SIRIUS ASTRONOMER

www.ocastronomers.org — The Newsletter of the Orange County Astronomers

November 2014 *Free to members, subscriptions $12 for 12 issues* **Volume 41, Number 11**

The October 23 partial solar eclipse is seen in this image from Pauline Acalin, who used an 8-inch Meade SCT with a Canon 50D imager to capture the eclipse. At bottom center is the largest sunspot grouping seen in the past twenty years, with a diameter greater than that of Jupiter. More eclipse photos can be seen in this issue!

OCA CLUB MEETING

The free and open club meeting will be held November 14 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month's speaker is Evan Kirby of Caltech, who will take us on An Archaelological Road Trip with the Keck Telescopes.

NEXT MEETINGS: Dec. 12, Jan. 9

STAR PARTIES

The Black Star Canyon site will open on November 22. The Anza site will be open on November 22. Members are encouraged to check the website calendar for the latest updates on star parties and other events.

Please check the website calendar for the outreach events this month! Volunteers are always welcome!

You are also reminded to check the web site frequently for updates to the calendar of events and other club news.

COMING UP

The next session of the Beginners Class will be held at the Heritage Museum of Orange County at 3101 West Harvard Street in Santa Ana on November 7. The following class will be held December 5.

GOTO SIG: TBA
Astro-Imagers SIG: Nov. 11, Dec. 9
Remote Telescopes: TBA
Astrophysics SIG: Nov. 21, Dec. 19
Dark Sky Group: TBA

Where does the sun's energy come from?

National Aeronautics and Space Administration

Every 1.5 millionths of a second, the sun releases more energy than all humans consume in an entire year. Its heat influences the environments of all the planets, dwarf planets, moons, asteroids, and comets in our solar system.

And that light travels far out into the cosmos—just one star among billions and billions.

Create a 'solar wind' that pushes against the fabric of interstellar space billions of miles away.

Allows gases and liquids to exist on many planets and moons, and causes icy comets to form fiery halos.

Powers the chemical reactions that make life possible on Earth.

That Heat...

The energy travels outward through a large area called the convective zone. Then it travels onward to the photosphere, where it emits heat, charged particles, and light.

How does a big ball of hydrogen create all that heat? The short answer is that it is big. If it were smaller, it would be just be a sphere of hydrogen, like Jupiter. But the sun is much bigger than Jupiter. It would take 433,333 Jupiters to fill it up!

That's a lot of hydrogen. That means it's held together by a whole lot of gravity. And THAT means there is a whole lot of pressure inside of it. There is so much pressure that the hydrogen atoms collide with enough force that they literally meld into a new element—helium.

Nuclear Fusion

This process—called nuclear fusion—releases energy while creating a chain reaction that allows it to occur over and over and over again. That energy builds up. It gets as hot as 15 million degrees Fahrenheit in the sun's core.

Space Place in a snap!

www.nasa.gov

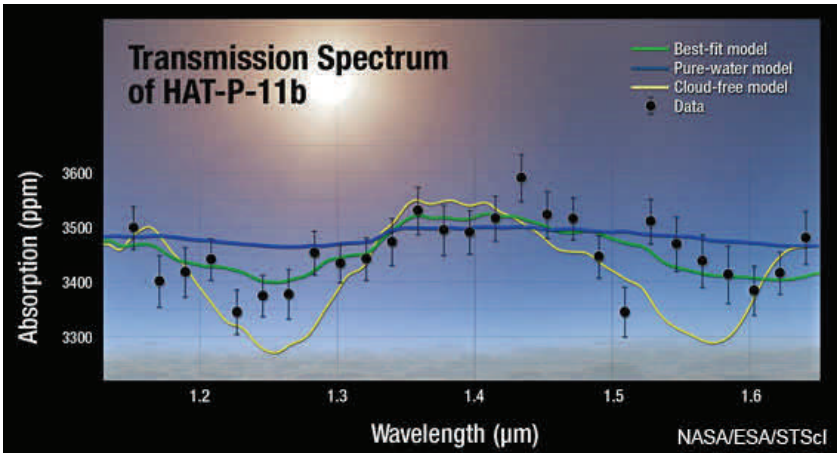
For more articles, games, and activities, visit **spaceplace.nasa.gov**

AstroSpace Update

November 2014

Gathered by Don Lynn from NASA and other sources

Inflation – Back in May I reported here that the team running the BICEP2 radiotelescope had found B-mode polarization in the Cosmic Microwave Background (CMB) that was likely caused by gravity waves left over from Cosmic Inflation, that fraction of a second after the Big Bang when the expansion of the Universe accelerated vastly. In June I reported that other scientists criticized the BICEP2 team for possibly not properly accounting for the polarization that foreground interstellar dust contributes. The Planck space telescope has been measuring polarization of the CMB over the entire sky, and has just released more analyzed polarization data. Unfortunately (for the BICEP2 team) their dust data matches fairly well with where the BICEP2 team thought they had found polarization from Inflation. The Planck team expects to have analyzed and released all their polarization and dust data by the end of the 2014. Then the BICEP2 team will repeat their calculations with even newer Planck data, and see if any Inflation polarization remains after subtracting off the dust polarization.



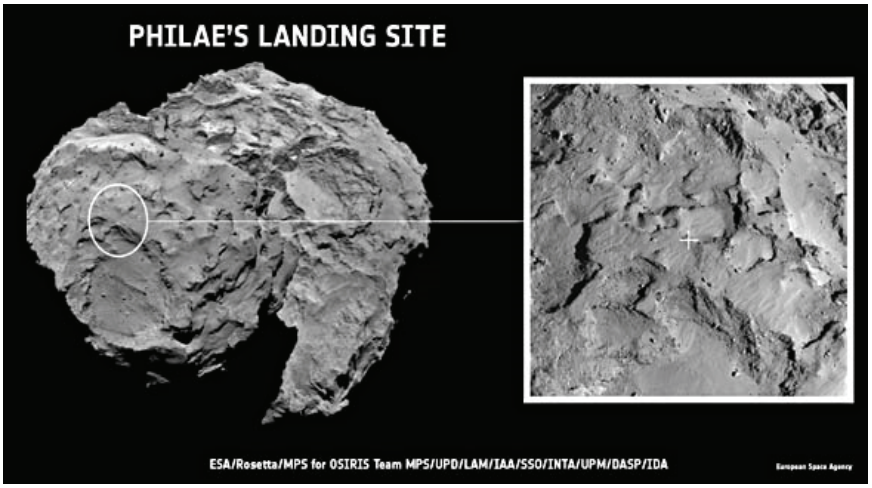
Exoplanet water vapor – Scientists have found clear skies and water vapor in measurements made of the atmosphere of an exoplanet about the size of Neptune. Observations from the Hubble, Spitzer and Kepler space telescopes were combined for this discovery. This is the smallest exoplanet from which molecules of any kind have been detected. Clouds in a planet's atmosphere can block the view to underlying molecules. The planet, designated HAT-P-11b, orbits very close to its star, making a lap about every 5 Earth days. It is 120 light-years away in Cygnus. It is a warm world thought to have a rocky core and gaseous atmosphere. The handful of planets smaller than Jupiter that have been previously observed all appeared to be cloudy, so no information on their atmospheres was obtained. The new observations were made with Hubble while the planet crossed in front of its star. Starlight shining through its atmosphere carried the imprint of molecules there. Observations by Spitzer and Kepler showed that the contributions to the spectrum from starspots were not masquerading as planet's atmosphere. Starspots on this star were shown to be too hot to contain water vapor. The team plans to examine more exo-Neptunes and possibly super-Earths (planets larger than Earth, but smaller than Neptune) to determine their atmospheric compositions.

Exoplanet aging its star – A new study using Chandra (X-ray space telescope) data shows that a giant exoplanet known as WASP-18b is making the star that it closely orbits act much older than it actually is. The star and its planet are located about 330 light-years away. The planet has a mass about 10 times that of Jupiter and completes its orbit in less than 23 hours, placing it in the "hot Jupiter" category (hot because it is so close to its star). The star has been determined to be between 0.5 and 2 billion years old, much younger than the Sun at about 5 billion years. Younger stars tend to be more active, exhibiting stronger magnetic fields, larger flares, and more intense X-ray emission than their old counterparts. Magnetic activity, flaring and X-ray emission are linked to the star's rotation, which generally slows with age. However, when astronomers looked at the WASP-18 star they didn't detect any X-rays. Researchers determined it is about 100 times less active than it should be for its age. The researchers argue that tidal forces created by the gravitational pull of the massive planet may have disrupted the magnetic field of the star. The strength of the magnetic field depends on the amount of convection in the star, or how intensely hot gas stirs the interior. The effect of tidal forces from the planet may also explain an unusually high amount of lithium found in earlier visible-light studies of this star. Lithium is usually abundant in younger stars, but over time convection carries lithium to the hot inner regions of a star, where it is destroyed by nuclear reactions. If there is less convection, the lithium does not circulate into the interior of the star as much, allowing more lithium to survive.

T Tauri winds – Astronomers using the ALMA radiotelescope array in Chile have observed what may be the 1st-ever signs of winds around a T Tauri star. T Tauri stars are the infant versions of stars like our Sun. T Tauri stars are named after their prototype star, an erratically varying star discovered in 1852. They are relatively normal, medium-size stars that are surrounded by the raw materials to build both rocky and gaseous planets. Though nearly invisible in optical light, these disks shine in both infrared and millimeter radio waves. The disk of a T Tauri star usually emits infrared radiation with a predictable energy distribution, but some act up in infrared. To account for the unexpected infrared, astronomers have proposed that winds may be emanating from some of the disks. So astronomers have been looking for evidence of such winds. The ALMA observations were made of AS 205 N, a T Tauri star located 407 light -years away in Ophiuchus, which had the strange infrared signature. ALMA observed the frequency given off by carbon monoxide, which usually is found in all cosmic gas clouds. ALMA confirmed gas was leaving the disk of this star, probably from a wind produced by the disk. The properties of the gas leaving the disk did not exactly match predictions. This could be due to the fact that AS 205 N is part of a multiple star system. The team plans to target other infrared-unusual T Tauri stars, with and without companions, to better understand this.

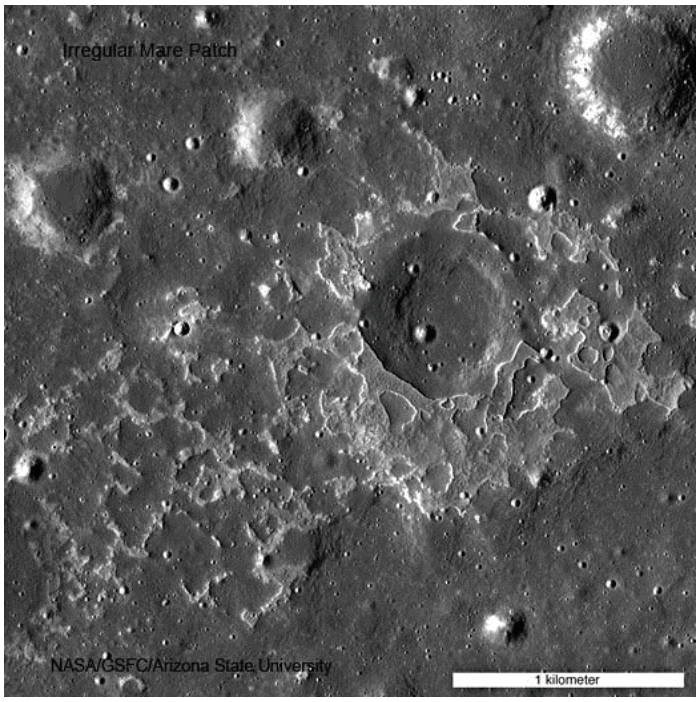
Hubble Space Telescope and ground-based telescope data have shown astronomers a monster black hole inside one of the tiniest galaxies known. The sizes of central black holes normally correlate well with the sizes of their galaxies, so this discovery was a surprise. The black hole is 5 times the mass of the one at the center of our Milky Way galaxy. It is in the M60-UCD1 dwarf galaxy that crams 140 million stars within a diameter of about 300 light-years, which is 1/500 the size of our galaxy. If you lived inside this dwarf galaxy, the night sky would dazzle with at least 1 million stars visible to the naked eye. The observation suggests dwarf galaxies may actually be the stripped remnants of larger galaxies that were torn apart during collisions with other galaxies rather than being born small. The black hole at the center of our Milky Way has the mass of 4 million Suns, and is roughly .01% of the galaxy's total mass, which is typical. The newly discovered black hole has the mass of 21 million Suns, which is a stunning 15% of the small galaxy's total mass.

Miranda (moon at Uranus) – New analysis was done of 3 very large geometric-shaped features known as coronae found on Miranda. The only other coronae known were discovered on Venus in 1983. A leading theory about their formation has been that they form when warm sub-surface fluids rise to the surface and form a dome. As the edges of the dome cool, the center collapses and warm fluid leaks out its sides, forming a crown-like structure. This raises the question of what process warmed Miranda's interior sufficiently for coronae formation. Scientists believe that tidal warming played an important role. Extensive new 3-D computer simulations have produced results that are consistent with the 3 coronae seen on Miranda. This innermost of Uranus's major moons has a weird jumble of seemingly unconnected surface features, including the coronae, huge cliffs, a gigantic canyon and parallel grooves.



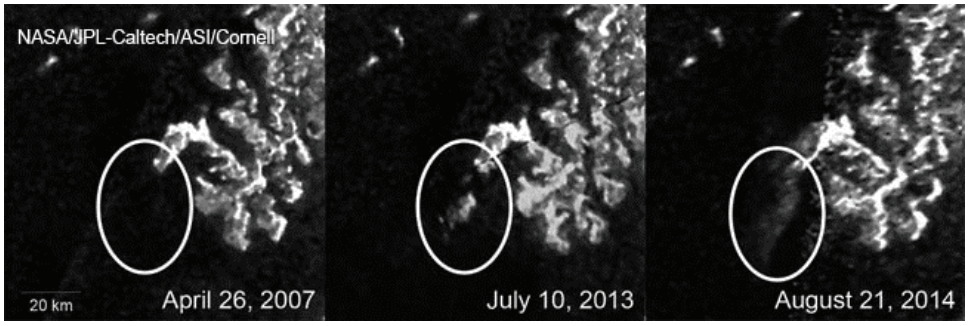
Philae – The landing location and date (November 12) were selected for the Philae spacecraft to land on the nucleus of Comet 67P/Churyumov-Gerasimenko. The 220-pound (100 kg) Philae rode to the comet on the back of Rosetta (European comet mission). The location is candidate J, which is on the "head" of the nucleus, which is shaped like a rubber ducky. None of the candidate landing locations met all the safety and science criteria, but J was considered the best they could do with the odd -shaped and boulder-covered nucleus. During the 7 hour descent, Philae's camera will take continuous series of photos. The comet will complete more than half a rotation during the descent. Philae descends unguided, with just the initial velocity (a slow walking speed) imparted by launch from Rosetta, and very little additional pull from the comet's weak gravity. Philae's propulsion system, rather than cushioning its landing, instead is designed to press it against the surface, while harpoons are fired into the surface to anchor it. Under each foot pad is an ice screw that will further grab the comet. Next Philae will take a 360-degree panoramic picture. The initial science phase will then begin, with other instruments analyzing the plasma and magnetic environment, and the surface and subsurface temperature. The lander will also drill and collect samples from beneath the surface, delivering them to the on

-board laboratory for analysis. The interior structure of the comet will be explored by sending radio waves through the surface toward Rosetta.



Lunar Reconnaissance Orbiter (LRO) has provided strong evidence that the Moon's volcanic activity slowed gradually instead of stopping abruptly about a billion years ago, as had generally been believed. Scores of distinctive rock deposits observed by LRO are estimated to be less than 100 million years old, with some possibly less than 50 million years old. This is going to make geologists rewrite the textbooks about the Moon. The deposits are scattered across the Moon's dark volcanic plains and are characterized by a mixture of smooth, rounded, shallow mounds next to patches of rough, blocky terrain. Because of this combination of textures, the researchers refer to these unusual areas as "irregular mare patches". The features are too small to be seen from Earth, averaging less than 1/3 of a mile (500 m) across. One of the largest, a well-studied area called Ina, was imaged from lunar orbit by Apollo 15 astronauts. The team identified a total of 70 irregular mare patches on the near side of the Moon. The large number of these features and their wide distribution strongly suggests that late-stage volcanic activity was an important part of the Moon's geologic history. The numbers and sizes of the impact craters impressed upon these areas indicate the deposits are relatively recent. The volcanic plains surrounding these distinctive regions are attributed to volcanic activity that started about 3.5 billion years ago and ended roughly 1 billion years ago. The age of the irregular mare patches tells us that the lunar mantle had to longer remain hot enough to provide magma to create these features. The new information is hard to reconcile with what is currently thought about the temperature of the interior of the Moon.

Opportunity (Mars rover) was commanded to reformat its flash memory, since that has caused several failures recently. This process identifies bad memory cells and avoids using them. The reformat was performed successfully, but the rover is still encountering memory errors occasionally. Rover controllers continue to investigate what can be done about the problem, though the rover has resumed roving and doing science.



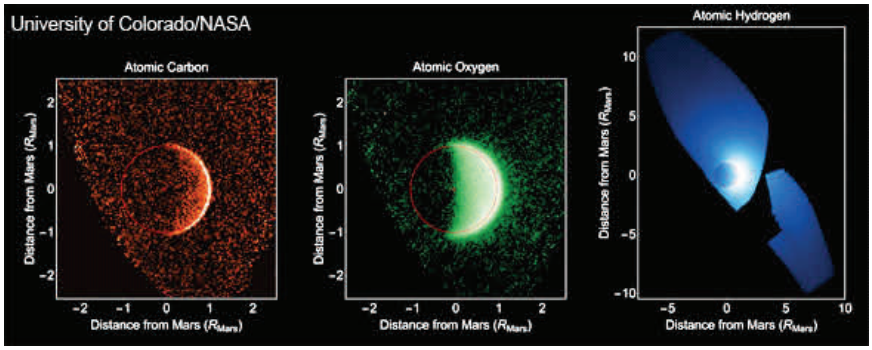
Cassini (Saturn mission) – In August I reported that Cassini had imaged an object that appeared in Ligeia Mare, one of the largest hydrocarbon seas on Saturn's moon Titan, and then it later disappeared. It's back. The feature covers an area of about 100 square miles (260 km^2). Its appearance changed between the 2 apparitions. It has been ruled out that it is caused by lowering of the sea to uncover subsurface features, since the overall shoreline did not move noticeably. Cassini will continue to monitor the area during its flybys of Titan. Maybe continued observation will explain what it is.

GRAIL (gravity-measuring Moon satellites) data has been used by scientists to solve a lunar mystery almost as old as the Moon itself. Early theories suggested the craggy outline of a region of the Moon's surface known as Oceanus Procellarum, or the Ocean of Storms, was caused by an asteroid impact. If this theory had been correct, the basin it formed would be the largest asteroid impact basin on the Moon. However, mission scientists studying GRAIL data believe they have found evidence the craggy outline of this roughly rectangular region (about 1600 miles = 2600 km across) is actually the result of the formation of ancient rift valleys. The rifts are buried beneath dark volcanic plains, but show up in gravity data. The lava-flooded rift valleys are unlike anything found anywhere else on the Moon. The rectangular pattern, with its angular corners and straight sides, contradicts the theory that Procellarum is an ancient impact basin. The study also noted a surprising similarity between the rectangular pattern of structures on the Moon and those surrounding the south polar region of Saturn's icy moon Enceladus. Both patterns appear to be related to volcanic and tectonic processes operating on their respective worlds.

Dawn (asteroid orbiter) entered safe mode after a component in the ion propulsion system was disabled apparently by a high-energy particle of radiation, but the spacecraft has been brought back to normal operation and is thrusting again. The main antenna was not aiming at Earth, so a secondary antenna had to be used to command Dawn back to operation. As a result of the break in thrusting, Dawn will enter orbit around dwarf planet/asteroid Ceres next April, about a month later than previously planned. The plans for exploring Ceres after attaining orbit, however, are not affected.

Gaia (astrometry space telescope), while scanning the sky to measure the positions, motions and spectra of stars in our galaxy, has discovered its 1st supernova explosion in a far-away galaxy. The event took place in a galaxy about 500 million light-years away and was revealed by a sudden rise in the galaxy's brightness between 2 Gaia observations separated by one month. Gaia began its scientific work the end of July in which it repeatedly scans the entire sky to eventually produce a catalog of 1 billion stars. On average, each of those stars will be measured 70 times over a 5-year period. Follow-up observations from other telescopes showed that the supernova was a type Ia. After the 1st few months of operation to build up a base catalog, it is predicted that Gaia should spot 3 new supernovas every day.

Barred spirals – Most spiral galaxies in the nearby Universe have a bar in their center, with the spiral arms coming off the ends. About 10 years ago an astronomer found that the fraction of barred galaxies dropped from 50-70% in the nearby Universe to 10% when the Universe was only 6 billion years old. Now astronomers are using the Galaxy Zoo, an online program of volunteer citizen scientists, to probe even deeper. The expectation was that bars should drop to zero when the Universe was about 5 billion years old. But instead it was found that the barred galaxies were as high as 10% back to when the Universe was only 3 billion years old. Whatever the mechanism is that forms bars, it started early in the history of the Universe, and took a very long time to grow to current numbers.



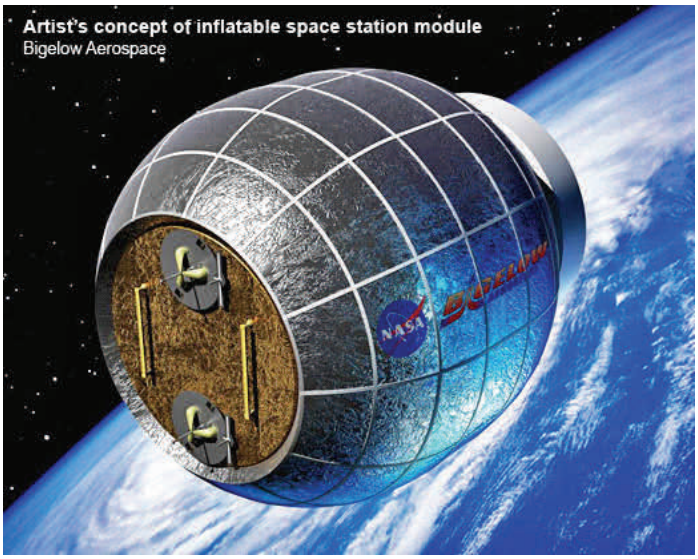
MAVEN (Mars atmospheric spacecraft) successfully entered Mars orbit September 21, where it is preparing to study the planet's upper atmosphere. MAVEN is the 1st spacecraft dedicated to exploring the tenuous upper atmosphere of Mars. This will greatly improve our understanding of the history of the Martian atmosphere, how its climate has changed, and how that has influenced the surface and potential habitability. After 6 weeks of commissioning, which includes maneuvering into its final science orbit and testing instruments and commands, MAVEN will then begin its 1 Earth-year primary mission taking measurements of the composition, structure and escape of gases in Mars' upper atmosphere and its interaction with the Sun and solar wind. The primary mission includes 5 deep-dip campaigns, in which MAVEN's lowest orbital point will be lowered from 93 miles (150 km) to about 77 miles (125 km). These

measurements will provide information down to where the upper and lower atmospheres meet. During initial commissioning, MAVEN has already measured the effects of a solar storm hitting Mars and produced a comprehensive map of ozone in the Martian atmosphere.

MOM (Indian Mars orbiter) arrived in Mars orbit the same week as MAVEN. MOM, also known as Mangalyaan, will study surface features, minerals, and the atmosphere. Its instruments complement those of MAVEN, and agreements have been made to share science between the 2 missions.

STEREO (solar space telescopes) – One of the pair of STEREO spacecraft (STEREO-Behind) failed to communicate with Earth after a planned reset of the spacecraft October 1. NASA is still attempting rescue efforts. The other STEREO spacecraft (STEREO-Ahead) is operating normally However, for over 3 months next spring, STEREO-Ahead will be too close to the Sun, as seen from Earth, to communicate fully with us, and during that time it was planned that STEREO-Behind would be the only source of information regarding activity on the back side (from Earth) of the Sun. If efforts to revive the spacecraft fail, then we will have no data during that period on back-side solar activity, severely limiting the forecasting of solar storms.

Inflatable space module – Astronauts aboard the International Space Station (ISS) are going to get an inflatable room addition next year. The Bigelow Expandable Activity Module (BEAM) is the 1st privately-built space habitat that will be added to ISS. It will be transported into orbit aboard a SpaceX Falcon 9 rocket. BEAM weighs about 3000 lbs (1400 kg) and is 13 ft (4 m) long and 10.5 ft (3 m) in diameter after inflation. NASA will use BEAM to test how non-metallic structures react to radiation, heat and overall operations in space. The Bigelow Company is planning in a few years to take tourists into orbit with up to 2 month stays in an inflatable space station (prices start at about $26 million).



Instant AstroSpace Updates

Astronomers looked at more than 22,000 galaxies and found that smaller galaxies efficiently create stars from gas, but most massive galaxies produce hardly any new stars, instead grow by **eating other galaxies**. Our Milky Way is at a tipping point and will create fewer new stars in the future, but will eat galaxies, including the Magellanic Clouds (but not for a few billion years).

The RapidScat instrument has been mounted on the outside of the **International Space Station** (ISS) to begin measuring ocean surface winds and help improve weather forecasts, including hurricane monitoring. It is the 1st of a series of Earth-monitoring instruments planned for ISS, with the 2nd being CATS, a laser device to measure clouds, pollution, dust and smoke, to be launched in December.

Symposium on Telescope Science Wins Again

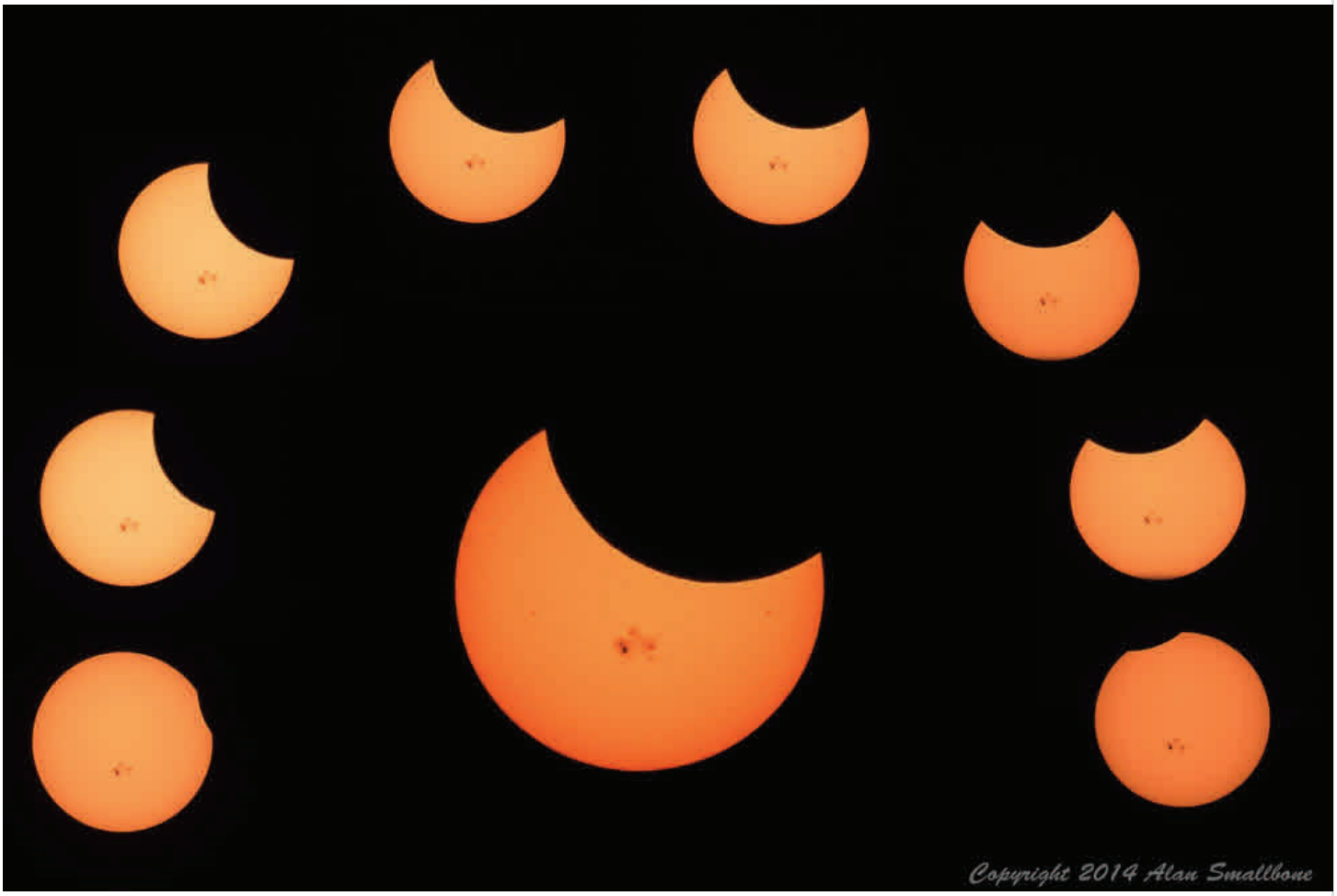
David Watson

The Society for Astronomical Sciences (SAS) cohosted their annual Symposium on Telescope Science with The American Association of Variable Star Observers (AAVSO) and Center for Backyard Astrophysics (CBA) June 12-14 in Corona. This symposium and its organizers and presenters provided an elegant merger of techniques of observing the universe and the science that defines it. The format was formal technical papers assembled in a bound proceedings for the attendees and presented by the authors in a series of short talks. Over 100 attended, including several Orange County Astronomers. OCA's Bob Buchheim presented a paper on Improving Signal-to-Noise and was elected to the SAS board. His neckties lent some refinement to the event.

The sessions began with a day of workshops. The main event was a thorough treatment of supernovae. Shorter topics provided instruction on observing and analysis tools. Two days of paper sessions introduced recent work by speakers from across the US and around the world. The topics included activities on deep space and solar system science as well as a terrestrial report of light pollution efforts.

Several presenters solicited observers to contribute to data collection for variable stars and other activities where amateur astronomy is contributing greatly to better funded professional research.

As a novice astronomer "groupie" I was thrilled to have sat at the knees of some of the preeminent amateur astronomers from around the world. It was an enriching experience, one that is recommended for all Orange County Astronomers. Information on the symposium and SAS, including the papers of past symposiums, is available at socastrosci.org.



This montage by Alan Smallbone shows the October 8 eclipse from first to last contact.

How I Bought My First Telescope

Christine K. McGill

If you don't currently own a telescope, you might want to wait before you decide to buy. You might not, however, want to wait as long as I did after joining the OCA: 2 years and 9 months.

Well, I didn't want to rush into a decision. I was busy. I didn't want to make the wrong choice and commit to something I might eventually come to dislike. Cost was another factor. And, finally, there was the fact that I could always borrow one. The club has some fine telescopes for members to borrow, such as the first one I used, a 10-inch Coulter Dobsonian. So, I took matters slowly: I learned my way around the sky with my binoculars and the Dobsonian. I also learned how to use the 10-inch Meade LX-200 SCT at the Anza Observatory, with it's object library and GOTO capabilities. Nice.

But, I have neither a "GOTO" nor an "ATM" personality. I could neither persuade myself to invest in an instrument that would do all the thinking for me, nor did I want to make one. Rock bottom, I just wanted a traditional telescope.

What to buy? Well, I thank my lucky stars that I didn't run out to buy a grocery-store telescope! (I actually saw a posting to the sci.astro.amateur newsgroup that read: "What are the best brands? Who sells absolutely the cheapest? I was looking at a telescope at Wal-Mart recently…") I believe that the best way to check out telescopes is to borrow one from the club or a friend, to go to star parties and spend some time with other club members, who are very willing to answer any questions one might have, to get involved with the use and maintenance of the club's telescopes. In addition, one should read everything one can find in print or on the internet. Sky and Telescope's pamphlet "Choosing Your First Telescope" is available from the club and from their website. In addition, many OEMs and resellers provide general information on telescopes for the potential buyer.

As it turns out, I was looking at ads on the internet and in magazines for about 2 weeks prior to my attending RTMC. I must have made a subconscious decision, because once I arrived at Big Bear, I had to buy a telescope. I could think of nothing else. This was only my second RTMC; at my first one, my big purchase was a set of books by Brent Watson, the "Finder Charts of the Messier Objects", designed for Telrad users. Thinking about my pocketbook, I was led (or misled) first to the used telescope vendors. I almost bought a 4-inch Meade refractor, when Don Lynn showed up and talked me out of it. I walked over to the Meade booth and stopped by Al Nagler's booth as well. Nothing really excited me, though. Later, in the women's dorm, I spoke to someone whose boyfriend sells scopes, and I went and looked at it and walked away (quickly) because it was dinnertime. At dinner, I expressed my desire to buy a telescope contingent upon my failing to win one at the door prize drawing. I enlisted Don Lynn and John Sanford and felt confident that I could arrive at the right

decision with the two of them along.

The following morning, we took off after breakfast, and arrived at a vendor of telescope-making kits. Uh-uh. The next booth belonged to Discovery Telescopes. I had never heard of them, but we stopped to look. The company is located in Oceanside, and they are a supplier of mirrors and telescopes to several big-name telescope companies. I grew increasingly interested, because the price range for their Newtonian reflectors was just right for me. (The company sells direct to the public.) Moreover, the telescopes on display (several Newtonian reflectors and a Dobsonian) were attractive, with a glossy black finish and mounted on aluminum tripods. There were 4.25-, 6- and 8-inch Newtonians on display. I was drawn to the 6-inch f/5 for its cost ($499), and asked John and Don to look at it.

The glass parabolic primary mirror showed crisp images, but I'm not an expert. My friends were impressed with the optics, and the mount appeared stable enough. Then, John reminded me of something Doug Millar had mentioned at breakfast: "Don't buy anything less than an 8-inch!" He pointed out that the 8-inch f/5 also included a DC motor drive (the RTMC special) for free, and the extra 2 inches of aperture would make a great difference. Aperture rules, right? Right! I made a deal for the telescope, which comes with a 25-mm Plossl, 2- and 1.25-inch rack-and-pinion focuser, mount and tripod (same as Orion's SkyView Deluxe EQ), the free DC drive and a 10-mm Plossl for less than $600, and I still haven't stopped smiling!

My telescope (named Lucille) is beautiful and very portable. I can setup and break down in under 20 minutes. I've hauled it to the Silverado star party, the Anza star party, to the Discovery museum in Santa Ana, and to Jim Benet's house. I've viewed the Dumbbell nebula, Albireo in Cygnus, Mizar in Ursa Major and M13, just to name a few objects. They are truly stunning and clear right out to the edge of the field. I'm never disappointed by the images, and no wonder: Discovery boasts these mirrors are accurate to 1/10 wave. Aaron Imaoka tried out his TeleVue zoom eyepiece (8 to 24 mm) on my scope, and now, I am really hooked. That must be what happens: you buy the scope, then you just spend, spend, spend to enhance it even more. Eventually, I want to try my hand at piggyback photography, but right now, I'm just content to learn my way round the sky, just like I wanted.

(NOTE: This article originally appeared as a Featured Article on the Orange County Astronomers website. Outdated weblinks and other information have been deleted from the article)

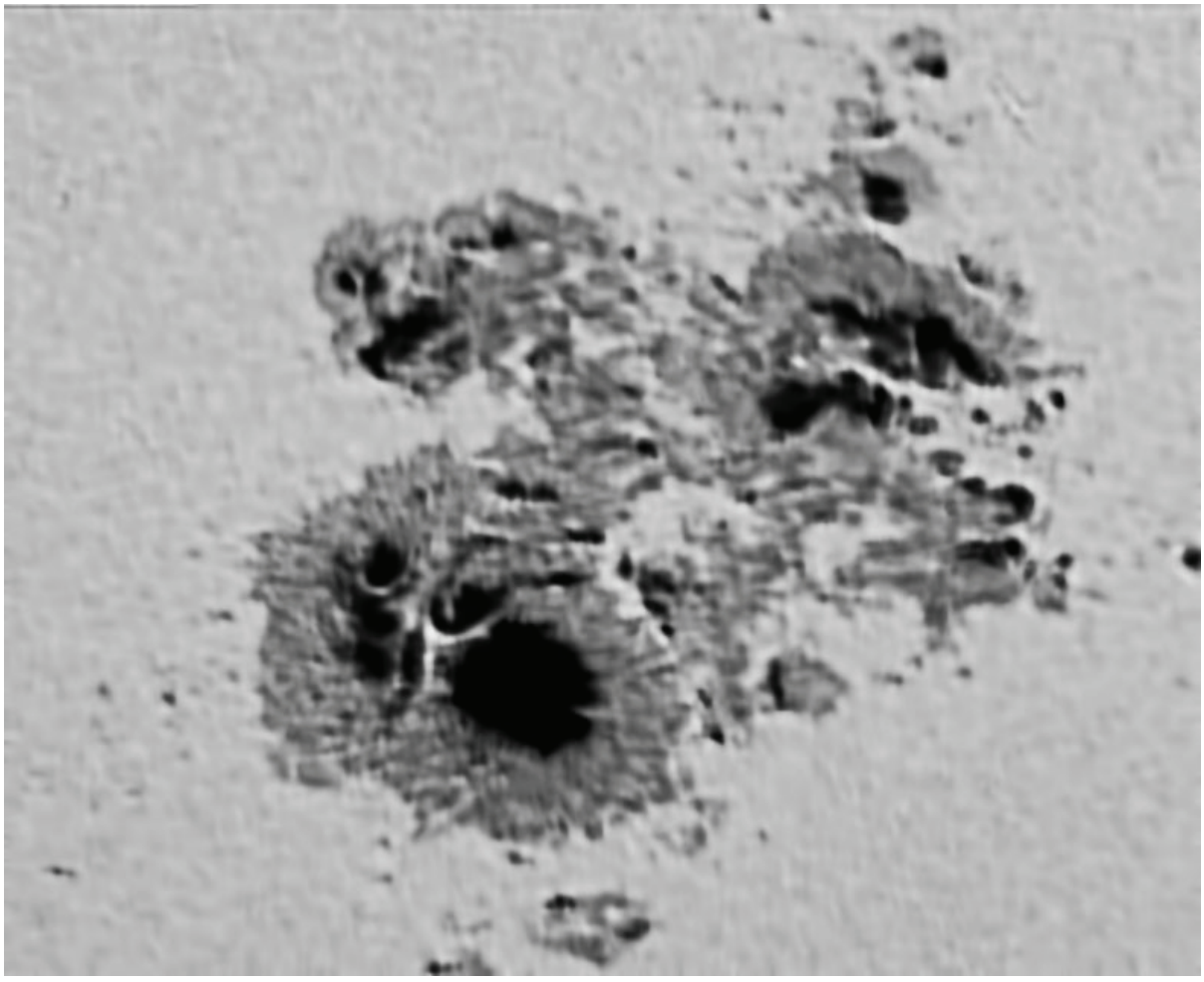
For Sale: Losmandy G11 German Equatorial Mount. This mount is the digital drive (non-Gemini GOTO) version. It has encoders, a Robin Casady dovetail saddle, and many extras. It has a payload capacity of 60 pounds, plus counterweights. If interested, contact John Fisanotti at jfisanotti@sbcglobal.net or 818-957-2605 and he will send you an eight-page brochure with further details and many more photos. Asking $2400 and will deliver to a local (within Southern California) buyer.

FOR SALE: 2 Meade Maksutovs. Take your choice or buy both - excellent optics, rarely used.

ETX-125 5" $575

LX-200 7" $1500

Contact Rick Hull email hull3@cox.net



Pat Knoll was able to image this very detailed image of the enormous sunspot grouping spotted just prior to last month's eclipse. Pat used a Mylar filter on his 10-inch LX200 in order to capture the image safely. ALWAYS use appropriate filters when imaging the Sun, even during an eclipse!

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