



# the Skyscraper

vol. 38 no. 10  
October  
2011

Amateur Astronomical Society of Rhode Island ★ 47 Peepoad Road ★ North Scituate, Rhode Island 02857 ★ www.theSkyscrapers.org

## AstroAssembly 2011

### Friday, September 30

at Seagrave Memorial Observatory

#### 6:30pm Refreshments

#### 7:30pm Tony Costanzo Astronomy-Shoppe

*Setting Circles Made Easy – The Lost Art*

#### 8:15pm Pete Peterson Skyscrapers, Inc.

*Astrometry – and Why I Need a 1-Meter Telescope*

#### 9:00pm Gerry Dyck Skyscrapers, Inc. & AAVSO

*The Variable Star Observations of Frank E. Seagrave*

Gerry Dyck, Skyscrapers member and AAVSO observer since 1978, will present a summary of the contribution which our namesake Frank E. Seagrave made to the AAVSO International Database. His talk will also mention the variable star observations of Skyscrapers founder, Prof. Charles Smiley.

#### 10:00pm Observing

The telescopes at Seagrave Observatory will be open for observing after the talks, weather permitting.

### Saturday, October 1

at Seagrave Memorial Observatory

#### 9:00am Registration & Refreshments

#### 10:00am Ed Turco Skyscrapers, Inc.

*The Amateur Astronomer's Equipment in 1961*

Join Ed Turco, long-time Skyscrapers member and master telescope maker, to remember the 'good old days' of amateur astronomy. Ed will have his telescopes and all sorts of goodies to show how astronomy was done in the 60s, before the advent of electronic assistance.

**ED TURCO** has been a very active member of Skyscrapers since 1961, holding most of the offices of the organization, conducting telescope making classes and giving many talks to this group and others. He has received many prestigious awards at Stellafane for his hand crafted telescopes, in optical and all other categories. This year, Ed is attending his 50th AstroAssembly.

#### 11:00am John Briggs Skyscrapers, Inc. & HUT Observatory

*Then & Now: Adventures in Colorado  
Astrophotography 1985-2011*

Skyscrapers member John W. Briggs moved to Colorado in late 1984 and soon began assisting master astrophotographer Professor Edgar Everhart of the University of Denver. A particle physicist turned telescope maker and astronomer, Everhart discovered two comets from Connecticut before his own move to Colorado circa 1970. Everhart went on to pioneer optimum techniques for hypersensitizing the remarkable Kodak 2415 Tech Pan emulsion. Applying Everhart's methods, including the use of custom tracking hardware, Briggs performed cometary astrometry and recorded an image of Comet Halley that made the cover of Sky & Telescope. All this was just before the CCD revolution. In 2010, after many intervening projects, Briggs returned to Colorado to operate another 16-inch telescope optimized for astrophotography. Now at the HUT Observatory in Eagle, Colorado, John is exploring modern CCD astrophotography and moving-body astrometry. The technical advances are amazing and are especially wonderful to anyone familiar with the common limitations of the old days. John will relate some of the interesting things he's now learning and will share recent results. He will also wax a bit nostalgic regarding the old days of films, plates, and dark rooms -- a photographic technology of which Briggs was once a proud practitioner, but now near totally obsolete!

**JOHN W. BRIGGS** is Astronomer in Residence at the HUT Observatory in Eagle, Colorado. A native of Westport Point, Massachusetts, John first visited Seagrave Observatory as a youngster with his father in the early 1970s. John's present work includes solar system astrometry, CCD photometry, and educational projects involving schools, science centers, and related organizations. Recently a visiting scholar at Phillips Academy in Andover, Massachusetts, John served for many years as an instrumentation engineer based at the University of Chicago's Yerkes Observatory. Among projects during that time were pioneering experiments with sodium laser "guide stars" now commonly used in adaptive optics; instrument commissioning for the Sloan Digital Sky Survey; field engineering for the Advanced Technology Solar Telescope Site Survey; and three visits to Antarctica, including a winter-over at South Pole Station for Chicago's Center for Astrophysical Research in Antarctica.

In earlier days John served as a parallax observer at Wesleyan's Van Vleck Observatory. In residence at Mount Wilson, he observed chromospherically active stars for the long-running HK

Project, the results of which suggest that stars have solar-like Maunder minima in their magnetic activity cycles. John enjoys the history of astronomy and is a past-president of the Antique Telescope Society. He also served on the editorial staff of *Sky & Telescope* magazine in the 1980s. On May 22 of this year, participating in a campaign organized by MIT and Williams College, John recorded an occultation by Pluto using the 24-inch telescope at Middlebury College in Vermont. He is currently organizing a workshop at Mount Wilson in association with the 2012 Transit of Venus.

## 12:00pm Lunch at the Stardust Grille

1:15pm **Dr. Sergei Khrushchev** Watson Institute, Brown University

### *To the Stars: Yuri Gagarin and the Launch of Manned Space Exploration*

Sergei Khrushchev, the son of the former Soviet Premier Nikita Khrushchev, is a Senior Fellow at Brown University's Watson Institute for International Studies. Working in the Soviet space program Design Bureau, Dr. Khrushchev has a very unique perspective on the efforts to launch cosmonauts into Earth orbit and then eventually to the Moon. Dr. Khrushchev will focus his talk on the legacy of Yuri Gagarin's historic flight aboard Vostok 1.

**DR. KHRUSHCHEV** focuses his research on the former Soviet Union's transition from a centralized to a decentralized society, as well as its transformation from a central to a market economy and its international security during this transition. One of his points of interest is the creation of a criminal society in Russia, as a consequence of the mistakes in the early stages of market reformation. He is also interested in the history of the Cold War and the turning points in relations between the US and the Soviet Union in the Khrushchev, Eisenhower, and Kennedy periods. Another focus of Dr. Khrushchev's interests is the history of Soviet missiles and space development, in which he played an active role, from 1958-1968.

Dr. Khrushchev has been a Senior Fellow since 1996 and a Senior Visiting Scholar from 1991-1996 at the Thomas J. Watson Jr. Institute for International Studies. In 1990, he was a Fellow at the Institute of Politics, John F. Kennedy School of Government at Harvard University. From 1968-1991, he served at the Control Computer Institute in Moscow, rising from Section Head to First Deputy Director in charge of research. From 1958-1968, he was an engineer, then Deputy Section head in charge of guidance systems for missile and space design.

In 1958-1968, Dr. Khrushchev participated in the Soviet missile and space program, including work on cruise missiles for submarines, military and research spacecraft, moon vehicles, and the "Proton," the world's largest space booster.

Dr. Khrushchev has his Soviet doctoral degree from the Ukrainian Academy of Science, a Ph.D. from the Moscow Technical University, and an M.A. with distinction from the Moscow Electric Power Institute.

From 1967 he helped Nikita Khrushchev to work on his memoirs. The full text of Nikita Khrushchev's memoirs, *The Time, the People, the Power*, was published in 1999 in four volumes by the Moscow News, a publishing house in Moscow (in Russian). Sergei Khrushchev edited Nikita Khrushchev's memoirs in three volumes "Commissar," "Reformer" and "Statesman" published in

USA in 2005-2007. It is joint project of Watson Institute and Penn State University. The same three volumes of Nikita Khrushchev memoirs edited by Sergei Khrushchev were published in China in 2007.

Since 1989, Dr. Khrushchev has lectured in the fields of Russian economic and political reforms; US-Soviet relations from 1950-1964; the history of the Soviet space program; and Nikita Khrushchev's economic, political, and security reforms.

Dr. Khrushchev is mentioned in the *Who's Who in the World*, *Who's Who in the United States*, *International Who's Who of Contemporary Achievements*, *International Authors and Writers*, *International Who's Who of Intellectuals*, and *Contemporary Authors Gala Research*. In the Soviet Union, he received the Lenin Prize for his research, the Prize of the Council of Ministers of the U.S.S.R., Hammer and Sickle Gold Star and title "Hero of Socialist Labor," several awards for achievements in space and computer research, and four awards from the Soviet Union Engineering Society. He is a full member of the International Academy of Information (1993), the Russian Space Academy (1994), a member of the Russian Society of Informatics (1990), and a member of the Russian Engineering Society (1970), a member of Vladimir Chelomey's scientific and Engineering Society (2003).

He is teaching in Brown University and lecturing in Naval War College in Newport, RI.

He is a regular commentator for the American media, and the author of more than 350 books and articles on engineering, computer science, history, and economy. He is also the author of Khrushchev on Khrushchev (1990), Nikita Khrushchev: Crisis and Missiles (1994), *The Political Economy of Russian Fragmentation* (1993), *Three Circles of Russian Market Reforms* (1995), *Nikita Khrushchev and the Creation of a Super Power* (2000). His books are published around the world in 12 languages. The last Sergei Khrushchev's Trilogy about Father: "Reformer. The Birth of a Superpower. Pensioner Souznogo Znacheniya" had been published in Russia in 2010. The first and new book from this Trilogy: "Reformer" under the title "Khrushchev in Power. Unfinished Reforms. 1961-1964." now translating in Chinese and English (Lynne Rienner Publishers in Boulder, Colorado).

2:30pm **Dr John Mustard** Brown University

### *What's Next for Mars Exploration*

The most technologically advanced and ambitious rover ever built will be launched to go the surface of Mars in late November of this year. The goal of the mission is to assess the habitability of the landing site using the rover's sophisticated instruments designed to measure the chemistry and mineralogy of the surface. The rover also includes an instrument to determine if there are organic molecules and compounds. Dr. Mustard will provide an overview of the current state of Mars exploration for habitability, and some key aspects of the rover mission.

**JOHN F. MUSTARD** is professor of Geological Sciences and professor of Environmental Studies at Brown University. He is also a Distinguished Visiting Scientist at the Jet Propulsion Laboratory at the California Institute of Technology. The central themes that run through his research are the processes that modify solid surfaces and the spatial and temporal scales that control environmental processes on Earth. He is the deputy principal investigator for the CRISM instrument on the Mars Reconnaissance Orbiter, a co-investigator for OMEGA on Mars Express, a

co-investigator on the Moon Mineralogy Mapper on Chandrayan, and served as co-investigator on Earth Observer 1 as Science Team Member. He is a Fellow of American Association for the Advancement of Science. He received his B.Sc. in geological sciences from the University of British Columbia, Vancouver, and his M.Sc. and Ph.D. in geological sciences from Brown University. He has served on National Academy of Science committees, and was the chair of the Mars Exploration Program Assessment Group (MEPAG) from 2007-2011.

4:00pm **Prof David Latham** Harvard College Observatory  
*Super-Earths and Life*

Transiting planets are special. The amount of light blocked by the planet as it passes in front of its host star sets the size of the planet (relative to the star). If an orbit can be derived from Doppler spectroscopy of the host star, the light curve also provides the orientation of the orbit, leading to the mass of the planet (again relative to the star). The resulting density for the planet can be used to constrain models for its structure and bulk properties. We are on the verge of using these techniques to characterize a population of Super Earths, planets in the range 1 to 10 Earth masses that may prove to be rocky or water worlds. Space missions such as Kepler, Plato, and TESS promise to play key roles in the discovery and characterization of Super Earths.

Transiting planets also provide remarkable opportunities for spectroscopy of planetary atmospheres: transmission spectra during transit events and thermal emission throughout the orbit, calibrated during secondary eclipse. Spectroscopy of Super Earths will not be easy, but is not out of the question for the James Webb Space Telescope. Our long-range vision is to attack big questions, such as "Does the diversity of planetary environments map onto a diversity of biochemistries, or is there only one chemistry for life?" A giant first step would be to study the diversity of global geochemistries on super-Earths and Earth analogs.

**DAVE LATHAM** is an astronomer at the Harvard-Smithsonian Center for Astrophysics in Cambridge. He works on the discovery and characterization of planets around other stars, with the goal of identifying planets enough like the Earth so that water could be liquid on the surface and life as we know it might be comfortable. NASA's Kepler mission is enabling important progress towards this goal.

## Saturday Evening

The Saturday evening program takes place at the North Scituate Community Center.

5:30pm **Reception**

6:30pm **Buffet Dinner**

7:30pm **Welcome & Raffle**

8:15pm **Dr Peter Schultz** Planetary Data Center, Brown University

*Two Comet Tails: Results from the DIXI and Stardust-NExT Missions*

On November 4, 2010 and February 14, 2011, two separate

but related missions made close encounters with the nuclei of one new (109P/Hartley - 2) and familiar comet (9P/Tempel - 1). These two missions established a new perspective on how comets evolve with time. The recommissioned Deep Impact Flyby Spacecraft visited Comet Hartley, which is termed a hyperactive comet because of its extraordinary activity for such a small nucleus. The recommissioned Stardust-Next mission returned to Comet Tempel and imaged not just the other side of the nucleus but also the crater produced by the Deep Impact collision in 2005. We'll look in more detail at the results from both missions and what it may mean for our general understanding of how comets evolve. DIXI revealed a new paradigm for the release of water into the coma. Stardust-NExT documented changes in the nucleus and evidence for surface activity leading to widespread deposits.

**DR. PETER SCHULTZ's** research interests focus on impact cratering processes revealed by hypervelocity laboratory impact experiments, the planetary surface record, and terrestrial ground truth. For the last 30 years, he has served as the Science Coordinator for the NASA Ames Vertical Gun Range (AVGR) and actively uses the facility along with his students. AVGR studies have included atmospheric effects on crater formation and ejecta emplacement, survival of the impactor, high-speed spectroscopy of impact vapor/plasma, magnetic field generation by hypervelocity impacts, impact angle effects on vaporization, impact angle effects on shock propagation and target damage, and general crater scaling relations. Currently, he is exploring the consequences of mega-impacts, the ejecta-velocity distribution of ejecta from hypervelocity impacts, and the evolution of shock effects in solid bodies.

Insights from such experiments led to his participation as a Co-Investigator in NASA's Discovery mission called "Deep Impact." This mission sent a 360 kg mass into a comet at 10.2 km/sec. These experiments are always placed in the context of understanding craters and the cratering process in contrasting planetary settings. For example, studies suggest that the atmosphere, instead of water, is the controlling variable for the fluidized ejecta around Martian craters. As a Magellan Guest Investigator, experiments allowed interpreting the nature of the ejecta deposits and crater morphology on Venus. In 2009, he was a Co-Investigator in the LCROSS (Lunar Crater Observing and Sensing Satellite), which discovered water molecules buried in the cold regolith under the shadows of the lunar poles. He is currently a Co-Investigator on NExT (the mission to return to Comet Tempel), and DIXI (the continuation of the DI spacecraft to look at Comet Hartley).

His research in cratering on the earth led to the discovery of evidence for several impacts captured late Cenozoic Argentine sediments of Argentina. To date, at least eight separate events (from 6 ka to almost 10 Ma) have been discovered. He and his colleagues are using these dated glasses to redefine the stratigraphy of the Argentine sediments across the Pampas. And in 2007, explored the first impact crater actually witnessed by humans in Peru.

He also continues to participate in a wide range of public and education outreach activities and is the Director of both the Rhode Island Space Grant Program and the Northeast Planetary Data Center at Brown University. Over the last several years, he has appeared in three different television programs highlighting some of his research: LCROSS mission (KQED); Comet Colli-

sion (Discovery); Space Mysteries Series (National Geographic TV); The Universe (History Channel); Miracle Planet 2 (NHK), Fireballs from Space (Discovery Channel), 96 Worlds and Counting (Discovery Channel), Projectiles (The Learning Channel, BBC), Known Universe (National Geographic), The Last Extinction (NOVA-NOW, PBS), and Earth Shocks (National Geographic).

In 2004, he received the Barringer Medal,

## President's Message

Tom Thibault

October has arrived and while most of you may be sad to see summer go, I am not one of them. It's not that I do not enjoy summer, but the late sunsets really cuts into my time under the stars. To the bewilderment of my wife, I've been anxiously waiting for this time of year to arrive. The sky goes dark early and the humidity in the air is low making for improved seeing. I've been tweaking my observatory and equipment. Jim Brenek corrected my mount's pier plate to allow me to improve the polar alignment, so I'm looking forward to getting out and capturing photos of the heavens. I hope all of you find some time to get out and take in the sights the fall has to offer.

Our September speaker, Alan Sliski gave an interesting presentation concerning his latest project. Alan is currently involved in the restoration of a 9.5 inch Warner and Swasey mount built in 1916. Alan talked about the men, Worcester Warner and Ambrose Swasey, their training and the early history of their company. He showed some of their astronomy related works, and then got into the history of the telescope he's presently restoring. It really looked like Alan was progressing nicely and indicated he would update us on his progress going forward.

October also marks the arrival of our premier event, AstroAssembly. Our 2nd V.P., Kathy Siok has organized a wonderful line-up of speakers this year. Kathy, with the help of numerous volunteers, has been diligently completing all the final details for what will be a memorable event. AstroAssembly has been a Skyscrapers tradition since 1952 and has been held annually with the exception of 1953 and 1954. This will make this year's event our 57th in the

an award for his contributions to the study of the impact cratering process from the Meteoritical Society. And in 2010, received the Distinguished Scientist Award from the International Hypervelocity Impact Society. He is presently Professor of Geological Sciences at Brown University. He received his PhD from the University of Texas at Austin and BA from Carleton College, Northfield, MN.

long history of Skyscrapers. This month's newsletter, as well as our Web Site following link, <http://www.theskyscrapers.org/astroassembly/>, has a full listing of guest speakers and activities. I urge our entire membership to attend AstroAssembly in support of our society. Come join in the festivities. What better way to spend a weekend than with good friends and those with a like interest of astronomy?

October we will continue with our Members' Programs. On Friday the 21st we are planning to hold our 3rd installment of the Constellation Program featuring the Fall Season. We are planning to meet at Seagrave at 7:00. So we may plan accordingly, you must pre-register by email or phone by Wednesday October 19th. My information follows below:

Tom Thibault Phone: 1-401-489-1957  
Email: [Deepspaceviewer@aol.com](mailto:Deepspaceviewer@aol.com)

The start time for this program will be 7:00 pm. If you need instruction on how to use a planisphere you can arrive at 6:30 pm for training. Please indicate this to us when you pre-register.

We are also planning to hold a Members' only Observing Night that evening as well. The evening will be closed to the public and all our telescopes will be open for our members viewing pleasure. Uranus and Neptune will be well placed for observing, so if you have never seen these two outer solar system planets, or it has been some time since you've observed them, come out and join your fellow Skyscrapers. We are planning to begin viewing at 8:00 PM.

My final note is a reminder to all: 2011/2012 membership dues were payable beginning in April. If you haven't remitted your dues please do so at your earliest convenience to continue your support of Skyscrapers. Dues can be mailed to Skyscrapers Inc., 47 Peepoad Road, North Scituate, RI. 02857, Attn: Jim Crawford, or feel free to see Jim personally during any of our functions he is in attendance.

Clear Skies



The Skyscraper is published monthly by Skyscrapers, Inc. Meetings are usually held on the first Friday of the month. Public observing is usually held every Saturday night at Seagrave Memorial Observatory, weather permitting.

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### Directions

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

### Submissions

Submissions to The Skyscraper are always welcome. Please submit items for the newsletter no later than **October 21** to Jim Hendrickson, 1 Sunflower Circle, North Providence, RI 02911 or e-mail to [jim@distantgalaxy.com](mailto:jim@distantgalaxy.com).

### E-mail subscriptions

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# The Constellations in October

Francine Jackson

Once again, the sign of the new season is beginning to make its way higher and higher in the sky. As October begins, the Great Square, symbol of fall, is getting easier to find in the southeast. As it rises, so does the rest of the constellation that the Great Square is a part of, Pegasus, the Flying Horse. Beginning at the Square, the star at the upper right is the end of his legs; the star at the lower right is the base of his neck. Follow it down, then crook upwards to his face. Legend has Pegasus as capable of flight, but his wings were so large there was no room for them in the sky, so they were cut off. Finally, notice the orientation of Pegasus - he's upside down, but still rather easy to identify.

Pegasus was involved in the rescue of the beautiful princess, Andromeda, the daughter of Cassiopeia and Cepheus. She was chained to the rocks in anticipation of being eaten by some type of sea monster. Exactly what the monster was is uncertain - some have it as a whale, as the large constellation Cetus, the Whale, is below Pegasus; others believe it might be Draco, the Dragon, but a fire-

breathing dragon rising out of the waters is kind of hard to fathom. The movie, "Clash of the Titans," based on this legend, had a Kracken as the hungry beast. Whatever it was, it was waiting for Andromeda to be his appetizer.

Andromeda can be easily recognized, as her shape is her monogram, a long, slender letter "A," found by beginning the top of the A at the upper left of the Great Square. From that star, follow the line of stars away; then, above each of those stars is another line. At the second star of each line, draw a line between them. You've made the A.

If you follow the cross of the A up one more distance, you might be able to see a sight fuzzy blob. That blob is the farthest object visible to the naked eye, the Andromeda Galaxy, M31. It has been determined to be about 2.5 to 3 million light years away. Also, this was the first one recognized as a separate galaxy, as opposed to a part of our own Milky Way. The discovery of this object began a search for other similar objects. We now know M31 is one of over 400 billion galaxies in our universe, and counting.

As Andromeda was a damsel in distress, she of course needed a Prince Charming, and he is located right next door. Continue to the left, or east of Andromeda, and you will see the upside-down crooked "Y" shape of Perseus. In order to save the princess, Perseus had to kill the horrible Gorgon the Medusa, a creature so awful looking her mere glance would turn anyone into stone.

Perseus had to kill this monster without looking at her. Luckily, he was gifted by the gods with a shield whereby he could capture her position, then, under a cloak of invisibility he was able to chop off her head and place it in a bag. He then jumped on Pegasus and flew to the water's edge, arriving just as the sea monster - whatever it was - came from under the water. At that moment, the monster heard his name called, and, looking up, saw a man reaching into a bag, then pulling out the head of the Medusa. Monster immediately turned into stone and sank to the bottom of the sea. Perseus then alit onto the water's edge, unshackled the lovely Andromeda, then the two jumped onto Pegasus's back, and they lived happily ever after.

At the end of Perseus's arm, just about where his hand is, is a star that our ancestors were actually afraid of, because it did what no other star they could see did: It changed brightness. All other stars were always the same, every time they were visible. Today we know that this star is one of two that orbit each other, one much dimmer than the other. As they revolve, the differing brightnesses of the two stars changes their appearance, from our perspective. Every three days, this star's magnitude undergoes a change of about 1.5. Our ancestors were so afraid of this star that they named it Algol, the Solitary, or Ghoul, star. Because of its position, this was thought to represent the head of the Medusa. In other words, you might not want to look too long at this star.

## October Meteor Showers

Dave Huestis

When is the last time you remember observing a decent display of shooting stars? Either the weather or a bright Moon has conspired to prevent us from indulging in this simple and inexpensive aspect of amateur astronomy. Perhaps you took advantage of the dark skies seen around Southern New England during the power outages caused by Tropical Storm Irene? On the Monday night (29th) following the storm, I observed about six meteors per hour before midnight. These meteors were not associated with any specific shower peak, though I did count a few Perseids among them.

Hopefully others who had an oppor-

tunity to look up at the night sky noticed the beauty of the heavens once all the lights had been extinguished. Maybe then they will be encouraged to turn off some outdoor lighting to allow starlight to awaken a new generation of young stargazers.

October provides two observing windows to observe more than a handful of shooting stars blazing across the night sky. First up is the Draconid meteor shower on the night of October 8-9. The Draconids are normally a minor shower, with ten or less yellowish meteors per hour at peak. These particles are fairly slow moving, hitting our atmosphere at only 12.5 miles per second.

However, one Canadian astronomer has predicted that the Earth might pass through a narrow but dense part of the meteor stream. Why? The Draconids are particles that were stripped off short-period (6.6 year orbit) comet 21P/Giacobini-Zinner. The comet last traveled through the inner solar system in July, 2005, and will next do so in February, 2012.

In the past, there has been a dramatic increase in the meteor shower rate a year before the comet's return. Numbers as high as 1,000 have been suggested from a dark sky location. More realistically that number could be 200 or so. Unfortunately the peak of activity is predicted to occur during daylight hours for us in the United States on the 8th. And since the peak will be short lived, we may only experience a little enhanced activity once darkness falls. Events like this scenario are difficult to forecast, but anything is possible.

So despite a Waxing Gibbous Moon, I'd highly recommend giving the Draconids an hour or two of your free time. The radiant point in the head of Draco will be high in the northern sky during early evening, so you don't have to wait until after midnight. (Also, the Moon will be in the opposite side of the sky.) Face north and you'll see Ursa Major (Big Bear), and the Big Dipper asterism. Draco stretches between Ursa Major and Polaris, the pole star, which is the end star in Ursa Minor (Little Bear), the Little Dipper asterism handle. Draco descends towards the northern horizon to the left of Polaris as the night progresses. It would be best to scan this entire region of sky for Draconids. By morning twilight, Draco's head will be sitting due north about 20 degrees above the horizon.

The second meteor shower of the month peaks on the night of October 21-22, with the best activity between midnight and dawn's early light. This major shooting

star display is called the Orionids, for the meteors appear to radiate out of the sky just above Orion's head and not far from his bright red super giant star Betelgeuse, which marks his right shoulder. These remnants of Halley's Comet intercept the Earth's orbit nearly head-on at 41.6 miles per second, so they quickly blaze across the sky.

Orion can easily be found. At 3:30 a.m. this giant of a constellation will be due south of your location and about halfway up above the horizon. A thin Waning Crescent Moon will be towards your east and will not affect observing conditions. Therefore, one could expect the typical hourly rate to peak at around 20 or so yellow and green meteors per hour. The Orionids are also noted for producing fireballs that create persistent dust trains high in the atmosphere.

While waiting for "burning rocks" to fall from the sky, you will certainly notice the brightest star in the sky, Sirius, to the lower left and east of Orion. However, there will

be an even brighter object noticeable that morning—Jupiter, to the upper right and west of Orion. Now rising before 7:00 p.m., Jupiter is observable at a more decent hour during the early evening. (I will provide a brief Jupiter observing guide in a future column.)

If you wish to observe astronomical bodies like the planets, which are quite a bit more distant than meteors, the local Rhode Island observatories are open on a regular schedule for you to enjoy the view of the heavens through some fine telescopes. Seagrave Memorial Observatory in North Scituate is open to the public every clear Saturday night. Also, Ladd Observatory in Providence is open every clear Tuesday night. Frosty Drew Observatory in Charlestown is open every clear Friday night year round. Be sure to check all the websites for the public night schedules and opening times before visiting these facilities.

Keep your eyes to the skies.

## Glenn Chaple's Sky Object of the Month

# Alberio β Cygni

October is a colorful month, with autumn foliage at its peak here in New England. There's a splash of color in the northern sky as well, and it's epitomized by the beautiful double star beta (?) Cygni, better known as Alberio.

This stellar showpiece combines a magnitude 3.3 star of spectral class K8 with a 5.5 mag B9-type star. The differences in spectral class yield contrasting colors or yellow and blue, more poetically described as "topaz

and sapphire." A generous 34 arc-second separation makes Albireo an easy target for small-aperture telescopes. In fact, the colors seem more intense in a 4-inch telescope than in a 10-inch. Albireo is a "must" target for autumn star parties, and is sure to surprise and delight the viewer who assumes all stars are white.

Albireo was first observed by Flamsteed in 1681. In 1976, the spectroscope revealed that the brighter component (Albireo A) is an extremely close binary pair. The companion is similar to Albireo B, and lies a mere 0.4 arc-seconds away – an impossible split for all but the largest optical telescopes. On his "Stars" website <http://stars.astro.illinois.edu/sow/sowlist.html>, Jim Kaler notes, 'From Albireo B, Albireo A would appear as brilliant orbiting orange and blue points about half a degree apart, the K giant shining with the light of 35 full Moons, the close class

B companion at about half of that". For an interesting "live" view of Albireo, check out this YouTube video clip <http://www.youtube.com/watch?v=YkTHKR7UBKw>.

There has been some debate as to whether Albireo A and B form a true binary system or are merely optically aligned. At a distance of over 385 light years, the two physically separated by 60 times the diameter of our solar system. Recent measures show that they are, indeed, traveling together and must have an orbital period of many thousands of years.

Albireo is the most-observed double star in the northern sky, but is it the most beautiful? Next month, we look at a serious challenger. Can you guess its identity?

Your comments on this column are welcome. E-mail me at [gchaple@hotmail.com](mailto:gchaple@hotmail.com)

Phases  
of the  
Moon



3



11



19



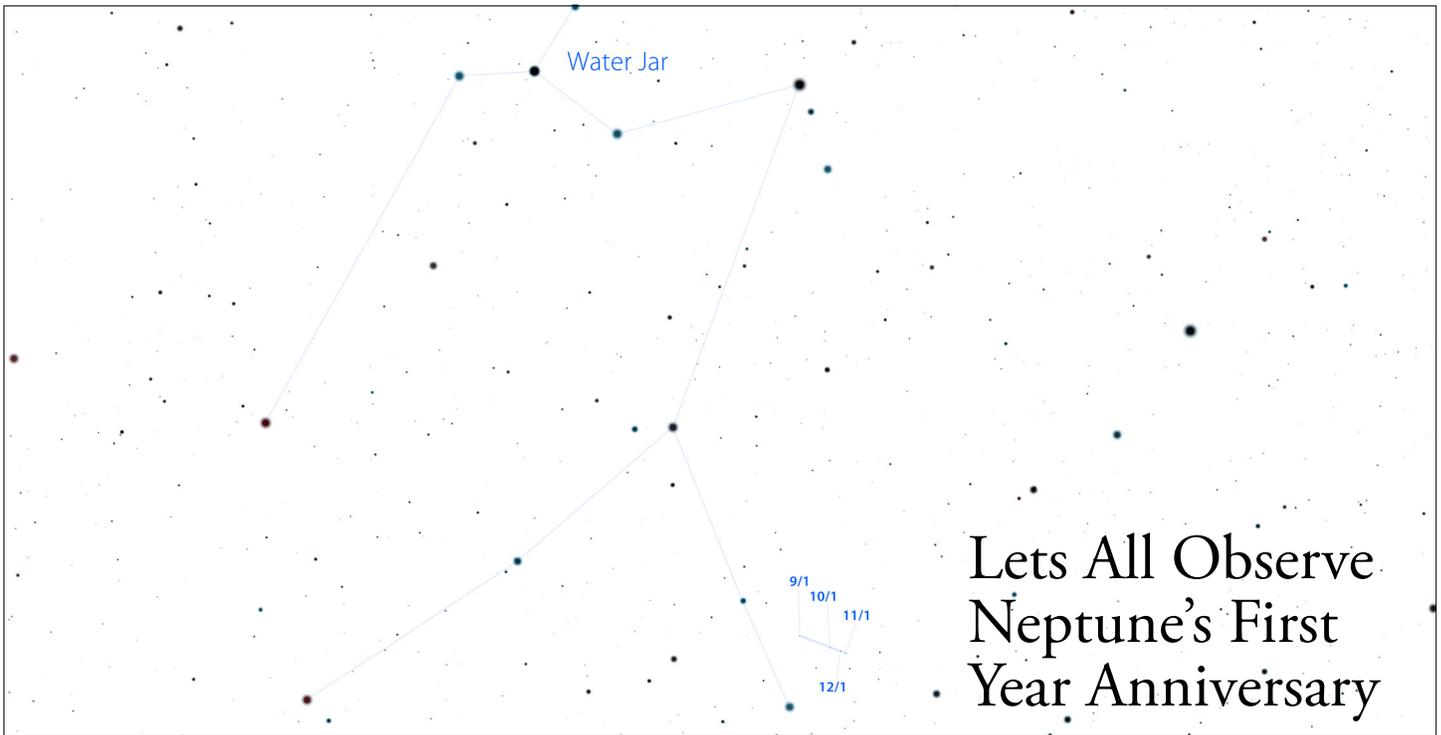
26

**Other notable events:** Saturn is in conjunction with the Sun on the 13th. Jupiter is at opposition in the 28th. is at greatest western elongation (18°) on the 2nd.

Seagrave Memorial  
Observatory is  
open to the public

weather permitting

**Saturdays: 8:00-10:00 pm**



## Lets All Observe Neptune's First Year Anniversary

September 23, 2011 marks the 165<sup>th</sup> anniversary of the discovery of Neptune by Johann Galle of the Berlin Observatory based on calculations made by LaVerrier in France. The discovery took place in 1846. Because it takes Neptune 165 years to orbit the sun, this year marks the first full “year” or trip around the sun since Neptune’s discovery.

The Trustees and Observatory Committee are inviting every Skyscrapers member to commemorate this event with a special observing invitation. Every Skyscraper member is challenged to observe both Uranus and Neptune over the next few months. Why both? Well, remember that it was because of perturbations in Uranus’ orbit that led LaVerrier and Adams in England to suggest that Neptune might exist. In addition the planets are quite close to each other in the sky. Uranus, at magnitude 5.8, is located in Pisces. Two hours in R.A. to the West is Neptune, at magnitude 7.9. It is located in Aquarius. If you have been faithfully reading “The Skyscraper” you may remember Jim placed an ephemeris of each planet in the September issue.

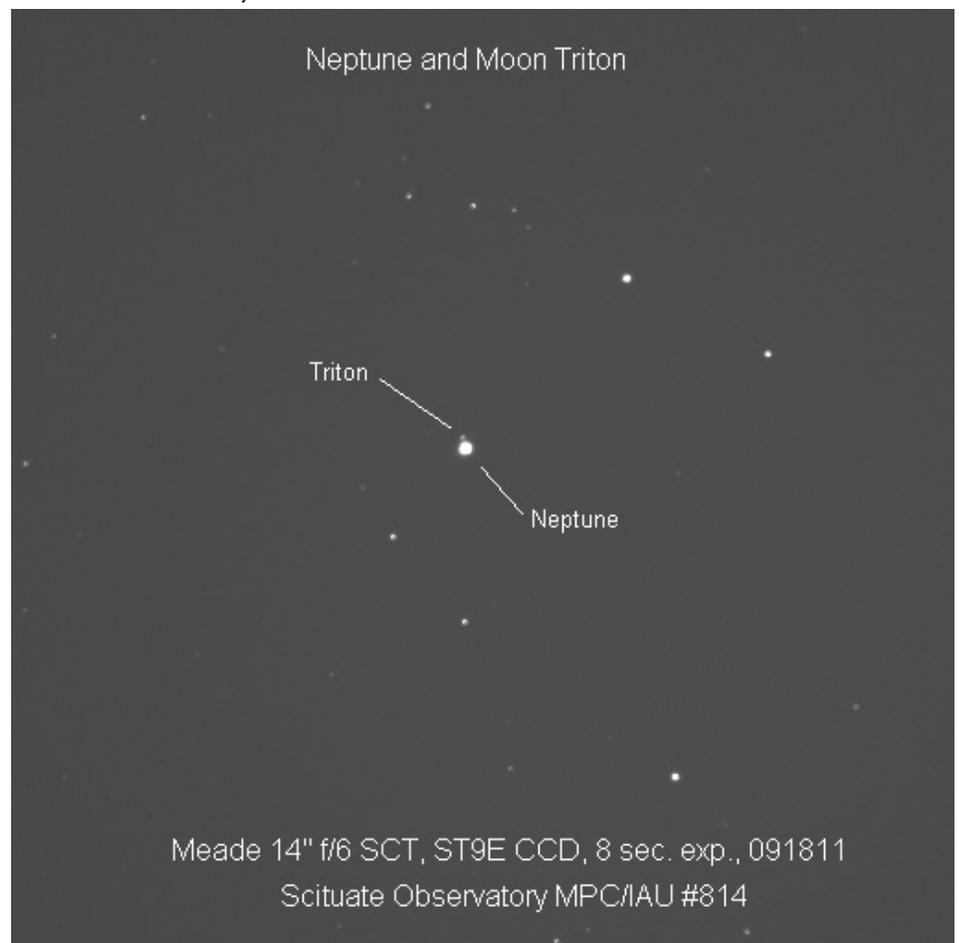
Everyone is not expected to find the planets on their own. You are invited to observe at Seagrave, Ladd or Frosty Drew observatories with the help of someone finding them for you. Or you can observe with your own scope from your favorite observing site.

The trustees are placing a poster on the wall in the Clark anteroom. Fill it out once

you have completed your observations. You do not need to see both planets on the same night. Just provide the date, time of each observation along with the size of instrument and location, along with any comments you would like to make. If you cannot make it to

Seagrave please send your observation info to Steve Siok by e-mail. [ssiok@cox.net](mailto:ssiok@cox.net)

Let’s all get out in the clear Fall weather and make this a successful observing project for all Skyscrapers.





# Ordinary turns into the Extraordinary

Tom Thibault

Yet another business trip! This time I needed to take a quick jaunt west to Phoenix, AZ. I was to test a design concept at one location and visit a number of other stores while in the area. Here was the plan: fly down Wednesday afternoon, get car and into hotel by 7:00, eat, hook up to the internet, and call it a day. Work all next day and catch a flight back real early the next morning. Not much time for the ordinary to turn into the extraordinary—at least that's what I thought.

The flight out and the first day went without a hitch. My window seat provided some great views as the Great Lakes went by and we crossed the Ohio and Mississippi Rivers. Large areas of flooded landscape could still be seen on each side of the rivers' banks. The ground below then turned to a multitude of circular patterns, circles, primarily full, but many others in partial stages. They ranged from  $\frac{1}{4}$  -  $\frac{3}{4}$  filled circles with one  $\frac{7}{8}$  complete and noticeably standing out like Pac Man amongst the rest. The final approach brought us over the arid countryside while the pilot flew between the rising thunderheads as we descended. It was a very nice flight and I ended the day with a good meal, a tall cool beverage, and a comfortable bed.

The next morning I was up early. I brewed a cup of coffee and sat out on the ground floor patio of my room. I was sipping my

wake-up juice, taking in the scenery and watching the wildlife gathering. Jack Rabbits and some type of desert Quail were rummaging about the sage brush. I even caught sight of a lone Hummingbird looking for nectar from the flowered plants. I lifted my cup for another sip and movement in the brush caught my eye. The rabbits and quail scattered in all directions. There, not more



than 30 feet from me was Wiley Coyote. I grabbed my camera and snapped a couple of pictures. To my dismay he stared at me calmly, then turned and trotted away. It appeared that Wiley missed out on breakfast that morning.

The rest of the day was filled with store visits, some stunning scenery, and incredible heat. The outside temps had reached 118 degrees by the end of the day. (Travel tip—avoid Phoenix in August.) Ended the day back at the hotel and yet another cold beverage. Later, as I walked to diner, I noticed the wind had begun to pick up

noticeably and the southern horizon had become obscured. The sky had acquired an adobe glow and the palm trees swayed and strained to the wind. The air's grittiness could be felt as it gusted...no outside table tonight. I had my meal inside and watched the reports of the Pombo (sandstorm) on the local news. The Pombo was followed by a lengthy electrical storm with continual flashes of heat lightning. It was quite the show, but time to call it a night. The 4:00AM wake-up call and a mad rush to the airport was on the agenda for tomorrow.

I made it to the airport and was looking forward to getting home. I was to meet my wife Lisa, her brother and a friend for supper that evening. I had enjoyed my brief visit and nature's show, but was happy to be making my way back home.

Now, as interesting as the trip had been so far, things were to take an astronomical twist. As I was seated at the gate, I noticed a pair of gentlemen arrive totting a grey locked container. The container was an approximately 2 foot square fiberglass case with a NASA logo sticker on it. I could hear bits and pieces of their conversation, which appeared to be related to testing and adjustments made to some equipment. When I boarded the plane I happened to be seated in front of the gentlemen and the case. Apparently, whatever was in the case warranted its own seat. Everyone got seated and



we taxied to the runway. We lifted off and as we rose, Phoenix could be seen nestled in the desert valley flanked by the hills and mountains. There appeared to be hazy patches of sky with defined edges and what appeared to be the remnants or beginnings of another Pombo. Well, that was farewell to Phoenix. Rhode Island, I'm on my way.

Being as inquisitive as I am, I couldn't resist inquiring of my fellow passengers what was in the mysterious case. The two gentlemen turned out to be David J. Lassiter and Norm Lee of NASA, both currently working on the GPM (Global Precipitation Measurement) Mission. We chatted on and off throughout the flight to BWI (Baltimore/Washington International). The craft will assist in the gathering of pre-

cipitation measurement around the globe to document and analyze trends and patterns. It appears the two were transporting one of the S-Band transponders to be used in the core spacecraft. The mission itself is a joint US/Japan venture with a launch date currently scheduled for December of 2013 from Tanegashima Space Center, Japan.

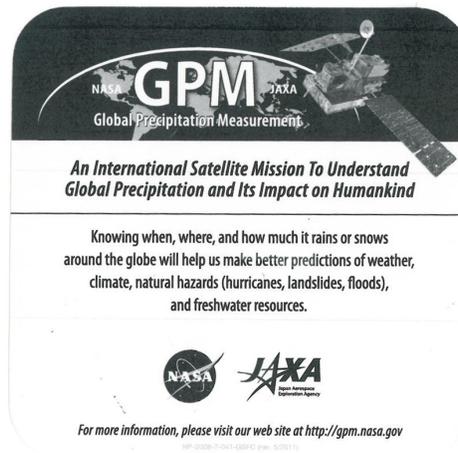
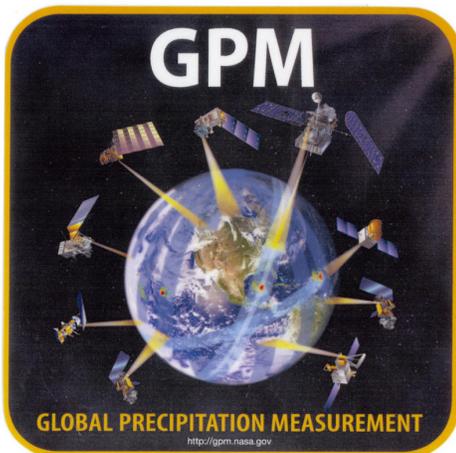
The spacecraft is currently under construction in a 100,000 clean room at the Goddard Flight Center in Greenbelt, MD. David noted "Once the transponder is integrated, next week or the week after depending on completion of current work, it will become the communication link used by the control center, same as on orbit. This will continue for the next two years leading up to flight". David and Norm had picked up

the component from a manufacturer facility in Phoenix. Due to some less than favorable experiences with commercial shipping David and Norm were sent to insure its safe arrival. It appeared nothing was too good for the S-Band. It was provided the window seat and became quite the celebrity during the flight.

I was not the only one to take notice of the square little fellow in gray, but one of our attractive flight attendants seemed quite interested in the fellow. She also inquired on his status and background, which David and Norm graciously conveyed. I chatted with David on the mission a bit and also spoke with Norm on one of his past projects at Palomar. It seems Norm had worked at Palomar on a project associated with low power lasers and had received phenomenal access at the site. Norm admitted his astronomical pursuits are not behind the eyepiece, but he was in awe of the facility.

David and Norm were great flight companions and very gracious for taking the time to give me the scoop on the GPM Mission. David provided the following Web Link, <http://pmm.nasa.gov/> which also covers its predecessor mission (TRMM) as well. David noted, "GPM is a large spacecraft. You can get a sense of this from the video of the antenna deployment system (2 meters+) then compare that to the graphic of the fully deployed spacecraft with instruments and solar arrays".

So the ordinary can change without warning. What started out as an ordinary business trip changed into the extraordinary! Which meant participation in the flight test of a future space mission component, at least in my mind.





# Skyscrapers Jam at the Newport Folk Festival

Saturday, July 30, 2011

Tom Thibault

The stage was being set; the skies were clear and a beautiful shade of blue. It was early when our members Bob Forgiel, Bob and Betty Horton, Dave Huestis, Alex Bergmann, Jim Crawford, Gerry Dyck, and Tom Thibault entered Fort Adams State Park in Newport, Rhode Island. They had arrived upon the request of Prof. Donald Lubowich of Hofstra University. Donald developed and has been promoting the Astronomy and Music Program for a number of years. Donald contacted Skyscrapers last winter asking if we would be interested in participating with his program this summer. Skyscrapers has always promoted Public Outreach and gladly accepted this opportu-

nity.

Fort Adams is a magnificently preserved military fort that once guarded the entry into Narragansett Bay. Fort Adams has hosted both the Newport Folk and Jazz Festivals for many years. The fort is an ideal setting for events—its location at the southern point of entry to Newport Harbor provides fantastic views of the ocean and all the sailing vessels entering and exiting. The large stone walls with arched entries and their cobblestone roads are picturesque. The main entry displayed a number of antique cannons on the grounds to the side of the large arched entry. The cobblestone and granite road showed its long history with grooves worn in the upward ramp below the arch as you entered. The grounds surrounding and within the fort are all well kept with green lawns and fields that lead to the water's edge on the exterior.

When we arrived early that Saturday morning, the fort was bustling with activity. Stages were being set-up, sound checks were occurring, and food and craft vendor were preparing for the day. We were to set-up within the walls in the large central grounds. Bob Forgiel had met with Donald and the festival organizers during the week and provided everyone with the when and where to gather. Everyone chipped in and we completed our display area rather quickly. Our pop-up tent and Jim Crawford's tent were set up as well as our tables and Skyscrapers

poster display. Bob Horton set up Brown University's Coronado SolarMax 90mm H-alpha solar scope and Sun Spotter. Bob Forgiel brought his 12" Meade with a white glass solar filter and 40mm PST and Gerry Dyck arrived with a 60mm H-alpha solar setup as well. Dave Huestis and Alex Bergmann had organized our tables with Skyscrapers Membership forms, web link handouts, and other items, so we were ready to rock, or would that be folk?

Donald Lubowich arrived with a van full of displays, literature and a special guest, no other than Galileo. Galileo (played by Mike Francis, formerly with the Boston Museum of Science) was dressed in his traditional garb, and had brought a replica of his telescope. Momma mia—what a guest. We all pitched in to help Donald set up some outstanding displays. They included a large 8' x 25' double sided banner with exquisite planetary and deep space images and content.

Accompanying Don was Dr. Peter Edmonds, outreach scientist for the Chandra X-ray Observatory at the Smithsonian Astrophysical Observatory at Harvard. Peter's role in this program involved providing and displaying images from the "From Earth to the Universe" exhibit. This consisted of 6 to 8 double sided poster size photo's on independent chrome display stands with Hubble photo and information regarding its imagery. Really nice stuff!

Well we were all set and ready to begin, the sun had risen high and the heat was beginning to bake. Luckily for us, there was a Del's Lemonade stand not far from us. I think that Skyscrapers themselves made enough purchases to fund a larger Del's cart for next year. The crowds began to arrive and bands began playing. We had one of the three stages at the event close to us so



we all were treated to some great music throughout the day. There was a steady flow of people visiting us and during the breaks between bands we were swarmed with individuals. They ranged from the very young children with their parents to seniors. Not only did it appear all age groups were represented, but those from all walks of life. All appeared interested in what we were offering and many engaged us in conversation. Those that appeared somewhat shy were quickly engaged by Jim Crawford. There were a number of times I would hear Jim say, "You want to see the sun, come take a look?" You all know Jim. He has his own special way to break the ice.

The views that day were fantastic. We had three groups of sun spots in view stretching across the face of the sun. These showed up great on Bob Forgiel's Meade and Brown's Sun Spotter. Brown's SolarMax 90mm H-alpha, Gerry Dyck's 60mm H-alpha, and Bob Forgiel's 40mm PST were providing marvelous views of the solar prominences. The prominences were plentiful and very active. Sol was being quite cooperative this day to the pleasure of all that visited and took in the view. I can't tell you how many times I heard people expressing their amazement and gratitude for the opportunity to view our sun close up. I'm sure many of them will never forget this experience and it may even have provided some individuals an incentive to make astronomy a hobby of their own. What a pleasure it is to share these experiences to so many.

Thanks to everyone who participated. What a great job promoting Skyscrapers, astronomy, and public education. I would urge all to consider joining us in the future when these great opportunities arise. It provides a great feeling of satisfaction to share the wonders of the universe with others and possibly instill a new interest in them.

Below are some photo's and the thoughts, comments, and personal experiences of those attending that day:



**Dave Huestis:**

We really didn't know what to expect at the Newport folk Festival since the details were being handled by a third party. Though it was Stellafane weekend, several members did volunteer to bring their own solar filtered telescopes to help share this interesting aspect of observational astronomy with the public.

Though we had a captured crowd so to speak, the festival goers were to enjoy the bands performing on several stages, both inside and outside the fort. We were set up inside the fort walls.

It was a hot day .. a very, very hot day.

Every Skyscraper volunteer had their own way of engaging the public. Often the subject would turn to other topics in astronomy. Quite a few seemed interested enough to pick up a Skyscrapers brochure. Perhaps we will see a few of them at a future monthly meeting.

Skyscrapers' participation in the Folk Festival was a very worthwhile adventure. We introduced two to three hundred people to just one of the wonders of astronomy. Whether it is a small group of 15 scouts, 150 students, or 300 concert goers, Skyscrapers excels in public outreach. The Sun nearly drained all of us to the brink of dehydration and exhaustion. Regardless, after just a few short minutes of engagement, our visitors left with an increased knowledge of our life-giving star. And that's what makes it all worthwhile (that, plus the Dell's lemonade stand 60 feet away!)



**Jim Crawford:**

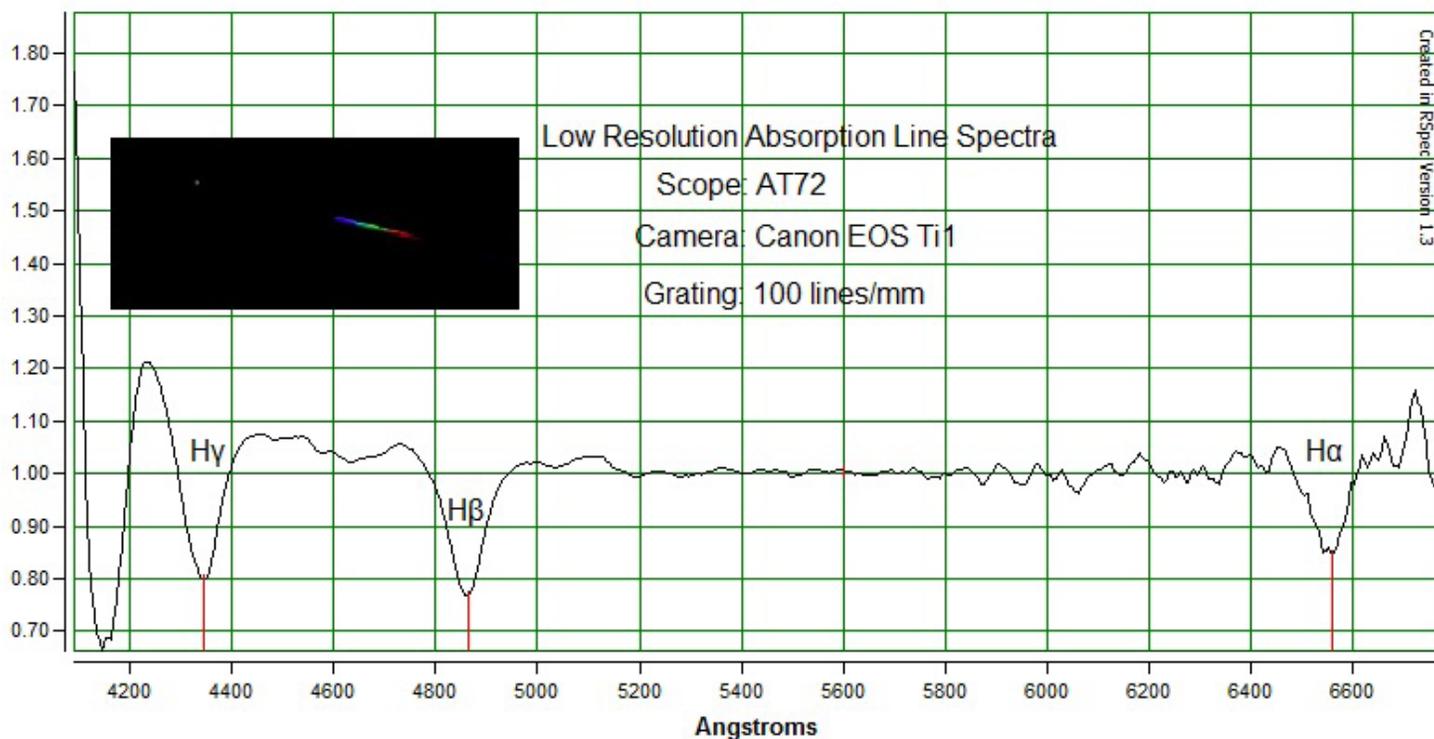
The best part of my participation was being with the more experienced members. They provided the visitors with an exciting explanation of our Sun's character. I'm an outgoing person and had a great time promoting our group and explaining the many things we do. The day was long, but really worth every hot moment.



**Gerry Dyck:**

I was pleased to be a small part of the astro event in Newport on Saturday. It was much less logistically stressful than I anticipated, due to the excellent help of Bob Forgiel. In retrospect I wish I had invested my three hours there a bit later in the day - after 11:30am, when the event seemed to really get going. Nevertheless, I enjoyed showing the sun to about 30 interested and appreciative people. It was good that the sun displayed easily-identifiable groups of spots for viewing by novices. All in all, it was a good time.

## Vega - Spectral Type A0v 09-10-2011



In the August issue of *Sky & Telescope*, there was an article about spectroscopy by amateurs. I bought a 'Star Analyzer' (a diffraction grating) and the software to go with it, RSPEC. I have been playing with it for the last month and have learned a few things. It has been a lot of fun. I have been interested in this for a very long time. For one thing, you don't need a big scope to low resolution spectroscopy. I could do a lot more if we only had more clear nights...  
Conrad Cardano

# September Reports

Ed Haskell, Secretary  
Jim Crawford, Treasurer

Business Meeting, Sept 9, 2011 8:30

Secretary Rpt: adopted with no changes from floor

Treasurer Rpt: was heard.

Trustee Rpt: Steve Siok

Work party in preparation Astro Assembly will meet on Sept 24th, 9:30 a.m. at Seagrave. The work includes interior cleaning of both the club house and the anti-room. Exterior grass cutting and trimming will also be done. Volunteers and requested and to contact Steve Siok via email or phone. Due to a scheduling problem Jim Crawford and his son will be at Seagrave on Sept 23rd at 9:30 a.m. to clean the club house and Anti-Room.

As a reminder, we are asking all members to make every attempt to view Uranus and Neptune from your home telescopes or during our regular open hours at Seagrave. We expect both planets can be found and seen with a large binos or a small scope. This is a marathon event and we have set up an observing log to record your observations. Contact Steve Siok for an electronic copy for home/remote use or enter the info at the posted log at Seagrave.

1st Vice President Rpt: Nothing to report

2nd Vice President Rpt: Kathy Siok  
Please send in your completed registration/banquet form with check early possible so we can plan accordingly.

Summarized the list of speakers and the subject of their presentations (Ed: she basically read from the list in my attachment)

Thanks to Bob Horton, Dave Huestis and Steve Siok and others for help to obtain a great list of speakers for Astro Assembly.

Reviewed plans for Friday banquet and Saturday's schedule of events. We are also looking for more volunteers to help with the

set up and especially the clean up afterwards. Please contact Kathy.

Donations of food are welcomed but request you let Kathy or Tom Thibault know what you're bringing.

Outreach Coordinator Rpt:

Bob Forgiel was not able to attend but sent word that the Women's Wilderness Group is tentatively scheduled for Friday, Oct 14, at 8:pm. We are asking for volunteers to help with the scopes and provide on-site assistance. Contact the Observatory Committee or Conrad Cardano by email.

Librarian Rpt: Amber attended meeting

Nothing to report

Historian Rpt: Huestis attended meeting

Nothing to report

Old Business: Nothing to report.

New Business: Nothing to report.

Good of the Organization:

Pat Landers asked for a moment of silence for the recent passing of a long time member, Mr. Sam Robbins. Skyscrapers extends its sympathy and condolences to Sam's family and friends.

New member Bob Simon recently visited the Amature telescope Makers of Boston website monthly meeting. Bob noted that the presenter was a PHD from California and thought we should research how the Boston group obtained their presenter from such a long distance. It's suggested that the speaker could provide talks from remote distances or coordinate between local groups to obtain speakers.

Bob Napier provided a brief slide show of his images taken via the Polymer Sky Survey Telescope. The images are of a Type 1A Super Nova at an 8-10 magnatude and is considered one of the brightest in thirty yrs.

Alex Bergemann presented a large group of 35mm slides of terrestrial images and Apollo 14. Due to the age of the slides Alex is working to improve on the color and resolution of each slide to donate a digital copy to the Seagrave Library.

Tom Thibault is working on the next session of Fall Constellation Night. He also suggested combining this with our regular observing night along with the Uranus and Neptune Observations.

Adjourned: 9:15pm

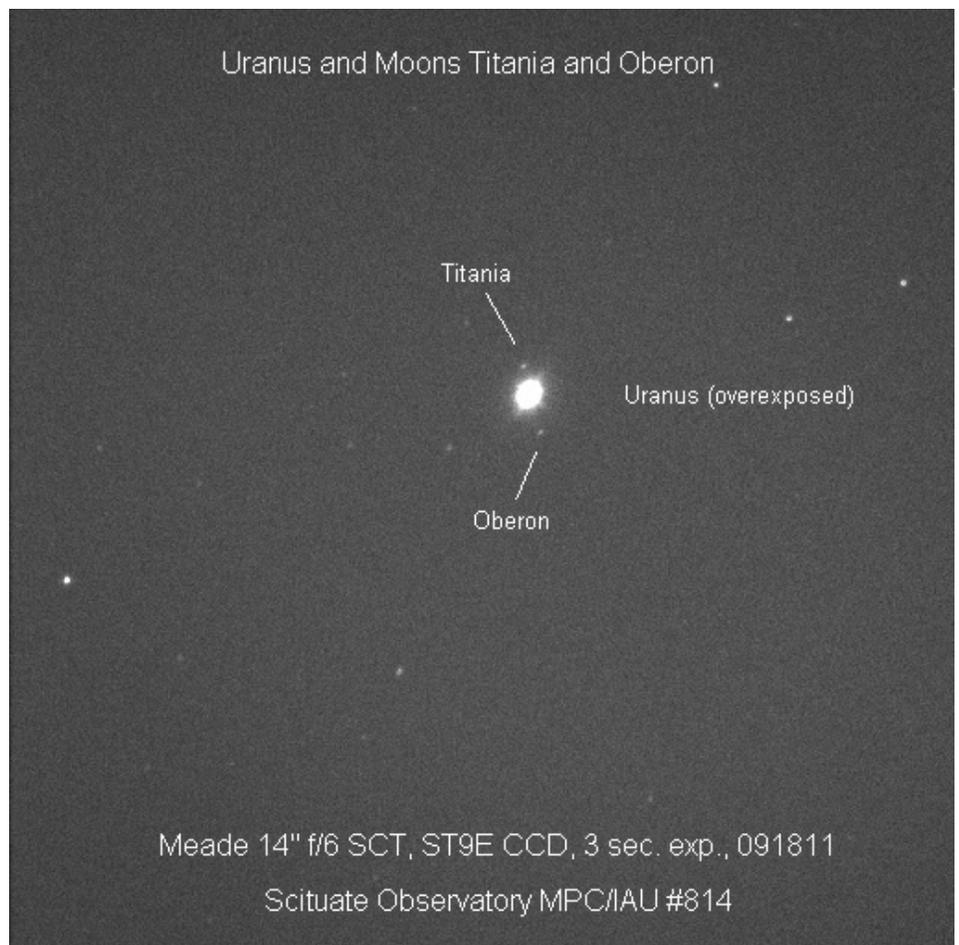
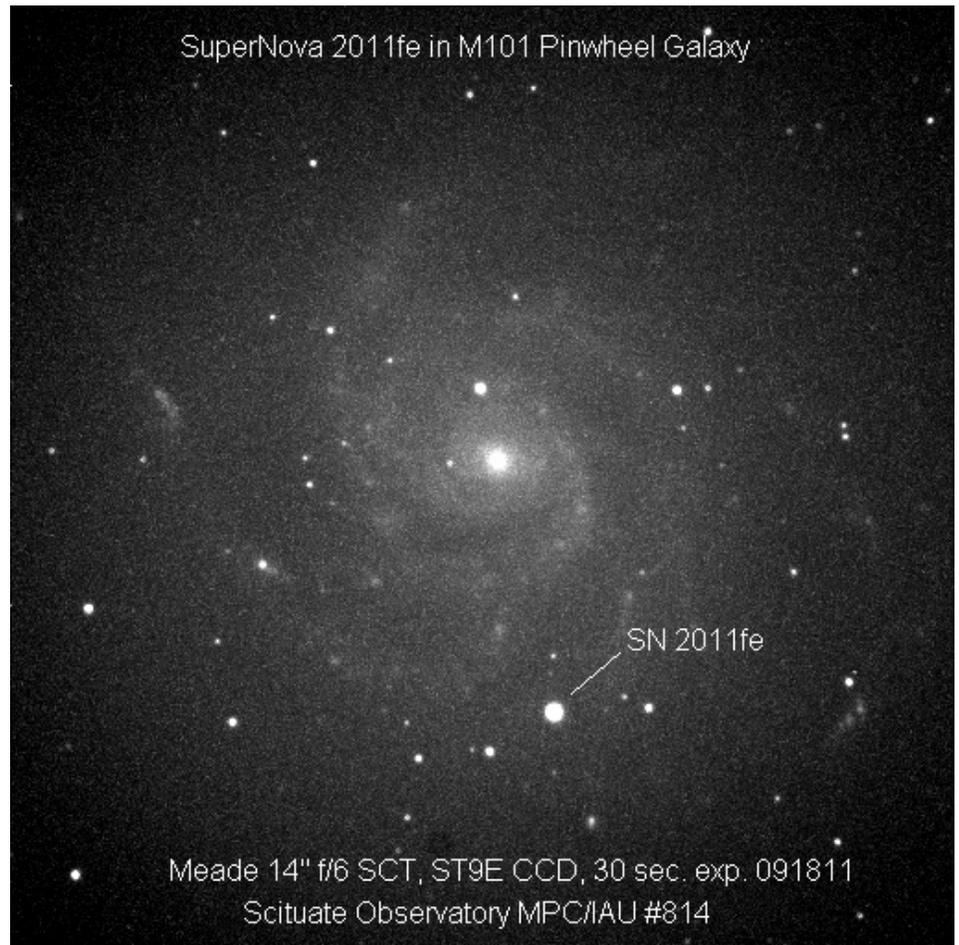
Respectfully submitted

Ed Haskell, Secretary



Budget as of 9/15/2011	2011-2012 Budget	Actual YTD	Difference
<b>INCOME</b>			
Astroincome	3,500.00	\$662.00	-\$2,838.00
Cookoutinc	500.00	\$404.00	-\$96.00
Donation, Other	300.00	\$520.00	220
Dues	3,075.00	\$2,090.00	-\$985.00
Interest Inc	125.00	\$27.09	-\$97.91
Starparty Donations	500.00	\$37.00	-\$463.00
<b>TOTAL INCOME</b>	<b>8,000.00</b>	<b>\$3,740.09</b>	<b>-\$4,259.91</b>
<b>EXPENSES</b>			
Astroexp	2,750.00	\$0.00	\$2,750.00
Cookoutexp	423.00	\$374.30	\$48.70
Corporation, State Fee	22.00	\$22.00	\$0.00
Domain Name	15.00	\$15.00	\$0.00
Donations	50.00	\$50.00	\$0.00
Electric	175.00	\$61.04	\$113.96
Insurance, Property	2,625.00	\$0.00	\$2,625.00
Postage and Delivery	225.00	\$87.82	\$137.18
Presidents Fund	150.00	\$25.00	\$125.00
Printing and Reproduction	140.00	\$14.45	\$125.55
Propane	375.00	\$80.25	\$294.75
Refreshment Expense	350.00	\$20.29	\$329.71
Trustee Exp	700.00	\$85.00	\$615.00
<b>TOTAL EXPENSES</b>	<b>8,000.00</b>	<b>\$835.15</b>	<b>\$7,164.85</b>
<b>Cash Assets</b>			
Citizens Checking	\$9,548.60		
Capitl One	\$11,496.98		
<b>Total</b>	<b>\$21,045.58</b>		

The Supernova 2011fe in the M101 galaxy was about 10th magnitude when the image was taken on Sept. 18, and easily seen in a 4-inch or larger telescope. This Type 1a SN has reached its peak brightness and will soon begin to fade. The image of Uranus with moons Titania and Oberon was taken on Sept. 18. The moons at about magnitudes 14 can be seen in a 10-inch or larger telescope in dark skies. The image of Neptune (page 7) with moon Triton, also taken on Sept. 18. The moon Triton, at about magnitude 13.5, might just be seen in an 8-inch or larger telescope in dark skies. It would be easy to spot in a 10-inch scope or larger. Photos by Bob Napier.



# Dark Clues to the Universe

Dr. Marc Rayman

Urban astronomers are always wishing for darker skies. But that complaint is due to light from Earth. What about the light coming from the night sky itself? When you think about it, why is the sky dark at all?

Of course, space appears dark at night because that is when our side of Earth faces away from the Sun. But what about all those other suns? Our own Milky Way galaxy contains over 200 billion stars, and the entire universe probably contains over 100 billion galaxies. You might suppose that that many stars would light up the night like daytime!

Until the 20th century, astronomers didn't think it was even possible to count all the stars in the universe. They thought the universe was infinite and unchanging.

Besides being very hard to imagine, the trouble with an infinite universe is that no matter where you look in the night sky, you should see a star. Stars should overlap each other in the sky like tree trunks in the middle of a very thick forest. But, if this were the case, the sky would be blazing with light. This problem greatly troubled astronomers and became known as "Olbers' Paradox" after

the 19th century astronomer Heinrich Olbers who wrote about it, although he was not the first to raise this astronomical mystery.

To try to explain the paradox, some 19th century scientists thought that dust clouds between the stars must be absorbing a lot of the starlight so it wouldn't shine through to us. But later scientists realized that the dust itself would absorb so much energy from the starlight that eventually it would glow as hot and bright as the stars themselves.

Astronomers now realize that the universe is not infinite. A finite universe—that is, a universe of limited size—even one with trillions of stars, just wouldn't have enough stars to light up all of space.

Although the idea of a finite universe explains why Earth's sky is dark at night, other factors work to make it even darker.

The universe is expanding. As a result, the



This Hubble Space Telescope image of Galaxy NGC 4414 was used to help calculate the expansion rate of the universe. The galaxy is about 60 million light-years away. Credit: NASA and The Hubble Heritage Team (STScI/AURA)

light that leaves a distant galaxy today will have much farther to travel to our eyes than the light that left it a million years ago or even one year ago. That means the amount of light energy reaching us from distant stars dwindles all the time. And the farther away the star, the less bright it will look to us.

Also, because space is expanding, the wavelengths of the light passing through it are expanding. Thus, the farther the light has traveled, the more red-shifted (and lower in energy) it becomes, perhaps red-shifting right out of the visible range. So, even darker skies prevail.

The universe, both finite in size and finite in age, is full of wonderful sights. See some bright, beautiful images of faraway galaxies against the blackness of space at the Space Place image galleries. Visit <http://spaceplace.nasa.gov/search/?q=gallery>.

*This article was provided by the Jet*

*Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.*

# 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.
- 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