SIRIUS ASTRONOMER

www.ocastronomers.org

The Newsletter of the Orange County Astronomers

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Comet ISON was captured on October 31, 2013 by Leon Aslan from our Anza site on its way to perihelion on November 28th. The comet will be best visible from mid-November to mid-December, passing 40 million miles from Earth on December 26th. Although many have dubbed this comet the 'Comet of the Century,' comets generally (and ISON in particular) have been known to behave erratically, with unpredictable periods of brightening and dimming as volatile frozen gases sublimate from their surfaces (sometimes breaking the comet apart completely) as they experience increasing temperatures during their inward journey toward the Sun.

OCA CLUB MEETING

The free and open club meeting will be held November 8 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, Dr. Virginia Trimble of UCI will present "Blurring the Boundaries among Astronomy, Physics, and Chemistry: The Moseley Centenary"

NEXT MEETINGS: December 13, January 10

STAR PARTIES

The Black Star Canyon site will open on November 30. The Anza site will be open on November 2 and November 30. 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 1. The following class will be held December 6.

GOTO SIG: TBA
Astro-Imagers SIG: Nov. 19, Dec. 17
Remote Telescopes: TBA
Astrophysics SIG: Nov. 15, Dec. 20
Dark Sky Group: TBA

AstroSpace Update

November 2013

Gathered by Don Lynn from NASA and other sources

Exoplanet clouds – Astronomers using data from the Kepler and Spitzer space telescopes have created a map of the clouds on an exoplanet (a planet beyond our solar system), a Jupiter-like world known as Kepler-7b. The planet has high clouds in the western hemisphere and clear skies in the east. Previous studies have made temperature maps of exoplanets, but this is the first cloud map. The planet is quite hot, at about 1500-1800°F (800-1000° C). This is relatively cool for a planet so close to its star (16 times closer than Earth is to its Sun). The cloud patterns on 7b do not seem to change much over time. It is one of the puffiest planets known (low density). It whips around its star in just less than 5 Earth days.

Exoplanet evaporating – Astronomers have found that an exoplanet found by Kepler is evaporating in response to massive stellar flares emitted by its star. This was deduced by the correlation between the shape and depth of the drop in light when the planet transited its star and the brightness variations of the star. In other words, stellar flares are causing a cloud of evaporating planet material to surround the planet. There is more blockage of light on the trailing side of the planet, meaning a tail is forming out of this evaporated material.

Spitzer (infrared space telescope) has become a premier tool for studying exoplanets. It was not designed for this duty, since the design was made before exoplanets were discovered in great numbers. The guidance system was not designed to hold the image of a star (and its planet) on a small fraction of a pixel, though that is what is needed to detect tiny changes in light level as an exoplanet transits its star, or is eclipsed by its star. By reducing usage of the battery heater, stability of guiding was increased. The pointing control device for precisely putting a star onto a spectrometer slit was found to increase stability of guiding, and can now be used on all observations, not just the spectrometer. Then tests were made to characterize performance of each quarter of each pixel. The resulting performance of Spitzer with these changes has allowed many observations of exoplanets and their atmospheres that had previously been beyond the capabilities of any telescope.

Cosmic microwave background (CMB), relic radiation from the Big Bang, is believed to be mildly polarized, in both E-mode and B-mode patterns. If you had eyes that see microwaves instead of ordinary light, putting on polarized sunglasses would let you see this. The E-mode is much easier to detect and was found in 2002. There are 2 causes that should imprint B-mode on the CMB: 1) gravitational lensing as the CMB passes massive objects on its way to us, and 2) the effects of inflation (the enormous acceleration in the expansion of the Universe in its first fraction of a second of existence). Recent observations from the South Pole (microwave) Telescope showed B-mode polarization, and the locations that it was seen in the sky were then compared with the locations of mass concentrations (such as large galaxy clusters), as found by the Herschel infrared space telescope, and they correlated. This means we have now detected cause 1 for B-mode polarization of the CMB. Planck (CMB space telescope) is currently making observations that may detect B-mode polarization from both causes. Those results are expected sometime in 2014. Positive results would boost our confidence that inflation is understood.

Hubble Space Telescope has discovered an extremely dense ultra-compact galaxy. It is dubbed M60-UCD1, and is a companion to the large elliptical galaxy M60, which is about 54 million light-years away. The density of stars is about 15,000 times greater than those found in the Sun's neighborhood in our Milky Way. Half the mass is found within a radius of only 80 light-years. The galaxy has a bright X-ray source in its center. One explanation for this is a giant black hole. It is estimated to be 10 billion years old. Astronomers are trying to determine if M60-UCD1 was born really jam-packed or if it is just the dense center of a larger galaxy that got the outer parts stripped away. The galaxy has Sun-like levels of heavy elements, and if the X-ray source turns out to be a black hole, then those 2 features would argue for it being the stripped-down center of a previously larger galaxy.



Hot gas – Enormous arms of hot gas have been revealed in the Coma galaxy cluster in data from 2 orbiting X-ray telescopes. Researchers think that these arms, which span at least ½ million light years, were most likely formed when smaller galaxy clusters had their gas stripped away by the head wind created by their motion. These features may provide insight into how the Coma cluster has grown through mergers of smaller groups of galaxies to become one of the largest gravity-held structures in the Universe. The newly discovered X-ray arms are estimated to be about 300 million years old, and they appear to have a rather smooth shape. Most theoretical work had expected galaxy cluster mergers to produce more turbulent structures.

Red nuggets – In 2005, Hubble spotted unusually small galaxies densely packed with red stars so distant that we were seeing them as they appeared when the Universe was young. They were nicknamed "red nuggets". But no red nuggets were seen nearby. A new study has found them hiding in plain sight. The Sloan Digital Sky Survey was searched for red nuggets, on the assumption that they may be so small that they appeared like stars. Their spectra were checked to see if they matched red nuggets. The study found more than 600 candidates that might be red nuggets. Then the team searched archived Hubble Space Telescope data to find images of the candidates. 9 have been found that match in size the more distant red nuggets. The most massive are up to 10 times the mass of our Milky Way, but are up to 10 times smaller. They are now being called compact massive galaxies. Plans are to study more of these objects with Hubble.

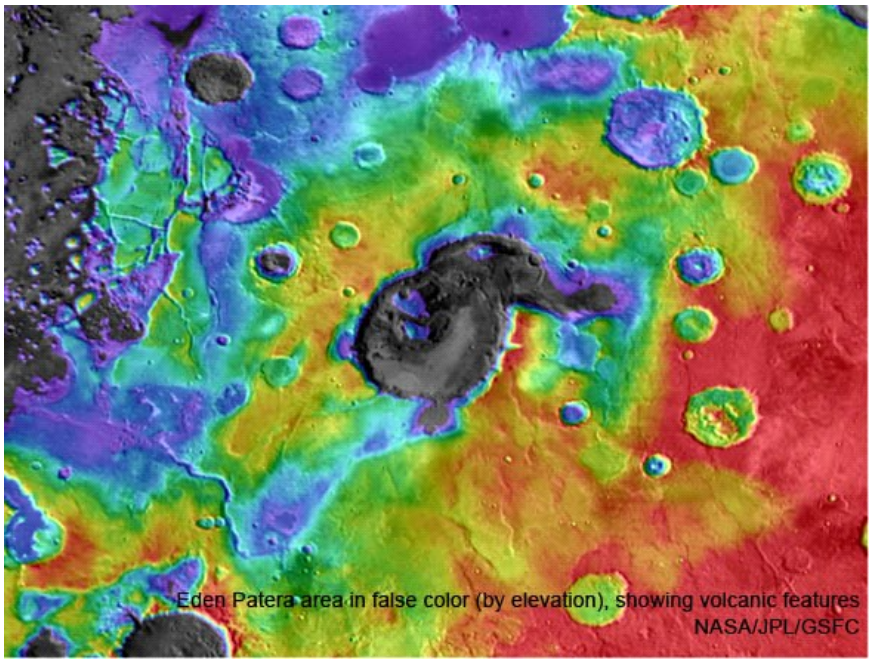
Dual mode pulsar – A team of scientists using a fleet of orbiting X-ray telescopes has discovered a millisecond pulsar with a dual identity: sometimes it pulses X-rays, and sometimes it pulses radio waves, but not both at once. Millisecond pulsars are neutron stars that spin between 100 and 1000 times per second, emitting a pulse every revolution. It is believed that material falling into the neutron star from its companion star causes the change in mode. Neutron stars can reach these incredibly fast rotation speeds by being spun up by material raining down from a companion star. Such material raining down typically produces X-rays, ending in a burst of X-rays when the accumulated material undergoes a nuclear reaction. Apparently with the newly discovered pulsar, the material comes in batches, and that material absorbs the radio pulses so that we see radio only between batches. It is located in the globular star cluster M28. It spins once every 3.9 milliseconds and has a companion star that orbits it every 11 hours.

Planetary nebula jet – A team of astronomers have for the 1st time found a jet of high-energy particles emanating from a dying star. Jets are typically found at newborn stars or black holes. This star, designated IRAS 15445-5449, is in the process of becoming a planetary nebula. It lies 23,000 light-years away in Triangulum Australe. The radio signal from the jet varies in a way that suggests it may last only a few decades. The jet may determine how the nebula will look when it finally gets lit up by the star.

Sylvia – Combined observations from the world's largest telescopes and small telescopes used by amateur astronomers, including stellar occultations, have tracked 2 asteroid moons as they orbit their parent asteroid (87) Sylvia. This not only allowed calculation of Sylvia's mass, but showed that most of it is concentrated in a spherical dense core surrounded by a fluffy or fractured outer layer. Another finding is that one of the moons, Romulus, is 15 miles (24 km) in diameter with an extremely elongated shape, possible made of 2 lobes joined together. This is not surprising if the moon formed from the accretion of fragments created by another body impacting Sylvia billions of years ago, as many astronomers theorize. Sylvia's shape was determined, and it is quite irregular.

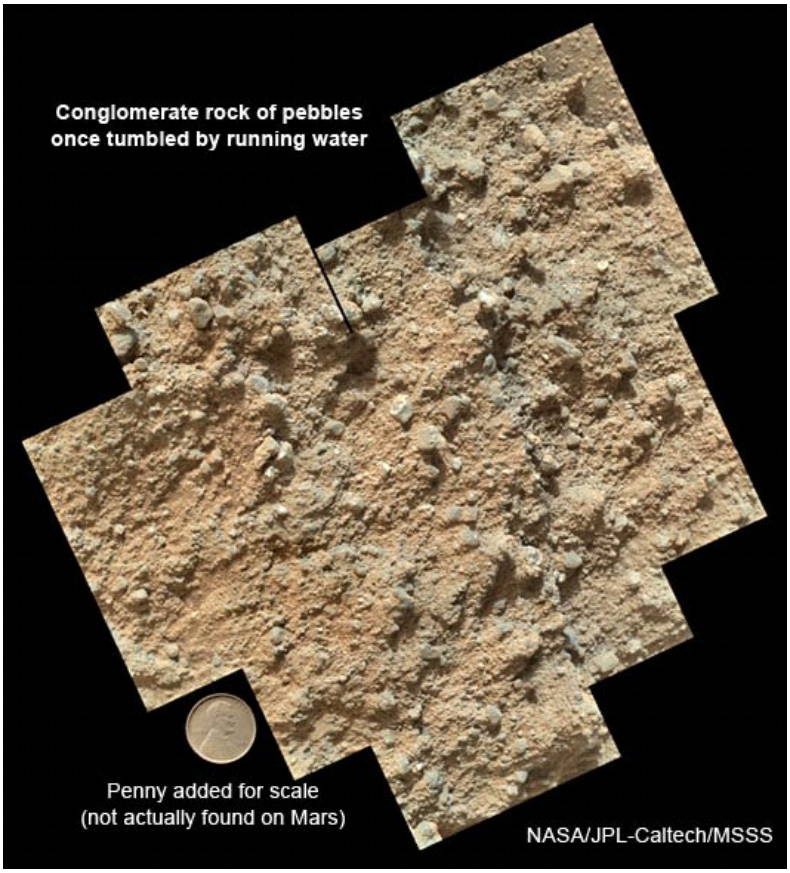
Opportunity (Mars rover) began ascending Solander Point, the 1st mountain the rover has climbed in its nearly a decade of roving. The point has layers of rock that are expected to shed light on Mars' ancient history. The rover is positioning itself on a north-facing slope, which will increase generation of power by its solar panels during the coming southern Mars winter, when the sun dips low and reduces solar power.

Martian volcanoes – A number of Martian volcanoes have been identified by their massive shield-shaped structure. But these are relatively youthful features. A new study looked for ancient volcanoes and found some candidates which are not shield-shaped, but appear to be volcanic craters. They do not have the raised rims characteristic of impact craters. This study suggests that these were more explosive than more recent volcanoes, probably due to more gases contained in the lava. If future work finds more ancient volcanoes this could contribute substantially to how Martian atmosphere formed. It would also explain the volcanic ash and dust that rovers have found on the surface.


Eden Patera area in false color (by elevation), showing volcanic features
NASA/JPL/GSFC

Europa – By analyzing the distinctive cracks lining the icy face of Jupiter's moon Europa, scientists found evidence that it likely had a tilted spin axis at some point. One of the mysteries of Europa is why the orientations of the long, straight cracks have changed over time. The new study found that a small tilt sometime in the past can explain much of what is observed. The cracks are believed to be the result of tidal stresses from the moon's elliptical orbit. A leading explanation for the crack orientation change had been that Europa's frozen outer shell might rotate slightly compared to the moon's core. However the tilt explanation seems to fit the observation of crack orientation better. The new explanation could mean that the cracks are more recent than thought. This is because precession of a tilt should change far faster (months) than drift in the icy shell (many thousands of years). Measuring the tilt of Europa's axis will now become a goal of any future mission.

Io – An international team of astronomers set out to better constrain the constituents of the thin atmosphere of Io (Jupiter moon). They detected the 2nd most abundant isotope of sulfur (34-S) and tentatively detected potassium chloride. The observations were made with the APEX radiotelescope in Chile. They expected to also find silicon monoxide and disulfur monoxide, but have not yet. It is possible that they are not present, but more likely the observations were not sensitive enough to detect them. They plan to try again using ALMA, an array of radiotelescopes like the single-dish APEX. Surprisingly the ratio between the sulfur isotopes 34/32 is twice as high as normal for the solar system. This result tells us that some process at Io is enriching 34.



Curiosity (Mars rover) used its automatic tool placement program for the 1st time. Instead of commands sent from Earth to place the arm with its tools in an exact spot (in 3 dimensions) in order to analyze a particular rock, the automatic system puts the arm close to the target, then uses pictures taken by the hazard camera to zero in on the rock's position exactly, without Earth intervention. Curiosity has discovered another patch of pebbles, this one dubbed Darwin, that were obviously tumbled by running water long ago. The discovery was made at the 1st waypoint on its trip toward the base of Mt. Sharp, the ultimate target area. Five waypoints were chosen from orbiter images as looking geologically interesting enough to stop and look around. Some analysis will be done on Darwin to determine if the rock

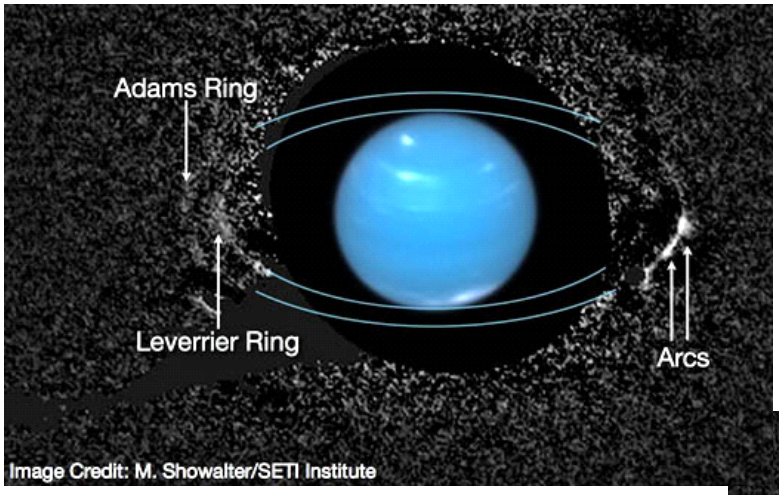
composition is the same as that of the previously found veins formed by flowing water (at an area dubbed Yellowknife Bay), in which case the water at the 2 locations likely flowed at the same time in Mars' history.

Curiosity has analyzed multiple samples of the Martian air and found no methane. Amounts as little as 1.3 parts per billion would show up in this analysis. This is a surprise to researchers because previous data from other spacecraft and telescopes have detected methane, in amounts about 6 times larger than this limit. One observation showed 45 parts per billion. Theoretically, such a concentration anywhere on the planet could not fail to be detected where Curiosity is located. The gas is potentially a sign of life, though it can also be produced without biology. Curiosity also has a concentration mode of analysis, which is more sensitive to small amounts, and this will be tried next.

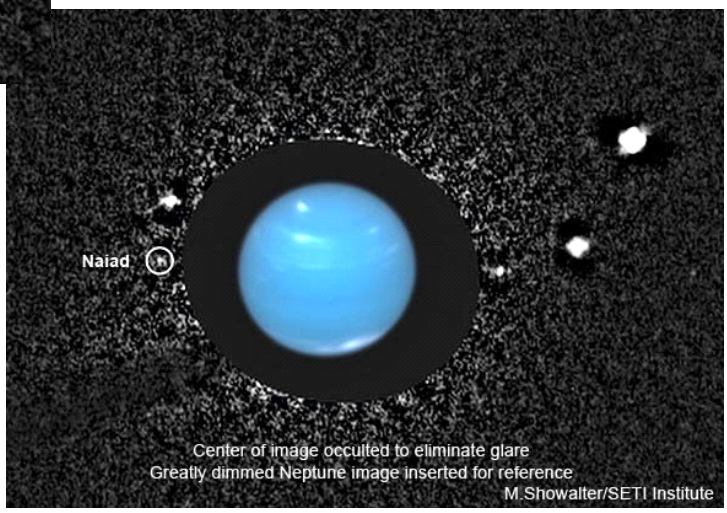
Curiosity found that fine-grained soil particles near its landing site have about 2% by weight of water bound to those particles. Since wind blows dust about the whole planet, the result likely holds for Martian dust in all locations. X-ray analysis identified 10 distinct minerals, including a surprisingly large portion of amorphous (non-crystalline) material. Chlorine was found by baking soil samples, which is likely contained in chlorate or perchlorate.

Cassini (Saturn mission) has detected propylene, a chemical used to make food storage containers and car bumpers, on Saturn's moon Titan. This is the 1st detection of propylene on any moon or planet, other than Earth. The detection was difficult because propylene's weak signature is crowded by related chemicals with much stronger signals.

Changes in surface brightness on Titan observed over 4 years by **Cassini** have added to evidence that cryovolcanism (volcanic activity of very cold liquids) is active there. A recent study found many volcanic-like features, such as flows, calderas and craters. Astronomers believe that beneath its icy surface there is an ocean of liquid water, possibly mixed with ammonia. The low number of impact craters seen on Titan suggests that the surface is relatively young and is therefore being actively remade. Something is replenishing the methane it Titan's atmosphere as fast as it is depleted, also suggesting cryovolcanism. The reflectivity of 2 areas with features suggesting cryovolcanism was found to change, one growing lighter, the other darker.



Naiad – Voyager 2 in 1989 discovered a moon at Neptune which was subsequently named Naiad, and it has never been seen again. The problem is that it is 2 million times fainter than Neptune, and never appears from Earth farther than 1 arcsecond from the planet. A new way of processing images was developed to suppress glare and applied to existing Hubble Space Telescope images of Neptune (actually without the planet, as it is covered by an occulting device in these images) and Naiad showed up as a faint point of light. It was a bit off from the expected position in its orbit, which probably means that other moons are perturbing it. The new image processing also brought out very dim parts of the rings and ring-arcs circling Neptune. 2 of the 4 arcs seen by Voyager have disappeared, showing that the arcs are transient features.



Juno (Jupiter mission) flew by the Earth October 9 at only 347 mi (559 km) altitude to get a gravity slingshot toward Jupiter. Some spacecraft error sent it into safe mode while out of contact during the flyby. Spacecraft controllers were able to return Juno to full operation, and it was found to be exactly on track toward Jupiter,

to arrive in 2016. All the planned observations during the flyby of the Moon and at least some of the Earth were successfully made before the glitch shut down operations.

Deep Impact mission has ended after almost 9 years in space after communications with the spacecraft were lost. The original mission was to deploy an impactor into Comet Tempel 1 and observe what materials were blown off. Then it gravity slingshot past Earth and aimed for Comet Hartley 2, which was observed close-up. Since then it has imaged various targets, including exoplanets, Comet Garradd and Comet ISON.

GOCE (satellite measuring Earth's gravity) is nearing its end of mission after more than 4 years, and the satellite will soon reenter our atmosphere. It has been orbiting Earth at the lowest altitude of any research satellite in order to be more sensitive to variations in gravity. It has an aerodynamic shape to reduce drag from the very thin atmosphere encountered at this low orbit. It uses fuel to counteract the drag, but will soon run out of fuel. Most of GOCE will disintegrate on reentry, but several parts might reach the ground.

Nobel Prize in Physics this year was awarded to Peter Higgs and François Englert for their theoretical work (about 1964) that predicted what has become known as the Higgs particle, which was finally detected by the Large Hadron Collider (LHC) last year. The Higgs particle is a result of the Higgs field, which was theorized in order to explain the variety of masses that all the other fundamental particles possess. It pays (as far as Nobel Prizes) to live long after your discoveries. A third scientist (Robert Brout) who contributed to the theory of the Higgs particle did not live long enough to get the prize. And the team of 5000 who ran the experiments on the LHC apparently were not even considered for the prize. Nobel rules do not allow for more than 3 (still alive) people to share a discovery. This is becoming increasingly an issue in today's world of science being done by large teams. In fact, a few other scientists were involved in the work that Higgs, Englert, and Brout did, but there was not room for them under the Nobel rules. Some experts have proposed that the omission of the discoverers of the Higgs particle simply means that they are being considered for a separate prize in future years. Time will tell.

Government shutdown, caused by Congress's failure to pass a budget, does not substantially affect spacecraft in space, as minimal operation crews were deemed "essential" and so remain on the job. However, public relations people were deemed non-essential, so we don't get to find out what the spacecraft are doing or discovering. Most NASA web sites are down during the shutdown, though JPL and some other organizations under contract to NASA are continuing normal operations including web site maintenance. One scary decision was that preparing the MAVEN spacecraft for imminent launch was non-essential, but this was reversed after 3 days, and launch preparations resumed. The launch window is from November 18 to December 7. After that, it's 26 months until Earth again aligns with Mars to allow a launch.

Instant AstroSpace Updates

ALMA (submillimeter wavelength radio telescope array in Chile) has taken delivery of its 66th and final antenna. ALMA has been operating since early 2010 with a subset of the antennas, and has already made a number of astronomical discoveries.


ALMA antennas
ESO

Cygnus (commercially developed [by Orbital Sciences] cargo spacecraft) docked for the 1st time with the International Space Station, making it the second type of American-made cargo craft to compete with the Russian Progress flights. It was delayed a week in docking due to a communications glitch, which was corrected by sending updated software to the onboard computer while on its way to the Station.

The asteroid designated **2013 QW1**, upon further investigation, turned out to be the 3rd stage of the Chinese Long March 3C rocket used to launch the Chang'e 2 spacecraft to the Moon in 2010.

China has announced that they plan to train and transport astronauts from other countries into space in the future. Only Chinese astronauts have participated in their space program until now, and the country has not participated in any multinational space efforts led by other countries.

Scientists have found that **amino acids**, the building blocks of life, can be created when icy comets collide with a planet, or when a rocky meteorite collides with an icy body.

Request for Outreach Help

From Jim Benet

The Orange County Astronomers have supported a robust schedule of Outreach programs throughout Orange County. During the past 15 years that I have been the coordinator of the program, members of the OCA have participated in over 760 Outreach programs for schools, parks, libraries and Scouts. In excess of 100,000 people have peered through our telescopes and learned something new about our universe. We have been recognized and honored for our work and we are all very proud of what we have accomplished. People have gotten interested in astronomy. New people have joined the OCA as a result of our Outreach program and the club has received over $12,000 in donations due to our activities.

Can this trend continue over the next several years? Can we get enough members to contribute and support our Outreach program and perpetuate this achievement into the future? This is up to you.

Over 50 schools have now requested Outreach programs for the 2013/14 school-year alone. Currently, we do not have enough active volunteers to support this level of activity. Our choices are clear. We are either going to have to get more members to help out or we are going to have to cancel Outreach programs at our schools. I would hope we can find a solution with the first option. But we desperately need your help to do so.

I am asking OCA members that have a telescope to please actively participate in the Outreach program during our busiest months: November through March. Many of you have done this before but have since dropped out. I am asking that you come back and help us again as you used to. I very much appreciate what you have done. I am also asking for new volunteers who have not done this before to come out and give it a try.

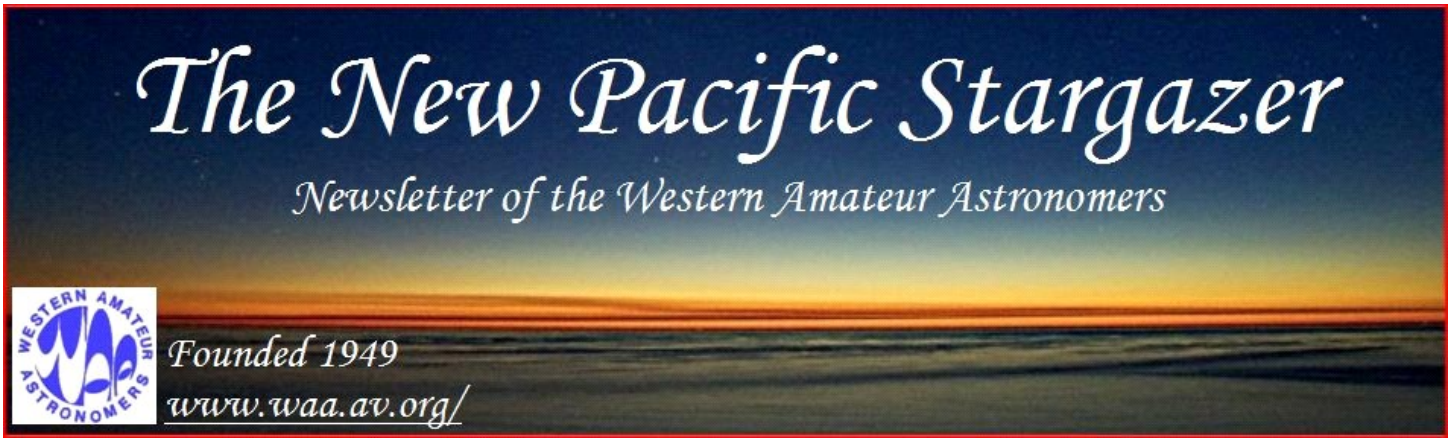
We have had the number of volunteers dwindle during the past few years due to attrition. Many of them have moved away. Some have had health issues and can no longer participate. A few have even past away. So we really need some new blood pumped into our veins. I would hate to have this worthwhile program die from lack of support. We have the best astronomy club in the country and I hope to say we have the best Outreach program in the country supported by the best bunch of volunteers anywhere.

Please, if you can help us, please let me know. My e-mail address is shown on back of the *Sirius Astronomer*. Thank you so much for your help and support.

Jim Benet

Outreach Coordinator

Orange County Astronomers



Western Amateur Astronomers Newsletter
Issue #2 is Now Available

by Tim Hogle, WAA Vice President and OCA Representative

WAA has completed the second issue of their recently re-launched newsletter, The New Pacific Stargazer, which is now on-line. It and the inaugural issue are now more easily accessible through a (much shorter) link on the WAA home page than when I announced the first issue here in July. To view or download either, go to the WAA home page, http://www.WAA.av.org, click Enter Here and scroll down to the newsletter header (shown above).

This newsletter is intended as an ongoing medium to communicate content of interest to members of the clubs which form the WAA itself. We welcome constructive comments and ideas for future issue content and enhancements – contact me if you have thoughts (my contact information is on the back of the Sirius Astronomer).

Also, if any of you in OCA would like to publish an article that you think may be of interest to a wider audience than just our club, I would encourage you to contact me about it or just submit a finished article to the newsletter editor, Don Saito (donsaito@yahoo.com). If you submit it directly to Don, be sure to indicate your OCA affiliation. (But don't forget, the Sirius Astronomer could benefit from your articles as well, and there is no reason why you cannot publish the same article in both; in fact, that is encouraged.)

Longtime OCA member Richard C. (Dick) Nordrum left this realm early on Sunday the 6th of October from complications due to Pancreatic Cancer.

He will be missed by his family, all his friends at the Orange county Science Fiction Club and The Orange county Computer Club. I assume that you all will miss him as well.

There will be a memorial and reception at Concordia University on the 10th of November. Time and exact place to be announced later.

Nominations for OCA Leadership

The Orange County Astronomers is managed by Officers and Trustees that are elected each year by the membership. Please consider whether you would like to play a role in the leadership of the club during 2014. Nominations are now open for Officer and Trustee positions (self-nominations are encouraged). Trustees must be 18 years or older and members of OCA for at least one year. Officers (President, Vice President, Treasurer, and Secretary) must meet the same eligibility requirements as Trustees, and in addition candidates for President and Vice President must have served as an OCA Trustee for one year, at some point during their lives.

If you would like to add your name to the ballot, please contact Bob Buchheim (OCA Secretary) at Bob@RKBuchheim.org or in person at the monthly meeting.

Nominations will close at the end of the November meeting. The ballot will be included in the December Sirius Astronomer, and completed ballots must be received by the club's Election Coordinator by the close of the January, 2014 General meeting. The new Board and Officers will take office at the January Board meeting.

As of October 30, the following candidates have "tossed their hats into the ring":

President: Greg Schedcik

Vice President: Reza AmirArjomond

Treasurer: Charlie Oostdyk

Secretary: Bob Buchheim

Trustees:

Alan Smallbone

Barbara Toy

Gary Schones

Kyle Coker

Sam Saeed

Shelia Cassidy

Steve Short

Amir Soheili

William Daly

Two Trustee candidates have not previously been members of the Board. They introduce themselves to the club as follows:



William Daly: My name is William G. Daly and I have been a member of OCA for two years. My primary interest is in astrophotography. I have attended a few Outreach programs and have gone to a few star parties. I have also taken an introductory class in Astronomy at a local community college.



Amir Soheili: I started learning telescopes and astronomy with my own first telescope, an ETX 125, in 2009. It was fun and very interesting. I was using it in my backyard, and sometimes I took it to Joshua Tree National Park to see the skies. After a while, I found OCA; I was so excited to find out that there is such a wonderful astronomy club is in my neighborhood. I attended a few OCA classes and I learnt more about astronomy and OCA activities. My wife and I became OCA members on 2011. OCA club gave us the opportunity to learn and practice astronomy more.

I love photography, especially taking pictures of the planets and deep sky objects. I used my SLR (without using a telescope) and a webcam (with a telescope) to take picture of the sky and planets. Last month I took a picture of the moon with my SLR and no telescope, it came out pretty good. I thought I can share it with you. I tried astrophotography with a web cam for a while to find out how it should be done. Well, I can say it wasn't easy, it requires a lot of time and attention, but it was pleasant.

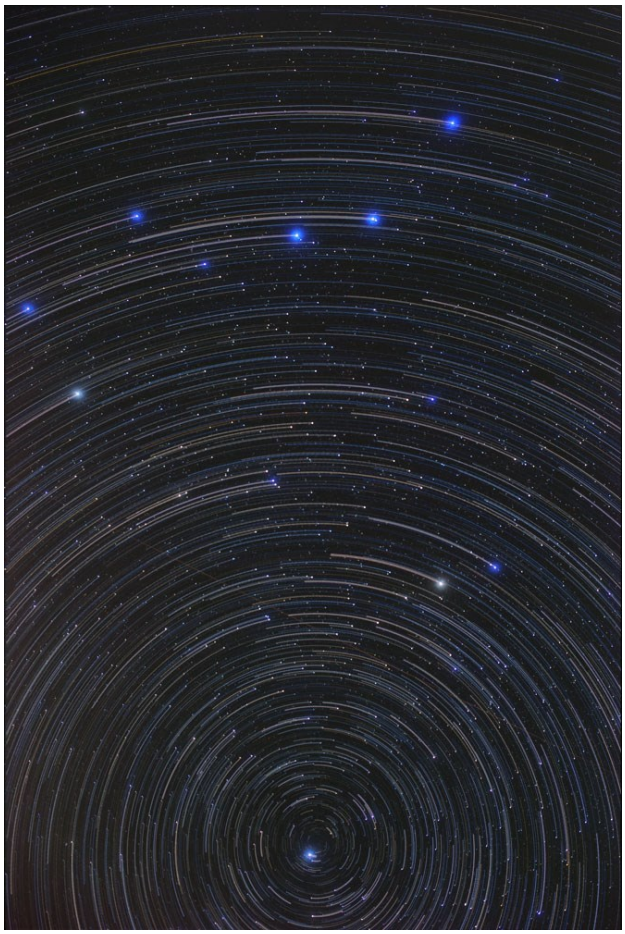
I believe that OCA is a great club for beginners and professional astronomers. I learned a lot from their classes, general meetings and from talking with the club members. I believe OCA is and will be a strong astronomy club and I am proud to be member of this club.

I have a Bachelor Degree in Mechanical Engineering and Master Degree in Computer Science. I am professional software developer, specialized in Mapping applications and Esri products. I am expert in databases, developing desktop apps, web sites and iOS apps (for iPhone and iPad). A few months ago I had the opportunity to talk to Reza Amir Arjomand and fix a few issues in OCA web site and bring the Image Gallery back.

I know that people managing the club and arranging clubs event have a passion about it. I feel the same and I would love to help OCA team as much as I can. When I saw the OCA Leadership nomination in Sirius Astronomers, I was excited and I thought that this is a great opportunity for me to help the club. I hope I can….



The Orion Nebula (M42) is one of the all-time winter favorites. Easily located in the "sword" descending from the center star (Alnilam) in the belt of the constellation Orion. Located roughly 1300 light-years from Earth, the Orion Nebula is visible to the naked eye and one of the first recognized stellar nurseries. Astronomers have directly observed protoplanetary disks, brown dwarfs, and Evaporating Gas Globules (EGGs) from which stars are formed in this complex. Even a relatively low-power instrument can reveal the Trapezium (center-right), an open cluster of four very young stars. Craig Bobchin obtained this image using a 12-inch Meade LX200 with a QV-3500ex imager in afocal combination with a 40mm Celestron Nexstar Plossl from our Anza site on February 8, 2003.



This image of the Big Dipper and Polaris was created by Leon Aslan from our Anza site on June 9, 2013. The trails are the apparent motion of the stars across the sky as the Earth rotates and were captured simply by leaving the camera fixed on Polaris with the shutter open for several hours. Note that Polaris leaves a small but noticeable trail of its own. Although many people think Polaris is fixed as the North Star, in fact it is not.

The Earth's axis of rotation is precessing, or moving relative to inertial space due to the gravitational influence of the Sun, Moon, and other planets on the Earth. The Earth's axis of rotation moves slowly westward relative to the night sky at a rough rate of one degree every 72 years, tracing out a complete circle over a roughly 26,000 year period. This is why star charts in the pre-computer age listed an epoch (usually in 50 or 100-year increments).

Precession has been noted and measured in historical times: it was first described by Hipparchus (using Babylonian records) between 147 and 127 BCE. The Egyptians, Mayans, Indians and Chinese may also have independently determined very rough estimates of the precession of the Earth's axis (the Indian estimate is within 300 years of the modern figure). In 3000 BCE, the time of the earliest Egyptian pharaohs, Thuban, a 4th magnitude star in the constellation Draco, was the North Star. In 12,000 years, Vega will come within five degrees of true North.

FOR SALE

Celestron super C-8, Meade heavy tripod with Celestron wedge, clock drives, 11 eyepieces, Parks filters, camera and ocular adaptors and other accessories, Burhams Celestial Handbook, Sky Atlas 2000, and books, all in five hard cases. $1000 O/B/O. email carlberg@ix.netcom.com for complete inventory. Contact David Carlberg at 714-842-5619

Celestron NexStar 5, barely used. $1400 o/b/o. Contact Carol at ccbopper@hotmail.com

Non-computerized C6 SGT including tube, mount (never used), Telrad finder, 25 mm eyepiece, focal reducer and case for the tube. Contact Michael Mirjahangir at 714-319-3103

Meade ETX-125C with accessories (tripod, carrying case, Autostar system, heat/dew cover, etc.) $500 o/b/o. Email SRFROGN@aol.com with copy to startraveler68@yahoo.com for details.

Skywatcher 100ED f/9 refractor with Celestron CG-4 mount. Scope comes with a hard case, 8X50mm finder, 2-inch dielectric diagonal, 2 LET eyepieces, and 4-inch Baader solar filter. CG-4 mount has motors for both RA and DEC. Optical tube can be sold separate. $600 o/b/o. Contact Val at 949-382-1869.

Celestron 90mm Maksutov Sky Prodigy with all attachments. $300. Contact Val at 949-382-1869.

Meade LX90 10" ACF, f/10, with Autostar; GPS; Smartfinder; Telrad finder; 6.7 and 40 mm eyepieces and 8X50 ViewFinder. $1700. Contact Don Rader at dgrconsult@roadrunner.com or 714-996-5138.

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