The ASTERISM

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

Volume XXIII No. 3 **November 2011**

What's Inside…

Note: Use bookmark panel in Adobe Reader.

SOLAR ACTIVITY IS BUSY

This image provided by NASA Goddard Space Flight Center in Greenbelt, Maryland is a recent observation of the Sun in ultraviolet frequencies

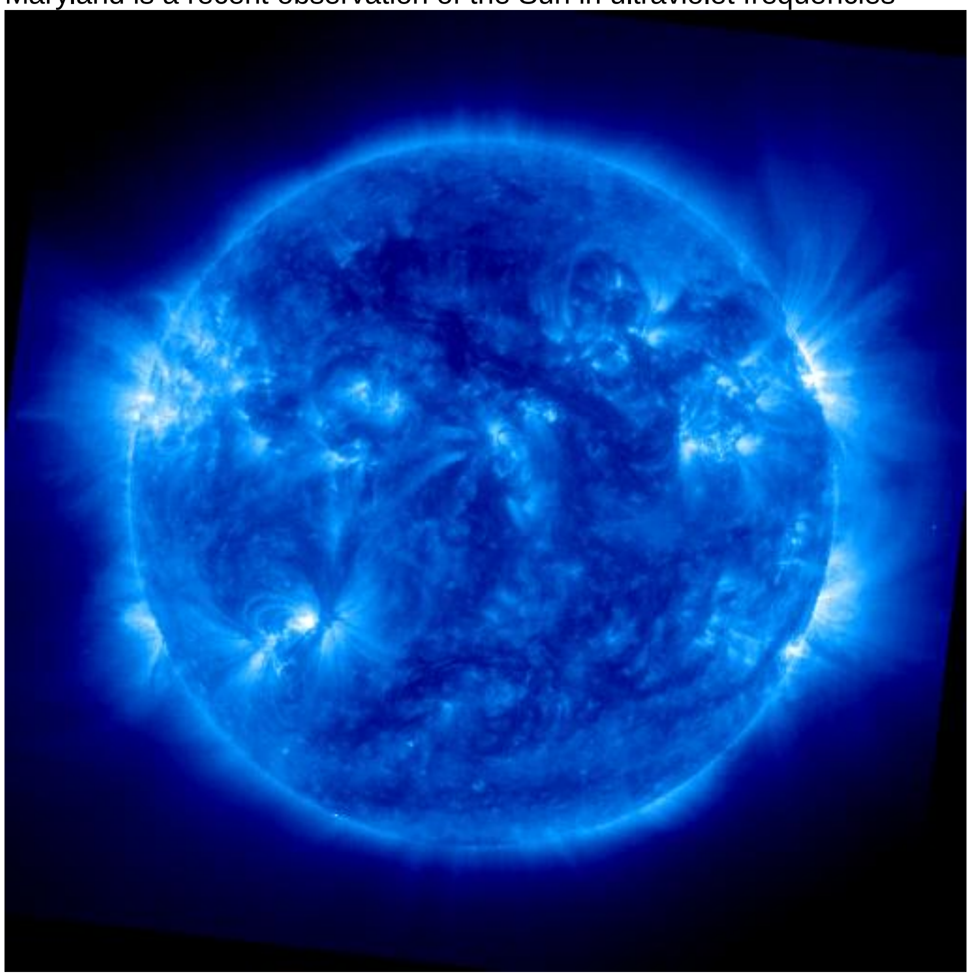

Image courtesy NASA Goddard Space Flight Center

GENERAL MEMBERSHIP MEETING NOVEMBER 18, 2011

ROY SMITH THEATRE - UCC CAMPUS 8:00 p.m.

Dr. Dale Gary
New Jersey Institute of Technology

Solar Radio Research and the EOVSA Project: Your Stimulus Tax Dollars at Work

In 2009, the National Science Foundation received $3 billion in stimulus funds with instructions to spend it within one fiscal year. In response, a special program, "Major Research Instrumentation--Recovery and Reinvestment" (MRI-R-squared) was announced. Through that program, AAI member Dale Gary was awarded $5.1 million for a major expansion of NJIT's solar radio observatory, the Owens Valley Solar Array. This project, called the Expanded Owens Valley Solar Array (EOVSA), is to be completed in time for the current solar cycle maximum in 2013. This talk describes some of today's most compelling solar research problems, what kind of instrument is needed to address these problems, and how EOVSA is designed to play a major role in a new era of radio solar physics.

Dr. Gary received his B.S. from the University of Michigan and his Ph.D. from the University of Colorado, Boulder, and he worked for 15 years at Caltech before coming to NJIT in 1997. He is a leader in the use of solar radio data for examining the conditions under which solar radio bursts affect cellular telephone signals, and he has been involved in the recent discovery that these bursts can cause the failure of GPS receivers. His research has been essential to understanding how these solar events occur. He has authored more than 130 articles in scholarly journals, and he is the current president of United Astronomy Clubs of New Jersey. He is also Distinguished Professor of Physics at NJIT and is Director of the Owens Valley Solar Array near Big Pine, California.

Please join us!

New Member

Amateur Astronomers, Inc. welcomes the following new member to our club during the month of November:

Jacob and Joseph Barnett of Maplewood
Michael Markowich of Cranford
David Mracek of Mountainside
Francisco Salcie of Perth Amboy

We hope you enjoy using Sperry Observatory and all the opportunities available to you as a member 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

Stewart's Skybox

by Stewart Meyers

When Steve Krisocki submitted the frame capture from "Curiosity", he brought up an interesting point. He said that almost no one mentions the International Space Station (ISS) except when something goes wrong. So, I decided to devote this column to the early history of the space stations. The later history will be in a future article

Another Brick

Unlike many other space ideas, space stations don't appear much in early science fiction. The first mention of anything remotely resembling a space station is in Edward Everett Hale's story "The Brick Moon" (1869). In this tale, a large brick sphere was going to be launched into orbit for use as an aid to navigation. Unfortunately, when a group of people is inspecting the satellite, it is launched prematurely and the visitors become unwilling space travelers.

The next mention of the idea was much more serious. Konstantin Tsiolkovski, the Russian schoolteacher who first proposed in a rational manner the idea of rockets and spaceflight, also proposed the idea of habitable structures in orbit around the Earth. Being way ahead of his time, he wrote that these objects would be powered by the Sun and would rotate to generate a sort of artificial gravity in the interior.

Another early mention of the space station concept was in J.D. Bernal's pamphlet "The World, The Flesh, and the Devil" (1929) (http://cscs.umich.edu/~crshalizi/Bernal/). His concept for a space station is an enormous sphere eight to ten miles in diameter. However, Bernal gets a bit fanciful when he goes into the details.

A major upsurge in interest in space stations took place after World War II. In 1947, a radar technician from the RAF (Royal Air Force) by the name of Arthur C. Clarke wrote a piece for Wireless World where he proposed that communications relays placed in geosynchronous orbit would greatly aid radio transmissions. While this is the first detailed mention of the communications satellite, it is also relevant to the topic of this column. Based on his experience with vacuum tubes and their notorious tendency to fail, Clarke believed that those relays would have to have crews in order to keep them repaired, which would make them space stations.

But within that year, AT&T would invent transistors, rendering vacuum tubes obsolete.

Meanwhile the chief German rocket scientist, Wehrner von Braun, came to the United States and continued his research into rockets as well as his belief in using them for space exploration. Soon, he was reunited with Willy Ley, a colleague from the German Rocket Society who came to the United States in the 1930's. Ley would write a book with von Braun titled "The Conquest of Space" depicting a vision for the future that featured large wheel-shaped space stations. The stations were wheel-shaped because they rotated in order to generate artificial gravity via centrifugal effects. These wheel-shaped stations would appear in science fiction right up until "2001: A Space Odyssey".

The Real Beginning

By the early 1960's, the United States was starting to see the shortcomings of spy plane surveillance of the Soviet Union and its allies. And in 1960, when the Soviets succeeded in shooting down a U-2 spy plane, it was very obvious that another method was needed. Since the late 1950's, it was realized that observations from orbit would be the ideal solution but it would be some time before the technology advanced enough to even attempt it.

The earliest American spy satellites carried film cameras. When the mission was finished, the satellite would drop a capsule with the film that would enter the atmosphere. After the capsule deployed its parachute, a military aircraft that would snag the parachute line before the capsule could hit the surface. Despite the rather unorthodox recovery procedure, these satellites achieved some success. But they were limited in the timeliness of their images as well as the fact that the locations they photographed were programmed and couldn't be changed on the fly. By about this time, video cameras were in use on weather satellites, but these did not have the resolution military reconnaissance required.

In 1963, a novel solution to the problem was suggested by the Air Force – a manned reconnaissance satellite. The plan called for a satellite that consisted of a long cylindrical module with a powerful camera inside and topped with a modified Gemini capsule.

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After the satellite reached orbit, the astronauts would open a hatch in the rear of the capsule and enter the larger satellite where they would operate the camera, process the film, and report the results back to Earth. At the end of the mission, the astronauts would return in the capsule and the station module would soon reenter the atmosphere and burn up. However, this program was too complex to be done secretly. Therefore the American government came up with a cover story that this would be a space station for scientific research called MOL (Manned Orbiting Laboratory).

While the American public bought this story, the government underestimated the deductive skills of the Soviet Union. The Soviets quickly figured out what MOL really was and decided they could do it too. Their program was known as Almaz and would be a bit more sophisticated than MOL. Unlike MOL, where the station would be used only for one mission, Almaz would be left in orbit to be visited and supplied by multiple missions. Also, unlike MOL where the astronauts would live in the capsule and only go to the lab module for work, Almaz had simple living arrangements inside the lab module.

Meanwhile, back in the United States, work began on MOL. Progress was slow and it went way over budget. Some aspects of the system were tested, such as the modified capsule, but by 1969, the project was quietly killed as improvements in cameras and electronics allowed unmanned spy satellites. However, the optics designed for MOL greatly influenced the camera design of the KH series of spy satellites.

The Russians continued with the Almaz program and it became operational in the early 1970's. While the cameras worked well, other systems had problems. In one case, there was a massive power failure that threatened the crew. It was fixed, but one of the cosmonauts was severely traumatized by the experience.

Consolation Prize for the Russians

Having failed in the race to the Moon, the Soviets turned to space stations. Applying the lessons learned from Almaz, they produced the Salyut series of space stations. On April 19th, 1971, the Soviets launched Salyut 1. The Soviets first sent a crew to Salyut 1 four days later but their Soyuz capsule could not properly dock with the station. On June 6th, 1973, another crew was sent and they docked with the station. However, there were numerous problems with the station and, after 23 days, the cosmonauts entered their Soyuz capsule and departed. Unfortunately, the jolt of undocking tripped a valve that was only supposed to open when the main parachute deployed to equalize the capsule's air pressure. Therefore, the capsule depressurized and the crew was killed.

The Soviets soon made some crew safety changes to the Soyuz and got back into the space station business and the Salyut series continued through the 1970's up until 1982. The last of the series, Salyut 7, tested the idea of large modules being added to a station.

The Yanks Get into the Game

When the Apollo lunar missions were ended, a new objective was needed for manned spaceflight. Given NASA's reduced budgets, it would be a space station. The result was Skylab. The station itself was fashioned from the third stage of a Saturn V rocket. It also sported two large solar panels as well as a set of four panels from a module that housed the Apollo Solar Telescope.

Skylab was launched on May 14th, 1973. However, trouble arose within minutes of launch. Due to damage to the launch vehicle, Skylab lost one of its large solar panels as well as a chunk of its outer wall and insulation. Upon entering orbit, the surviving large panel only partially deployed. Since a replacement station was not an option, it looked like Skylab would have to be abandoned. But NASA felt there was another way.

The first mission to Skylab, launched only 11 days after the station, was faced with the task of trying to repair the station. Using good old-fashioned ingenuity, the astronauts fashioned a solar shade from a large sheet of material and fastened it to the side of the station that was damaged. Then, came the problem of the stuck solar panel. One of the astronauts, Charles "Pete" Conrad, went out on a space walk to size up the situation. After removing a piece of metal that was obstructing the panel, he simply pulled on it as hard as he could. The panel then

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MEMBER ONLY
STAR PARTY
JENNY JUMP
STATE PARK
HOPE, NJ
SATURDAY
NOVEMBER 29, 7:00PM

Why do satellites stay up?

Answer: Actually, a satellite is always falling. It is just falling along a path that keeps it away from Earth.

We are used to seeing NASA launches. They send vehicles rocketing out over the Atlantic. That process does two things. First, it lifts the payload some hundreds of miles off the surface of Earth, to where the atmosphere practically disappears. Second, it accelerates the payload to such horizontal (parallel to Earth's surface) speed that the load's trajectory curves "down" more slowly than the surface does. The speed needed is why you first have to get the payload out of the atmosphere.

Atlantis, the last shuttle, lifted to an altitude of about 240 mi. At that altitude, a speed just under 17,200 mi/hr causes the orbiter to "fall" along a path whose curvature is that of a circle with radius 4,200 mi. In other words, it makes the orbiter travel around the planet in a circle 240 miles above the surface. The 240 altitude was chosen for getting to the International Space Station (ISS). The 4,200 number comes from pretending that Earth is a sphere with radius of 3960 mi. (As to the acceleration, remember that our planet rotates. A shuttle sitting at Cape Canaveral is already circling east at more than 900 mi/hr. That is why we do not launch rockets from California over the Pacific.)

If at that height, you push the satellite a little faster, then it goes "up." It enters an elliptical orbit with the 240 mi as **perigee** (minimum altitude) and, on the opposite side of Earth, a higher **apogee** (maximum). Make it a little slower, and the satellite goes "down"; its elliptical orbit will have the 240 as apogee and drop toward a smaller minimum on the opposite side.

In that case, why do some of them crash?

Answer: Air resistance slows them, and therefore causes them to curve to the surface.

At an altitude of 240 mi, the atmosphere is less than a billionth as dense as at sea level. Nevertheless, it will slow an orbiter sufficiently to bring it to 180 mi. in about 42 months. (The time depends, as the effect of air resistance always does, on the mass, shape, and size of the orbiter.) The orbit of the ISS is never allowed to deteriorate to as low as that altitude; every month or two, it receives a speed boost to increase the apogee, then a boost at apogee to raise the perigee beyond 200 mi. From 180 mi., the increased density would drop the Station to 110 mi. in about 100 days, and from there it would drop to Earth in a few days.

Such was the path of the Upper Atmosphere Research Satellite, URAS, the one we were warned to duck in September. Around Sep 8, its orbit ranged from 150 to 170 mi. Twelve days later, it was at around 130 mi. Three days after that, it fell in pieces over the Pacific and maybe Canada.

Atlantis did the slowing down by design. Pointing its tail ahead, it fired its engine to take 225 mi/hr from the speed. (Are you old enough to remember "retrorockets"?) Absent air resistance, that reduction would have lowered perigee to about 30 mi. In the shuttle's actual descent, it needed no further braking because it *took advantage* of air resistance. Indeed, it increased resistance by presenting its chest to the onrushing air. In that stable attitude, Atlantis could resist the stresses of the reentry, and both resist and dissipate the heat. The URAS had no such stability. Its irregular shape made it just another meteoroid. It began tumbling; after that, its destruction got under way about 40 mi up. The same factors were at work in the 2003 destruction of the shuttle Columbia. The shearing of one of its wings rendered Columbia asymmetric; its tumbling made disintegration unavoidable. Atlantis controlled its reentry, and at 10 mi high turned into an airplane in controlled flight.

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Stewart's Skybox

by Stewart Meyers

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popped open. The station was saved. Despite the loss of one large solar panel, the station had enough electrical power to function as intended.

The first mission to Skylab lasted 28 days. The second mission was launched in July 1973 and lasted for 59 days. The third and final mission set a space endurance record of 84 days and ran from November 1973 to February 1974, a record that would stand until 1977 when it was bested by a crew on Salyut 6 who stayed aboard a total of 96 days.

During those three missions, a number of discoveries were made. The biggest were the effects of microgravity on human physiology. It was also discovered that exercise could reduce, but not eliminate these effects. Also, a number of items were tested to see how well they could be used in micro-gravity, including a forerunner of the Manned Maneuvering Unit. The attached Apollo Solar Telescope proved the value of observing the Sun from space. In all, Skylab was a major success.

However, this is not the end of the story of space stations. The rest of the story will appear in a future article.

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THE GREAT JOVIAN STORM

by Bonnie B. Witzgall

There we were, poised to launch the Great AAI Jupiter Jubilee. At the last minute, we had to put a hold on the count due to a huge storm, not unlike the massive storms that rage on Jupiter.

The opposition of Jupiter was October 29, 2011, perfect for a Saturday night open house and public presentation. This is the time when a planet's surface is fully lit by the Sun as seen from Earth, and is at its closest to our world. That provides the best view of the planet from Earth and the best time to present it to our public visitors. Members of Amateur Astronomer, Inc. worked hard to plan this special Saturday night event. Members designed the advertising flyer, delivered the information to the local media and advertised it in neighborhood schools. Personal telescopes were set to congregate around the sundial next to William Miller Sperry Observatory. AAI members would offer good view of Jupiter and anything else available in the Autumn sky. Inside the Observatory, AAI Qualified Observers were ready to staff the 10 inch and 24 inch telescopes. Many of the public who visit our building on Friday nights have never viewed the night sky through a telescope. This unusual night would be a new opportunity to see Jupiter close-up and observe the four Galilean Satellites.

Knowing that the evening would be chilly, AAI planned to serve hot drinks to our guests and hard-working members. In keeping with the holiday weekend, we bought Halloween candy and healthy snacks to offer to the projected crowds. The Juno Probe would be the subject of a grand presentation set for 8PM that fateful night. The new NASA probe, launching in late November, will collect information on Jupiter and its immense magnetic field, as well as the nature of its interior. As proven by this unexpected snowstorm, it is important to know your planet's weather patterns. Juno is an historic space mission and AAI was ready to introduce and explain it to the eager audience. All that now erased by a historic Nor'easter.

Some compared the October freaky blizzard it to a surprise Halloween trick. Yet, the Solar System moves along within the celestial mechanics of the universe. The opposition of Jupiter on October 29, 2011 happened as predicted without Humans observing it from Virginia to Maine. Luckily, the great Jovian planet consents to an earthbound audience from September through April. Members will get ready again for this coming weekend. The night of November 5th is the new launch date of the AAI Jupiter Jubilee.

The media used the phrase 'Snowtober' to describe the unusual event. Members of AAI will remember it as the Great Halloween Storm that froze out an opportunity to show off the great storms on Jupiter.

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MEMBERSHIP DUES

Regular Membership:	$21
Sustaining Membership:	$31
Sponsoring Membership:	$46
Family Membership:	$5
First Time Application Fee:	$3
Sky & Telescope:	$32.95
Astronomy subscription:	$34

(Subscription renewals to *S&T* can be done directly. See "Membrship-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

DOME DUTY

Nov 25	Team A
Dec 2	Team B
Dec 9	Team C
Dec 16	Team D

FRIDAYS AT SPERRY

December 2, 2011
What's Up? A Down to Earth Sky Guide Kathy Vaccari
Space Missions Briefing
Bill Whitehead

December 9, 2011
Women in Astronomy
Dr. Al Gottlieb

December 23, 2011
TBA

December 30, 2011
TBA

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

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The next **General Membership Meeting** is the third **Friday, December 16, 2011.** The guest speaker is **Andy Poniros**, the solar system ambassador for NASA/JPL he will speak on **The Icy Moons of Saturn**. **PLEASE JOIN US**

Theater in the Sky

by Ron Ruemmler

December 2011 is a busy month for planet watchers. The longest nights of the year find all the players showing off for the holidays.

Venus follows its timid reappearance last month with a dramatic jump into the early southwestern darkness, setting two and a half hours after the **Sun** by New Year's Eve. The Brightest Planet is still on the far side of the **Sun** from us, so its apparent diameter is only half what it will be as it nears the **Earth** next year, but now it shows us most of its illuminated side. Its brightness, therefore, is fairly constant around magnitude -4 all year round.

As **Venus** is setting, **Jupiter** is reaching its maximum altitude just below the little bent finger of Aries, the Ram, very high in the south. At magnitude -2.6, the Giant Planet has faded a bit from its October opposition, but it dominates the primetime sky.

Mars rises just before midnight. The Red Planet is just finishing the dim half of its two year cycle so we have something to look forward to in 2012. Already, telescope users should be able to see some surface features.

Saturn rises in the wee hours of the morning just as **Jupiter** sets. Picking out the Ringed Planet can be tricky since it is fairly close to Spica, the alpha star in Virgo, the Virgin. **Saturn** is on the left and very slightly brighter than the star, since the apparent tilt of its rings is rapidly increasing. At 14 degrees, this is the largest tilt angle since 2006.

Although **Mercury** passes between us and the **Sun** early this month, it rapidly jumps up into the morning sky. Its maximum altitude, maximum brightness (mag. -0.3), maximum elongation from the **Sun**, and conjunction with the **Moon** all happen at the same time two or three days before Christmas. A "star" in the east, indeed!

A total lunar eclipse occurs this month, parts of which are visible almost everywhere on the globe except all of South America and the eastern edge of North America!

December Sky Calendar (times are PM unless noted)

2 Fri 4:52 AM	First Quarter **Moon**
4 Sun 4:00 AM	**Mercury** at conjunction between the **Earth** and the **Sun**
5 Mon 5:30	**Jupiter** lower left of the **Moon**
6 Tue 5:30	**Jupiter** lower right of the **Moon**
8 Thu 4:28	Earliest sunset of the year
10 Sat 9:36 AM	Full **Moon**; Total Lunar Eclipse (not visible from NJ)
17 Sat 6:15 AM	**Mars** upper right of **Moon**
17 Sat 7:48	Last Quarter **Moon**
19 Mon 6:15 AM	**Saturn** left of crescent **Moon** with Spica between them
20 Tue 6:15 AM	**Saturn** directly above crescent **Moon**
22 Thu 12:30 AM	Winter Solstice; shortest day of the year
22 Thu 6:20 AM	**Mercury** far lower left of thin crescent **Moon**
23 Fri 6:30 AM	**Mercury** upper right of very thin crescent **Moon**
23 Fri 10:00	**Mercury** at maximum elongation from the **Sun**
24 Sat 1:06	New **Moon**
25 Sun 11:00 AM	Equation of time is 0; set your sundial
26 Mon 5:30	**Venus** left of very thin crescent **Moon**
27 Tue 5:30	**Venus** below crescent **Moon**

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