



NEWSLETTER

Autumnal Equinox 2011

RITTENHOUSE ASTRONOMICAL SOCIETY

Founded 1888 WWW.RITTENHOUSEASTRONOMICALSOCIETY.ORG

OPEN TO PUBLIC AND STUDENTS

7:15 PM

The Franklin Institute

20th Street and Benjamin Franklin Parkway

Upcoming Meetings Include:

Date	Speaker	Topic
October 12	Dr. Mitch Struble University of Penn	Starpiles in Clusters of Galaxies
November 9	Dr. Hanno Rein Institute of Advanced Studies	Detecting ExoPlanets
December 14	Charles Zarcone Delaware Valley Astronomical Society	Sounds of the Universe

Very Special Event!

The Franklin Institute invites all of us to attend a very special event. Please see invitation on last page of our newsletter for details.



Fels Planetarium Dome Star from the Franklin Institute Science Museum, Philadelphia, PA

STS-135 Shuttle Commander Chris Ferguson seeks to inspire kids to study science as a way to give back to his hometown community which inspired him to accomplish great goals and become a space shuttle astronaut. Ferguson brought this small piece of the Franklin Institute to the space station and back. The 5-pointed 4-inch star from the Franklin Institute's Fels Planetarium dome will be put on public display for the future enjoyment of millions of kids of all ages.

September's Meeting

Ted Williams

Our opening meeting was quite a 'fun' time, which is a description that is not usually used to describe an astronomy lecture.

Our guest speaker, Laura Mesijet warmed immediately to Rittenhouse members and the visiting public on her return to the Franklin Institute. We could all tell she felt right at home taking her place behind the console of the Fels planetarium. Expecting some type of astronomy lecture, Laura surprised everyone as we all laughed and awed at an array of pictures and video clips from film and television showing how planetariums are depicted in modern culture. Laura's presentation was more akin to a video DJ spinning out some oldies, and some cultural hits! She themed the presentation by looking for similarities between the media pieces. Thanks Laura, it was great to have you back with us under the stars at the Fels planetarium. (Television and movie stars included!)

A demonstration relating the astronomy application "Astrolabe" to the night time sky started the meeting by Ted Williams. Alan Daroff took the night to the next level finding planets and variable stars. Dr. Friedman can always lighten the audience with the humorous perspective and the live music performed by Dan McCormick took the meeting to a whole new level of enjoyment. Laura topped everything off nicely.

The evening was totally clouded out, yet many followed David Walker to the rooftop observatory. He kept many in attendance as he talked about the history of the observatory and the telescope. Many members, guests and students stayed till we closed at 10:00 pm. The moon made a fuzzy appearance through the haze for the last half hour.

A really gratifying night!

President's Message

Dr. Milton Friedman

As the hurricanes and earthquakes become less frequent and the nights are cool with clear skies, the autumnal equinox seems to invite astronomers out at night to enjoy astronomy challenges such as spotting galaxies and dim stars far out in the universe. The crystal clear nighttime skies make us glue our eyes to the scopes. We're prepared to find difficult objects in autumn and winter.

Sure, we'd all like to brag about our views of the planets as Saturn heads eastward against the background stars as it moves farther west and dives toward the western horizon while Jupiter rises in the east with its pearl-like moons. Neptune, Uranus and the asteroid Vesta seek to drop images on our retinas. But nothing is more rewarding than observing the moon as its image changes from night to night. For some strange reason, amateur astronomers prefer to find the planets and deep sky challenges over views of the moon which is at a relatively close viewing distance of a quarter of a million miles from The Franklin Institute.

We can see more detail on the moon with 7X50 binoculars than Galileo could see with his telescope at 33 power because his lens was of such poor quality. The moon's diameter is one-fourth that of Earth and the moon's density is 1/81 of Earth's because it is made of less dense materials than our planet. To make a distance-scale comparison, if Earth was a ball 8 inches in diameter, the moon would be a ball just under 2 inches across. In our comparison, the two balls would be separated by an approximate distance of 20 feet and the sun would be over one and a half miles away.

Nearly 4 billion years ago, a chunk of Earth was knocked off when a probable planet struck Earth. That material went up and into orbit. Later it condensed and formed the moon. There is no significant magnetic field on the moon so don't bring a compass if you go there. The moon's crust is thinner on the near side, which always faces us, than the crust thickness on the far side. The thinner crust facing us is the reason why more maria formed on the near side.

The maria are the so called "seas" that erroneously were thought to contain oceans. The maria are dark, flat areas that resulted from lava flows 3.8 to 3.1 billion years ago. They never contained water but resembled Earth's oceans in appearance from here.

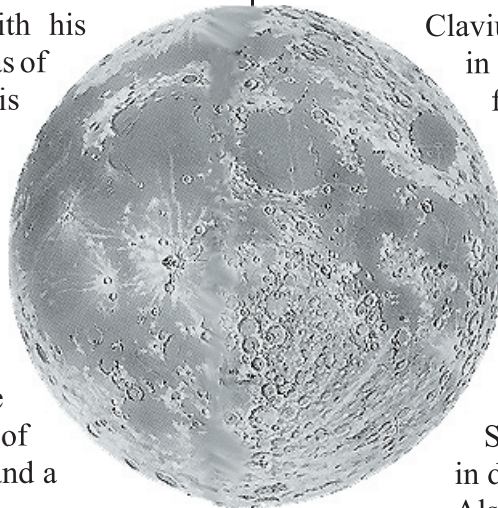
The highlands are the rugged and heavily cratered whitish areas. These formed 4.0 to 3.8 billion years ago, less than a billion years after the moon formed. The moon's surface is covered by dust known as regolith which resulted when meteor and asteroid impacts on the moon were ground into dust. Rills are cracks in the moon's floor. Irregular rills are thought to occur from lava flows while the straight rills are just faults in the moon's surface. Ridges on the moon are the opposite of rills. They are raised areas. Craters are caused by impacts of asteroids or meteors. These range in size from tiny up to Clavius at 138 miles across. Some have mountain peaks in the centers.

There are some strange facts about the moon. Some impact craters eject material that forms streamers going in all directions. The most obvious are the rays from crater Tycho which stream hundreds of miles over the moon's surface. Other spooky happenings are the transient lunar phenomena where gases have been reported ejecting out of the moon's surface.

The moon has more curvature because it is a sphere 1/4 the size of Earth. Even though the rim of the crater Clavius is 16,000 feet high, a person standing in the center of Clavius would see only a flat horizon and not be able to see the elevated rim because of the curvature of the moon. The largest moon crater on the near side, which is the side of the moon visible from Earth, is Bailly, a 184 mile diameter crater down at the southwest edge of the moon best seen near full moon. The largest crater on the moon is on the far side named South Pole-Aitken Basin. It is 1,550 miles in diameter and over 5 miles deep.

Also on the moon are lacus (lakes without water), sinuses (bays), palus (marsh), impact basins and of course, the 11 large maria, 12 inconspicuous maria and the Ocean Procellarum (Ocean of Storms once thought to be the equivalent of our Pacific Ocean). and many mountains.

The moon, when it is closest to Earth known as perigee is 221,000 miles away and when farthest from Earth at apogee is 253,000 miles distant. The average distance between the Earth and moons is 239,000 miles. From Earth, the moon is 14 percent bigger at perigee. Driving to the moon from here at 70 mph would take 135 days, the same distance a light beam takes 1.52 seconds. This travel time will get longer because the moon is moving away from Earth at 1.5 inches a year. At the equator of the moon, the daytime



temperature reaches 273 degrees Fahrenheit while at night it drops to -244 degrees Fahrenheit. If you got there and walked on the moon as the 12 Apollo astronauts did, your footprint on the lunar surface would remain unchanged for over 10 million years.

Standing on the moon and looking back at Earth we'd see our planet four times the size of the full moon, and Earth doesn't move across the sky as seen from the moon. A full day on the moon from one sunrise to another takes an average of 29 days. For two weeks the near side is in sunlight followed by two weeks of darkness.

If you just had your eyes refracted, squint and try to see a golf ball on the moon (which you can't). When Apollo 14 astronaut Alan Shepard was on the moon in 1971, he hit a golf ball which went nearly a half a mile!



Public Star Watch with Willingboro

Ted Williams

Rittenhouse Members at Large traveled to Batsto Historic Village this September and premiered our astronomical exhibit "RAS Observation Station." After attending many previous Willingboro events, it became evident that they had all bases covered as far as Telescopes, Interactive Demonstrations, and a Slide Show preview of the star watch for visitors. What more could be done? How could we be of any help?

One point that is difficult for people to understand is basic orientation. After pointing north, and pointing the North Star to our average visitor, we find that they can still be easily lost. Walking around total darkness is disorienting to some so we designed a Compass Rose that is dimly lighted that one can stand on. We provided some cots to lay on allowing much better views of the Zenith point with binoculars. We powered up some iPads and Mobile Phones with Astronomy Applications, passed around binoculars, and kept a few telescopes nearby for closer inspection.



The compass rose is a hit with young visitors who like standing or jumping around the lighted circle. Young observers were the first to climb onto the cots to look up. An iPad with Stellarium software as a guide, a Rittenhouse member with a green laser by your side, the observer gets to unlock the secrets of the sky.

Throw in a couple of Light Sabers to help people understand angle of altitude and angle of azimuth and we feel we have a rather attractive astronomical interactive exhibit (forgive the Museum terminology.) We finally set up a WiFi hotspot and pass around the password, and we find visitors downloading the applications as we are demonstrating how they are used.

Look for us on October 1 at Atsion Field. We will set up at the far end of the field with Willingboro Members. We encourage you to stop at all the various telescopes they have set up, and stroll on down the line for a good gaze at the night sky.



Green Lasers help to point out Pegasus in the sky. Credit Dan McCormick

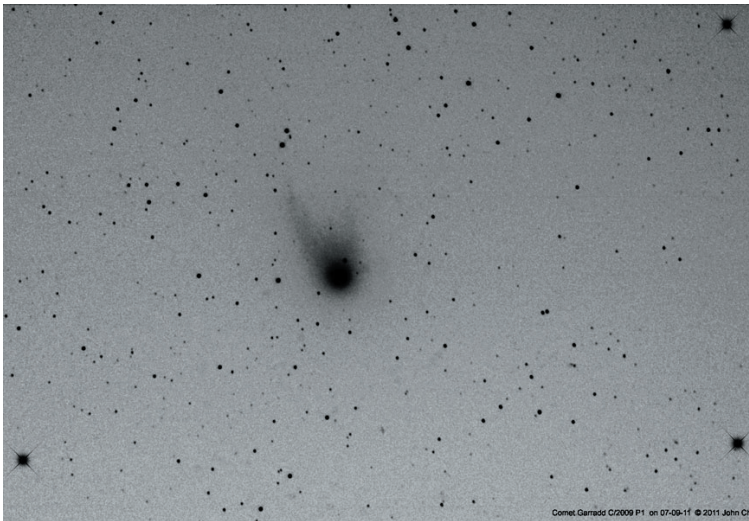
Gazer's Outlook

Summer's Other Triangle in Lyra

Joe Stieber

I stepped out at 3 am this morning (August 5th) to my front yard in Maple Shade, NJ, in an effort to spot comet C/2009 P1 (Garradd) with my 16x70 binoculars. I did notice a dim smudge in the general area where I expected it, and when I went back in and compared it to some reference stars in SkyTools, it matched. It's a good sign when a comet is visible from light polluted Maple Shade (it will be a lot easier at Batsto).

Anyway, while I was out, I also swung over to Lyra for a look at our current challenge, the small triangle anchored by bright Vega with double stars Epsilon Lyrae and Zeta Lyrae at the other two apices. It was a pretty grouping with Epsilon 1 & 2 easy to split in the binoculars (like a little pair of headlights since they are similar in brightness). However, I was surprised how easy it was to split Zeta, even handheld. It's one of those things I never paid much attention to before, but now that I did, the close pairing of uneven brightness was quite attractive.



Introducing Comet Garradd

Image Credit & Copyright: John Chumack (Galactic Images)

Explanation: Another large snowball is falling toward the Sun. Comet Garradd was discovered two years ago by Gordon Garradd in Australia, and is currently visible through a small telescope at visual magnitude nine. Officially designated C/2009 P1 (Garradd), the comet will likely continue to brighten, with recent projections placing it at peak magnitude six or seven in February 2012, just below naked eye visibility. Comet Garradd is already showing a short tail and is seen as the elongated fuzzy patch in the above negative image recorded earlier this month from Yellow Springs, Ohio, USA. Other comets are also currently falling into the inner Solar System and brightening as well, including C/2010 X1 (Elenin), expected to peak near magnitude six in early September, 45P/Honda-Mrkos-Pajdusakova expected to peak brighten past magnitude eight in mid-August, and C/2011 L4 (PANSTARRS) which may become visible to the unaided eye during the early months of 2013.

The Asteroid Vesta in Capricornus

Joe Stieber

More properly, it's 4 Vesta, a minor planet. The "4" indicates it was the fourth such object discovered (in 1807). However, the somewhat archaic term "asteriod" (meaning star like) remains an apt description since that's what it looks like in ground-based telescopes. Even the Hubble Space Telescope produces an image covering just a handful of pixels. Only now that the Dawn spacecraft has reached Vesta can we see a significant angular size and real surface features, such as craters. Check out NASA's Dawn web site (but ignore their pompous "protoplanet" description): <http://dawn.jpl.nasa.gov/>

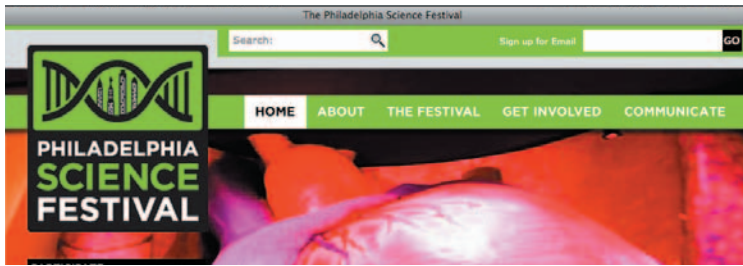
Anyway, I've been following Vesta since June 2, 2011, when it was near Iota Capricorni (the unmarked star close to the start of Vesta's track on the Sky & Telescope finder chart). I've seen it on a couple dozen nights since then with my binoculars (usually 10x42s, but if it's really hazy, 16x70s might be necessary from my suburban location in Maple Shade, NJ). It's current position (July 24th) is about 5 degrees from Iota Cap, but since it took a curving path to get there, it's covered about 7.5 degrees since then. With binoculars, the motion compared to nearby stars is readily evident after a couple of nights.

To find Vesta, wait until at least 11 pm (since it now rises about 9:20 pm), then start by looking for relatively bright Deneb Algedi and Nashira at the eastern end of Capricornus' stick figure (marked as Delta and Gamma respectively on the S&T finder chart). To confirm them in binoculars, look just above them for a row of three stars (42, 44 and 45 Cap) that is almost perpendicular to a line connecting Deneb Algedi and Nashira.

Once Deneb Algedi and Nashira are confirmed, move down along the bottom left of the Capricornus stick figure to the reference stars appropriate for the date (the shape of the stick figure has been described as a clown mouth or a bikini bottom). Vesta is around magnitude 6, so it's a fairly bright binocular object. By the beginning of August 2011, it will reach magnitude 5.7, so it will be a naked-eye object from a dark location on a moonless night -- a naked-eye sighting is one of my upcoming personal challenges!

If you want to see more of the background sky than the S&T chart shows, use a planetarium program. Stellarium is a good one, it's available for multiple platforms (Windows, Mac and Linux), and it's free! <http://stellarium.org/>

Finally, S&T has a brief article about spotting Vesta and another relatively bright asteroid, Ceres (the first one discovered, in 1801). There's a link to the original finder charts for both of them: <http://www.skyandtelescope.com/observing/objects/asteroids/12224918>



Learning from the Philadelphia Science Festival

Ted Williams

Our engagement with The Franklin Institute and the Philadelphia Science Festival has been an interesting exercise in what a volunteer organization is all about, in particular our society. Our plan was to gather together and represent ourselves at the Festival on the parkway with some exhibits of educational value. A conduit of communication was established on our Members Network through a group dedicated to PSF formed. Over the weeks, 12 members signed on. Some amazing suggestions and ideas were posted by our group. They ranged the full spectrum from “A Walk through Time,” “Scale Solar System Models,” “Educational Kiosks,” to the expected telescope displays. It was engaging to discuss on-line some of the suggestions which were all taken to Derrick Pitts at the Franklin Institute.

I think we surprised even Derrick with the scope of some of the projects, to which he gave full approval for any of them that we could implement which he felt would be a great addition to the Festival. He provided some tips and suggestions for the ideas at hand and we were ready to begin.

The Festival happened to fall at the same time as a major astronomy conference, so a double challenge of engaging members was upon us. As we waited for the legions of volunteers to implement those great ideas we quickly came to realize that there is no legion of RAS button wearing volunteers ready to build, create, and implement our dreams. It brings to bear a strong question, what is our volunteer organization all about?

It is most important for all to realize that any idea that was backed by a member willing to do the footwork, collect the supplies or do the work required of that idea was a success. Please know I do not consider the idea generating as time wasted, but time to get inspired. Those ideas gave many of us a purse of activities that we might use professionally, or can be considered for next year’s festival. Remember many of us are teachers, some are museum educators and we are always on the look for creative astronomy or

science promotions and projects. I thank the members that contributed on-line with their ideas and suggestions; it was enlightening for those of us who engaged in that phase of planning for the festival. Much thanks goes to those that provided the ‘people-power’ (listed below) to represent us on the parkway, and at the city wide science telescope night. The success of the festival ensures it’s return in 2012 as a viable citywide event.

People Power for the telescope night included: Ruth List, Denise Vacca, Dave Walker, Joe Stieber, Alan Daroff, Carol Ludolph, William Lee, Alfred Ryan, Mike Mountjoy, Ted Williams, and Derrick Pitts.

People Power for the festival on the parkway included: Fern Culhane, Dave Walker, Ruth List, Ted Williams, Mike Mountjoy, Winston Wright, Carol Ludolph and Chris Richardson.



Philadelphia Science Festival Fall Community Astronomy Night

Derrick Pitts

Recalling the success of the Philadelphia Science Festival Community Astronomy Night last April, I'm writing to ask if any of our members would be interested in participating in the PSF Fall CAN (Community Astronomy Night) by bringing a telescope for public observing to one of the locations listed below.

Like the spring CAN, this event is being held in conjunction with the Philadelphia Science Festival and was requested by the participating locations from the April event. They all were so grateful to be included and the viewers all had such a good time that they asked if it could be arranged again. We agreed to do it again next spring, but they implored us to organize an event for this fall, they didn't want to wait until spring. With such interest and enthusiasm from the communities, how could we say no? Actually, the PSF team saw the CAN as the most successful event of the whole festival in that it was one of the few that really achieved their true goal of community involvement in science activities. So PSF really wanted to do this again, we just didn't know the communities would be so enthusiastic about it! In fact, this event was seen as a hallmark of what really set the PSF apart from other science festivals. None of the other festivals across the country did community astronomy like we did community astronomy! We are deeply appreciative for your participation the the April event. It was your participation that made it the success it was.



The Fall date is **Thursday, Oct. 6th**, from 7 to 10 p.m. (sunset is at 6:35 that evening). To keep things simple, there's no rain date and we'll notify all by noon if the weather doesn't look good.

Here are the other observing locations for the event:

- **Folk Arts Cultural Treasures – 1023 Callowhill St. Center City**
- **Philadelphia Center for Arts and Technology – 2111 Eastburn Ave., East Mt. Airy**
- **University of the Sciences – Main Quad, 43rd and Woodland**
- **Fairhill Burial Ground - 2900 Germantown Ave., North Philadelphia**
- **Falomi Campground – 1717 Croskey St., near 23rd and Cecil B. Moore Ave.(not far from Temple University)**
- **David Rittenhouse Observatory - University of Pennsylvania, 33rd and Walnut Sts.**
- **Lynch Observatory --Drexel University, 31st and Chestnut Sts.**

The university observatories will staff their facilities (as expected), except University of the Sciences has no observatory. Their main quad will be the observing location for a telescope. Each of the other locations is associated with a community center/neighborhood association and is adjacent to that community center. We have a contact person and facilitator at each of the community center sites and can connect you directly to them.

The TFI Observatory volunteers and I are taking the Institute Celestrons out to various locations around the city that evening as well.

Don't think there will be t-shirts this time but we are making a flyer, I'm creating an observing activity handout, we'll promote on our website, the PSF website, on FB and Twitter, and on radio and TV as well.

I'd be grateful if you'd distribute this to your membership I ask them to me know if anyone is interested. I can be contacted via email or by phone. My contact information is: 215 448 1234(v) (OR) 215 448 1188(f)

Open House Report

Ted Williams

Our last meeting of the academic year was posted on our website as an Open House. When we have promoted the night as a “members night” in the past, it has resulted in many asking if the meeting is open to the general public or is the evening for members only? We have decided to call the meeting an “Open House” since it is really a time for members to present to all in attendance.

The June meeting night was an amazing success, with many members, guests and families of those presenting adding to our audience. Our organization has an amazing array of talented individuals and it was quite evident to those in attendance. Here is a synopsis of the information shared.

Alan Daroff	Sky Report Alan prepared us for some planet spotting for the upcoming weeks by showing some sights of the early morning sky.
Ted Williams	Weekly Challenges - Ted decided to give his time over to the many presenters to follow and worked in some business items during the transitions between speakers.
Dr. Milt Friedman	President’s address - Dr. Friedman filled us in on past officers Charles Leander Doolittle (shown below) and his son Eric Doolittle. They were the only Father and Son link found in our historic blue book.
Joe Stieber	Public Star Watches - Joe showed what the Public Star watches are like at Batsto, Atsion and Franklin Parker Preserve. Pictures of the facilities, grounds and telescope set ups were included.
Luke Brown	Right Ascension / Declination-Luke demonstrated the difference between Sidereal and Solar days proposing some amazing patterns and rotational numbers that may have surprised some, and amused others.
Mike Mountjoy	KML Google Layers/Astronomical Software Group - Mike demonstrated how to load KML layers from our Astronomical Software group which open Google and are Astronomically related.
Brian Paton	Hubble Review - Brian shared a project he has developed for the Mallon Planetarium in Eagleville PA. It was a review of the recent accomplishments of the Hubble Space Telescope and the Missions to repair, restore and improve it’s capabilities.
Drew Maser	Prepare for Venus Transit - Getting us prepared for the last Venus transit for quite some time to come. He showed some amazing viewing locations and a review of the previous transit.

Dr. Ken Kremer	On Site with Endeavour - Dr. Kremer brought members up to date with the current Endeavour mission that was just successfully completed. He also shared some recent mosaics from Mars, including one highlighted on APOD.
Shawn Rush	Fly me to the Moon - Well, Shaun flew us right past the moon out to some of the nearer Exoplanets. A grand view of our Milky Way, from inside and out was a treat for members that were along for the voyage!
Denise Vacca	Most Amazing Vehicle Ever Built - Denise shared a favorite video clip of the Lunar Rover that was built but may never be used. An amazing look at some amazing technology and some humor to close out the meeting.

Observatory:

Those who attended our observing session (who were able to tolerate the rooftop heat) were treated to a view of Saturn. About 10 stars were visible through the heated, humidity soaked skies, but spirits were high, and all enjoyed the view

From Dr. Friedman: I wish to thank all our presenters at the Rittenhouse Astronomical Society meeting held in the Franklin Institute on June 8, 2011. As you can see by the synopsis above, the audience was treated to many areas of astronomy related subjects. These included sky observing highlights, nighttime observing at dark sites in New Jersey, reference work in astronomy done by early members of our society, Hubble telescope repair missions, the 2012 Venus transit event, a planetarium trip through and beyond our galaxy, using astronomical software, latitude and longitude in the sky, close-up space shuttle photos taken at the Kennedy Space Center, and a new space rover.

The evening climaxed with a trip upstairs to the observatory. Again, thanks to an informative evening by our participating members.



Existing in Three Dimensions: The RAS World

Ted Williams

Our Society has had a long history and much time to develop and change over the years. Starting initially as a way for people to pool funds for the purchase of astronomical gear (telescopes in particular) was one of the driving forces that brought people with astronomical interests together. Over the years RAS became a forum of exchange for information between local college observatories that were eager to share what they were studying with the general public and each other. As colleges moved away from having their own observatory (world wide web access helps to provide that now-a-days), RAS focused on that same educational basis, sharing astronomical interest with members by providing astronomy talks and presentations from talented presenters in the astronomy and related physical sciences. Being a society that welcomes people at all levels of astronomical interest (enthusiast to professional) it might help those new to us how our group exists. It can be summed into three dimensions.

Dimension 1 – Public Education

Our public dimension is our great monthly meetings at The Franklin Institute. A change in direction pioneered by a previous president Eleanor Valdala, set our focus to become that of a general educational organization sharing astronomy happenings, and discoveries, while offering a place for anyone with astronomical interests to gather and learn together.

What we currently see is a return attendance of 30 members that attend most all meetings, another 30 semi-regular members attending many meetings, and as many as 60 more guests or visitors. When we host a big name speaker our attendance can swell to reach 300 as with Brother Guy Consolmagno or reach an extra 120 with Dr. Robert Nemiroff from Astronomy Picture of the Day. Astronaut/ Commander Christopher Ferguson gathered 150 in Franklin Hall on a return from a shuttle mission. Meetings usually include some star orientation talks or astronomy related lessons, usually conducted in the Fels Planetarium. We include astronomy headlines from our President, an update of what's up by the Vice President, and follow with a guest speaker, many of whom come from local universities, astronomy organizations, including professionals in scientific and astronomy related fields. Each year we try to create a large scale meeting/event with

internationally recognized speakers or astronomers. We end the meetings viewing planets or deep sky objects in the Bloom Observatory or when the weather blocks the view with a "Directed Mixer" where members engage with visitors and have designated topics they enjoy speaking about. All visitors and guests are encouraged to speak with anyone sharing their questions or comments.

Dimension 2 – Professional Development

Due to our association with The Franklin Institute, our society shares some commonalities with other astronomy societies associated with large museums and planetariums. The AAA at the American Museum of Natural History, and The AAAP at Princeton University come to mind. Due to the association with well know science museums, these organizations attract a larger number of members that are working in the field. By that, I mean those that are working professionals in Astronomy, and those immediately related to it through museums, education, and associated scientific fields. We offer members a way to bring their writings to the membership and general public through our Newsletter. Some of our professionals post their work in our newsletter as part of their professional growth experience. Please know the articles are all done voluntarily and are compiled from member submissions directly to the newsletter editor or on our Members Network web site.

We also attract those looking to network with others entering these fields. Our members are from a wide range of professions including doctors, lawyers, and teachers that share their interest and passion for astronomy while simultaneously gaining a greater understanding.

Dimension 3 – Cyber Existence

As we grow into the future, we should prepare to migrate our newsletter mailings, and our monthly star charts onto the world-wide-web. We have some members that are still not connected to the internet and for the time being our paper mailings meet their needs. There will come at time when the paper mailing will become cost prohibitive. If we wish our organization to continue into the future, we need to increase our attention and address a presence in "Cyberspace". That is where the future generations are talking, and converging. To engage with those on line, we activated a Facebook page, and also increased our usage of our members' network on a private networking site that is provided with membership in our organization. We started offering selected astronomy sights as a challenge for members to search out and share their view.



Members are welcome to engage as much or as little they desire with other members between meetings on the network. Please know we have members that have chosen not to engage on our network and are content to attend meetings when they can. One advantage that becomes clear to us is that we are a society that still provides its members with 'face time' through our monthly public meetings which we now support by an electronic presence on line. We may also consider in the future that we may be an on-line organization that provides it's members with the ability to meet in person. We are learning as we go with our new Facebook presence, and our Members Networking site and you are welcome to learn along with us.

As a member of RAS, you are welcome to get involved as you like participating in one of the dimensions, or all three, the choice is yours. We feel it is an exciting challenge to engage future generations with astronomy and are thrilled about the new and evolving technologies that help this to happen. We welcome those fellow members that are along for the ride (either in person, or in cyberspace.)



Atlantis unveiled for Shuttle Grand Finale as stormy weather passed over the launch pad. Credit: Ken Kremer

Ghostly Twilight Landing of Atlantis Closes NASA Space Shuttle Era

Dr. Ken Kremer

Barely discernible in the pre-dawn twilight and appearing as an eerie, ghost like figure, Space Shuttle Atlantis and her four person crew swiftly glided to a triumphant landing at the Kennedy Space Center to close out NASA's storied three decade long Space Shuttle Era. In the wink of an eye it was all over and the final shuttle chapter was written.

Atlantis touched down almost invisibly on Runway 15 at the Shuttle Landing Facility at 5:57 a.m. EDT on July 21



Atlantis thunders to life at Launch Pad 39 A at KSC on July 8. Credit: Ken Kremer

and rolled to a stop moments later to conclude the history making 13 day flight to the International Space Station and back. During the STS-135 mission Atlantis orbited the Earth 200 times and journeyed 5,284,862 miles.

STS-135 was the 135th and last shuttle mission. This was Atlantis 33rd flight and the 37th overall to the station. Atlantis was the last of NASA's three shuttle orbiters to be retired and all will be publicly displayed at museums.

Chris Ferguson led the all veteran STS-135 crew of space flyers and will be recorded in history as the final Space Shuttle Commander for the Grand Finale of the shuttle program. This was Ferguson's third shuttle flight and his second as Commander. Joining Ferguson was Pilot Doug Hurley and Mission Specialists Sandy Magnus and Rex Walheim.

I witnessed many key STS-135 processing events on the path to flight including the payload preparations, orbiter rolover from the Orbiter Processing Facility, Lift and Mate activities inside the VAB, the terminal countdown demonstration test (TCDT) crew training, shuttle stack rollout to the launch pad and an extremely rare post-rollout up close tour of the shuttle stack on top of the Mobile Launch Platform - including exquisite viewing from all over the launch pad gantry from top to bottom.

On June 28, NASA Shuttle managers announced a unanimous "GO" for liftoff and officially set July 8 as Atlantis launch date. They emphasized how absolutely crucial STS-135 is to the future well being and basic functioning of the \$100 Billion International Space Station (ISS) and for sustaining ISS operations for about one year into 2012.

Tucked inside Atlantis cargo bay was the Italian- built "Raffaello" logistics module - which functions as a 'moving van' in space. The primary goal was to deliver "Raffaello" to the million pound orbiting outpost during the 13 day flight.

Raffaello was packed to the gills with more than 9,400 pounds of critical spare parts, food, water, crew provisions, gear, equipment and science experiments that will keep the station stocked and the crew fed for a year. About one third of the cargo is food - much of it provided by Russia. The secondary nestled payload was the Robotic Refueling Mission (RRM) which will demonstrate tools and techniques to repair and refuel satellites already in orbit.

On July 4, blastoff was finally at hand and the final shuttle crew flew into the Space Coast launch site on a wave of T-38 training jets from in Houston, Texas and touched down at the shuttle landing strip. The countdown clock began ticking backwards on July 5 ahead of a gloomy weather forecast.

In the final hours before launch. The crew departed crew quarters, lingered long to wave goodbye to the cheering crowd of thousands of gathered NASA employees, officials and media and then sped off to Pad 39A in the Astrovan to be strapped into their waiting seats of eternal adventure. I'll never forget these stirring and exhilarating moments of Launch Day.

Space Shuttle Atlantis soared to space for one last history making time on July 8 at 11:29 a.m. EDT despite the dauntingly poor weather, low lying clouds and a last moment countdown glitch at T - 31 seconds that threatened to derail the launch in the closing seconds

But ultimately all coalesced and combined for an unpredictably tense shuttle drama that went down to the wire and put on a pulse pounding and spectacular sky show that we who were lucky to witness will remember forever.

About 750,000 hugely excited spectators jammed the Florida space coast beaches, roadways and hotels to witness a historic event that we will sadly never see again. That morning, no one expected to see a launch. Then, all of a sudden about 45 minutes before launch time the sky brightened and spirits rose. Miraculously, a small hole



Wheels Stop ! The Space Shuttle Era Ended Here – with Atlantis touchdown on Runway 15 for the Final Flight on July 21, 2011 at the Kennedy Space Center, Florida. Credit: Ken Kremer

appeared in the sky above the Kennedy Space Center and headed directly for the launch pad as if on cue.

Just 29 seconds later as the crescendo of blazing fire, brimstone and crackling thunder mounted, Atlantis disappeared into the cloud deck on a huge plume of smoke and ash.

All objectives were accomplished during the flight. Shortly after the landing I was one of the very small group of media allowed to visit Atlantis at the runway – this was the first time NASA allowed media at the runway. We then watched as the orbiter was towed back to the processing hanger for the final time – a sad and bittersweet moment.

Altogether Atlantis flew 33 missions, spent 307 days in space, orbited Earth 4,848 times and traveled 125,935,769 miles. Atlantis was the last of NASA three orbiters to be retired and closed out the Space Shuttle Era. Her future retirement home will be a short distance away at Kennedy Space Center Visitor Complex (KSCVC).

Wheels stop marked the dreaded end of American manned spaceflight from American soil for many years to come. No one can say with certainty how or when America will again launch humans to space. America is now fully dependent on the Russians to loft Americas to space and the ISS for the next three to five years at a minimum aboard Russian Soyuz capsules. However, with the recent failure of the Russian Progress cargo carrier there is no assured access to space from Russia either.

Stay tuned Read more about Juno, GRAIL, Curiosity, Rovers and Dawn next month.

Check all my STS-135 features and interview with Commander Chris Ferguson online at Universe Today starting here:

- [Love of Science Drives Last Shuttle Commander – Chris Ferguson Brings Science Museum to Orbit](#)
- [Last Towback of a Flight Worthy Space Shuttle – Atlantis Post Touchdown Photo Album](#)
- [Wheels Stop ! With Awesome Atlantis on the Shuttle Runway](#)
- [Shuttle Atlantis Soars to Space One Last time: Photo Album](#)

NASA's 135th and final shuttle mission takes flight on July 8 at 11:29 a.m. from the Kennedy Space Center in Florida bound for the ISS. Credit: Ken Kremer



Atlantis Final Blastoff on July 8. Stormy morning weather broke and Atlantis punched through a small hole in the sky which miraculously appeared. Credit: Ken Kremer



Atlantis was towed back from the Shuttle Landing Facility after touchdown. Credit: Ken Kremer



The final Space Shuttle Crew for STS 135. From left: Mission Specialist Rex Walheim and Sandy Magnus, Pilot Doug Hurley Shuttle Commander Chris Ferguson. Credit: Ken Kremer

Astronomy Outreach:

Dr. Ken Kremer

Please contact Ken for more info or science outreach presentations:

- **AAAP** talk on the Space Shuttle and the Future of NASA has been rescheduled to Nov 2011 and I'll have my personal postcards and frameable prints for sale.
- **Bucks-Mont Astronomical Association (BMAA):** Ottsville, PA, Oct 5, Wed, 8 PM, "7 Years of Mars Rovers" Website: <http://www.bma2.org/Sdv.html>
- **Amateur Astronomers Association of Princeton:** Princeton University, Princeton, NJ, Nov 8, 8 PM "Atlantis, the End of Americas Shuttle Program and What's Beyond for NASA". Website: <http://www.princetonastronomy.org/>
- **Washington Crossing State Park:** Titusville NJ, Nov 12, Sat, 1 PM. "7 Years of Mars Rovers (in 3-D)" Ken Kremer: Spaceflight magazine & Universe Today Email: kremerken@yahoo.com website: www.kenkremer.com <http://www.universetoday.com/author/ken-kremer/>

Rittenhouse Astronomical Society

P.O. box 283

Feasterville, PA 19053-0283



LANDING ATLANTIS— EXPLORING NEW FRONTIERS

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