



## President's Message

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**Note: Use bookmark panel in Adobe Reader.**

Welcome to the 2013-2014 observing season, I hope you all had a wonderful summer! Over the summer, your Executive Committee has accomplished a lot, and I am grateful for all the efforts of our members.

Our vice-president, Mary Ducca has booked all of our guest speakers for the upcoming 2013-2014 season and the brochure has been printed. (Pick up a copy at Sperry or download it from [www.asterism.org](http://www.asterism.org)). Jim Nordhausen, chair of the Technical and Telescope Services Committee, and his team have removed the 24" lens and sent it to be re-fitted in Georgia, re-aluminized in Florida, and (hopefully) returned to Sperry by the end of October. While the mirror is out for repair, he and his crew have undertaken a number of other repairs and technical improvements to the 24." While the cost of these renovations is steep, it is covered by funds available from an estate bequest that is restricted to improvement of the 24." Clif Ashcraft is working on a new desk for the 24"dome area. Aaron Zuckerman, the new chair of the Computer Services Committee, is ready to replace our old webpage with an updated and streamlined version. Many thanks also go to Bobby Marinov for his assistance in rendering a new site designed to mystify and astound. Our College Liaison Committee (Richard Greenstein, Joe Arcaro, Jim Nordhausen, Mary Ducca and Al Witzgall) have been engaged in discussions with Union County College regarding changes to AAI's permitted use of the Observatory, including the need to reduce our workshop footprint (to make room for UCC's new surveying equipment). Thanks (again) go out to Jim Nordhausen and his team for coordinating clean up and consolidation of the workshop. Over the summer, Joe Arcaro and Helder Jacinto have completed a long-overdue, by-law required audit of AAI and their report and recommendations have been circulated to the membership for review before consideration at the September 20 General Membership Meeting. The bottom line is that AAI is in good corporate shape, but there are some specific recommendations for improvement.

AAI is currently over two hundred members strong. In addition to the elected Trustees and Executive Committee, there are fifteen standing committees offering members a wealth of learning and leadership opportunities. The committees and chairs are listed on AAI's website, and any one of them would welcome the addition of your unique talents and energies.

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# GENERAL MEMBERSHIP MEETING      SEPTEMBER 20, 2013

**ROY SMITH THEATER - UCC CAMPUS**

**8:00 p.m.**



## High-Contrast Imaging and the Search for Exo- Earths

Dr. Robert Vanderbei,  
Princeton University

Over the last 20 years, astronomers have discovered many planets around other stars. But, most of them are not very Earth-like and virtually none of them have been imaged directly. Dr. Vanderbei will explain what is hard about finding and imaging Earth-like planets. Then, he will describe some of the approaches that are being considered to solve this challenging engineering problem.

**PLEASE JOIN US!!!**

### AAI OFFICERS FOR 2013-2014

President – Joseph A. Ascione  
Vice President – Mary Ducca  
Treasurer – Marcus Valdez  
Recording Secretary – Alan P. Witzgall  
Corresponding Sec'y – David Satkowski

#### Trustees

FTE May 2014 – Brian McGuinness  
FTE May 2015 – Elaine Scala  
FTE May 2016 – John Sichel

## SOLAR OBSERVING AT TRAILSIDE SATURDAY SEPTEMBER 21, AT 1P.M. WEATHER PERMITTING

Member attendance is welcome and appreciated, if you would like to assist this program please contact any officer or trustee at our Friday meeting.

### New Members Wanted!!

Amateur Astronomers, Inc. has no new members to report from the September Executive Committee meeting! Speak to your friends and colleagues on the merits of membership.

**April and Deniz Turkmen, Polina Sannino**

and

**Jessica Foerst**

The above members were accepted over the summer by the Executive Committee. We welcome them.

Irene Greenstein, Membership Chair

**STAR PARTY  
SPERRY OBSERVATORY  
FRIDAY OCTOBER 5  
at 7:30 p.m.**

**MEMBER ONLY STAR PARTY  
JENNY JUMP STATE PARK  
HOPE, NJ  
SATURDAY OCTOBER 11, 7:30PM**

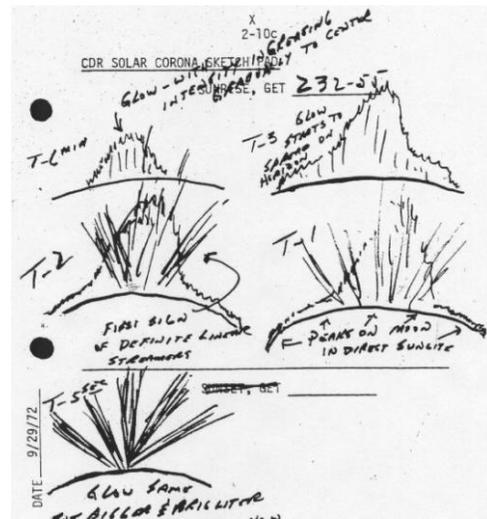
This is the annual lunar article that was supposed to run in the September 2012 issue, but was preempted by a tribute to the late Neil Armstrong. But, since things haven't changed much in lunar news since then, and since it is September, here is the column. This time, rather than focus on one aspect of lunar science, this column will mention several recent developments concerning the Moon.

## Lunar Dust Science Takes a Quantum Leap?

One of, if not the most serious, obstacles to any human exploration or presence on the Moon is the omnipresent lunar dust. This is formed from billions of years of micrometeorite bombardment of the lunar surface. Since there is no wind or water erosion on the Moon, the particles of dust are extremely jagged and quite damaging to machines as well as, possibly, to humans. On top of that, lunar dust even acts strange compared to its Earth counterpart.

Since the Surveyor missions to the Moon, it has been known that lunar dust can pick up electrostatic charge from the charged particle and other emissions from the Sun combined with the strong temperature variations from sunlight to shadow. As a result, it can be levitated by these charges a short distance above the lunar surface for a time. However, some particles can go to even greater heights, as seen in the witnessed by the crew of Apollo 17 as they orbited the Moon. Despite this, none of the recent lunar probes has found any evidence for these high altitude particles. But that should change with NASA's recently launched lunar probe, LADEE (Lunar Atmosphere and Dust Environment Explorer), as it will study these high altitude particles. In fact, LADEE's science mission should start by the time you read this article. But the strangeness of lunar dust doesn't stop there.

Amongst the samples brought back by the Apollo missions, there were beads of glass that formed during impacts. Scientists hypothesized the beads might contain gases from the molten rock, which could reveal details about the composition of the Moon. The challenge was how to study the beads without damaging them.



Sketch of high altitude lunar dust as seen by Gene Cernan on Apollo 17 ([http://www.nasa.gov/sites/default/files/images/455852main\\_Cernan\\_sketch\\_lgweb.jpg](http://www.nasa.gov/sites/default/files/images/455852main_Cernan_sketch_lgweb.jpg))

In June of 2012, Marek Zbik of the Queensland University of Technology found the means to study these tiny objects – using an X-ray system to create images of the interior of the beads. Much to Zbik's surprise, there wasn't any gas at all. Instead there were glass nanoparticles (nanoparticles are measured in nanometers, each nanometer equals one-billionth of a meter). Nanoparticles are of considerable interest in material science as they often have different properties than their constituent substances have at larger scales. And, due to their extremely small size, these lunar glass nanoparticles are subject to some of the effects of quantum mechanics. When these beads are hit with micrometeorites, the nanoparticles are released and become part of the lunar dust and might explain some of its odd properties. Details can be read here. ([http://www.moondaily.com/reports/Nanoparticles\\_found\\_in\\_moon\\_glass\\_bubbles\\_explain\\_weird\\_lunar\\_oil\\_behaviour\\_999.html](http://www.moondaily.com/reports/Nanoparticles_found_in_moon_glass_bubbles_explain_weird_lunar_oil_behaviour_999.html))

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This discovery highlights how strange lunar dust can be, but it could also offer scientists potential new options to explore when it comes to controlling it, something that would be greatly needed for future lunar exploration. Zbik also believes that studying how these particles formed could lead to improvements in manufacturing nanoparticles here on Earth.

## A Big Splat or Was It?

As most AAI members probably know, the consensus view on how the Moon formed is something known as “the Big Splat”. The theory holds that early in the history of the solar system, when Earth was a barely crusted over ball of molten rock and metal, an object about the size of Mars struck Earth and the debris that was knocked into space eventually accreted and became the Moon. (The hypothetical striking object is referred to as “Theia” after the mother of Selene, the Moon deity of Greek mythology). However, some legitimate scientists, including Apollo 17 astronaut/geologist Harrison Schmitt, have criticized the theory. They cite reports that the isotope ratios of elements such as oxygen, titanium, and tungsten found in some lunar rocks are very similar to those of Earth rocks and not consistent with the Big Splat. Junjun Zhang of the University of Chicago, studied this further in 2012 and found that the isotope ratios were not just similar – they were identical. However this finding may not necessarily mean the end of the Big Splat.

One possible solution would be if Theia struck in a manner that allowed more debris from Earth to be lofted into space. Alternately, the impact of Theia could have sped up the rotation of the now totally molten Earth fast enough for some Earth material to come literally flying off into space, also explaining the similarities. But this rotational solution has some problems with angular momentum. Of course, a simpler explanation could be that we only have samples from a few small regions of the Moon. Samples from other areas might have different isotope ratios. This issue will only be resolved when we have a more complete understanding of the Moon.

Further details of Zhang's work can be read at <http://news.sciencemag.org/2012/03/findings-cast-doubt-moon-origins>

## The Childless Big Splat

In the February 2012 Skybox column, I had reported on how Martin Jutzi (University of Bern) and Eric Aspaugh (University of California, Santa Cruz) had an explanation for the fact that the crust of the side of the Moon that faces Earth is much thinner than that on the other side as well as how there are only maria (the dark relatively smooth area on the Moon) on the near side. They argued that, at some point in early lunar history, the Moon was struck by an object that had precisely one-third the diameter and four percent the mass of the Moon at an implausibly low velocity, and got splattered all over the far side, thickening the crust. At the time, I had pointed out that this scenario depended on some quite contrived circumstances and that the correct explanation would have more to do with tidal effects from the Earth. It seems that I was right all along.

When the Moon was initially formed, it orbited much closer to the Earth than it does now. This has been borne out by multiple lines of evidence, including the behavior of the lunar orbit as well as changes in the length of a day on Earth over billions of years. Due to this increased proximity, the tidal effects on both bodies were far stronger than anything we see today. One consequence of these effects is that the rotation periods of the Earth and Moon get slower. Since the Moon is far less massive than the Earth, the Moon is far more affected. It rotates slower and slower until one side faces Earth all the time (the situation we have now). Since this effect was strongest in the Moon's formative era, it altered the development of the Moon and made it slightly out of round. The long axis is perpendicular to the Earth. If the Moon's rotation got synchronized slowly, as seems likely, the lavas that formed the lunar mare would concentrate towards the heavier end of the long axis, the end facing the Earth. No preposterously slow moving object required. For those desiring a more technical explanation, here it is:

<http://www.caltech.edu/content/looking-man-moon>

## Look! No Reaction Wheels!

One of the downsides of doing astronomy from spacecraft is that a complicated system is needed to allow the telescope to move to acquire targets and also to keep the instrument steady as the observations are being made. Most space observatories use devices called reaction wheels for this purpose.

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A reaction wheel is essentially a powered gyroscope that can be made to spin at varied speeds. By controlling the speeds of the reaction wheels, a space telescope can be made to move to reach a target and also to keep pointing at the target for as long as needed.

While reaction wheels are based on sound physical principles and they do work, the problem is that the wheels tend to fail after a time, usually at an inopportune part of the mission. It was failure in two reaction wheels that brought about the recent demise of the Kepler mission (a topic for a future column). What if there was a way to do observations from space without needing reaction wheels?

It turns out that the Chinese may have found the answer. They likely realized that, if you want a space observatory to be rock steady, why not attach it to a rock? In this case the rock is our Moon. Among the instruments aboard the next Chinese lunar mission,

the Chang'e-3 lander, is a near-ultraviolet telescope ([http://www.moondaily.com/reports/Moon\\_landing\\_mission\\_to\\_use\\_secret\\_weapons\\_999.html](http://www.moondaily.com/reports/Moon_landing_mission_to_use_secret_weapons_999.html)), which will make astronomical observations from the lunar surface. If this small-scale experiment is successful, perhaps the Moon will become the platform of choice for future space observatories. If lunar bases are built, as several space programs plan to do, that means it will be possible to repair and maintain the lunar space observatories, lengthening their lives even further.

Also on the Chang'e-3 mission is a rover that will explore the area around the landing site. The rover is equipped with the first ground penetrating radar system ever sent to the Moon. This is expected to have a range of up to 200 meters.

For an object that appears unchanging through our telescopes, there is certainly quite a bit going on. Who knows what lunar discoveries will come next?

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## PRESIDENT'S MESSAGE

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Any member is welcomed to apply for appointment to chair any of the committees. In particular we need a few organized and energetic individuals to chair those committees (other than Program chair) currently chaired by the President or Vice President. In addition, as AAI has increased its outreach efforts over the years, more and more responsibilities have fallen under the auspices of the Displays and Presentations Committee. While Mary Ducca has done an admirable job with that committee over the years, her new executive duties, she will need more help with that committee. We are seeking several individuals to serve as vice-chairs with specific responsibilities, toward the end that one may eventually step in to chair that committee

Please peruse the standing committee descriptions in the by-laws and contact the chair of any committee that piques your interest.

In addition, as word of our outreach efforts spreads, AAI has seen a significant up-tick in requests for scout, youth, school and other small group presentations (both at Sperry and off-site). Many of these programs are pre-packaged so that you need only

learn a simple script and shadow an experienced presenter once to learn the gist of herding cats. We really need more folks to step up and share their enthusiasm for astronomy with these groups. After all, these are our future club members! Please contact Mary Ducca if you'd like to help with youth groups.

The Executive Committee meets on the second Thursday of the month at Sperry, sometime after 8 p.m., (dependent on the College's use of the classroom). All AAI members are welcomed, indeed, encouraged, to attend Executive Committee meetings. Your Executive Committee welcomes your participation.

**Here's wishing you all a new season of clear skies and excellent viewing!**

Joseph A. Ascione,  
President, Amateur Astronomers, Inc.

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All Qualified Observers

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Research Committee

[technical@asterism.org](mailto:technical@asterism.org)

Technical Committee

## MEMBERSHIP DUES

Regular Membership:	\$21
Sustaining Membership:	\$31
Sponsoring Membership:	\$46
Family Membership:	\$5
First Time Application Fee:	\$3
<i>Sky &amp; Telescope:</i>	\$32.95
<i>Astronomy</i> subscription:	\$34

(Subscription renewals to *S&T* can be done directly. See "Membership-Dues" on website for details.)

*AAI Dues can be paid in person to our Membership Chair, or by mail to: AAI, PO Box 111, Garwood, NJ 07027-0111*

## DOME DUTY

Sept	20	Team A
Sept	27	Team B
Oct	4	Team C
Oct	11	Team D

## FRIDAYS AT SPERRY

**Sept 27, 2013**

**The Largest Neutron Star Mass Yet Recorded Has Broad Implications**  
Dr. Al Gottlieb

**Oct 4, 2013**

**What's Up? A Down to Earth Sky Guide** Kathy Vaccari  
**Space Missions Briefing**  
Bill Whitehead

**Oct 11, 2013**

**Taking the Stars – Ancient Navigation Instruments**  
Alan P. Witzgall

**Oct 25, 2013**

**Tales From the Dark Side of the Dome**  
Alan P. Witzgall

*All schedules above were accurate at time of publication. Please check [www.asterism.org](http://www.asterism.org) for latest information (click on "Club Activities")*

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The next **General Membership Meeting** is the third **Friday, October 18, 2013**. Our speaker is **Dr. Marc Favata** of Montclair State University his topic is **Listening to the Dark Side of the Universe Black Holes and Gravitational Waves**.

**PLEASE JOIN US!**

# Theater<sup>in</sup>the Sky

by Ron Ruemmler

September 2013 finds **Venus** still fairly low in evening twilight. The brightest planet gets lots of company as it is passed in turn by Spica, the **Moon**, **Saturn**, and Zubenelgenubi, the pretty binocular double star in Libra, the Scales.

A good time to appreciate just how bright **Venus** is happens around the 6th when it is near Spica, the alpha star in Virgo, the Virgin. At magnitude -4, **Venus** is a full 5 magnitudes brighter than Spica. This means the planet is 100 times as bright as the star. Every difference of one magnitude translates to a difference in brightness of the fifth root of 100 or about 2.5.

The most impressive event of the month is the conjunction of **Venus** and the crescent **Moon** on the 8th. The **Moon** actually covers the planet as observed from Uruguay, Argentina, and Chile. Spica is still nearby to the lower right while **Saturn** is coming in from the upper left.

For early risers, **Mars** passes through the Beehive star cluster in Cancer, the Crab. Binoculars and a dark sky will be needed around the 8th, so don't wait for twilight.

The year's closest conjunction between a planet and a first magnitude star is when **Mercury** passes 0.7 degrees above Spica on the 24th. This is extremely low and far to the right of **Venus** and, probably, not observable. In fact, **Mercury** is terribly close to the **Sun** all month.

**Jupiter**'s dominance of the morning sky is only challenged by the waning crescent **Moon** near the end of the month, while **Uranus** is preparing for its opposition in October. Just past its own opposition last month, **Neptune** is now high in the south all evening.

## September (times are PM unless noted)

1 Sun 5:30 AM	Crescent <b>Moon</b> directly below <b>Jupiter</b> and upper right of <b>Mars</b>
2 Mon 5:30 AM	Thin crescent <b>Moon</b> lower right of <b>Mars</b>
5 Thu 7:36 AM	New <b>Moon</b>
5 Thu 8:00	Spica 1.6 degrees lower left of <b>Venus</b> (closest)
6 Fri 8:00	Spica lower right of <b>Venus</b>
8 Sun 8:00	<b>Venus</b> 2.8 degrees right of Crescent <b>Moon</b> ; occultation from S. America
8 Sun 5:00 AM	<b>Mars</b> passes in front of Beehive star cluster (binoculars)
9 Mon 8:00	<b>Saturn</b> right of crescent <b>Moon</b> and upper left of <b>Venus</b>
12 Thu 1:08	First Quarter <b>Moon</b>
18 Wed 7:45	<b>Saturn</b> 3.5 degrees upper right of <b>Venus</b> (closest)
19 Thu 7:13 AM	Full <b>Moon</b> (nearest equinox hence "Harvest <b>Moon</b> ")
22 Sun 4:44	Autumnal Equinox; Fall begins
23 Mon 7:30	Zubenelgenubi (binocular double star) 2 degrees above <b>Venus</b>
24 Tue 7:20	<b>Mercury</b> 0.7 degrees above Spica (very low in WSW)
26 Thu 11:55	Last Quarter <b>Moon</b>
28 Sat 5:45 AM	<b>Jupiter</b> upper left of fat crescent <b>Moon</b>



# Theater in the Sky

by Ron Ruemmler

October 2013 features lots of lovely meetings between stars, planets, and, especially, the crescent **Moon**. Even the morning events are fairly accessible thanks to Daylight Savings Time.

The first morning of the month finds the crescent **Moon** making a nice triangle with **Mars** and Regulus, the alpha star in Leo, the Lion. Four weeks later the pattern is repeated with the star and planet switching places! In the middle of the month orange **Mars** and blue-white Regulus pass within one degree of each other.

Every evening session has to start with **Venus**. The "Evening Star" is so far south that it comes within two degrees of Antares, the rusty heart of Scorpius, the Scorpion, about the same time **Mars** is meeting Regulus in the morning.

This month's Full **Moon** will clip the **Earth**'s partial shadow causing a penumbral lunar eclipse. The lower 76.5 percent of the **Moon**'s diameter will be in the shadow. Since 70 percent immersion is considered the threshold of observability, it will be a close call. Oddly, the best time to try is about 13 minutes after the moment of Full **Moon**.

Telescope users have a good chance of glimpsing Comet ISON before its expected glorious showing later this year. The comet hovers just above **Mars** in the morning sky for the first three weeks of the month. This is not only as viewed from **Earth**, but is also a true close encounter in space. Our ninth magnitude comet would be seen as a lovely second magnitude object from **Mars**!

## October (times are PM unless noted)

- 1 Tue 5:30 AM Crescent **Moon** below **Mars** and right of Regulus (isosceles triangle)
- 3 Thu 10:00 AM **Uranus** at opposition from the **Sun**
- 4 Fri 8:35 New **Moon**
- 6 Sun 7:00 Very thin crescent **Moon** below **Saturn** and upper right of **Mercury**
- 8 Tue 7:00 Crescent **Moon** upper left of **Venus** and upper right of Antares
- 9 Wed 6:00 AM **Mercury** at greatest elongation from the **Sun**
- 11 Fri 7:02 First Quarter **Moon**
- 12 Sat Astronomy Day Many observatories open to the public
- 15 Tue 6:00 AM **Mars** one degree above Regulus and below Comet ISON
- 16 Wed 7:00 Antares 1.5 degrees below **Venus**
- 18 Fri 5:56 Moonrise (see next two entries)
- 18 Fri 7:38 Full **Moon**
- 18 Fri 7:51 Deepest penumbral lunar eclipse
- 25 Fri 6:00 AM **Jupiter** upper left of **Moon**
- 26 Sat 7:40 Last Quarter **Moon**
- 29 Tue 6:00 AM Crescent **Moon** below Regulus and right of **Mars** (equilateral triangle)

