SIRIUS ASTRONOMER

www.ocastronomers.org

The Newsletter of the Orange County Astronomers

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Variable stars are a popular and simple observing project that even a beginning amateur astronomer can engage in. Delta Cephei, the prototype of the Cepheid class of variable stars, is one of the closest to Earth at 887 light-years away. Delta Cephei varies from magnitude 3.48 to magnitude 4.37 over a period of 5.37 days. OCA member Vittal Badithe captured this image from Irvine on 9/28/16.

OCA CLUB MEETING

The free and open club meeting will be held March 10 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, Dr. Shoko Sakai of UCLA will tell us how to observe objects we cannot see.

NEXT MEETINGS: Apr. 14, May 12 (speakers TBA)

STAR PARTIES

The Black Star Canyon site will open on March 25. The Anza site will be open on March 25. 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 sessions of the Beginners Class will be held at the Heritage Museum of Orange County at 3101 West Harvard Street in Santa Ana on March 3 and April 7.

Youth SIG: contact Doug Millar
Astro-Imagers SIG: Mar. 14, Apr. 11
Remote Telescopes: contact Delmar Christiansen
Astrophysics SIG: Mar. 17, Apr. 21
Dark Sky Group: contact Barbara Toy

President's Message

By Barbara Toy

Changes on the OCA Board:

As some of you may remember, we had our annual election for the Board of Trustees in January, and Steve Short was elected as the President for 2017. He has always had a busy schedule and many responsibilities outside the club, and he found that he was not able to continue with what would have been his third term as the club President and resigned that position. The Board selected me to fill the position in his place, so it will be my privilege to serve as your President for 2017.

With the change in the presidency, the OCA Board was left with a vacant Trustee position, and we asked for volunteers so we would have a full Board for 2017. We were delighted that we had three candidates, Doug Millar, John Hoot and William Daly. Since there were other candidates and his schedule was full, William decided to withdraw his candidacy, but we thank him for his willingness to become involved in the management of the club and hope he may run for a Trustee position in the future.

The Board members had to make the difficult decision between the remaining two candidates, and selected Doug Millar to fill the vacancy. Those who come to our general meetings have seen him as the coordinator for the youth group and the person who has been doing the club announcements since Bob Buchheim stepped down as club Secretary. Doug was a member of the Board in the 1990s, and his wife, Helen Mahoney, is a former President of the club, so this won't be an entirely new experience for him. We are looking forward to working with him as our new Trustee for 2017.

The sad news here is that John Hoot won't be joining the Board this year. He recently retired from his consulting business (he did a lot of work for Meade Instruments over the years, a client of particular interest to many members of the club), and is keeping himself busy with his own research projects and work with CUREA at Mt. Wilson, among other things. His website has a lot of information on his ongoing projects, and is well worth a visit: http://www.ssccorp.com/observatory. It's great that, with retirement, John has more time to get involved with the club again, and we appreciate his willingness to volunteer for the vacant Trustee position.

A Retrospective on Steve Short:

I am very glad that Steve Short was able to preside at the club banquet, the first we've had for a number of years, which was on January 14 at JT Schmid in Anaheim. This was a project he and Bonnie Short spent a lot of time and effort on, and it was a great success – good food, good company and conversation, great talk by Joel Harris on the upcoming eclipse on August 21 – Steve and Bonnie have every reason to be proud of that accomplishment and I hope they enjoyed it as much as the rest of us who attended.

Steve also decided to step down from his position as Black Star Canyon coordinator, a position he took over from Bob Buchheim over a decade ago. He advised the board that Steve Mizera has agreed

to take on that position, and that he has been orienting him on what's involved to make the transition go smoothly. We are very grateful to Steve Short for all the time and effort he put into making these star parties a success over the years he has managed them, and to Steve Mizera for volunteering to become the new Black Star Canyon coordinator.

Those who were on Steve Short's mailing list for Black Star Canyon are familiar with his summaries of what should be in good position for viewing for these star parties, including transient events like Iridium flares and the ISS passing over the site; he posted these on the club website as well. He has done these for years, and put a lot of time and effort into them. Many people found them helpful and informative, particularly those who were fairly new to astronomy – and even those with experience appreciated knowing when they might see the ISS or an Iridium flare, as they are always fun and not everyone has time or remembers to hunt down the information before heading out to a star party.

Steve has always had an interest in helping beginners get past that initial learning curve that causes a lot of people to give up in frustration before they get to the point that they can find the objects they are interested in reliably and enjoy the views. It seems he often spent more time helping others than he did looking through his own telescope, but he genuinely enjoyed it. He assisted with the Beginners Astronomy Class for many years, was a regular volunteer for the "How to Use Your Telescope" sessions, and also was active with the Outreach program pretty much since he joined the club in 2003. He also participated in Explore the Stars, a multi-club outreach program at Observatory Campground at Palomar Mountain, and gave a number of his "Sky Tours" as the featured presenter before the evening's viewing started.

The Loaner Scope program was another of Steve's projects – it had developed a number of problems over the years, and Steve came up with a better tracking system for equipment that was out on loan and helped build up the stock of telescopes to make it a strong program again. His final coup was finding Sandy and Scott Graham to take on the management of that program, and we are very grateful for their efforts, which, among other things, give people a chance to try out different scopes before deciding what they want to get for themselves.

This is by no means an exhaustive list of what Steve has been involved in during the time he's been a member of the club. Before he was president, he was on the board as a trustee for many years, and often volunteered to help with different issues or projects that came up, in addition to all of his other activities, and he's also been active in a number of the club's special interest groups. When one is involved in a lot of activities, the fun of doing the hobby for its own sake can sometimes get lost – I hope, when things settle down for him, that Steve is able to have some time to enjoy the night sky, just for himself, and also that we'll continue to see him at club events that he finds fun and interesting.

Whatever he decides to do, we certainly wish Steve and Bonnie long and happy lives filled with family, friends and activities that they enjoy, and thank them both for all they've done for the club over the years. I'm sorry that Steve wasn't present at the club general meeting on February 8 to hear the round of applause he received from everyone there, which I'm sure would have been even louder and longer if he had been present in person for it.

On Another Steve – Our Editor, Steve Condrey:

When I was looking at some past issues of the Sirius Astronomer, I realized that Steve Condrey has

been our editor since 2003, when he took it over from Darren Thibodeaux. That means that this is his 14th year as editor – 14 years of pulling together material to fill each issue, organizing it and figuring out how everything should fit, sometimes doing judicious pruning or adjustment if needed, finalizing it and getting it to the printer, every month, 12 times a year.

That is really impressive, and he's continued to do it while working full time, going to school to finish a degree, dealing with issues with his and his wife's extended families, and raising an adopted son and daughter with all of the challenges parents of young children have. As if that wasn't enough, he also periodically does informative "What's Up" programs for us, and in the past, before they became parents, Steve and Sandy were the Anza House Coordinators, and Steve spent some time on the OCA Board as a trustee, as well.

So, next time you see Steve Condrey at a meeting or other event, please thank him for keeping the Sirius Astronomer the fine publication it is for all the years he's been its editor, and for all his other activities on behalf of the club in the time he's been a member. And, if you really want to make his day – write an article that he might be able to use in the newsletter!

Anza Issues

In case you're wondering why the Anza site was closed for several weeks in January and February, our well pump failed and had to be replaced, and then we discovered that the storage tank, which had a small leak before the pump failure, completely failed in the time the pump was out and would no longer hold water at all (it went in around 1980, so we can't claim we didn't get our money's worth from it). That has now been replaced as well, and while all that was going on we had no water on site and therefore no restrooms. Once the replacement pump and tank were in, it turned out there was a mistake in how they did the connections on the tank – our plumbing system at Anza is somewhat unusual – and no water was reaching the club observatory or Anza House. The well company (Heritage Well Service, which has been a pleasure to work with on these issues and past repairs we needed for our water system) quickly made the necessary changes, and the water should be fully back in service. If anyone finds a problem with it, please notify Alan Smallbone (asmallbone@earthlink.net), the current club Secretary and also our point person with the well service, or me (btoy@cox.net).

Meade Classic LX200 10" Telescope For Sale. Eyepieces Included (1.25"): Televue Panoptic 22mm; Televue Panoptic 35mm; Televue Nagler Type-2 12mm; Meade Super Plossl 26mm. $1850. Call Chris at 714-296-7683

Astro Physics Mount for Sale
1. **AP 1200 GTO Mount with keypad**
2. **1200 Precision-Adjust Rotating Pier Adapter with Azimuth Bearing (1200RPA) for 10" ATS Pier.**
3. **One 18 pound Counterweight for 1.875" Diameter Shaft**
4. **16" Mounting Plate**
5. **Losmandy Polar Alignment Scope - (PASILL4)**
6. **Polar Alignment Scope Cover - (Q12700)**

$6,500.00
Contact Rick at 310-489-8561

AstroSpace Update

March 2017

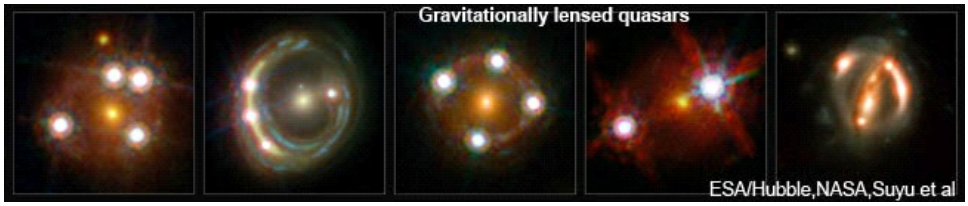
Gathered by Don Lynn from NASA and other sources

Gene Cernan (1934-2017), the last human to set foot on the Moon, has died at age 82. He actually went to the Moon twice (one of 3 people to do so), Apollo 10 and Apollo 17. The former was the final test of the Apollo system, done in lunar orbit, before Armstrong and Aldrin landed 2 months later. Cernan was previously the pilot on Gemini 9, during which he became the 2nd American to conduct a spacewalk (3rd ever). He commanded Apollo 17, and his pilot was Harrison Schmitt, the only geologist to walk on the Moon. In the lunar rover, Cernan set the lunar land speed record (11.2 mph = 18 k/hr). When he left the Moon he said, "we shall return, with peace and hope for all mankind." It is sad that he did not live long enough to see that happen. Only 6 of the 12 people who set foot on the Moon remain alive, all in their 80s.

Milky Way mass – A new mass estimate for our Milky Way has been made, and it falls at the lower end of the uncertainty of lower previous estimates, and considerably below some other higher values. The way to measure mass is to find an object slightly outside the galaxy and measure its proper motion (movement in RA and declination). This is difficult because such motion of any object outside our galaxy is extremely small. Measuring the radial motion is easy, using Doppler shift. Knowing the total motion, using the equation of orbital motion gives the mass. The new measurement chose a few very distant globular clusters. They are not beyond all of the halo of dark matter, so it measured only the mass of the part of the galaxy interior to that distance. But then all the previous mass measurements of the Milky Way have also been footnoted that they included only mass interior to the most distant object used in the measurement, so this was taken into account in comparing the various measurements. To put a number on it, the new estimate is that 600-750 billion Sun's masses lie within 600,000 light-years of the Milky Way's center. Two previous estimates had put the mass over a trillion solar masses within 300-400 thousand light-years. The Gaia spacecraft is well into its mission to measure extremely accurate positions and motions of objects, so we may soon have the data to get a more accurate measure of our galaxy's mass.

Void – It has been known since the 1980s that our Local Group of galaxies (Milky Way, Andromeda and friends) is moving toward the Great Attractor, a collection of galaxy clusters and also toward the Shapley Supercluster of galaxies, which is generally behind the Great Attractor. A new study of galaxy catalogs also shows that the Local Group is moving away from a huge void. Previous calculations showed we are moving faster (390 m/s = 630 km/s) than the gravity of the Great Attractor and the Shapley Supercluster could explain. But the lack of gravitation from the void, added to the attractions, seems to be enough to explain our speed.

Supernova changing type – Supernovas are classified as Type I if they show little evidence of hydrogen in their spectra, or as Type II with abundant hydrogen. Supernova 2014C was judged Type I, but within a year it changed to show the hydrogen of a Type II. A new study showed that the shock wave from the supernova had during that period expanded to reach a shell of hydrogen surrounding the exploded star. Apparently late in the life of the star it had thrown off a huge amount of hydrogen with some heavier elements mixed in. Data from NuSTAR (X-ray space telescope) allowed calculation of the speed of the shock wave and how much material is in the shell (equivalent to the mass of our Sun). A massive star late in life should not be throwing off that much material. In X-rays, the supernova brightened after the explosion, a result of the shock hitting the material. More work is needed to explain the material thrown off.



Expansion of the Universe – A new study found that the Universe is expanding (the Hubble constant) (71.9 km/s-Mpc) faster than the speed calculated from Planck spacecraft data (66.9), a recent authoritative determination. The new number did agree, however,

with the latest calculation from Type Ia supernovas. The new study was based on the timing differences seen in flaring events of a handful of quasars, as seen in multiple images caused by gravitational lensing. The Planck calculation was based on patterns in the Cosmic Microwave Background (CMB). All 3 methods are independent ways of calculating the Hubble constant. Ideas put forth for explaining the discrepancy are: dark energy may be growing, dark matter may be changing, General Relativity is not quite right, or an unthought-of factor affects the measurements of the CMB, supernovas, or gravitational lensing. Efforts to pin down the Hubble constant will continue, including this same study team measuring 100 lensed quasars. In this age of silly acronyms, I hesitate to mention that the group who made the new study calls themselves HOLiCOW.

Massive stars when they form reach the stage where fusion begins and they light up before they have grown to the huge masses that we occasionally observe. The pressure of starlight is sufficient to push away surrounding gas, which is needed for the stars to grow further. So how do those stars reach such huge masses? A new computer simulation of star formation that uses finer resolution than previously finds that instabilities form such that small fingers of gas continue to feed that gas into the star even as gas in most directions is being pushed away. More work is needed on the simulation, since it does not yet account for stellar winds and magnetic fields, but it looks like the mystery of how massive stars form has been solved.

Gaia (star position space telescope) – A new study of Gaia data searched for RR Lyrae stars, a type of pulsating variables. The study found a low-luminosity halo of stars around the Large Magellanic Cloud (LMC, a nearby small galaxy). The extent of that halo showed that the LMC has more mass (in order to gravitationally hold the halo) than thought, perhaps as much as 10% of the mass of our Milky Way. The study also found a stream of stars between the LMC and SMC (Small Magellanic Cloud, of course), apparently pulled out of the SMC by gravitational interaction. The most recent close pass and interaction between these 2 occurred about 200 million years ago. This stream had long been predicted. It also appeared that some stars there had been pulled out of the LMC by interaction with the Milky Way. The stream contains both stars and gas, but they are separated somewhat due to drag on the gas from passing through the corona of ionized gas surrounding the Milky Way. More study of the gas and stars of the stream allowed calculation of the density and mass of the Milky Way's corona.

Pulsing white dwarf – A long-known white dwarf star named AR Scorpii has been found to be sending out a (2-directional) beam of radiation as it spins, like a lighthouse. All previous stars that acted this way were neutron stars, known as pulsars. The star is 380 light-years away. We don't see the beam directly, but observe its disturbance on the white dwarf's companion star, a red dwarf. The white dwarf spins every 2 minutes, so twice every 2 minutes the radiation strikes the red dwarf. The 2 stars orbit each other every 3.6 hours. The light from the system is highly polarized, indicating a strong magnetic field.

Long TDE – When a star gets too close to a supermassive black hole, it is torn apart by tidal forces, and much of the material falls into the black hole, heating extremely and emitting X-rays as it falls. This is known as a tidal disruption event (TDE). Dozens have been observed, and none has lasted longer than a year, except the one at the black hole known as XJ1500+0154, which has been going on for 10 years. Why so long? The best theories are that it was an exceptionally large star or that much more than the usual fraction of the star was torn apart. Observations will continue to try to explain this. It is located in a small galaxy 1.8 billion light-years away.

Intermediate black hole – Lots of black holes are known with masses under 100 times the Sun's mass, and lots are known above 100,000. Only a handful lie between these, and the evidence for these is weak. A new paper makes the best case for an intermediate mass black hole. 25 pulsars in the globular cluster 47 Tucanae were measured, and from their orbital motion it was calculated what the mass is in the center of the globular. 2200 Sun's masses were not accounted for by stars, and that is presumably the mass of a black hole. There are competing theories for how an intermediate mass black hole could form, so further study will be made to try to determine the method of formation.

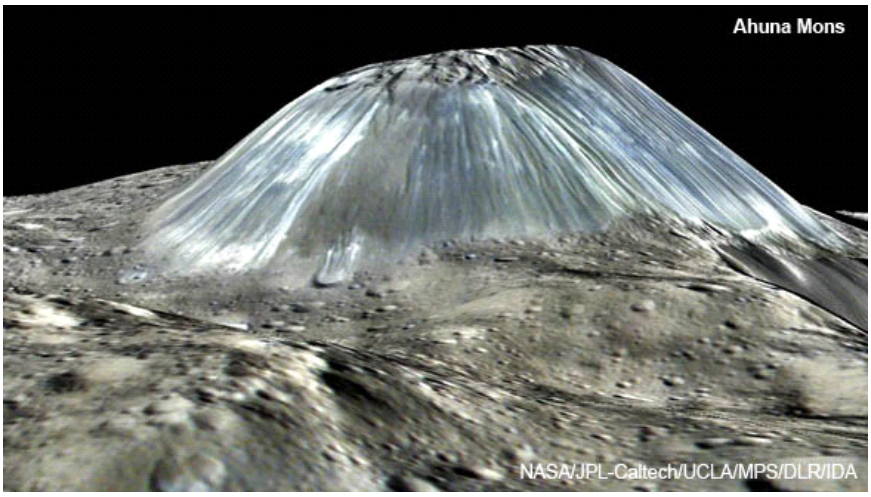
Likely exoplanet – Hubble Space Telescope images of the star TW Hydrae taken over 18 years show a dark area in the disk about the star that rotates once every 16 years. Orbit formulas show that nothing could be orbiting at that distance with that period, so astronomers have interpreted the object as a shadow of something orbiting much closer to the star. The shadow is too wide for a planet, so is likely the shadow of a 2nd inner disk. But the shadow of a disk should not move unless the disk causing it precesses, that is, wobbles. That indicates something is tugging on the inner disk, probably the gravity of a nearby planet. Radio observations with the ALMA array show an inner disk with a gap in it, the gap likely caused by a planet. Though such a planet has not been seen, these 2 lines of reasoning show it probably exists.

Directly imaged exoplanets – In 2008, 3 planets were discovered orbiting the star HR 8799, and a year plus later a 4th was found. The Keck Observatory in Hawaii has been imaging all 4 planets now for 7 years (using a coronagraph to block the glare of the star) and put together a movie of their orbital motion. Their periods range from about 40 to 400 years, so only portions of their orbits have occurred. It's looking like they may be in resonance with each other, that is, each planet's period is a multiple of the one inside it. The planetary system is 129 light-years away in Pegasus, is less than 60 million years old, and the star is intrinsically almost 5 times as bright as the Sun.

A vortex coronagraph, a newly constructed device, has seen its 1st light at the Keck Observatory. Instead of using an opaque disk to block a glaringly bright star, it uses cancellation of light waves out of phase. It will be used to search for planets, disks, and brown dwarfs quite close to stars. It is allowing such objects to be seen 2-3 times closer to their stars than ordinary coronagraphs. A previous version of the vortex coronagraph was recently tested on the Palomar 5-meter telescope. It was invented in 2005.

Oxygen – Every time the Moon in its orbit about the Earth passes opposite the Sun, the lunar surface is bombarded by particles (mostly nitrogen and oxygen) that were knocked off the Earth's upper atmosphere by solar wind. During the rest of the Moon's orbit, the solar wind is the principal effect on the lunar surface. However, this has only been going on for 2.4 billion years, since that is the time when plants exhaled so much oxygen that it changed the composition of Earth's atmosphere. It had been thought that oxygen and nitrogen found in lunar rocks came from Earth by this means, but the Japanese lunar orbiter Kaguya caught those gases in the act of moving from Earth to the Moon, proving the concept. Further study of oxygen in the lunar surface could give us a history of the rise of oxygen on Earth, and give implications about the life that caused that oxygen.

Ahuna – The asteroid Ceres has only one tall mountain, about 2.5 miles (4 km) high. Why one? The mountain, named Ahuna Mons, is thought to be a cryovolcano, that is, one that erupts ice and cold liquid. A new paper analyzes how fast ice on Ceres should slump (like ice in glaciers creeps downward), and came up with 10-50 yards (m) of slump per million years. So Ahuna will sink to nothing in 80-400 million years. Apparently cryovolcanism is the only mountain-building force on Ceres, and all the volcanoes but one are old enough to have sunk. The paper team is now going to look for remains of flattened volcanoes on Ceres to bolster this theory.



Enceladus (Saturn's moon) – Scientists have been studying the dark markings on Enceladus. Some of the material from the geysers there falls back down on the surface and some is expelled into the E-ring about the planet. But E-ring material often later strikes Enceladus. The discoloration caused by the geyser material is different if it has spent time in the E-ring. Fallout appears bluish, while ring material is yellowish. The geyser material is known to be salt-rich (the Cassini spacecraft flew through it and measured its constituents). But the ring material is more salt-free. Apparently salty material preferentially falls back. E-ring material also strikes Tethys, so that is also being studied. On Tethys, over time, the E-ring material darkens more due to radiation striking it, transforming it into organic (carbon compounds) goo. Similar material on Enceladus interacts with geyser material, apparently protecting it better from radiation. All this is telling us about the conditions in Enceladus's frozen-over ocean, the source of the geyser material.

Martian ridges – A number of ridges that outline polygon shapes have been seen on Mars, and it is thought that different methods of forming them occurred. A large sample is needed for further study to determine how common the different formation methods are and what characteristics they have. A citizen science project called Planet Four: Ridges has begun to get the public involved in searching images of the Martian surface for such ridges. The most spectacular seem to be thin blade-like walls, some as tall as a 16-story building, that are thought to be hardened lava that flowed up through cracks, and were exposed by later erosion. But there are also minerals veins that probably precipitated from water, and other formation methods.

Martian water mystery – Yet another study has found problems in explaining the obvious signs of flowing water on Mars billions of years ago. The flowing water requires a denser atmosphere in the past to keep water from immediately evaporating, and requires a greenhouse effect in the past to keep water from immediately freezing. The favored gas for the greenhouse effect is carbon dioxide (CO_2), but large amounts of that in the past would cause huge amounts of carbonate to form on the surface in the past. But carbonate is rare on the surface, confirmed by rover data, and there is no way carbonate could have disappeared after forming, at least in the area visited by rover Curiosity. Also, calculations show that any reasonable amount of CO_2 would not have kept Mars warm enough during the period early in the history of the Sun when it produced substantially less heat than now. Some scientists are now reviving a theory put forth by Carl Sagan 40 years ago, that the greenhouse effect was from a combination of CO_2 and hydrogen. Where would the hydrogen have come from? Possibly methane from volcanic activity, which breaks down into hydrogen. Studies of the volcanic mountains on Mars show that there was heavy volcanic activity over at least 3 long periods in the last 3.5 billion years. A new computer simulation shows that a reasonable mix of CO_2, hydrogen and methane would warm Mars enough.

Martian volcanic activity – A study of 12 Martian meteorites, that is, pieces of the surface of Mars blasted into space by asteroid impact that later fell to Earth, showed by their chemical composition that they all came from a single volcano on Mars and were all ejected into space about 1 million years ago, but the ages since they flowed out of the volcano ranged from 327 million years ago to 2.4 billion. This shows that volcanic activity at that location on Mars persisted for over 2 billion years. This is the longest lived volcano known in the Solar System.

Meteorites – A new study of ancient sediments shows that the types of meteorites striking the Earth have changed substantially over the eons. It appears that major collisions, probably in the asteroid belt, result in a shift in the types of meteorites. A type of meteorite with chondrules (tiny drop-like structures) is further divided into 3 classes: H, L and LL. It is thought that 3 different collisions in the past produced the 3 classes. Currently a large proportion of meteorites striking Earth are H and L. The L class were rarer before 466 million years ago, indicating that is when a collision occurred that broke up an asteroid of L class. For about a million years after 466 million years ago, nearly all meteorites were L. Before that, achondrites (meteorites without chondrules) made up about half of all those striking Earth. There were also more LL and fewer H back then. Gravitational perturbations by Jupiter or other planets of asteroid orbits could also change the mix of meteorite types striking Earth.

Instant AstroSpace Updates

Since the explosion of a SpaceX rocket last September heavily damaged launch pad 40 at Cape Canaveral, efforts have been accelerated to convert **pad 39A** from its former role with Space Shuttles (and previously Apollo rockets) to be able to launch SpaceX rockets. The 1st 39A SpaceX launch, a Space Station resupply mission, should have taken place by the time you read this.

Curiosity rover discovered a 3rd meteorite lying on Mars's surface. Like all others (including Opportunity's 5 finds) this is an iron one, which seems strange in that stony meteorites are much more common than iron ones on Earth.

The 1st results of the **Twin Study** have been released, comparing Scott Kelly during his 340 day stay in space with his identical twin Mark on Earth. The biggest surprises were that Scott experienced inflammation in space and his white blood cell telomeres (the protective ends of chromosomes) lengthened while in space (but returned to normal afterward), when they should continually shorten with age.

More results from **Juno** (Jupiter orbiter): Jupiter's magnetic fields and aurora are larger and more powerful than thought; belts and zones (dark and light bands on the cloud surface) extend deep into the planet's interior.

Opportunity rover celebrated its 13th birthday on Mars in January, having taken over 216,000 images and roved over 27 miles (43 km), and is still making amazing discoveries.

The Japanese **Akatsuki** spacecraft has found bow-shaped features in the Venusian atmosphere that appear to be waves caused by air flow over mountainous terrain, probably Aphrodite Terra, that propagate all the way up to the lower stratosphere.

Beyond the planet orbiting Proxima Centauri, the nearest known **exoplanets in their habitable zone** (where liquid water could exist on a planet) are Kapteyn b (13 light-years away) and Wolf 1061 c (14 light-years away). A new study shows that radiation at Wolf would make life unlikely, but conditions are more favorable for possible life at Kapteyn.

Western Amateur Astronomers Board Meeting Notes by Tim Hogle, WAA Vice President and OCA Representative

Western Amateur Astronomers (WAA), an umbrella organization of astronomy clubs, of which OCA is a long standing member, had its regular winter board meeting this year on February 4 at the home of Msgr Ron Royer in Springville, CA. Clubs represented at the meeting included OCA, Los Angeles Astronomical Society, China Lake Astronomical Society, Eastbay Astronomical Society, Astronomical Association of Northern California, Chabot Telescope Makers Workshop, Mount Diablo Astronomical Society, and Mount Diablo Observatory Association.

Publication of WAA's newsletter, the New Pacific Stargazer, is continuing, with two issues published during the last year. We hope to have a regular Spring issue out in the next month or so and a special Eclipse USA issue at the beginning of summer, sharing hopefully unique resources on this year's highly anticipated total eclipse crossing the country on August 21, then another special issue reporting on individual eclipse results in the fall. If any of you OCAers are interested in getting your eclipse material published, let me know. And beyond eclipses, we still invite club members who have something they would like to publish that would be of interest to other amateurs within and outside OCA (astronomical projects, great ideas, subjects of astronomically-sensitive environmental concern, etc) to write it up and contact me. We do have a mechanism for submissions and are actively looking for material to publish, with full credit to the author. My contact info is on the back of the Sirius Astronomer, and I would be happy to provide details on submission of material for publication.

WAA's now not-so-new web site, http://www.waastro.org, is now official and we are still developing new capabilities. There are, however, still some migration issues from our old site, which is being maintained for those with legacy equipment and slow internet connections.

One of WAA's most well-known functions is to select and award the very prestigious G. Bruce Blair medal to a living individual who has made truly outstanding contributions to amateur astronomy over a significant period of time. The Blair Award has a history going back to 1954; the list of recipients is posted on the WAA web site.

This year the Blair award is going to a husband and wife team, which has a precedent in Art and Natalie Leonard in 1962. They are Jim and Virginia Strogen, former SoCal residents who moved to Missouri some years ago. There were no astronomy clubs anywhere near that part of the country, so in 2007 they founded the Camden County Astronomical Association, which has grown to nearly 100 members and now owns a 10-acre observing site with two observatories. The club draws speakers from throughout Missouri. Their outreach efforts have had a dramatic impact in advancing amateur astronomy even beyond the state borders. They are currently involved in expanding the club's capabilities in educational and research astronomy as well. Jim and Virginia have turned an astronomical desert in to an astronomical oasis. The award is again to be presented at RTMC this year. Come and hear more of how the Strogens have impacted the lives of many for astronomy.

Other items of business from the WAA meeting include reports from member clubs in attendance about their activities and concerns, ongoing discussions about possible expansion of WAA's service to and improved communications between member clubs, and again volunteering to staff the Camp Oakes telescopes during RTMC. We welcome ideas from OCA members as to what WAA could do to serve the member clubs and individual members in a significant fashion.

WAA will again have an information booth at RTMC this year. Stop by and say hello. For more info about and a fresh look at WAA, visit the new web site and take a peek at the New Pacific Stargazer.

Solar Eclipse Provides Coronal Glimpse

By Marcus Woo

On August 21, 2017, North Americans will enjoy a rare treat: The first total solar eclipse visible from the continent since 1979. The sky will darken and the temperature will drop, in one of the most dramatic cosmic events on Earth. It could be a once-in-a-lifetime show indeed. But it will also be an opportunity to do some science. Only during an eclipse, when the moon blocks the light from the sun's surface, does the sun's corona fully reveal itself. The corona is the hot and wispy atmosphere of the sun, extending far beyond the solar disk. But it's relatively dim, merely as bright as the full moon at night. The glaring sun, about a million times brighter, renders the corona invisible.

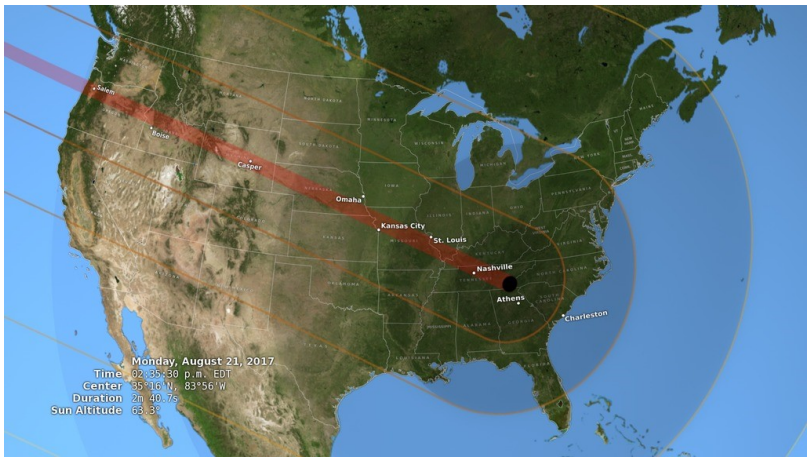


Illustration showing the United States during the total solar eclipse of August 21, 2017, with the umbra (black oval), penumbra (concentric shaded ovals), and path of totality (red) through or very near several major cities. Credit: Goddard Science Visualization Studio, NASA

"The beauty of eclipse observations is that they are, at present, the only opportunity where one can observe the corona [in visible light] starting from the solar surface out to several solar radii," says Shadia Habbal, an astronomer at the University of Hawaii. To study the corona, she's traveled the world having experienced 14 total eclipses (she missed only five due to weather). This summer, she and her team will set up identical imaging systems and spectrometers at five locations along the path of totality, collecting data that's normally impossible to get.

Ground-based coronagraphs, instruments designed to study the corona by blocking the sun, can't view the full extent of the corona. Solar space-based telescopes don't have the spectrographs needed to measure how the temperatures vary throughout the corona. These temperature variations show how the sun's chemical composition is distributed—crucial information for solving one of long-standing mysteries about the corona: how it gets so hot. While the sun's surface is 9980 degrees Farenheit (5800 Kelvins), the corona can reach several millions of degrees Farenheit. Researchers have proposed many explanations involving magneto-acoustic waves and the dissipation of magnetic fields, but none can account for the wide-ranging temperature distribution in the corona, Habbal says.

You too can contribute to science through one of several citizen science projects. For example, you can also help study the corona through the Citizen CATE experiment; help produce a high definition, time-expanded video of the eclipse; use your ham radio to probe how an eclipse affects the propagation of radio waves in the ionosphere; or even observe how wildlife responds to such a unique event. Otherwise, Habbal still encourages everyone to experience the eclipse. Never look directly at the sun, of course (find more safety guidelines here: https://eclipse2017.nasa.gov/safety). But during the approximately 2.5 minutes of totality, you may remove your safety glasses and watch the eclipse directly—only then can you see the glorious corona. So enjoy the show. The next one visible from North America won't be until 2024.

For more information about the upcoming eclipse, please see:

NASA Eclipse citizen science page https://eclipse2017.nasa.gov/citizen-science

NASA Eclipse safety guidelines https://eclipse2017.nasa.gov/safety

Want to teach kids about eclipses? Go to the NASA Space Place and see our article on solar and lunar eclipses! http://spaceplace.nasa.gov/eclipses/

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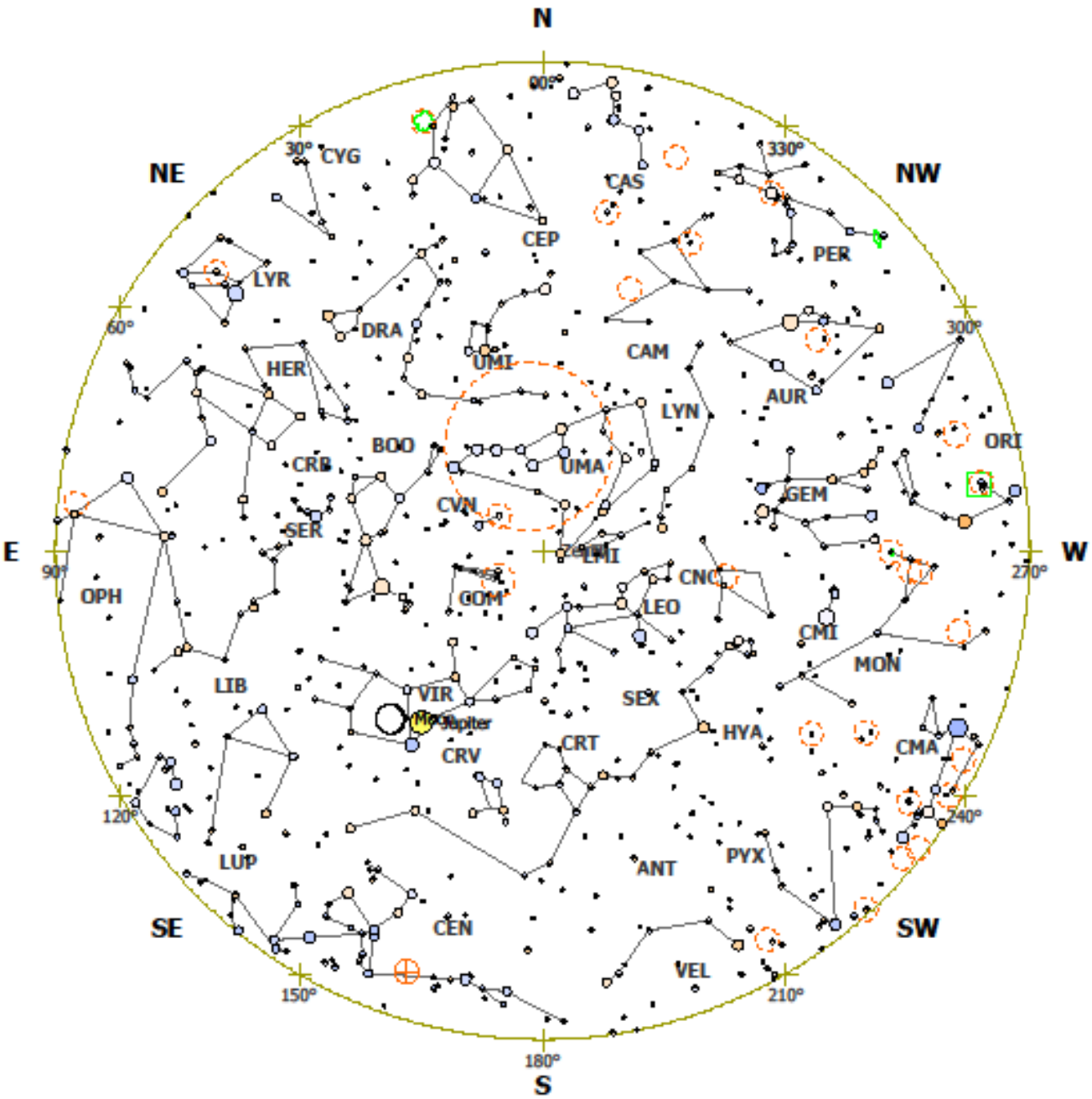
Whole Sky Chart - March 2017



Symbols

- Galaxy
- Quasar
- Globular cluster
- Open cluster
- Bright nebula
- Dark nebula
- Planetary nebula
- Supernova remnant
- Antisolar point
- Asteroid
- Comet
- Meteor shower

Magnitudes and temperatures (× 1000 K)

-6	-5	-4	-3	-2	-1	0	1	2	3	4	5
40	25	20	15	10	8	7	6	5	4	3	2

Location

United States, CA, Long Beach
Lon: 118° 11′ 18″ W, Lat: 33° 46′ 01″ N
Time zone: GMT-08:00
Elevation: 29 feet above sea level

Time

Local time: 2017-03-15 00:00:00
Universal time: 2017-03-15 08:00:00
Julian date: 2457827.83333
Sidereal time: 11h 39m 43s

View

Field of view: 200° 00′ 00″
RA: 11h 39m 42.82s, Dec: +33° 46′ 01.0″
Azi: 180° 00′ 00.0″, Alt: +90° 00′ 00.0″
Constellation: Ursa Major

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