon leave the morning sky, and then, once again, will join the evening western horizon. More of you, I'm sure, will take the time to enjoy the brilliance of our third brightest celestial body then, but, if you are awake in the early morning, please run outside, even for just a few seconds, to enjoy Venus with Jupiter and Mars. You'll be glad you did.

Francine Jackson is Skyscrapers Public Relations Spokesperson, writes the weekly newsletter for Ladd Observatory, teaches astronomy at Framingham State and serves as planetarian at the University of Rhode Island. See more at http://theskyscrapers.org/francine-jackson

Conrad Cardano reports on first light from his new Dye Hill Observatory, a modified Rubbermaid shed housing his 102mm equatorially mounted refractor. The image is of the Bubble Nebula, NGC 7635 in Cassiopeia.

Star Party & Workshops Update

by Tracy Prell, Photos by Tracy Press & Jim Hendrickson

Seagrave Observatory Workshop: Beauty of the Night by Francine Jackson; November 7

Skyscrapers, Inc member Francine Jackson held a workshop tonight called "Beauty of the Night "at our meeting hall attended for both young and old. Her presentation focused on the various Constellations in the Sky, how to locate them and when do they appear during the various times and seasons of the year. She discussed Andromeda, Cassiopeia, Gemini, Orion and Perseus to name a few. Francine has a tremendous amount of knowledge concerning the stars and the mythical stories behind them which really stimulated everyone's interest. There was a question and answer period afterwards which everyone enjoyed.

After her presentation, our Observatory was opened by our member Dave Huestis for public viewing. Dave is also our historian. Francine is a also a Staff Astronomer at the Ladd Observatory which is home to a 12" Refractor telescope in Providence, RI. This observatory is managed by Brown University.

Thank you Francine and Dave for your time and volunteerism in educating the public.

Seagrave Observatory Workshop: Language of Sky Observing by Steve Siok; November 14

Skyscraper's member Steve Siok gave a great presentation tonight on "The Language of Sky Observing!" When it comes to astronomy, it appears there are so many different terms that people don't understand or too confused about. Steve makes it simple and talks about these terms normally used to find our way around the sky when we look up at the stars and planets. He explains in detail from where you're standing on Earth, how do you determine your position relative to the sky and what direction and time of day to locate the various planets and stars! He discussed the Earth's location within the solar system and about inferior and superior planets. He explained the terms such as zenith, meridian, circumpolar and celestial spheres and our constellations.

When you have someone as knowledgeable about the night sky as Steve along with his Powerpoint presentation, it is really easy to understand. There's always a question and answer period afterwards to further assist you in understanding our wonderful Universe. We also had the pleasure of having other Skyscrapers members as well such as; Professor Ian Dell'Antonio from Brown University and Francine Jackson, staff astronomer at Ladd Observatory, Jim Hendrickson our expert astrophotographer along with our astronomer Kent Cameron tonight at the workshop. They were there to answer any additional questions you may have. These are wonderful workshops in various areas of astronomy that Skyscrapers, Inc offers to the public and our members...cost of these workshops to the public is $5, if you are a member, the workshops are free. After the workshop, Kent opened the Seagrave Memorial Observatory where we viewed M15 (a globular cluster in the constellation Pegasus) and M57 (the Ring Nebula which is a planetary nebula in the northern constellation of Lyra) Professor Ian Dell'Antonio set up another telescope outside to view the various stars and nebula clusters. Many Kudos to our fine volunteers in educating the public, young and old alike.

Solar Star Party at Seagrave Observatory November 21

We had Solar Star Party today, Saturday, November 21, 2015, from 12:00 to 3 pm at Skyscrapers, Inc. Jeff Padell, Bob Horton, Jim Hendrickson, myself and several other members set up their telescopes with white light and H-alpha filters to safely observe the sun.

We had terrific views of the sun and observed some sun spots which correspond to concentrations of magnetic field flux that inhibit convection and result in reduced surface temperature compared to the surrounding photosphere. It was a perfect day for solar observing with sunny clear skies which made it so much more enjoyable.

Seagrave Observatory Workshop: Introduction to Astrophotography by Bob Horton; November 21

On November 21, 2015 at 6 pm, Bob Horton., President of Skyscrapers, Inc., gave a very informative presentation on astrophotography. Bob showed many beautiful images he took with his camera, with and without using Photoshop processing. He explained to start off in astrophotography you don't need to invest a lot of money. You can use your existing camera in most cases with a good tripod, tripod head, and a remote shutter release cable, wireless remote, or set your camera for an automatic delay. It is important to know your camera and what it's capabilities are. Experiment with the different settings of the camera, but especially when you put it in full manual mode if your able, adjusting the F-stops (lens aperture opening) shutter speed and ISO (equivalent to film speed settings) and using your manual focus. When you find the correct settings you can either save them in your custom mode if you have that feature on your camera or you can write down the settings. Also the image properties of the image you took afterwards will tell you what your settings were in most cases. Bob talked about the many various types of adapters that can connect your camera or smartphone to a telescope. They are not that expensive and you can get some outstanding images with what you already own. Here is a link for adapters for your camera http://www.telescopeadapters.com/.

We also had Jim Hendrickson, Francine Jackson, Jeff Padell and Bill Gucfa, all members of Skyscrapers assisting the public with observing the night sky and explaining what they were looking at! Jeff had his telescope pointed at a beautiful double-star and Bill was kind enough to show the public the moon with our 8" Alvan Clark refractor telescope inside our observatory.

The public is always welcome to attend one of our meetings with their children and enjoy learning about and seeing the "Wonders of Our Beautiful Universe." Donations are kindly accepted to help maintain our facilities and telescopes and they are tax-deductible.

The Sun, Moon & Planets in December

This table contains the ephemeris of the objects in the Solar System for each Saturday night in December. Times are in Eastern Standard Time calculated for Seagrave Observatory (41.845N, 71.590W).

Object	Date	RA	Dec	Const	Mag	Size	Elong	Phase(%)	Dist(S)	Dist(E)	Rise	Transit	Set
Sun	**5**	16 44.2	-22 17.5	Oph	-26.8	1,947.3	-	-	-	0.99	06:57	11:36	16:15
	12	17 14.8	-23 01.8	Oph	-26.8	1,949.1	-	-	-	0.98	07:04	11:40	16:15
	19	17 45.8	-23 23.7	Sgr	-26.8	1,950.5	-	-	-	0.98	07:08	11:43	16:17
	26	18 16.9	-23 22.8	Sgr	-26.8	1,951.5	-	-	-	0.98	07:12	11:46	16:21
Moon	**5**	12 03.0	0 39.4	Vir	-11.4	1,753.5	72° W	35	-	-	01:09	07:16	13:16
	12	17 41.7	-18 55.3	Oph	-6.9	1,835.7	8° E	1	-	-	07:46	12:47	17:48
	19	0 05.5	0 28.8	Psc	-12.1	1,962.5	95° E	54	-	-	12:28	18:53	01:27
	26	6 47.8	17 36.9	Gem	-12.7	1,907.8	172° W	99	-	-	18:01	01:20	08:33
Mercury	**5**	17 25.1	-25 04.0	Oph	-0.5	4.8	10° E	96	0.45	1.39	07:54	12:19	16:44
	12	18 12.9	-25 37.0	Sgr	-0.5	5.1	13° E	92	0.43	1.32	08:17	12:39	17:02
	19	18 59.5	-24 58.7	Sgr	-0.5	5.5	17° E	85	0.40	1.22	08:32	12:58	17:24
	26	19 41.2	-23 11.2	Sgr	-0.5	6.3	19° E	70	0.36	1.07	08:37	13:11	17:46
Venus	**5**	13 54.0	-9 18.6	Vir	-4.0	17.2	43° W	68	0.72	0.99	03:17	08:46	14:15
	12	14 25.7	-12 01.4	Lib	-4.0	16.4	42° W	71	0.72	1.03	03:32	08:50	14:09
	19	14 58.3	-14 34.5	Lib	-4.0	15.6	40° W	73	0.72	1.08	03:47	08:56	14:04
	26	15 31.9	-16 53.1	Lib	-4.0	15.0	39° W	75	0.72	1.13	04:02	09:02	14:01
Mars	**5**	12 50.6	-3 49.7	Vir	1.5	4.8	59° W	93	1.67	1.93	01:53	07:42	13:30
	12	13 05.7	-5 23.2	Vir	1.5	5.0	62° W	93	1.66	1.87	01:46	07:29	13:12
	19	13 20.7	-6 53.9	Vir	1.4	5.2	66° W	92	1.66	1.81	01:39	07:17	12:54
	26	13 35.6	-8 21.4	Vir	1.3	5.4	69° W	92	1.66	1.74	01:32	07:04	12:36
1 Ceres	**5**	21 01.6	-25 52.0	Cap	9.3	0.4	58° E	98	2.98	3.37	11:31	15:51	20:12
	12	21 11.0	-25 05.6	Cap	9.3	0.4	54° E	98	2.98	3.46	11:09	15:33	19:58
	19	21 20.6	-24 16.8	Cap	9.3	0.4	49° E	98	2.98	3.53	10:47	15:15	19:44
	26	21 30.5	-23 25.8	Cap	9.3	0.3	44° E	99	2.98	3.60	10:26	14:58	19:30
Jupiter	**5**	11 30.3	4 25.4	Leo	-1.8	35.9	81° W	99	5.41	5.48	00:03	06:21	12:38
	12	11 32.7	4 11.7	Leo	-1.9	36.7	88° W	99	5.41	5.36	23:38	05:55	12:13
	19	11 34.7	4 01.3	Leo	-1.9	37.5	94° W	99	5.41	5.25	23:13	05:30	11:46
	26	11 36.1	3 54.4	Leo	-2.0	38.3	101° W	99	5.41	5.14	22:48	05:04	11:20
Saturn	**5**	16 26.2	-20 01.9	Oph	0.5	15.1	5° W	100	10.01	10.99	06:29	11:16	16:02
	12	16 29.7	-20 09.8	Oph	0.5	15.1	11° W	100	10.01	10.97	06:06	10:52	15:38
	19	16 33.1	-20 17.3	Oph	0.5	15.1	17° W	100	10.01	10.95	05:42	10:28	15:13
	26	16 36.5	-20 24.1	Oph	0.5	15.2	23° W	100	10.01	10.90	05:19	10:03	14:48
Uranus	**5**	1 02.7	5 58.8	Psc	5.8	3.6	124° E	100	19.98	19.41	13:27	19:51	02:14
	12	1 02.4	5 56.6	Psc	5.8	3.6	117° E	100	19.98	19.51	12:59	19:23	01:46
	19	1 02.1	5 55.4	Psc	5.8	3.6	110° E	100	19.98	19.62	12:32	18:55	01:18
	26	1 02.0	5 55.1	Psc	5.8	3.6	103° E	100	19.98	19.74	12:04	18:27	00:51
Neptune	**5**	22 36.4	-9 38.9	Aqr	7.9	2.3	85° E	100	29.96	30.04	11:58	17:25	22:52
	12	22 36.7	-9 37.0	Aqr	7.9	2.3	78° E	100	29.96	30.16	11:30	16:58	22:25
	19	22 37.1	-9 34.5	Aqr	7.9	2.3	71° E	100	29.96	30.27	11:03	16:30	21:58
	26	22 37.6	-9 31.5	Aqr	7.9	2.2	64° E	100	29.96	30.38	10:36	16:03	21:31
Pluto	**5**	19 00.7	-21 03.3	Sgr	14.3	0.2	32° E	100	33.00	33.83	09:08	13:50	18:32
	12	19 01.7	-21 02.7	Sgr	14.3	0.2	25° E	100	33.00	33.89	08:41	13:23	18:05
	26	19 03.7	-21 01.2	Sgr	14.3	0.2	11° E	100	33.01	33.98	07:48	12:30	17:12

Our Solar System Is Almost Normal, But Not Quite

by Ethan Siegel

t was just over 20 years ago that the very first exoplanet was found and confirmed to be orbiting a star not so different from our own sun. Fast forward to the present day, and the stellar wobble method, wherein the gravitational tug of a planet perturbs a star's motion, has been surpassed in success by the transit method, wherein a planet transits across the disk of its parent star, blocking a portion of its light in a periodic fashion. Thanks to these methods and NASA's Kepler spacecraft, we've identified many thousands of candidate planets, with nearly 2,000 of them having been confirmed, and their masses and densities measured.

The gas giants found in our solar system actually turn out to be remarkably typical: Jupiter-mass planets are very common, with less-massive and more-massive giants both extremely common. Saturn—the least dense world in our solar system—is actually of a fairly typical density for a gas giant world. It turns out that there are many planets out there with Saturn's density or less. The rocky worlds are a little harder to quantify, because our methods and missions are much better at finding higher-mass planets than low-mass ones. Nevertheless, the lowest mass planets found are comparable to Earth and Venus, and range from just as dense to slightly less dense. We also find that we fall right into the middle of the "bell curve" for how old planetary systems are: we're definitely typical in that regard.

But there are a few big surprises, which is to say there are three major ways our solar system is an outlier among the planets we've observed:

All our solar system's planets are significantly farther out than the average distance for exoplanets around their stars. More than half of the planets we've discovered are closer to their star than Mercury is to ours, which might be a selection effect (closer planets are easier to find), but it might indicate a way our star is unusual: being devoid of very close-in planets.

All eight of our solar system's planets' orbits are highly circular, with even the eccentric Mars and Mercury only having a few percent deviation from a perfect circle. But most exoplanets have significant eccentricities, which could indicate something unusual about us.

And finally, one of the most common classes of exoplanet—a super-Earth or mini-Neptune, with 1.5-to-10 times the mass of Earth—is completely missing from our solar system.

Until we develop the technology to probe for lower-mass planets at even greater distances around other star systems, we won't truly know for certain how unusual we really are!

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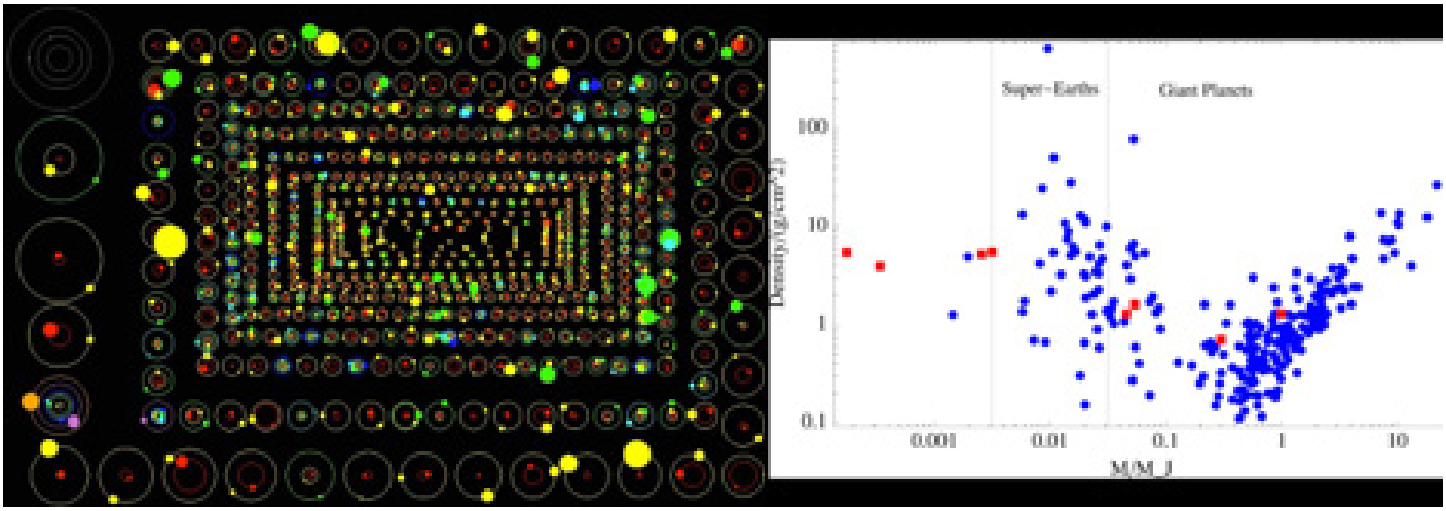

NASA / Kepler Dan Fabricky (L), of a selection of the known Kepler exoplanets; Rebecca G. Martin and Mario Livio (2015) ApJ 810, 105 (R), of 287 confirmed exoplanets relative to our eight solar system planets.

November Reports

Skyscrapers November Meeting Minutes — 11/6/2015

Bob Horton called the Skyscrapers' November meeting to order at 7:25 p.m.

President, Bob Horton, welcomed everyone and explained that the observatory would be open for a tour after the meeting. Generally if the skies are clear, people are welcome to stay for observing, and there is a public open night on every Saturday evening, weather permitting.

Treasurer Report: Ed Haskell reported one new member: Terrance Turner, who was not present. • A motion was raised and seconded for a proposed change to the organization's Article IV: Membership, Section 2, Constitutional Amendment: "An applicant for Junior, Regular, Family, and Senior shall submit the standard form of Membership application together with noted dues, shall be proposed by an existing member at a regular meeting, and shall become a member upon receiving a favorable majority vote at a subsequent regular meeting of the Society." This motion will be voted on at the next monthly meeting.

Announcements: Francine Jackson noted that the recent star party at the State House had between 14-15 telescopes with approximately 75 people attending. This event was organized by Kim Arcand to tie in with President Obama's White House astronomy night. • Bob reported that we had six telescopes at the Women's Wilderness Weekend on October 16 at URI's Alton Jones campus. The Society received a $75 donation. • Steve Siok informed those present that an upcoming trip to Mystic Seaport in Connecticut was being planned. The visit to the Seaport would include its regular attractions plus nonrefundable ($20 Group rate) tickets for the special exhibition: "Ships, Clocks & Stars: The Quest for Longitude," as well as the Treworgy Planetarium program ($3.50). Members and nonmembers are invited along on the Seaport trip. Dinner at a local restaurant would conclude the outing. If interested, please speak with Steve following the meeting. • Bob reported that on next Friday, November 13, there will be a star party at the Portsmouth Middle School and is looking for volunteers. The time has not been confirmed, but it would be approximately 7:00 p.m.


Alan Sliski

Workshop Programs: Francine reported that the quarterly workshop series has resumed and is scheduled for 6:00 p.m. on Saturday evenings. • She noted that the first workshop was held October 24 with Ian Dell-Antonio and featured "Our Star: The Sun." • Francine will run "The Beauty of the Night" constellation workshop on Saturday, November 7. • Steve Siok's workshop on the fundamentals of astronomy, "The Language of Sky Observing" will be on the following Saturday, November 14. • Bob Horton's workshop "Introduction to Astrophotography" is scheduled for November 21. • The workshops will not run during the Thanksgiving week, but will resume on December 5, with how to purchase "A Telescope for the Holidays?"

First Vice-President Report: Steve Siok noted that the following monthly speakers have been confirmed: Friday, December 4 (at Seagrave) will be Dr. Anna Frebel from MIT presenting "The Earliest Stars"; Friday, January 15 (at the Community Center) will be member Steve Hubbard speaking about "An Astronomical Vacation in Chile"; Friday, February 5 (at the Community Center) will be Dr. Wallace Arthur from Farleigh Dickensen University talking about "Cosmic Rays"; and Friday, March 4 (at the Community Center) will be Gordon Blackadder from Brown University discussing "Cosmology and the Decay of Dark Matter."

Good of the Organization: Jeff Padell said that he will be hosting a "Solar Day," on November 21st at Seagrave Observatory, from 12:00 p.m. to 3:00 p.m., weather permitting. Members are invited to bring their telescopes and solar filters. He will have an H-Alpha scope, Lunt LS50 on alt-az mount, as well as white light filters and a pair of "Sunoculars." Jeff will also bring his Canon camera and solar filter to demonstrate safe solar photography. • Bob noted that there have been bright fireballs observed from the Taurid meteor shower, which produces grazers. • Bob also remarked upon the morning planetary alignment with Jupiter, Venus, and Mars. He noted that the crescent Moon will be next to Venus tomorrow morning. • Bob said that Internet connectivity will be installed in the Meeting Hall tomorrow. This action will support our grant proposal for the remote connectivity with the proposed 27-inch telescope. • Dave Huestis reported that there was a recent coronal mass ejection (CME) due to a large sunspot group.

Alan Sliski, of the Antique Telescope Society (ATS), presented the talk, "The Rescue & Revival of the 1965 Princeton Boller & Chivens." Alan reported that this project was three years in the making. Four members from the ATS were on a "mission" to safely relocate this massive 1965 electro-mechanical instrument from Princeton University to New Mexico, where plans are to modernize and install it into a new observatory in the Southwest.

The meeting ended at 8:33. Submitted by Tina Huestis, Secretary.

Board of Directors Meeting Minutes — 11/19/15

Attendees: Jim Crawford, Ian Dell-Antonio, Ed Haskell, Jim Hendrickson, Bob Horton, Tina Huestis, Matt Ouellette, Tracy Prell, Kathy Siok, Steve Siok, and Tom Thibault.

President Bob Horton called the meeting to order at 7:05 p.m. at Seagrave Observatory.

Internet Access: Bob informed everyone that Seagrave now has wireless fiber optic Internet access.

Treasurer's Report: Ed Haskell distributed the financial reporting for AstroAssembly. The total income from the 2015 event was $3,255, minus the total expenses of $928, leaving a net profit of $2,327. (This figure does not reflect any AstroAssembly donations.) Ed noted that prior year's AstroAssembly net profit was $1,786. • Ed explained that he intends to close the organization's financial book in mid December and upgrade our Quicken software. He also reported that the Skyscrapers' Citizen's Bank account is now closed. • Bob reminded the Board that our 2015 goals were to cut AstroAssembly expenses and to increase

the level of donations derived from open nights, special programs, and star parties, which we have been successful in accomplishing.

Programs: Steve Siok informed the group that the following monthly speakers have been booked: Friday, December 4 (at Seagrave) will be Dr. Anna Frebel from MIT presenting "The Earliest Stars"; Friday, January 15 (at the Community Center) will be member Steve Hubbard speaking about "An Astronomical Vacation in Chile"; Friday, February 5 (at the Community Center) will be Dr. Wallace Arthur from Farleigh Dickinson University talking about "Cosmic Rays"; and Friday, March 4 (at the Community Center) will be Gordon Blackadder from Brown University discussing "Cosmology and the Decay of Dark Matter." • Steve suggested that with the newly installed Internet access at Seagrave, it will now be possible to expand our monthly programming to include virtual Skype real-time presenters, as well as the occasional use of prerecorded presentations and webcasts. • The Board discussed logistics for the Society's holiday party. It was noted that this year's annual party will not coincide with our December meeting since we were not able to secure the community center for that date. The holiday party will actually be held at January's meeting. After discussion, it was agreed that the potluck will consist of desserts. We will furnish coffee and beverages. • Steve informed the group that he has been strategizing programming for AstroAssembly 2016, and if anyone has suggestions on speakers or topics to contact him. • A discussion then followed on the pros/cons of changing the date of AstroAssembly, offering a rain date, purchasing a tent, and moving the daytime venue to the community center; however no decisions were made. • Bob told the Board that a winter goal should be to set up remote access control of the 12-inch telescope, leveraging our new wireless Internet capabilities. In this way, even if our facility is not open due to snow cover, it may still be possible for limited access to the instruments to offer virtual observing for our membership.

Workshop Series: Bob reported that the quarterly workshops have been ongoing, and the attendance has been between six to ten participants. Since darkness falls earlier, it was noted that some people have been showing up well before the 7:00 time. • The workshop schedule is publicized on the Society's website.

Large Remote-Controlled Telescope: There was discussion on the realistic time frame for the 27-inch telescope being operational. It was agreed not to delay the grant writing until the resolution of the possible land donation by Gene Allen, (owner of the undeveloped abutting property). • Bob reported that the town will allow a new building on the Peeptoad property, perhaps requiring a variance. • Tom Thibault reported that he has been researching prefabricated domes. • It was agreed that at the next Board meeting, the goal will be to select a dome type/model, determine the buildings' ventilation needs, its optimum floor layout, and to have an estimate of its foundation cost. • Ian Dell-Antonio reported that his grant writing goal is to submit proposals by spring. He is currently communicating with CCRI, Roger Williams University, and URI. Ian will bring a draft of the grant for review at the January Board meeting.

Nominations: Bob reminded everyone that nominations should be started in mid November in order to be completed in time for April elections. • It was agreed that the current officers should reach out to new members and encourage them to get more involved in the organization. Perhaps by mentoring/apprenticing interested newcomers with specific AstroAssembly job responsibilities, their experience, confidence, and likelihood to run for future offices would increase.

Miscellaneous: The group agreed that driveway snowplowing should be done during the winter, allowing emergency access to the buildings and permitting limited use of the instruments for potential remote-access viewing. • The next Board meeting will be held in January, possibly at the Greenville Library. Details and dates TBD.

Meeting adjourned at 8:33. Submitted by Tina Huestis, Secretary

Bob Horton & Bob Napier test the wireless internet connection at Seagrave Observatory, November 7.

Directions to Seagrave Memorial Observatory

www.theSkyscrapers.org

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.

SKYSCRAPERS INC.

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