SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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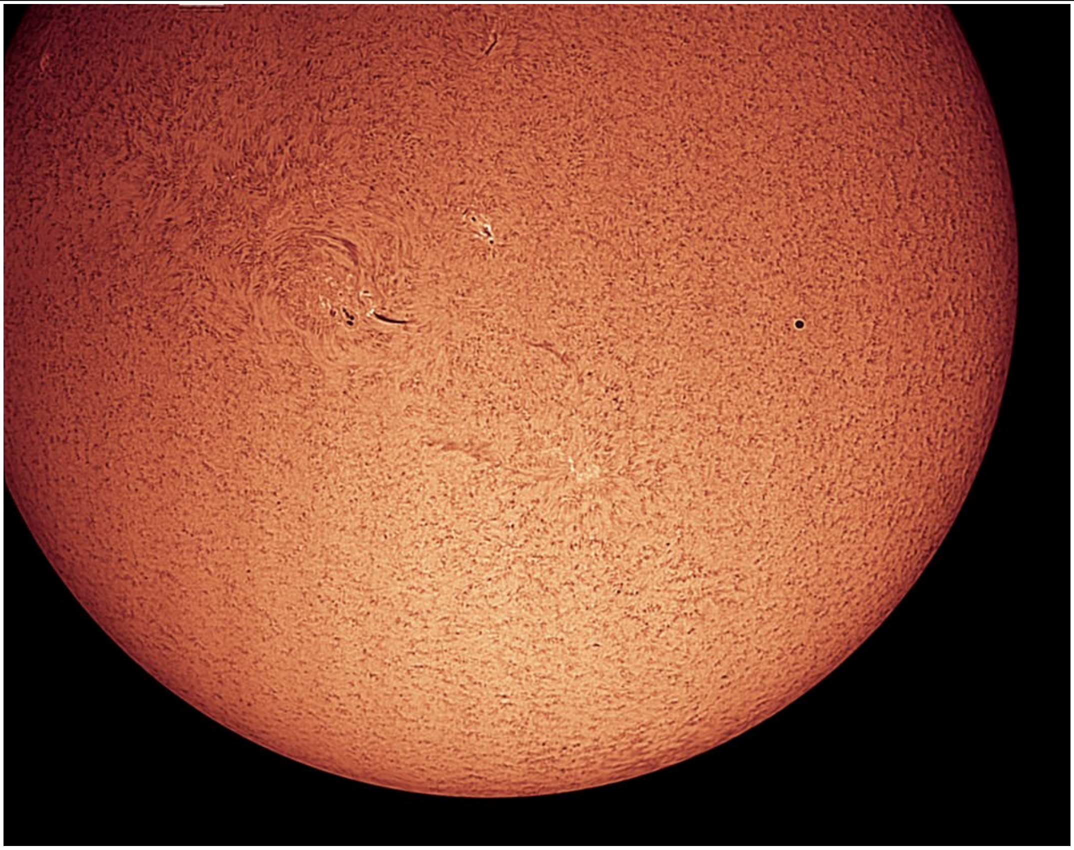


The May 9 Mercury transit was captured by Craig Bobchin in this H-alpha image taken with a Coronado Sorlarmax 90. Mercury is the perfectly round dot near the 3-o'clock position on the solar disk. Transits of Mercury currently occur in May (if Mercury is at aphelieon) or November (if Mercury is at perihelion), usually within a few days of either May 8 or November 10. The November transits can occur in intervals of 7, 13, or 33 years; the May transits occur in intervals of 13 or 33 years. If you missed this one, the next transit will take place November 11, 2019, so start planning now!

OCA CLUB MEETING

The free and open club meeting will be held June 10 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month's speaker is Ben Shappee of Carnegie Observatories discussing The All-Sky Automated Survey for Supernovae.

NEXT MEETINGS: July 8, August 12

STAR PARTIES

The Black Star Canyon site will open on June 25 and July 25. The Anza site will be open on June 4 and July 2. 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 July 1. The following class will be held August 5.

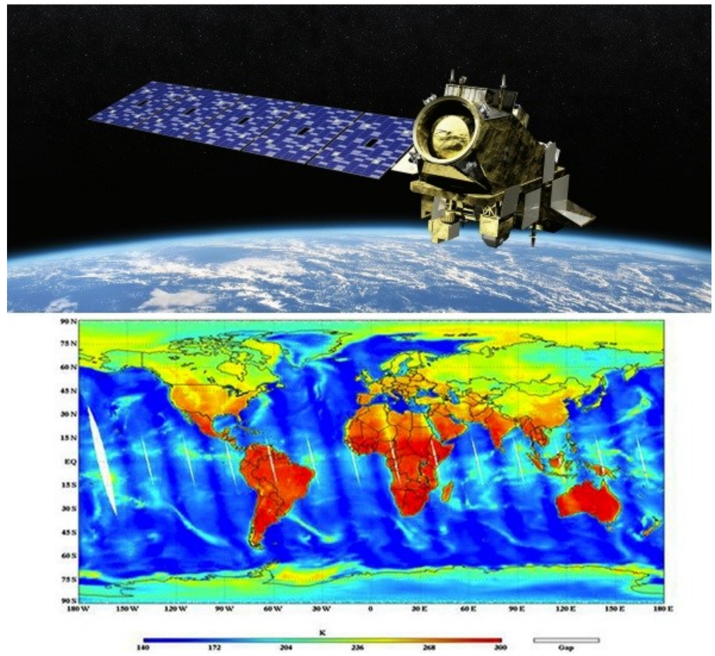
NEW! Teen Observers Group: contact Doug Millar
GOTO SIG: contact Mike Bertin
Astro-Imagers SIG: July 12, Aug. 9
Remote Telescopes: contact Delmar Christiansen
Astrophysics SIG: July 15, Aug. 19
Dark Sky Group: contact Barbara Toy

NOAA's Joint Polar Satellite System (JPSS) to revolutionize Earth-watching

By Ethan Siegel

If you want to collect data with a variety of instruments over an entire planet as quickly as possible, there are two trade-offs you have to consider: how far away you are from the world in question, and what orientation and direction you choose to orbit it. For a single satellite, the best of all worlds comes from a low-Earth polar orbit, which does all of the following:

- orbits the Earth very quickly: once every 101 minutes,
- is close enough at 824 km high to take incredibly high-resolution imagery,
- has five separate instruments each probing various weather and climate phenomena,
- and is capable of obtaining full-planet coverage every 12 hours.



An artist's concept of the JPSS-2 Satellite for NOAA and NASA by Orbital ATK (top); complete temperature map of the world from NOAA's National Weather Service (bottom).

The type of data this new satellite – the Joint Polar Satellite System-1 (JPSS-1) -- will take will be essential to extreme weather prediction and in early warning systems, which could have severely mitigated the impact of natural disasters like Hurricane Katrina. Each of the five instruments on board are fundamentally different and complementary to one another. They are:

1. The Cross-track Infrared Sounder (CrIS), which will measure the 3D structure of the atmosphere, water vapor and temperature in over 1,000 infrared spectral channels. This instrument is vital for weather forecasting up to seven days in advance of major weather events.

2. The Advanced Technology Microwave Sounder (ATMS), which assists CrIS by adding 22 microwave channels to improve temperature and moisture readings down to 1 Kelvin accuracy for tropospheric layers.

3. The Visible Infrared Imaging Radiometer Suite (VIIRS) instrument, which takes visible and infrared pictures at a resolution of just 400 meters (1312 feet), enables us to track not just weather patterns but fires, sea temperatures, nighttime light pollution as well as ocean-color observations.

4. The Ozone Mapping and Profiler Suite (OMPS), which measures how the ozone concentration varies with altitude and in time over every location on Earth's surface. This instrument is a vital tool for understanding how effectively ultraviolet light penetrates the atmosphere.

5. Finally, the Clouds and the Earth's Radiant System (CERES) will help understand the effect of clouds on Earth's energy balance, presently one of the largest sources of uncertainty in climate modeling.

The JPSS-1 satellite is a sophisticated weather monitoring tool, and paves the way for its' sister satellites JPSS-2, 3 and 4. It promises to not only provide early and detailed warnings for disasters like hurricanes, volcanoes and storms, but for longer-term effects like droughts and climate changes. Emergency responders, airline pilots, cargo ships, farmers and coastal residents all rely on NOAA and the National Weather Service for informative short-and-long-term data. The JPSS constellation of satellites will extend and enhance our monitoring capabilities far into the future.

This article is provided by NASA Space Place.

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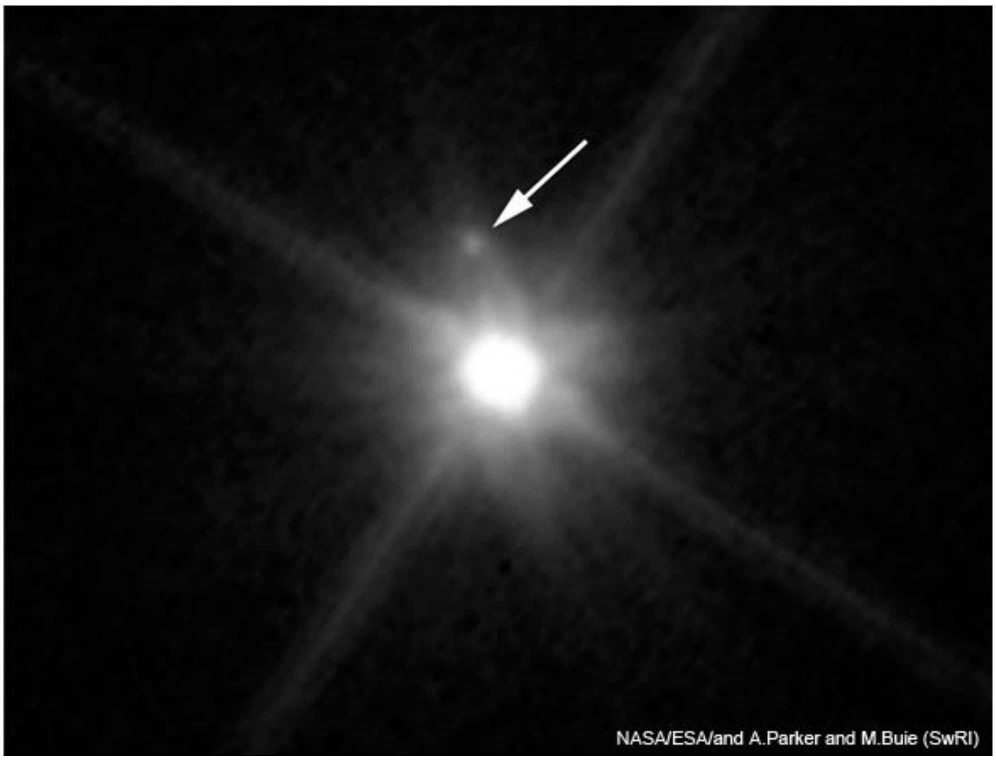
AstroSpace Update

June 2016

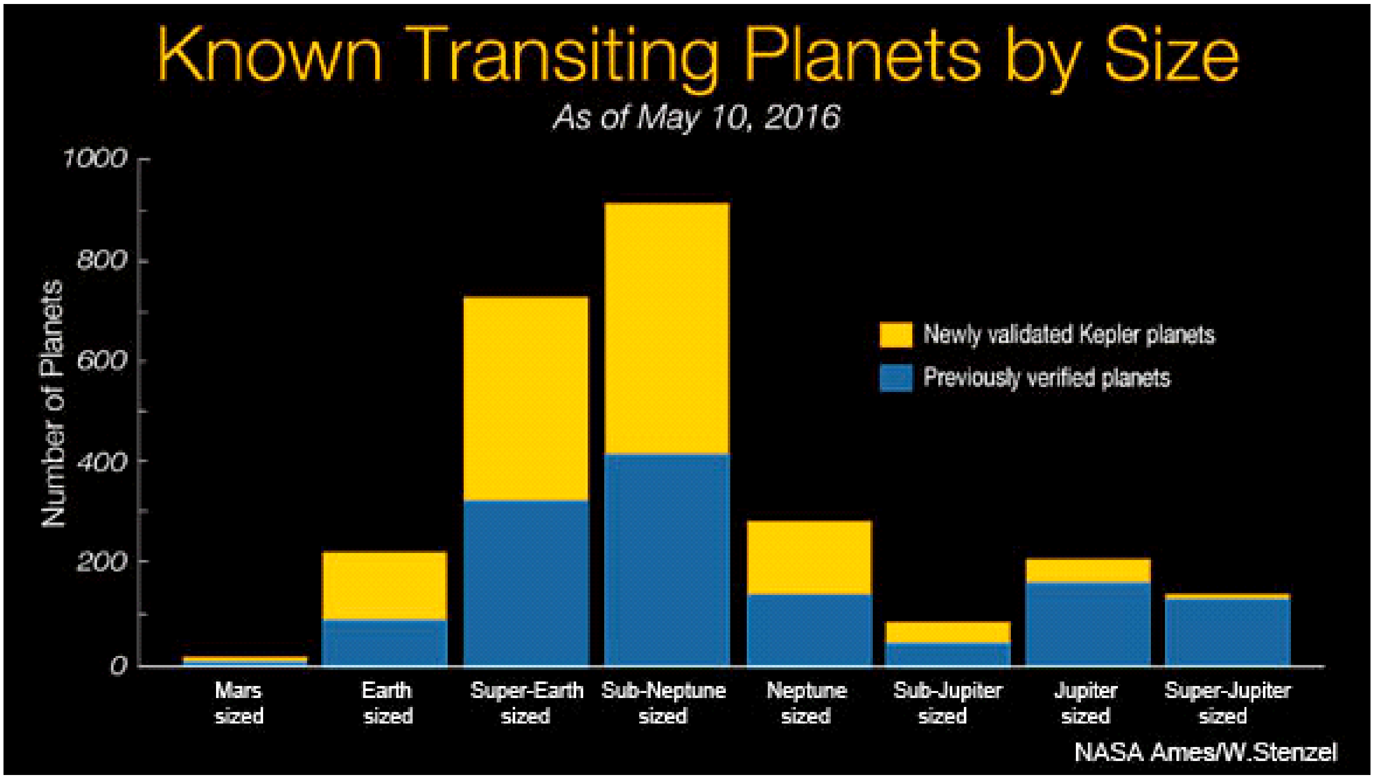
Gathered by Don Lynn from NASA and other sources

Another dwarf planet – Several years ago, a fairly large body was found beyond Neptune, which was provisionally named 2007 OR10 (year of discovery is the "2007" in the name). Data from the Herschel and Kepler space telescopes was recently used to determine how much of the sunlight striking it is reflected, and how much absorbed and re-radiated as infrared. This allowed calculation of its reflectivity and diameter. It was found to be the darkest (least reflective) of the large trans-Neptunian objects, and the 3rd largest of them, at 955 mi (1535 km). This size will be sufficient to officially declare it a dwarf planet. The new study also found it to be rotating in about 45 hours, making it one of the slowest rotating objects in the Solar System. The discoverers (Mike Brown, of Pluto killer fame, and 2 colleagues) are now looking for a suitable name. Of course further study will be done to try to determine why it is so dark and why it is rotating so slowly.



Makemake moon – Of the 4 largest trans-Neptunian objects before the above discovery, 3 have known moons. Naturally some astronomers looked very hard for a moon at the 4th, Makemake. After some unsuccessful attempts over the last decade, the Hubble Space Telescope finally imaged a moon. It is 1300 times dimmer than Makemake (magnitude 24.8), and it does not show up all the time. Its orbit may be edge on to us and its orbital distance small, so it spends much of its time too close to Makemake to be observable. With few images, the orbit is not well determined yet. It is estimated to be about 100 mi (160 km) in diameter. This discovery may resolve a mystery seen in previous observations of Makemake. It appeared that the dwarf planet consisted of mostly bright cold material, but a little dark and warmer material, but the dark warm spot did not rotate with Makemake. The dark warm spot is probably its moon. If the orbit is close to edge-on, we may get some mutual events, that is, the moon passing in front of and behind its primary. Observations of such events tell us a lot about the moon and its dwarf planet. Now astronomers will have to search for a moon orbiting 2007 OR10, since it was promoted into the group of very large trans-Neptunians and is the only one without a known moon.

Nearby Earth-sized planets – Astronomers using the TRAPPIST telescope (0.6 m = 24-inch) in Chile have discovered (using the transit method) 3 planets orbiting an ultracool dwarf star just 40 light-years away. The worlds have sizes and temperatures roughly similar to Earth. The star is much cooler than the Sun, and the planets orbit much closer to their star than Earth does to the Sun. Despite being so close to Earth, this star is too dim and too red to be seen with the naked eye or even visually with a large amateur telescope. It lies in Aquarius. These are the 1st planets found around such a dim star. The James Webb Space Telescope and some other future telescopes should be able to detect the atmospheres of these planets, and look for signs of life. The orbital period of 1 planet is uncertain, but the other 2 are well measured at 1.5 and 2.4 Earth days. The 2 receive somewhat more sunlight from their sun than Earth does from its Sun. So they are probably too hot to be considered in the habitable zone (defined as the area where liquid water could exist on their surface), but may have cooler places on the surface that would be water friendly. About 15% of stars in the Sun's neighborhood are ultracool dwarfs, so this discovery may spark more searches for planets about these fairly abundant stars.



Kepler (planet-finding space telescope) – During its primary mission, Kepler found 4696 objects that were candidates to be planets. Because things other than planets sometimes produce slight dimming of stars, these candidates had to be confirmed by different observations. Up until recently, 1041 of these had been confirmed. So the Kepler team wrote a computer program that analyzed every Kepler observation to see how well it matched with previously confirmed planets or with confirmed non-planets, and assigned a probability that each candidate was a planet. If the probability assigned exceeded 99%, the team proclaimed it confirmed. So now there are 2325 confirmed Kepler planets. 428 of the candidates were assigned a probability that they were almost certainly imposters, not planets. About 1900 candidates could not be decided by the program. 9 newly confirmed planets are in their habitable zone.

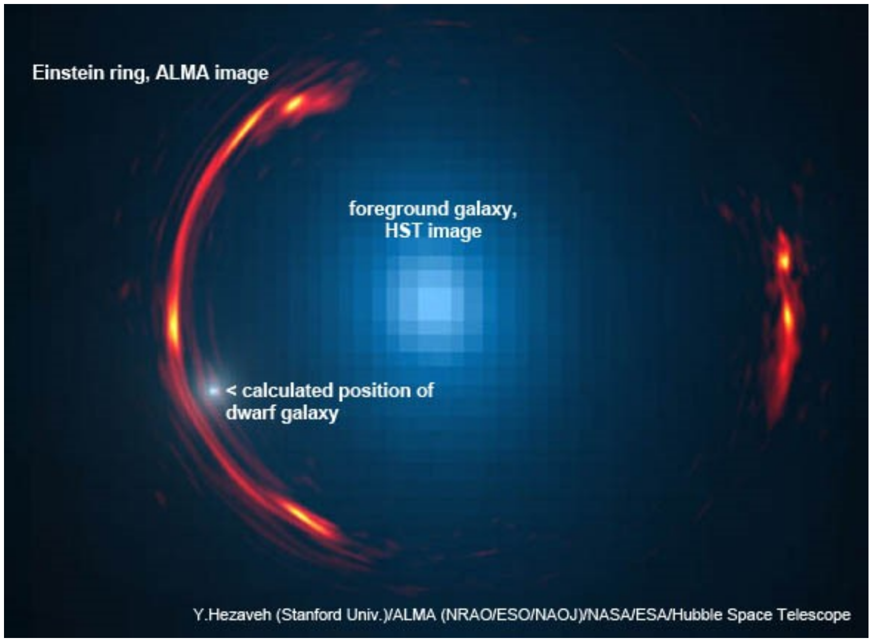
Neutrino sources – The IceCube Neutrino Observatory, buried deep in Antarctic ice, has over the years of operation detected a few neutrinos with astoundingly high energies. Unfortunately, the source directions of electron neutrinos (and the highest energy ones seen by IceCube happen to be electron neutrinos, rather than the 2 other types of neutrinos) are not very precisely determined. So what kind of object creates these high energy neutrinos remains a mystery. The best theory is blazars (bright quasars with jets that happen to be pointed at us). So a team of astronomers went looking for blazars in the general areas of the sources of the 3 most energetic neutrinos to see if any of the blazars had observable (in any form of light) outbursts at the times the neutrinos were seen. They got one hit: a blazar designated PKS B1424-418 that corresponded to the number 1 neutrino (which had been nicknamed Big Bird, after the Sesame Street character). They calculated statistically that there is a 95% chance that the blazar produced the Big Bird neutrino. The team is now examining IceCube records of energetic muon neutrinos, because their sources can be pinned down more precisely than electron neutrinos, and comparing those to blazars outbursting.

Galaxies' heavy elements – A team of astronomers used the Keck Telescope in Hawaii to study content of heavy elements (heavier than helium, inaccurately termed "metals" by astronomers) in distant galaxies. They discovered that the heavy element contents are quite similar, irrespective of the galaxies' star formation rates. In nearby galaxies this is not true; the heavy element content is higher in less-active-star-forming nearby galaxies. The galaxies studied were so distant that their light took about 11 billion years to reach us. What this discovery is probably telling us is that the process that regulated star formation 11 billion years ago was different than today. The heavy element content in the distant galaxies was about 1/5 of what is average in today's galaxies. Stars manufacture heavy elements, so over time this content is expected to increase.

Brightest supernova – I reported here in March that the intrinsically brightest supernova ever seen had been discovered, and that it strained theories on how that much energy could be produced. It just got worse for the theoreticians. About 3 months after it began dimming, the ultraviolet light produced got considerably brighter for 40-some days, though the visible light continued to fade during this period. Now it almost certainly gave off too much energy to be explained, and no one has an explanation for the ultraviolet brightening either. Rebrightening supernovas have been seen before, but that's because the blast ran into surrounding material; but spectra do not show the characteristics of colliding material in this case.

Nearby galaxy discovered – Theoretically, a lot more dwarf galaxies should have formed in the vicinity of the Milky Way than have been found. Another has been found, dubbed Crater 2, and it is the 4th largest and one of the most distant of our galaxy's dwarf companions. It was so hard to find because its stars are spread out and mixed with foreground Milky Way stars. It was found in survey data collected by the Very Large Telescope in Chile, by using a computer program that searches for slight overcrowding of stars. It was then established as a separate entity by its content of red giant and horizontal branch stars, generally not found in the Milky Way's disk. Crater 2 lies about 390,000 light-years away. It is 6500 light-years across. Only the Sagittarius dwarf and the Magellanic Clouds exceed this size among our galaxy's companions. Because its stars are spread out and distant, it appears about 100 times fainter than the Sagittarius dwarf and almost 10,000 times fainter than the Large Magellanic Cloud. Crater 2 seems to be in a similar orbit to the Crater globular cluster, and the Leo IV, Leo V and Leo II dwarf galaxies. They may all have fallen together into our galaxy's gravity. Either a lot more of these really dim galaxies need to be found or our theories of galaxy formation need to be changed.

ALMA (radiotelescope array in Chile) was used by astronomers to image an Einstein ring, the radio light of a distant galaxy distorted into a ring by the gravity of a massive elliptical galaxy that happens to lie in front of it. But to get exactly the shape of the ring observed, another team of astronomers showed that there has to be a dwarf galaxy with a mass of billions of Suns accompanying the foreground galaxy. Since no object can be seen by the Hubble Space Telescope at the required location, the dwarf galaxy must be mostly or entirely dark matter rather than stars. Dwarf galaxies such as this with little or no stars may explain the lack of known dwarf galaxies near our Milky Way (see previous item).



Aligned jets – Deep imaging using the Giant Metrewave Radio Telescope in India has revealed that supermassive black holes in a region of the distant Universe are all spinning out radio jets in the same direction. There is no way that this direction could be transmitted between them, so they must have formed while affected by some force that caused the alignment. There must have been spin over this volume of space at the time of formation. Rotating magnetic fields are one possibility, but others are being proposed. Astronomers were not looking for this effect, but rather were just investigating some of the faintest radio sources. Earlier observations have found correlations in the orientations of galaxies, but not of jets.

Protoplanetary disk measured – Astronomers have for years used light echoes to measure masses of supermassive black holes. The time delay between a flicker from material falling into the black hole and the echo of the flicker off the accretion disk tells the size of the inside edge of that disk. The mass has a mathematical relation to that disk edge size. For the 1st time light echoes have now been used to determine the size of the disk where planets may be forming (protoplanetary disk) about a young star. The Spitzer Space Telescope and several ground-based telescopes were used to monitor 27 young stars in the Rho Ophiuchus region. Only 1 (termed YLW 16B) had flickering suitable for echo work. The echo lagged by 75 seconds, which implies a disk inner edge radius of about 7 million miles (11 million km). This agrees fairly well with the theoretical limit of where dust should sublimate (evaporate) from the star's heat. They plan to apply the echo technique to other young stars and their disks.

Cassini (Saturn mission) has found that 36 of the millions of dust grains that it sampled must have come from interstellar space, because they moved much faster and in different directions than dust native to Saturn. The vast majority of the millions came from the jets on Enceladus that spray material into space. Some interstellar dust was expected, since Ulysses and Galileo spacecraft found such. Cassini had the instrumentation to analyze the composition of captured dust, unlike Ulysses and Galileo. The interstellar dust was found to be a specific mixture of minerals, not ice. The interstellar grains had a surprisingly similar chemical make-up, containing rock-forming elements such as magnesium, silicon, iron, and calcium in proportions matching the known averages for the cosmos. More reactive elements like sulfur and carbon were found to be less abundant compared to cosmic averages. Such dust is produced when stars die. With the variety of star types, it is surprising that the dust measured was so uniform. Dust preserved in meteorites is more diverse.

Cassini viewed a bright star passing behind a plume of gas and dust spewing from Saturn's moon Enceladus, using its Ultraviolet Imaging Spectrograph. Thus it was able to measure the amount of water vapor erupting. The plume, originating from the region around the moon's south pole and extending hundreds of miles into space, is more than 90% water vapor. Other instruments on Cassini have observed that the number of water ice grains being ejected from Enceladus was 3 times greater when the moon was farthest from Saturn, compared to when it was closest in its elliptical orbit. This was Cassini's 1st opportunity to see if the amount of vapor also changes with its orbital position. It was predicted the vapor would be 2 times greater when farthest, but it was only 20% greater. So a little more gas throws out a lot more ice grains.

Recurring slope lineae (RSL) are dark streaks found on some slopes on Mars. They appear in warm seasons, then fade the rest of the Martian year. They have been linked by spectral measurements to melting of ground ice. A new study duplicating Martian conditions in a test chamber showed that the RSL can be created with very little water, which then boils violently in the low pressure and causes landslides.

Curiosity (Mars rover) completed its 2nd Martian year (687 Earth days each) on the red planet. This repetition helps distinguish between seasonal events and sporadic ones. For example, a large spike in methane during the 1st autumn did not repeat in the 2nd, so was a sporadic event. The low level of methane present other than the spike did repeat subtle changes with the seasons. Other seasonal changes involved the air temperature, pressure, ultraviolet level and water vapor. Air temperature varied between 61°F (16°C) on a summer afternoon to minus 148°F (-100°C) on a winter night. The air pressure changed substantially with the seasons, since a substantial fraction of the carbon dioxide freezes into dry ice at each winter pole. The atmosphere local to Curiosity was found to be clearest in winter, dustiest in spring and summer, and windiest in autumn. Curiosity has driven over 7.9 miles (12.7 km) and taken over 320,000 pictures.

New launch site – Russia made its 1st launch from its new rocket launch facility, named the Vostochny Cosmodrome. It is designed to partially replace the Baikonur launch site, which ended up in Kazakhstan, not Russia, after the breakup of the Soviet Union. Russia pays rent to use Baikonur. Russia has 2 other launch sites: Plesetsk, which is too far north for many kinds of launches, and Svobodny, which is not equipped for launches with crews aboard. By 2020, Vostochny is scheduled to be making 45% of Russia's launches.

Instant AstroSpace Updates

One of the 3 satellites on the 1st rocket out of Vostochny was the **Lomonosov astrophysics observatory**, named after the 18th century writer and scientist. Lomonosov will observe the Earth, gamma-ray bursts, cosmic rays, geomagnetic storms, potentially hazardous asteroids, and Transient Luminous Events (which are sometimes referred to as "upward lightning").

Venus is the hottest planet in our Solar System, not because it is closest to the Sun, but because its clouds trap heat, with its surface over 870°F (465°C). New study of data from Venus Express, which operated 2006-2014, surprisingly found **lower temperatures at Venus's poles** than anywhere on Earth.

Dawn (asteroid mission) has released new images from dwarf planet Ceres showing oddly shaped (polygonal) Haulani Crater, with its landslides emanating from its crater rim, and Oxo Crater, the 2nd brightest feature on Ceres, with its relatively large slump in its crater rim.

The 2018 phase of **ExoMars** (joint European-Russian Mars missions), which consists of a rover and surface platform, has been postponed until 2020 due to technical and funding delays. The 2016 ExoMars phase, consisting of the Trace Gas Orbiter and the Schiaparelli lander, is already on its way to the red planet.

SOFIA (airplane mounted 100-inch infrared telescope) has detected atomic oxygen in Mars's atmosphere for the 1st time since the Viking and Mariner missions of the 1970s, coming up with about half the abundance previously measured. Atomic oxygen affects how other gases escape Mars, but it is notoriously difficult to measure.

Random Thoughts – Eyepieces & Eyes

by Chuck Dyson

(originally appeared in May 2016 issue of Temecula Valley Astronomer)

OK, I will go first and man-up; yes I do have one and now it is your turn to admit that you probably have one too. What am I talking about? I am talking about that box, case, locker, tomb, or closet full of eyepieces that where once the perfect eyepieces for your observing tastes at the time of purchase but then eyepiece design and your tastes changed and the old perfect eyepieces went into your storage locker to make way for the new perfect eyepieces.

Why do we do this, is it necessary, how much eyepiece do we really need?

First I find it to be just fascinating that people can go and buy an Orion 80mm short tube refractor and slap a TeleVue on the back end of it and loudly proclaim that the image of object X in this scope is just as good as he remembers the image of the same object being in his buddies 80mm Takahashi-TeleVue combination when they looked at it last week. I do not think so, although the Orion is a decent scope it is no Takahashi and although the TeleVue is a great eyepiece it is not magic

Personally whether it is a compound scope, a refractor, or a reflector, I view these things as having four components that contribute to the quality of the final image, the first three are the objective lens or the primary mirror and then the eyepiece diagonal in the compound and refractor scopes and the diagonal mirror in the reflector (I do not include the secondary mirror in the compound scope as it is well fixed and rarely if ever needs adjusting, the diagonal in the reflector however is another story) finally the light goes through the eyepiece and out of the scope. Now any one of these components can degrade the image and the other components have not the ability to resurrect a degraded image, having said all that though let's be honest after getting started in astronomy by going out and purchasing a modest scope and accessories very few of us have the financial wherewithal to go out and purchase a high quality and bigger scope with better and more accessories when we want to move up in astronomy.

This financial brake on our urge to spend more money on a hobby that we are excited about is a good thing because it gives us time to actually use and become familiar with our equipment and ourselves as in what we like to look at and how good is our equipment at showing us what we spend the majority of time observing. If I spend the majority of time on planets then I would be interested in a high power narrow field of view eyepiece in order to maximize my ability to see detail, but If I am into extended objects like globular clusters or galaxies I may want a medium high power eyepiece with a wide field of view to give me that floating in space effect of the object under observation at the expense of detail especially with the objects that are 75% or more to the edge of the field of view. It is also goes without saying that you should buy eyepieces that will work with the scope that that you intend to upgrade to. As an example, I purchased a 3.2mm FL eyepiece for my 600mm Fl refractor and it gave me a 187X image and that is about as much magnification as I like; however, my next refractor has a FL of 990mm and that gives me a 309X image with the 3.2mm FL eyepiece, this eyepiece now spends much of its life in my eyepiece box. *(continued on page 8)*

(continued from page 7)

Another habit that I have that fills up my eyepiece box is to purchase one eyepiece of a new series of eyepieces for trial and then decide that I do not want the series, hello box here is your new resident. My final habit that leads to the box is the path that runs through my psyche. I have two eyepiece sets that I keep for personal reasons, the first is a set of Edmund RKE eyepieces and those were the first eyepieces that I ever purchased when I started to observe in the 80's, and the second is a set of Vixen 2-inch eyepieces (old style) that I just wanted to collect, I don't use them I just have them.

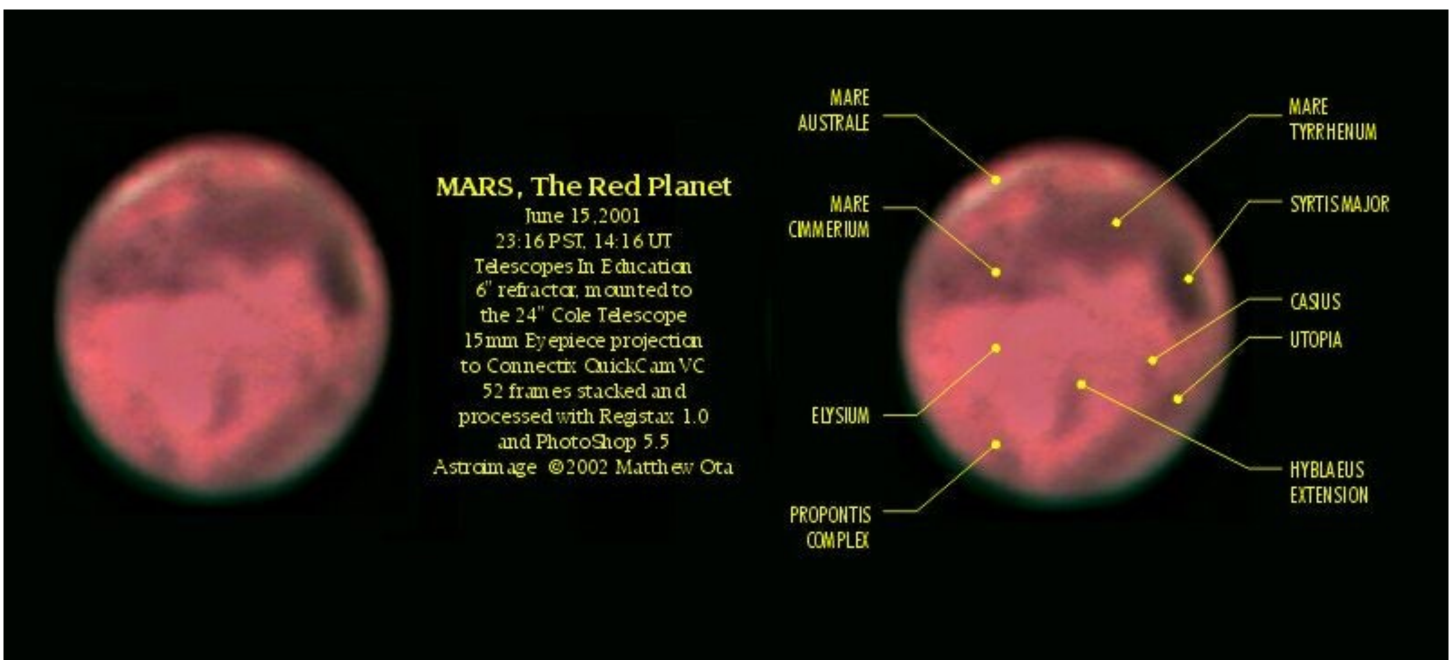
Finally we get to that fourth component that is necessary for a quality image and it's your eye. Your eye actually performs two functions, the first is to focus the pencil of light coming from the telescope via a two lens fluid spaced system (the cornea is also a lens), and the second is to process the photons into a chemical/electrical signal that goes to your brain and is transformed in to a mental image. Now the funny thing about your eye is that the cones are way bigger than the rods so for a given area there are more rods and your visual acuity (ability to see detail) should be better in an area that is mostly rods compared to an area that is mostly cones, right?

Nope, because the signal coming from rods is bundled several rods to one nerve and that makes several rods in one element that is larger than the cone and each cone has its own nerve ending to accept its signal. The result of this arrangement is that if one rod in a bundle gets excited then a signal is sent to your brain and an image can be built up from the signals coming from different bundles a low resolution signal to be sure but a signal; on the other hand, if a cone does not receive enough photons to excite it there is no signal sent to your brain and no picture, but with enough photons many or all of the cones get excited and a high resolution picture can be formed in your brain.

Probably the best example of this phenomenon is the blinking nebula most people can see it with averted vision (rod rich vision) and cannot see it when looking directly at it (cone rich vision). The cones in your eye are mostly concentrated in an area that is within 30° of the eye's central axis and this results in a 60° area of high definition images, but after that the rods start taking over and the image becomes low definition; so, eyepieces with AFOV of greater than 60° will show you more sky but the area of high definition viewing will stay the same, are you comfortable with that and do you want to pay the price of that 120° eyepiece?

Now it goes without saying that just as no two people are exactly alike, no two eyes are exactly alike and yet how often, if ever, do we go to the optometrist or ophthalmologist and say I am an amateur astronomer please examine my eyes and let me know what is the largest cone of light my eyes will accept, how good is my visual acuity, is there visual field impairment, and how good is my contrast sensitivity? Not only do we not get our eyes checked that often, but how many times have you gone on-line to look at user reviews of an eyepiece you want to buy and how many of these reviews have given you the reviewers last eye exam results? In my experience the number is zero.

What we are ultimately left with is what I usually do; buy the eyepiece with the best ad and hope for the best.



This image of Mars was generated by former OCA member Matthew Ota during the 2001 opposition. The OCA Image Album doesn't have any images of Mars created after the 2007 opposition. Let's get out there and get some new ones, folks!

John Brashear—A Perspective

By Chuck Dyson

(adapted from material appearing in the April issue of Temecula Valley Astronomer)

The article in the January 2016 issue of *Sky and Telescope* by Al Paslow (page 68) concerning the discovery of a time capsule at the Brashear factory, got me to thinking: who was John Brashear and why was this capsule so important?

Why was there such a hub bub over a time capsule by a gentleman who as far as I knew built quality but modest telescopes? The answer arrived, in part, in the March Sky and Telescope magazine on page 34 in an article about the refurbishing of the Lowell refractor. The article mentions that much science was done using the refractor by Vesto Slipher including measuring the velocities of spiral nebula (the name for galaxies before Hubble) with his modified Brashear spectrograph. This Mr. Brashear seems to have been more than a telescope maker and I must know more; hence, I don my electronic SCUBA gear and dive into the internet.

John Brashear was born in 1840 to a family of very modest means; however, at age nine John's grandfather (I am already starting to bond with John) took him to see a telescope as scopes were very much a novelty at that time and to pay the five cents for John to look through it. Throughout his life John mentioned over and over that the views of the Moon and Saturn were the defining moments in his life. As there were no commercial telescopes and he had not the monies to commission a scope, John did not get to look through a scope that he owned until after he finished school (10th grade), finished a machinist apprenticeship (5 years), became a journeyman machinist and then a millwright and even then all he and his wife could afford was a five inch piece of optical glass and books on math and optical theory. After three years of study, grinding, and consultation with the astronomers at the Allegheny Observatory, John finally had a finished objective lens for his telescope but when checking it one more time for blemishes he dropped it and it broke. Disaster; however, because John had worked with the astronomers at Allegheny Observatory and they had been impressed with his work they purchased a new piece of glass for John out of the observatory budget. The second lens was finished in shorter time than the first and was a success. Now, even though the Brashears had an optical tube, they had no mount for the new telescope (I do not recommend that you do what they did next). They then determined which wall of their house had the best view of the night sky and sawed a hole in the wall and used the wall as their mount. One of the first things that the Brashears did with the new telescope was to have the children of the neighborhood come into the house and look through the scope. Public outreach was always a constant part of the Brashears life and yes he would have been a great member of the TVA.

It appears that in the 1870's there was a serious lack of optical craftsmen and thus the Brashears were soon making lenses for professional and amateur astronomers and by the 1880's, with money from a venture capitalist, they were working full time in their own small factory. At about this time the French had developed a method of silvering the back of glass to produce a superior mirror for ladies' boudoirs. The mirrored telescopes of this time had mirrors of metal and when the metal oxidized the entire mirror had to be reconfigured to produce a new surface that was not oxidized and this happened every one to two years, not fun and very expensive. The behind the glass silvering technique was modified to become a cumbersome but effective in front of the glass silvering technique; the new mirrors were much more reflective than the metal ones and much easier to re-coat with new silver. What John Brashear now did was to refine, simplify, and improve on the silvering process and the Brashear process became the standard technique for all glass mirrors until 1934 when silver was replaced by the aluminum vapor process that we use today.

With the increase in business from the telescope mirrors as well as refractor lenses, the factory, with another infusion of cash from the venture capitalists of the day, was expanded to its final size and it was during this expansion that the time capsule was placed in one of the pillars. Also at this time John Brashear, who had been servicing spectrographs from the observatories on the East coast (you can only imagine what it was like in the 1880's to get your spectrograph shipped to Europe for servicing), started designing and building his own spectrographs and these became the preferred instrument by astronomers all over the world and thus its presence at Lowell's Mars Hill Observatory as Mr. Lowell was one who had to have the very best.

Although John Brashear had only a tenth grade education, he taught himself math to the point where he was teaching university level astronomy and became the director of the Allegheny Observatory. In following years, he became the acting chancellor of University Of Pittsburgh and a member of the Board of Directors of Carnegie-Mellon University.

In the beginning, America sent its students to Europe for the best education and American scientists went to Europe for state-of-the-art instruments. Starting in the late 1800's to the early 1900's, a group of American renaissance men in science/education and in industry changed that metric with students and researchers started coming to America for education and state-of-the-art equipment. John Brashear & Co was a big part of that change and a snapshot of the man, the factory, and people is what was in that time capsule; however, the city of Pittsburgh only wanted the old factory gone as cheaply as possible until the contents and their significance was brought to the attention of the news by Mr. Paslow and then the story changed and the city threatened litigation, withheld payment to the salvage company and did what city officials do when threatened with embarrassment. Fortunately for all a local museum with a collection of artifacts from the Brashear factory came forward with an offer and purchased the time capsule so as to add its contents to the exhibit on the Brashear story. So the city was able to save face, our understanding of the history and contributions of the Brashear factory and family was enhanced, and hopefully the exhibit at the Sen. John Heinz History Center will inspire us to go out and *carpe diem* (seize the day).

Oh, yes, the city's big interest in the time capsule: in the background of the photo of the Brashear factory is the only known image of Pittsburgh's first stadium Recreation Park, the birthplace of professional football and the site of Pittsburgh's first baseball victory in the National League. Well, all I can say is that the city has its priorities and I have mine and they ain't the same, at all.

The ashes of John Brashear and his wife are in a vault in the basement of their beloved Allegheny Observatory and their epitaph is from one of the favorite poems.

"I have loved the stars too fondly

To be fearful of the night."

I would also like to thank the editors of Sky and Telescope magazine for printing the articles that led me through a most interesting historical journey

OCA GROUP FOR TEENAGERS TO START

I would like to announce the start of a special group for teenagers in OCA. Briefly, the group is set up so that teenagers have activities and interaction that is specifically targeted to them. We are going to organize it around activities and keep in communications via email and an email reflector like a Yahoo group. Some of the activities we are working on for this year are the following:

We have been offered a free night on the Mt. Wilson 60" telescope; date yet to be set.

We have been invited to participate in a meteor count during the Perseid meteor shower in August. We will hold it at the Anza site.

We are working on access to a remotely controlled telescope in Australia and have it available to group members.

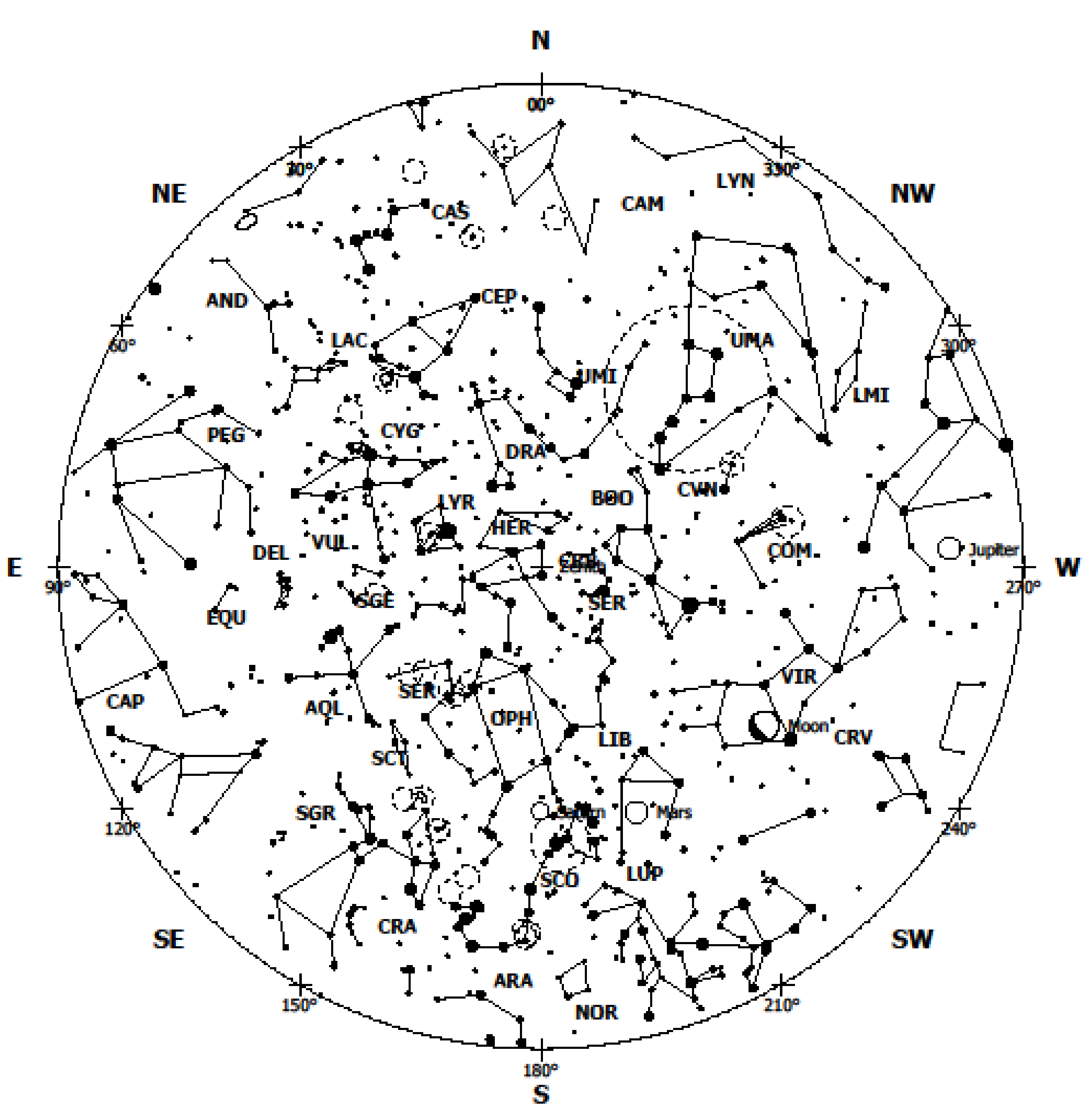
More are being planned.

If you know someone who would like to be in the group, please send me their name, age, and an appropriate email address.

Doug Millar, group coordinator

drzarkof56@yahoo.com

June 2016 Whole Sky Chart



Symbols

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

Magnitudes

-6 -5 -4 -3 -2 -1 0 1 2 3 4 5

Location	Time	View
United States, CA, Long Beach	Local time: 2016-06-15 00:00:00	Field of view: 200° 00′ 00″
Lon: 118° 11′ 18″ W, Lat: 33° 46′ 01″ N	Universal time: 2016-06-15 07:00:00	RA: 16h 43m 13.56s, Dec: +33° 46′ 01.0″
Time zone: GMT-08:00	Julian date: 2457554.79167	Azi: 180° 00′ 00.0″, Alt: +90° 00′ 00.0″
Elevation: 29 feet above sea level	Sidereal time: 16h 43m 14s	Constellation: Hercules

SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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