

# The **ASTERISM**

*as' ter ism ~ a recognizable pattern of stars*  
*con stel la' tion ~ an internationally designated area of the sky*

Volume XXI No. 11

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*Note: Use bookmark panel in Adobe Reader.*

## SOLAR OBSERVING TO COMMENCE AT TRAILSIDE

Thanks to Martin Minnicino's gift of a Hydrogen-Alpha filter, Ray Shapp's loan of additional materials, and the manufacturing genius of Clif Ashcraft, Amateur Astronomers, Inc. now has use of a Hydrogen-Alpha 60mm sidewalk astronomy telescope for solar observations. The telescope premiered at the AAI Open House at Sperry on July 4<sup>th</sup>. AAI intends to conduct regular solar observing sessions at the Union County's Trailside Nature and Science Center every Saturday at 1 p.m. starting on July 31. Thank you all! (See article on Page 8).



On May 30, 2010, Cliff Ashcraft obtained the image above using an optical tube with a Hydrogen-alpha filter set to his 10-inch Meade Schmidt-Cassegrain telescope.

A few weeks ago, I gave the Friday night public talk at Sperry Observatory. Its title was "The Color of the Moon" and was well attended by many of the Union County College students. After the presentation, a young woman came up and thanked me for the lecture. She said, "I understood everything you explained. You used simple words."

I appreciated her kind words, but then I realized her intention. She was grateful that someone taught astronomy in plain language. With basic explanations and straightforward diagrams, she realized that she was able to comprehend and value the astronomical lesson.

How do other teachers or lecturer present? The old joke says that the difference between astrology and astronomy is lots and lots of math. Members of AAI know students and public visitors avoid astronomy lectures for fear of not understanding the subject. People visualize astronomers as Einstein-types or quantum mechanics who mutter in incomprehensible equations. Sometimes astronomers are perceived as egg-heads or nerds with no possible connection to the real world and no desire to share their secret knowledge with the masses.

Members of AAI are basic people from many lifestyles and occupations. As 'amateur' astronomers, we must find time for our astronomical passions in between life's more mundane obligations. We have no time to intensely probe into the cosmic deep while juggling a job, household, car repairs and economic survival. We need clear and simple astronomical explanations that get to the point. We enjoy the lesson and then share it with others.

The active AAI members who volunteer every Friday night contribute in different ways to share information with our public guests. Sperry Observatory is a bridge between the cosmic deep and the curious visitors who want to learn, but not be scared away. Be aware of

everybody's perception of astronomy and try to unite them under one dome. Approach the teaching of astronomy as a chance to reveal the wonders of the sky and alleviate the old fears. If you have a discussion, you can open their eyes to the skies, not hit audiences in the head with scary terminology or perplexing concepts.

That night, the young woman who thanked me was pleased with the way I explained the Moon's color, but she also taught me a lesson. Keep it simple and alleviate the people's fearful concepts of astronomy. It is AAI's duty to explain the Heavens with one simple word at a time.



### QUOTE TRIVIA

"We do not ask for what useful purpose the birds do sing, for song is their pleasure since they were created for singing. Similarly, we ought not to ask why the human mind troubles to fathom the secrets of the heavens ... The diversity of the phenomena of Nature is so great, and the treasures hidden in the heavens so rich, precisely in order that the human mind shall never be lacking in fresh nourishment."

**Attribution and more appear in a similarly colored box .**

# Stewart's Skybox

by Stewart Meyers

There has been much discussion concerning President Obama's recent decision to cancel the Constellation program and the Ares I (both of which were chronicled in the November 2009 column). This has generated strong opinions, even among Apollo-era astronauts, with Buzz Aldrin in favor of the Obama Administration decision and Neil Armstrong breaking his long public silence to oppose the move.

One provision in Obama's plan is to turn over the transport of equipment, and later astronauts, to low Earth orbit to private companies. Many who opposed the cancellation of the Constellation program expressed great skepticism as to whether private enterprise could handle the responsibility. Those doubts took a major hit on June 18<sup>th</sup>, when a privately designed and operated rocket successfully launched from the Kennedy Space Center on a mission to test out the rocket and capsule. In light of this success, the topic for this column is the company responsible for this major leap for private space enterprise.

## SpaceX: The Front Runner (So Far)

The company that built and launched the rocket mentioned in the previous paragraph was Space Exploration Technologies Corporation, better known as SpaceX (<http://www.spacex.com>). Founded in 2002 by Elon Musk, whose previous venture was the Internet payment system Paypal, SpaceX made rapid progress in learning the business of spacecraft design by hiring veterans from major aerospace firms such as Boeing, TRW, as well as British and German companies. And SpaceX even hired Ken Bowersox, a former astronaut, to head their manned spaceflight operations.

In addition to earning a COTS (Commercial Orbital Transport System) contract from NASA, SpaceX also has the goal of providing satellite launch services to other customers as well. To meet these objectives, SpaceX designed three launch vehicles.

The Falcon 1 is the earliest and smallest of the fleet. It is a two-stage rocket and stands 81 feet tall. The first stage is powered by a single Merlin rocket engine. The Merlin is one of two engines designed by SpaceX. Though it is liquid fueled (kerosene and liquid oxygen), it is recoverable like the Space Shuttle solid rocket boosters and can be refitted for reuse. The second stage uses a single

Kestrel engine (another SpaceX design). It is non-recoverable. Both of these engines are relatively simple and reliable designs that fit into the SpaceX philosophy of lowering the cost of space access. The Falcon 1 can lift about a ton into a low Earth orbit.



SpaceX Falcon 9 rocket on the pad at Kennedy Space Center

[http://www.spacex.com/galleryimages/f9\\_verticalonpad1.jpg](http://www.spacex.com/galleryimages/f9_verticalonpad1.jpg)

The Falcon 9 (this was the rocket that was launched on June 18<sup>th</sup>) is the medium lift rocket in the SpaceX stable and is about 180 feet tall. The 9 in its designation is due to the fact that the first stage contains nine Merlin engines. One advantage of this configuration is that the first stage can still function perfectly even if one engine quits completely. There is no indication whether or not this stage is recoverable like the first stage of the Falcon 1. The second stage uses a single Merlin engine. The Falcon 9 can lift about 11 tons into a low Earth orbit and almost five tons into a geosynchronous orbit.

This is the rocket that SpaceX will use to deliver both supplies and astronauts to the ISS. Of course, the capabilities of the Falcon 9 would also serve well for launching satellites.

(Continued on Page 6)

## Review of Duracell Power Pack 600

As promised in my first column, here is a review of the one item that all *goto* telescopes can't function without.

In New Jersey we usually have numerous nights of clouds followed by one or two clear nights. On those clear nights I take advantage of the clearing and stay out late (viewing of course). The other thing we have in New Jersey is a dew point that is usually close to the ambient temperature so some type of dew control is needed.

One clear night last winter, I took out my Celestron 9.25 on an ASGT mount with a Thousand Oaks Dew Control and Kendrick 10" dew strap.

After 4 hours of viewing, the Celestron 7AMP Hour power pack ran out of battery. Several things contributed to only 4 hours of run time, the first was that it was in low 30's, the dew heater was cranked up all the way and as it was a great night I was slewing too many objects.

As soon as Mars came up, the battery switched into low power mode which meant my session was done.

As the 7amp hour Celestron power tank had died on various occasions previous, I decided it was time for a new battery. There are various batteries available such as boat or scooter or low cost jump start batteries. The issue with boat and scooter batteries is that they need a case and a charger and I was looking for a premade package. The issue with most low cost jump start batteries is the amount of power available and I wanted at least 25amp hours. My research took me to the forums on [www.cloudynights.com](http://www.cloudynights.com). There are several batteries available from various companies, I decided to buy the Duracell Power Pack 600, as I have had good experience with Duracell. The cost was reasonable and the battery had a lot of power. The battery was purchased on line from [www.tigerdirect.com](http://www.tigerdirect.com) for \$139 with free shipping, considering the weight of the battery, I thought this was a definite benefit. Please note that there are other manufacturers producing similar batteries any of these may also meet your needs, but this article is specific to my satisfaction with the Duracell.

The battery is delivered within 3 days of ordering. The battery comes nicely double boxed. The first thing I notice is how heavy the battery is, compared

A few pictures of the Duracell Power Pack:

Front and back of Powerpack (Photos by H. Jacinto)



The manual recommends charging it for up to 35 hours, the first time. I tried it and the battery went into trickle mode after 3 hours, to be safe I let it charge overnight. While it was charging, I read the manual in detail. There is a lot to like about this battery, so I have documented the pros and cons on the table on the following page:

**(Continued on Page 5)**

“For powering just a telescope’s dual axis drive, a power pack with a 7 ampere-hour capacity is more than adequate for many nights’ use. But the high-speed motors of some high-torque GoTo telescopes can draw as much as 3 amps at 12 volts, quickly draining a small power pack before the night is over. Add antidead heater coils and CCD cameras, and the modern observer quickly encounters a mini energy crisis in the field. ... Separate power packs with 15-30 ampere-hour capacities are a minimum for the high-tech observer. Rechargers that work off solar panels are a great idea for long stays at remote sites. **The Backyard Astronomer’s Guide, Third Edition**, Dickinson, Terence & Dyer, Alan, Firefly Books Ltd.,2008 at page 92

## The Right Stuff

(Continued from previous page)

Pros	Description
Cost	The battery is \$139, which is a very reasonable cost, considering it has an inverter to run 120 volt AC equipment, a 28AMP Hour Sealed Battery, a charger that changes to trickle mode and several other nice to have features.
Trickle Charger	My one biggest complaint about the Celestron Power Pack was that you had to unplug the charger or you could overcharge the battery. The Duracell goes into trickle mode, so that it can be left plugged in all the time. I generally charge the batteries every week so I won't leave it plugged in, but not worrying about overcharging is great.
% Battery Life Reading	The Duracell has a % of useful live reading which gives one an idea of how much battery life they will have. I can't vouch for how accurate it is, but it is better than the power Tank which a yellow light comes on when you are done.
Battery Size	A 28 AMP Hour is probably as much power as anyone should need, I set out my 6" scope one night, cranked up the dew heater and left it running all night long and the battery still had 80% battery life in the morning. Since I got 4 hours with a 7AMP hour battery pack on the 9.25 I expect to get at least 12-16 hours with the Duracell which is more than I need.
Handle Build Quality	The Duracell has a very nice handle to carry it. The build quality is nice, mostly smooth plastic with some padding on the feet.
Accessories	The Duracell is very full featured, including some nice add ons such as French Language Stickers (for all our friends in Quebec), three 120 volt AC outlets, a car battery booster cable that comes in its own bag for storage, a flashlight and a radio.

Cons	Description
Size and Weight	The battery is very heavy, it weighs over 25 pounds and is large. I don't mind it, but be prepared it is another heavy item to carry in addition to the telescope, mount, etc.
Charger Wall Wart	The wall wart is HUGE. This thing is 2 inches by 3 inches, considering that size usually equates to a lot of energy being used, I won't be leaving this plugged in all the time. Please note the manual recommends that you leave the battery plugged in when not being used.
No red light	The light that comes with the battery is white and pretty strong, don't turn it on at a star party
Too much stuff	I really only wanted a battery pack, some features such as the clock and radio are not really needed. I used the radio last night and the sound quality is ok, I guess if you use this at a construction sight, having a radio is nice, but it's a feature I don't need.
No way to turn off the clock	There is a clock and radio and while you can turn off the radio, the clock can't be turned off.

### Conclusion:

In the end, I would buy the battery pack again as I feel that the Pros outweigh the cons. If you find yourself running out of power and want a large power pack, I would recommend the Duracell Power Pack 600. My next article will discuss the Cloudy Nights website. Until next month, may your equipment work and your skies be clear!

[Questions and comments for Helder Jacinto may be e-mailed to: [Jacinto.hf@google.com](mailto:Jacinto.hf@google.com) ]

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## Stewart's Skybox

(Continued from page 3)

The Falcon 9 Heavy is the largest and most powerful rocket from SpaceX. It consists of three Falcon 9 first stages, two of them functioning as strap-on boosters and a single Falcon 9 second stage. This configuration allows the Falcon 9 Heavy to launch 35 tons into a low Earth orbit and 21 tons into a geosynchronous orbit.

When it comes to transporting cargo and astronauts to the ISS, the Falcon 9 will carry a vehicle known as Dragon. There are two basic versions of Dragon and they look identical. The cargo version will consist of a capsule shaped something like a lampshade that will be pressurized to transport cargo that cannot be exposed to vacuum. The trunk (the cylindrical area behind the capsule would transport cargo that does not need special attention and is not pressurized. The thrusters and solar panels are mounted behind the trunk. The manned version also has a crew escape system, flight controls, and a full life support system. In the manned configuration, Dragon can carry a crew of seven.



Artist conception of Dragon in Earth orbit  
([http://www.spacex.com/assets/img/dragon\\_pica.jpg](http://www.spacex.com/assets/img/dragon_pica.jpg))

Based on the company website, SpaceX will begin testing the cargo variant of Dragon in 2011. Already, NASA has begun to train astronauts in how to work with and offload Dragon when it docks with the ISS. No schedule was given for tests of the manned variant.

### The Other Guys

Of the other companies involved in the effort to develop a private low Earth orbit transport capability, United Launch Alliance (<http://www.ulalaunch.com>), also known as ULA is probably the best known. ULA was founded in 2006 as a joint venture of Boeing and Lockheed Martin. Unlike SpaceX, which had to quickly learn the ins and outs of rocket design to create their Merlin series of rockets, ULA already had a long history of rocket building due to its parent companies and also has much experience in the satellite business. ULA has three well-known rockets in its stable: The Atlas V, Delta IV, and Delta II, all of which have had long histories of launching satellites and probes to other planets. Either one would give ULA an immense edge in private space transport.

However, ULA does not seem to be as aggressive as SpaceX when it comes to pursuing COTS agreements with NASA. And when it comes to developing a means to transport astronauts, ULA appears to have no interest, despite their excellent collection of rockets. Recently, a representative of ULA was asked why they haven't man-rated (tested the engines and other rocket components at a set percentage above their specifications) the Atlas V and Delta IV. The response from ULA was that NASA had not asked them to do that. This shows lack of initiative on the part of ULA. If ULA had decided to man-rate those rockets on their own when it was announced that the Shuttle fleet would be retired, we probably wouldn't have to wait as long before we can send astronauts to the ISS without using the Russian Soyuz capsules and could even beat SpaceX in landing COTS agreements.

So, while ULA is still a potential contender in the race to develop a private crew and cargo delivery system, it appears that SpaceX will beat them to the punch. This could shape up to be another example of David beating Goliath.

Back in the 1960's, Gene Roddenberry imagined that the Starship Enterprise would play a major role in man's future in space. Today, we are on the verge of another enterprise, in this case, the one called private, paving the way for more human access to space.

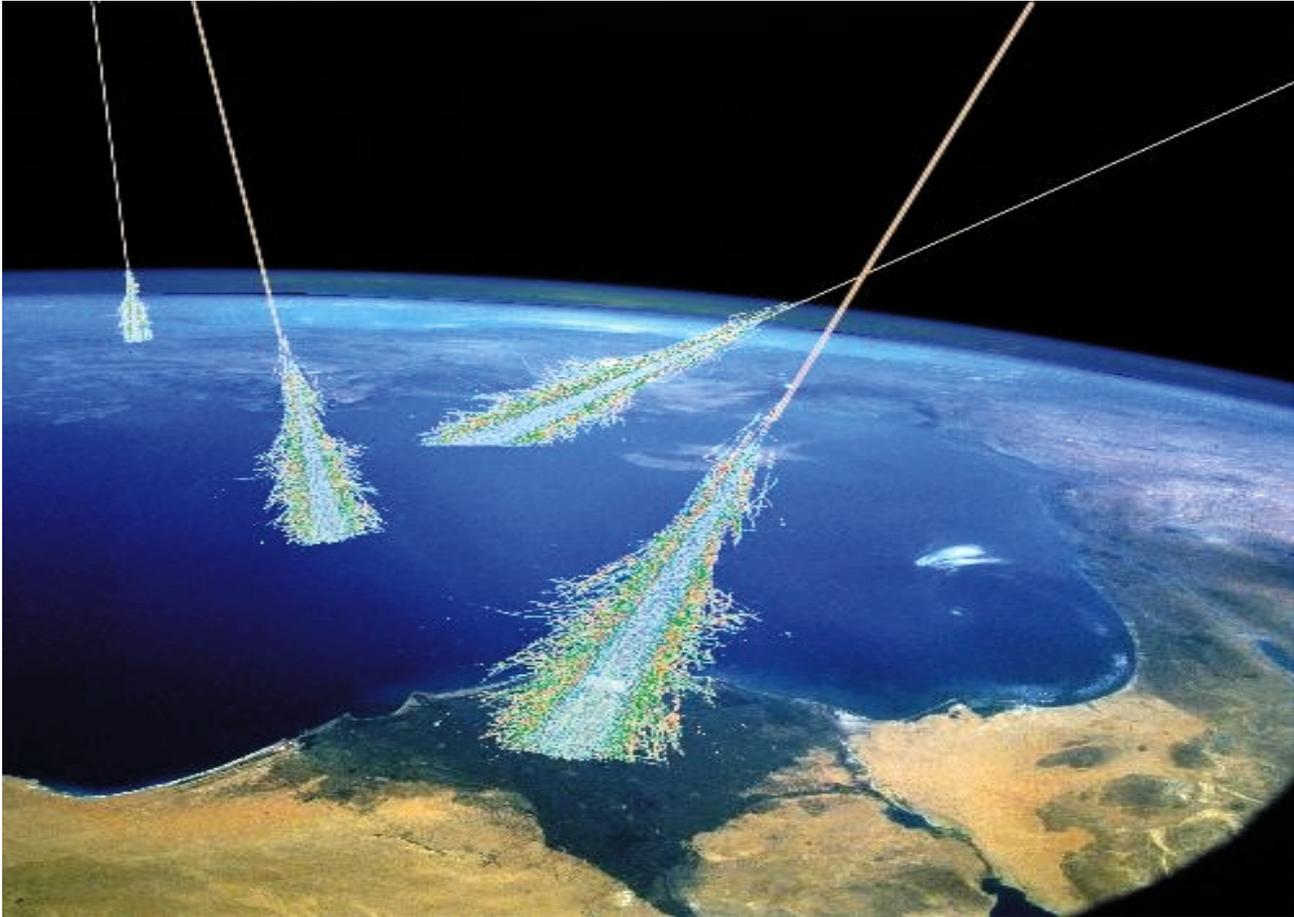
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# What are Cosmic Rays, and where do they come from? Luciuk

by Michael

One of astronomy's mysteries is the origin of cosmic rays. Cosmic rays aren't really rays at all. They are nuclear particles, electrons, and atoms that have lost electrons, becoming ions. The most energetic seem to come from all directions and are of galactic (low to medium energy) or

possibly extra-galactic (high energy) origin, maybe from supernova shocks. Since cosmic rays are charged particles, they are affected by galactic magnetic fields, which mask their original source's direction. The Sun also produces low energy cosmic rays. (Continued on Page 8)



**Figure 1**

Figure 1 is an artist's illustration of incoming cosmic rays. It shows that when cosmic rays enter our atmosphere, collisions with molecules in the air like nitrogen, generate a large variety of nuclear particles and ultraviolet light. These particles spread out over large areas, and can be detected by various means to indicate the presence of a high energy cosmic ray particle.

[http://antwrp.gsfc.nasa.gov/apod/image/0608/crshower2\\_nasa\\_big.jpg](http://antwrp.gsfc.nasa.gov/apod/image/0608/crshower2_nasa_big.jpg)

(Article continued on next page)

## Cosmic Rays by Michael Luciuk

(Continued from previous page)

An important detection facility is the Pierre Auger Observatory located in Argentina. This facility has 1,600 water tanks scattered over an area larger than Rhode Island where the radiation from impinging particles are detected signifying a cosmic ray. Auger also detects the faint ultraviolet radiation from nitrogen molecules disturbed by incoming particles, acting as another detection mechanism. There are plans to construct a northern Auger branch in Colorado that will cover four times the area of its Argentine facility.

Victor Hess (1883-1964), an Austrian-American physicist was the discoverer of cosmic rays in 1912, for which he received the Nobel Prize. He determined that ionization levels increased with altitude, indicating that something from space was creating ionization.

Figure 2 illustrates the frequency of cosmic rays detected versus their energy. Occurrence varies inversely as energy. As the graph illustrates,  $10^{11}$  electron volt (eV) cosmic rays occur about once per second within a square meter,  $10^{16}$  eV cosmic rays occur about once per year within a square meter and  $10^{19}$  eV cosmic rays occur about once per year within a square kilometer area. This shows why very large areas are necessary to detect highly energetic cosmic rays.

The most energetic cosmic ray detected so far was  $3 \times 10^{20}$  eV. This is the equivalent to the energy of a tennis ball travelling at over 90 mph, from a proton travelling at virtually the speed of light. Recall also, the CERN Large Hadron Collider will only have a maximum energy of  $1.4 \times 10^{13}$  eV. This should put

to rest alarmists who are concerned that the (LHC) will create a black hole that will devour the Earth. We've been bombarded by cosmic rays that exceed the LHC's energy for billions of years and the Earth is still here.

### REFERENCES

[http://antwtrp.gsfc.nasa.gov/apod/image/0608/crshower2\\_nasa\\_big.jpg](http://antwtrp.gsfc.nasa.gov/apod/image/0608/crshower2_nasa_big.jpg)

[http://en.wikipedia.org/wiki/Cosmic\\_ray](http://en.wikipedia.org/wiki/Cosmic_ray)

<http://www.auger.org/>

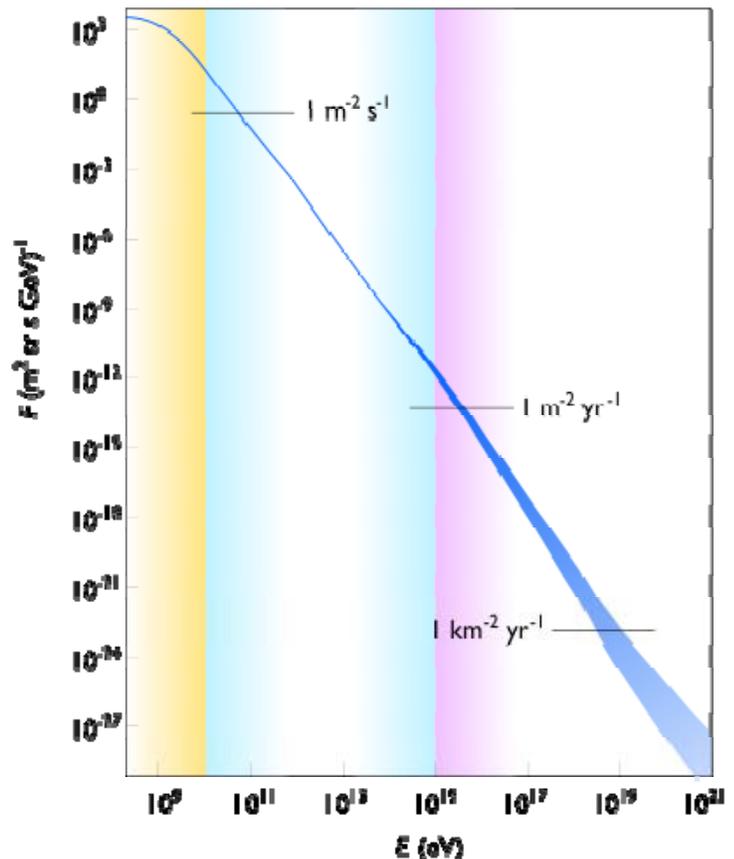


Figure 2. Cosmic Ray energy Spectrum  
[http://en.wikipedia.org/wiki/Cosmic\\_ray](http://en.wikipedia.org/wiki/Cosmic_ray)

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### Welcome New Members

Amateur Astronomers, Inc. welcomes the following new members to our club for July:  
**Richard Siegel and Elliot Siegel.**

We hope you enjoy using Sperry Observatory and all the opportunities available to you as members such as seminars, lectures, training, observing, and research. Our Qualified Observer course is a great place to start. It is equivalent to a college-level introduction to Astronomy, and it includes hands-on training on our 24-inch reflecting telescope. For this and other opportunities, check the **Club Activities** section of the website.

Again, welcome to AAI

Irene Greenstein, Membership Chair

## Solar Observing at Trailside Ascione

By Ray Shapp as told by J.

Yes, there will be solar observing at Trailside soon. This article relates how this has come to be and it provides a few photos of the work that went into this project. Martin Minnicino of Scotch Plains, a new member, donated a Meade EXT 125 telescope and mount to AAI with assorted accessories. AAI thanks Martin for his generous gift.

One of those accessories is a Coronado SolarMax H-Alpha filter set with a T-Max tuner.

Clif Ashcraft cut and threaded an adapter that holds the SolarMax filter and T-Max tuner to the sky end of a 60mm refractor. He replaced the original focuser with a new rack and pinion focuser that accepts the Coronado BF10 blocking filter. Clif also mounted the tube securely to Ray's tripod.



Coronado SolarMax Hydrogen-alpha filter and T-Max tuner adapted to a 60mm refractor.  
(Both images on this page courtesy of C. Ashcraft)

The cover image was taken May 30 through the Coronado filter set attached to the 60 mm refractor which was strapped to Clif's Meade 10-inch SCT for easy pointing and tracking. See photo on opposite side. Clif took the image using his new Flea3 video camera just stuck into the BF10 blocking filter.

Using a 26 mm Plossl eyepiece, the whole Sun can be seen the ~8 mm image from the 900 mm focal length objective easily fits through the 10 mm wide blocking filter.

The 60mm refractor, the new focuser and eyepiece, and an equatorial mount tripod are on indefinite loan to AAI from Ray Shapp.



Solar 'Scope strapped to Clif's 10-inch Meade Schmidt-Cassegrain telescope. Note Coronado BF-10 blocking filter at the focuser.

The next step is to coordinate with the County of Union to have a regular Saturday presence for solar observing. Some volunteers have already come forward to staff this project, more are needed. Please contact Ray Shapp.

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The earlier quote was taken from *Mysterium Cosmographicum* (1596) by **Johannes Kepler** born in Weil, Germany in 1571, and died in 1630 in Regensburg, Bavaria, Germany. He was a German mathematician, astronomer and astrologer. He taught mathematics and astronomy at the Protestant School of Graz later to be known as the [University of Graz](http://en.wikipedia.org/wiki/University_of_Graz) (1594 -1600). This was his first work, which was a defense of the Copernican system. Compiled from Wikipedia. [http://en.wikipedia.org/wiki/Johannes\\_Kepler](http://en.wikipedia.org/wiki/Johannes_Kepler) other information about Johannes Kepler can be found at [http://www.johanneskepler.com/johannes\\_kepler\\_bibliography.htm](http://www.johanneskepler.com/johannes_kepler_bibliography.htm)

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## 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 subscription:</i>	\$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 Membership Chair or Treasurer, or by mail to: AAI, PO Box 111, Garwood, NJ 07027-0111*

## DOMESTIC DUTY

July 16	Team E
July 23	Team A
July 30	Team B
August 6	Team C
August 13	Team D

## FRIDAYS AT SPERRY

**July 16, 2010**

**No Place for the Timid** Al Witzgall

**July 23, 2010**

**The Music of the Spheres -The Connection between Planetary Orbits and Music** Jim Stekas

**July 30, 2010**

**Space Mission Briefing**

Karl Hunting

**Ask Dr. Lew** Dr. Lew Thomas

**August 6, 2010**

**Space Mission Briefing**

Bill Whitehead

**What's Up? A Down to Earth Sky Guide** Kathy Vaccari

**August 13, 2010**

**N.A.S.A. Updates** Michele Tofel

*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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Again tremendous thanks goes to Ray Shapp for his assistance on the July issue of *The Asterism*.

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

by Ron Ruemmler

August 2010 presents the finale of the long convergence of **Mars**, **Saturn**, and **Venus**. First, the dimmest members of the trio meet just before the month begins. Then **Saturn** drifts down to **Venus** a week later.

Finally, on the 18th, **Mars** meets **Venus**. Two months later, all three planets will be gone from the evening sky. As an added bonus, Spica, the alpha star in Virgo, the Virgin, moves down toward the setting **Sun** every August and passes just one degree above **Venus** on the last evening of this month. Since **Mars** is still within five degrees of the pair, they all constitute a "trio" by some references. This is the tightest trio of the year involving such bright objects.

**Mercury** has a fairly average evening showing this month, but it passes above the two day old **Moon** just four days after its own elongation from the **Sun**. If the tiny crescent **Moon** is indeed visible on the 11th, it will, by definition, mark the first evening of Ramadan, the Muslim month of fasting.

After these objects set by around 9:00 PM the rest of the night belongs to **Jupiter**. The Giant Planet will dominate the evening sky for most of the rest of the year and onward into 2011. **Uranus** hangs in there just three degrees to **Jupiter's** upper right as the month begins and less than two degrees by the end.

Meteor showers are usually a disappointment in our light polluted skies, but this month may provide an exception. The Perseids will come just two days after New **Moon**, so only man-made sources of light have to be avoided. In contrast, the November Leonids will come just three days before Full **Moon**. Darkness will not come until 3:30 AM and it will surely be colder.

So if it's warm and clear on the evening of the 12th, consider setting up a lawn chair facing northeast around midnight and see what happens. No optical aids are necessary. Just don't expect more than about one "shooting star" per minute.

## August Sky Calendar

1	Sun 9:20	<b>Mars</b> two degrees lower left of Saturn, both upper left of <b>Venus</b>
3	Tue 12:59A	Last Quarter <b>Moon</b>
7	Sat 9:00	<b>Mercury</b> at maximum elongation from setting <b>Sun</b>
8	Sun 9:10	<b>Saturn</b> three degrees upper right of <b>Venus</b>
8	Sun 9:10	<b>Mars</b> four degrees upper left of <b>Venus</b>
9	Mon 11:08	New <b>Moon</b> , just 15 hours before perigee
10	Tue 2:00P	<b>Moon</b> closest to <b>Earth</b> ; expect extreme tides
11	Wed 8:30	<b>Mercury</b> above extremely thin crescent <b>Moon</b>
12	Thu 9:00	<b>Mars</b> , <b>Venus</b> , and <b>Saturn</b> all above thin crescent <b>Moon</b>
12	Thu 11:00	Beginning of Perseid meteor shower
16	Mon 2:14P	First Quarter <b>Moon</b>
18	Wed 9:00	<b>Mars</b> two degrees upper left of <b>Venus</b>
20	Fri 6:00A	<b>Neptune</b> at opposition from the <b>Sun</b> ; up all night
20	Fri 9:00	<b>Venus</b> at maximum elongation from setting <b>Sun</b>
24	Tue 1:05P	Full <b>Moon</b>
31	Tue 8:30	Spica one degree upper right of <b>Venus</b>
31	Tue 8:30	<b>Venus-Mars-Spica</b> in 4.2 degree circle; closest trio of 2010

