SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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Jupiter is featured often in this newsletter because it is one of the most appealing objects in the night sky even for very small telescopes. The king of Solar System planets is prominent in the night sky throughout the month, located near Aldebaran in the constellation Taurus. Pat Knoll took this image on January 18th from his observing site at Kearney Mesa, California, using a Meade LX200 Classic at f/40 with a 4X Powermate. The image was compiled from a two-minute run with an Imaging Source DFK 21AU618.AS camera .

OCA CLUB MEETING

The free and open club meeting will be held February 8 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, UCSD's Dr. Burgasser will present "The Coldest Stars: Y-Dwarfs and the Fuzzy Border between Stars and Planets."

NEXT MEETINGS: March 8, April 12

STAR PARTIES

The Black Star Canyon site will open on February 2. The Anza site will be open on February 9. 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 February 1st. The following class will be held March 1st

GOTO SIG: TBA
Astro-Imagers SIG: Feb. 19, Mar. 19
Remote Telescopes: TBA
Astrophysics SIG: Feb. 15, Mar. 15
Dark Sky Group: TBA

NASA's Space Place

The Art of Space Imagery/Diane K. Fisher

When you see spectacular space images taken in infrared light by the Spitzer Space Telescope and other non-visible-light telescopes, you may wonder where those beautiful colors came from? After all, if the telescopes were recording infrared or ultraviolet light, we wouldn't see anything at all. So are the images "colorized" or "false colored"?

This image of M101 combines images from four different telescopes, each detecting a different part of the spectrum. Red indicates infrared information from Spitzer's 24-micron detector, and shows the cool dust in the galaxy. Yellow shows the visible starlight from the Hubble telescope. Cyan is ultraviolet light from the Galaxy Evolution Explorer space telescope, which shows the hottest and youngest stars. And magenta is X-ray energy detected by the Chandra X-ray Observatory, indicating incredibly hot activity, like accretion around black holes.

No, not really. The colors are translated. Just as a foreign language can be translated into our native language, an image made with light that falls outside the range of our seeing can be "translated" into colors we can see. Scientists process these images so they can not only see them, but they can also tease out all sorts of information the light can reveal. For example, wisely done color translation can reveal relative temperatures of stars, dust, and gas in the images, and show fine structural details of galaxies and nebulae.

Spitzer's Infrared Array Camera (IRAC), for example, is a four-channel camera, meaning that it has four different detector arrays, each measuring light at one particular wavelength. Each image from each detector array resembles a grayscale image, because the entire detector array is responding to only one wavelength of light. However, the relative brightness will vary across the array. So, starting with one detector array, the first step is to determine what is the brightest thing and the darkest thing in the image. Software is used to pick out this dynamic range and to re-compute the value of each pixel. This process produces a grey-scale image. At the end of this process, for Spitzer, we will have four grayscale images, one for each for the four IRAC detectors.

Matter of different temperatures emit different wavelengths of light. A cool object emits longer wavelengths (lower energies) of light than a warmer object. So, for each scene, we will see four grayscale images, each of them different. Normally, the three primary colors are assigned to these gray-scale images based on the order they appear in the spectrum, with blue assigned to the shortest wavelength, and red to the longest. In the case of Spitzer, with four wavelengths to represent, a secondary color is chosen, such as yellow. So images that combine all four of the IRAC's infrared detectors are remapped into red, yellow, green, and blue wavelengths in the visible part of the spectrum.

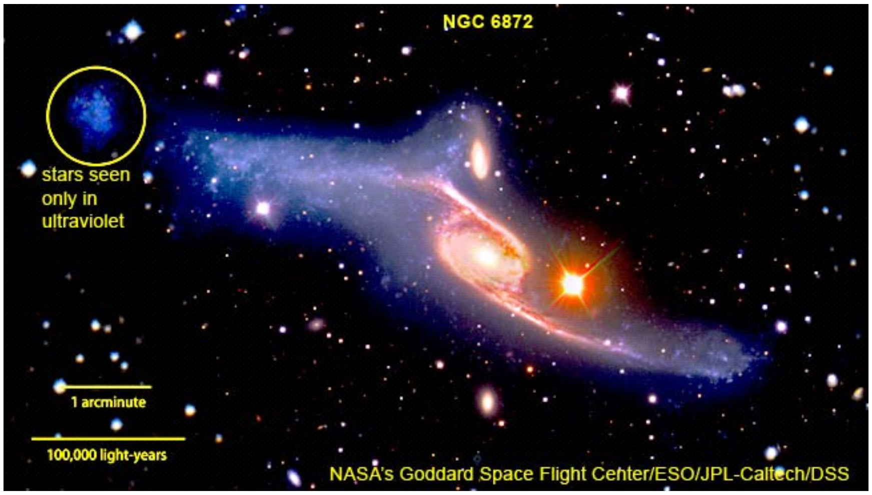
Download a new Spitzer poster of the center of the Milky Way. On the back is a more complete and colorfully-illustrated explanation of the "art of space imagery." Go to spaceplace.nasa.gov/posters/#milky-way.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

AstroSpace Update

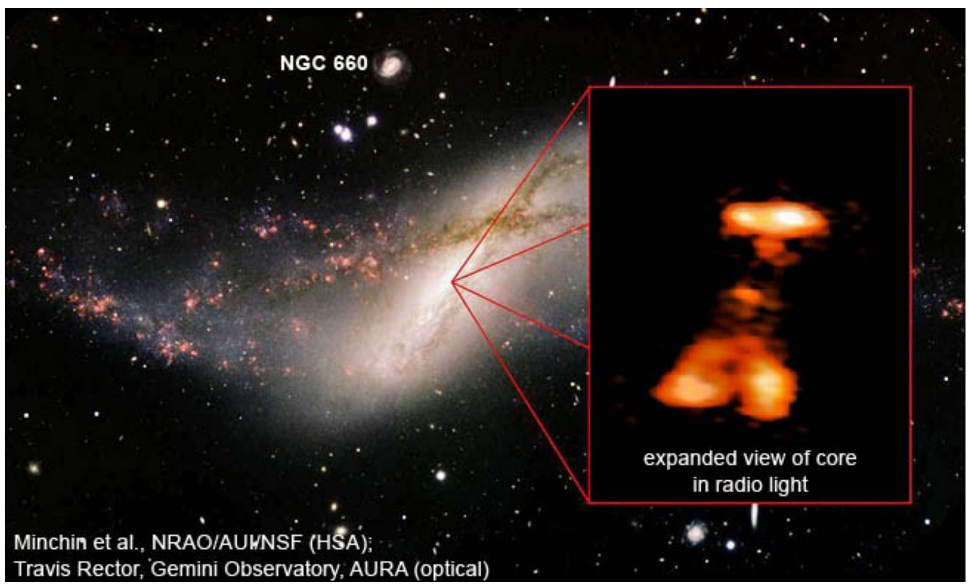
February 2013

Gathered by Don Lynn from NASA and other sources



Largest spiral – NGC 6872 has long been known to be a very large barred spiral galaxy. New analysis of GALEX (ultraviolet space telescope) observations shows hot star formation regions farther out in this galaxy's arms than are seen in visible light. From tip to tip of the 2 arms measures 522,000 light-years, making it the largest known spiral galaxy. It is about 5 times the size of our Milky Way. The galaxy's unusual size and very elongated arms stem from its interaction with a much smaller disk galaxy (IC 4970), which has only about 1/5 the mass of NGC 6872. Computer simulations match the current state best for a close approach by IC 4970 about 130 million years ago, following a path that took it nearly along the plane of the spiral's disk in the same direction it rotates. The pair is located 212 million light-years away in Pavo. The youngest stars are at the end of the arms, and stellar ages get progressively older toward the galaxy's center. No recent star formation was found along the bar, indicating it formed at least a few billion years ago. The galaxy's bar is also large, measuring about 26,000 light-years in radius.

Galaxy outburst – While conducting a long-term study of molecules in galaxies using the Arecibo radiotelescope, astronomers were surprised to find a massive outburst in one of the galaxies (NGC 660), a spiral 44 million light-years away in Pisces. An array of radiotelescopes was used to get a high-resolution image of the outburst. The result was more complex than expected. They thought they would see either the ring of an expanding supernova or a jet of superfast material from the galaxy's core. Instead, they saw 5 sites of bright radio emission, 1 near the center of the galaxy and 2 on either side. The best explanation is there are jets coming from the central black hole, but the jets are precessing, or wobbling. Continued observations will be made to try to confirm this.



Another – In 2011 Fermi (gamma-ray space telescope) and VLBA (radiotelescope array) observed a blast of energy from a galaxy so distant that its light has been traveling 10.6 billion years to reach us. Theorists expect gamma-ray bursts occur very close to a galaxy's central black hole. The 2011 flare showed that the gamma-ray emission originated about 70 light-years from the galaxy's central black hole, much farther than theory. The host galaxy has been known as a source of radio emission since the 1960s. Gamma rays had been detected from it in the 1990s, but this is the 1st time it erupted since Fermi was launched. At the height of the outburst, the galaxy was more than 10,000 times brighter than the luminosity of the entire Milky Way. At the galaxy's core lies a supermassive black hole weighing 2.6 billion times the Sun's mass. Some of the matter falling toward the black hole is accelerated outward at almost the speed of light, creating dual particle jets. 1 jet happens to point almost directly toward Earth. The 2011 blast revealed a bright knot moving at a calculated 99.87% the speed of light. It was noted that visible light emissions were changing in step with gamma rays. During the most intense flaring the polarization of light and radio waves was found to change in sync. Putting this all together allowed pinpointing the source of the gamma rays. The astronomers think that the gamma rays were produced when electrons moving near the speed of light within the jet collided with visible and infrared light. Such a collision can kick the light up to much higher energies. The source of the visible and infrared light is unclear so far.

Milky Way outflow – Astronomers made radio observations of the giant bubble structures at the center of the Milky Way to determine what causes them. Enormous outflows of charged particles, stretching more than halfway across the sky and moving at supersonic speeds, have been detected. The source of the energy has been somewhat of a mystery, since it is about 1 million times the energy of a supernova explosion. The outflows extend 50,000 light-years out of the galactic plane. They match previously identified regions of gamma-ray emission called Fermi bubbles and a haze of microwave emission. Previously it was unclear whether it was quasar-like activity or star formation that injected energy into the outflows. The recent findings show that the phenomenon is driven by many generations of stars forming and exploding as supernovas over the last 100 million years. Magnetic measurements imply the activity happened in several bouts. Further analyses of the polarization and magnetic fields will be made.

Glitch explaining glitches – Pulsars rotate at extremely stable speeds, but occasionally they speed up in brief events called glitches. The prevailing theory is that these events arise as a rapidly spinning superfluid within the star transfers rotational energy to the star's crust. However a team of astronomers has used a computer model that shows this theory does not produce glitches as large as those observed.

Chandra (X-ray space telescope) has made a time-lapse movie of a fast-moving jet of particles produced by a rapidly rotating neutron star, the Vela Pulsar. The star is about 12 miles in diameter, rotates every 0.089 seconds (quicker than a helicopter rotor), and is about 1000 light-years away. The charged particles are racing out in the jet at about 70% the speed of light, to a distance of about 0.7 light-year. The movie shows that the jet seems to be wobbling with a period of about 120 days. 1 possible cause of wobbling is that the pulsar is slightly distorted, not a perfect sphere. This distortion could be caused by the fast rotation and/or glitches. A deviation from spherical of just 1 part in 100 million would explain the wobble. Further observations will be made to try to confirm the wobble. If so, this will be the 1st observation of a neutron star wobbling. If non-spherical, the neutron star should be producing gravity waves, perhaps strongly enough to be detected by the next generation of gravity-wave detectors.

Herschel (infrared space telescope) imaged the asteroid Apophis as it made a pass by Earth in January. Infrared brightness correlates with size better than does visible light brightness, so a better value for the asteroid's size was calculated (1066 ft [±49] = 325 m [±15]). The previous best estimate was 886 ft (270 m). This means it is much larger, less reflective of visible light (23%), and much less dense than thought previously. Apophis became famous soon after its discovery in 2004 because initial orbit calculations showed it had a 2.7% chance of striking Earth in 2029 or 2036. Better measurements reduced this chance to a few chances in a million, and the measurements made during January's pass reduced the chances further to 1 in 10 million or so. But get your telescope out in 2029 to watch as it passes about 10 times closer than the Moon.

Swirling solar wind – Using the Cluster quartet of satellites, scientists have zoomed in on the solar wind to reveal the finest detail yet, finding tiny turbulent swirls that could play a big role in hearing the wind. As the solar wind expands away from the Sun, it cools down, but to a much smaller extent than smoothly expanding gas should. Hence it is thought that turbulence plays a key part in maintaining the wind's heat. The new study was made by flying 2 of the Cluster satellites just 12 miles (20 km) apart along the direction of the plasma flow. By comparing the results with computer simulations, scientists confirmed the existence of sheets of electric current on the borders of turbulent swirls. Cluster previously has detected much larger current sheets.

Exocomets (comets orbiting other stars) – A search for exocomets has found 6 likely candidates. They were all found by a telescope at the McDonald Observatory in Texas, and all orbit young type A stars (because the detection method works best with type A spectra). Along with previous discoveries, that makes 10 nearby stars thought to possess comets. Only 1 of those 10 is known to have planets, though all have massive disks that usually form planets. The exocomets are detected by their effect on the spectrum of their star, which happens only when a comet is evaporating mightily during a close pass by its star. It is thought that planets are likely the reason that comets get deflected from their birthplace toward their star. Both planets and comets are believed to form from material leftover from star formation. These lines of reasoning imply that planets and comets should often be found together. Recent estimates of planet frequency show that they are at least as common as stars, so exocomets probably are also quite common.

Exoasteroids – Astronomers have discovered what appears to be a large asteroid belt around the star Vega, using data from the Spitzer and Herschel infrared space telescopes. The discovery makes Vega similar to Fomalhaut, which seems to have belts at the right place for an asteroid belt and a Kuiper belt. Both Vega and Fomalhaut's inner and outer belts have a gap between, likely maintained by the gravitational influence of multiple planets. Vegas belts contain far more material than our solar system's asteroid and Kuiper belts. This is because Vega is far younger than our system (which has cleaned out material over time), and Vega likely formed from an initially more massive cloud of gas and dust than our system. Vega, Fomalhaut and our system each has the outer belt about 10 times the distance as the inner belt.

More Fomalhaut – Astronomers were surprised to find, using the Hubble space telescope, that the debris belt about Fomalhaut is wider than previously known, spanning space from 14 to nearly 20 billion miles (23-32 billion km) from the star. Even more surprisingly the orbit of the planet Fomalhaut b was found to follow an unusually elliptical orbit that carries it through the vast dust ring. It swings as close as 4.6 and as far as 27 billion miles (7.4-43 billion km) from the star. The astronomers consider this circumstantial evidence there may be other planet-like bodies in the system that gravitationally disturbed Fomalhaut b into this orbit. Hubble also found the dust and ice belt encircling the star has an apparent gap slicing across the belt. This might have been carved by another undetected planet. If the orbit of Fomalhaut b lies in the plane of the dust belt, then the planet will intersect the belt around 2032, and could collide with debris. However, if it is not co-planar, then future years will only see a gradual dimming of the planet as it recedes from its star. One astronomer hypothesized that the extreme orbit explains why the planet is unusually bright in visible light, but very dim in infrared. It is possible the planet's optical brightness is caused by a ring or shroud of dust, which reflects starlight. Such dust could be produced by satellites orbiting the planet when they collide with each other or debris. Observations will continue for years to try to confirm these theories.

Nearby exoplanets – A team of astronomers has discovered that Tau Ceti, one of the closest and most Sun-like stars, appears to host 5 planets, 1 in the habitable zone (where temperatures could allow liquid water to exist). Tau is only 12 light-years away and is visible to the naked eye. It is the closest single star with a Sun-like spectrum. The masses of the 5 planets are estimated to be 2-6 times Earth's mass, making it the lowest mass planetary system known. The one in the habitable zone is estimated at 5 times Earth's mass, making it the smallest habitable-zone planet known. Tau Ceti was chosen for a project to make a computer model of the noise that pollutes Doppler measurements of a star's spectrum, since Tau was thought to have no planets tugging on the star. Instead the computer model showed that only 5 planets could explain the Doppler measurements. Those measurements were made with 3 state-of-the-art spectrographs on telescopes in Chile, Australia, and Hawaii.

Another habitable zone – Astronomers have found a new candidate exoplanet in the habitable zone of the star HD 40307 in Pictor. It has a mass 7 times that of Earth. It is about 42 light-years away. The star was known to have 3 close-in planets, but new data filtering techniques uncovered another smaller wobble in the star by a more distant planet. It is believed from its distance to not be rotationally locked, and thus would have day and night. Nothing is known yet about the planet's properties. It would make a good target for a space telescope, because it is close to us and fairly distant from its star.

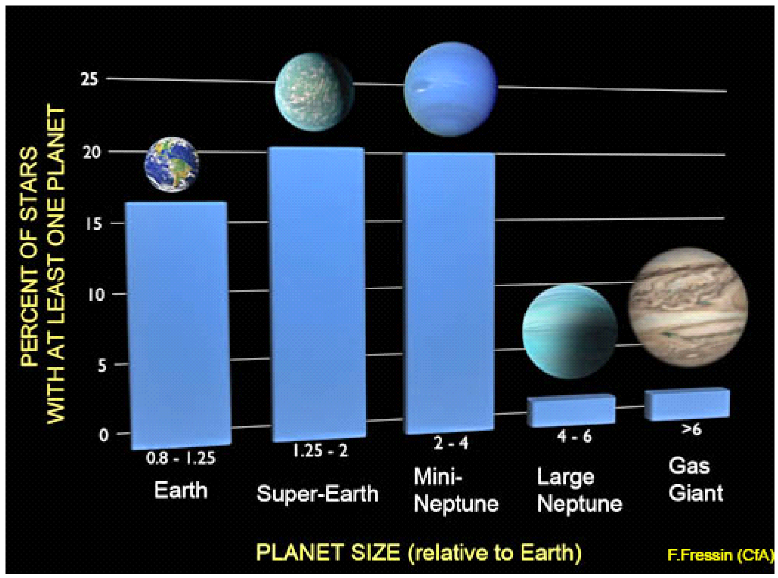
Yet another – Volunteer citizen scientists with Planethunters search Kepler (planet-hunting space telescope) data for indications of planets that have been overlooked by the computer programs that automatically search the data. Planethunters have found 15 more planet candidates in the habitable zones of their planets. 1 of the 15, designated PH2 b, has already been confirmed as a planet by ground-based observations. Though PH2 b may not be suitable for life, it could easily have moons that are. 19 previously discovered planets are believed to lie in the habitable zones of their stars. This all points to planets in the habitable zone being fairly common.

More exoplanets – A new study by astronomers provides yet more evidence that planetary systems are the cosmic norm. The team analyzed planets orbiting a star called Kepler-32 and concluded that they are representative of the majority in the galaxy. Extrapolating, there are at least 100 billion planets in our Milky Way, or about the same number as stars. The new study is of an M-type (red) dwarf star, and those stars outnumber all other types in our galaxy. The Kepler-32 system happens to be oriented edgewise to us, so that we detect with the Kepler space telescope all its planets transiting in front of their star. Other teams have estimated roughly the same number of planets in our Milky Way, but this is the 1st study that took into account the type M stars. Since the new study did not take into account planets distant from their stars, nor other types of stars, the actual number of planets is certainly larger, perhaps double. The Kepler-32 system has 5 planets ranging from 0.8 to 2.7 times the diameter of Earth and orbit extremely close to their star. That star is ½ the size and mass of our Sun. The outer planet is in the habitable zone. The planets likely formed farther from their star and migrated inward over time. The 3rd and 4th planets are not very dense, meaning that they are likely made of volatile compounds such as carbon dioxide and methane. The planets would have to have formed with these compounds farther from the star where it was cooler. 3 of the planets orbit in synchronization, with orbital period ratios of 2:1 or 3:1. Planets do not form with such synchronization, but acquire it during movement toward their star.

Kepler mission has released a new list of 461 planet candidates, which now must be checked out by other telescopes to rule out other causes that may mimic the signal of a planet (such as starspots). This adds to the about 2300 already on the list from previous Kepler data releases. The longer term observations now available are tending to find smaller planets, multiple planets orbiting a star, and those more distant from their stars. So the proportions are increasing of planets in multiple-planet systems, near Earth mass and near the habitable zone. The increase in multiple-planet systems not only says such systems are more common than thought, it also means planets are more likely coplanar, that is, all planets of a system lie in the same plane, or nearly so. If planets orbit in different planes, Kepler is unlikely to see multiple planets pass in front of their stars. During the past year, the number of Kepler candidates confirmed as planets has risen from 33 to 105. Statistical analysis of the Kepler candidates shows that 17% of stars have a planet roughly the size of Earth. This result is valid only for planets close to their stars (about as close as Mercury is to the Sun), since Kepler more easily detects those. 50% of stars probably have a planet the size of Earth or larger (again, only for planets close to their stars).

Adding in more distant planets is estimated to bring that to 70% of stars. Planets tend to be more common the smaller the planet is, at least down to about Earth-sized, which is the limit of Kepler sensitivity. Gas giants are found orbiting only about 5% of stars. This result is good out to about 400-day orbits. All sizes of planets were found to be equally likely orbiting all types of stars, with the exception that gas giants favor large stars. Computer simulations of planets indicate that only about 1/10 of the planet candidates will turn out to be something non-planetary masquerading; that is, 90% of the candidates are expected to be real.

Planet formation – A team of astronomers using the ALMA array of radiotelescopes in Chile has studied the young star HD 142527 and found streams of gas flowing across gaps in the star's surrounding disk. These are the 1st direct observations of these streams, which are expected to be created by giant planets guzzling gas as they grow. The star is more than 450 light-years away, and is surrounded by a disk of gas and dust, the remains of the cloud from which the star formed. A gap, which is thought to have been carved by newly forming gas giant planets clearing out their orbits, divides the disk into an inner and an outer part. The inner disk reaches out to the equivalent of the orbit of Saturn in our system, while the outer disk begins 14 times farther out. The outer disk does not surround the star uniformly instead, it has a horseshoe shape, probably a result of the gravitational effect of orbiting giant planets. According to theory, the giant planets grow by capturing gas from the outer disk in streams that form bridges across the gap. This is the 1st time the bridges have been seen directly. ALMA observes at submillimeter wavelengths, between infrared and radio, and is impervious to the glare from the star that affects infrared and visible-light observations. The planets grow by capturing some of the gas from the outer disk, but much material overshoots and feeds into the inner disk. The observations answer another question about the disk. As the central star is still forming by capturing material from the inner disk, the inner disk would have already been devoured if it was not somehow being replenished. The rate seen of gas streaming in is sufficient to do this replenishment. The amount of residual gas implies the mass of the objects capturing the material is more likely gas-giant sized rather than something larger, like a companion star. The gas giant planets have not been detected directly, though searched for in infrared. However they should be deeply embedded in the gas, which probably hides them.

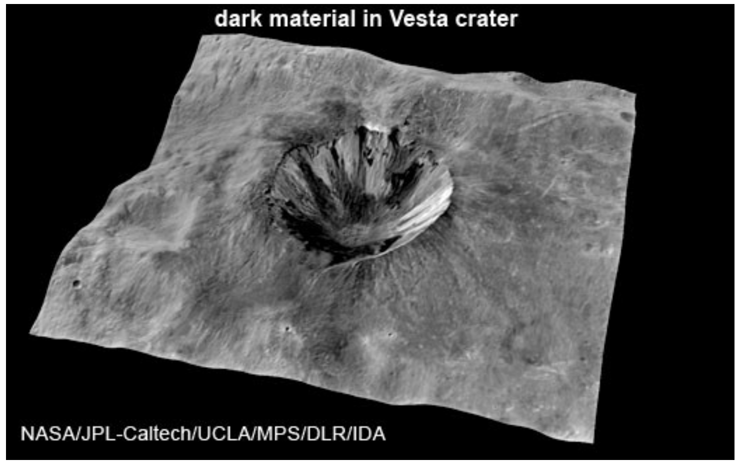


Vesta – A new study of images from Dawn (asteroid mission) examines remarkable, dark-as-coal material that speckles the surface of the giant asteroid Vesta. Scientists are using the images to understand the impact environment early in Vesta's evolution. The dark material is carbon-rich, and tends to appear around the edges of 1 giant impact basins in Vesta's southern hemisphere. The analysis suggests that the dark material was most likely delivered by the object that struck Vesta to create the basin known as Venineia, about 2-3 billion years ago.

Cassini (Saturn orbiter) observations of Titan have been studied and found to be consistent with blocks of hydrocarbon ice floating on some of the hydrocarbon (mainly methane and ethane) lakes. Most liquids contract when they freeze, including ethane and methane, so their ice should sink (unlike water, which expands as it freezes). However laboratory experiments show that under the atmospheric pressure existing on Titan, the nitrogen air inclusion in methane ice causes it to float in liquid methane, at least over a certain temperature range near the freezing point. In fact, both floating and sinking methane ice could exist in a Titan lake. Further radar observations will be made to see if the objects that may be floating methane ice change with time and the seasons.

Water on Mars – Researchers analyzing a small meteorite that came from Mars have found it contains 10 times more water than other Martian meteorites. The newly analyzed meteorite better matches the amount of water found in surface material by the Mars rovers and Mars orbiters. It is significantly older than most other Martian meteorites. It was found in 2011 in the Sahara Desert, is designated NWA (North West Africa) 7034, and has been determined to have formed 2.1 billion years ago. It is not known from what part of Mars or from how deep any of the Martian meteorites originated. NWA 7034's composition is different from any previously studied Martian meteorite. It is made of cemented fragments of basalt, rock that forms from rapidly cooled lava. The fragments are primarily feldspar and pyroxene, most likely from volcanic activity. Researchers theorize the large amount of water in NWA 7034 may have originated from interaction of the rocks with water present in Mars's crust 2.1 billion years ago. It also has a different mixture of oxygen isotopes than other Martian meteorites.

Hubble Space Telescope was used to discover the most distant well-measured type Ia supernova known. Measuring the distances of type Ia supernovas is what led astronomers to the conclusion that the expansion of the Universe is speeding up, which is now referred to as dark energy. The supernova was spotted in 2004, but a good distance was not obtained. After the ACS camera with spectrograph was installed in the Hubble during the last service mission, it became possible to take a spectrum of the galaxy in which the 2004 supernova occurred. This new spectrum showed the galaxy (and therefore supernova) had a redshift of 1.71, which indicates the light from there takes 10 billion years to reach us. No supernova more distant than this has been accurately measured by spectrum.


dark material in Vesta crater
NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

Hubble, along with Spitzer, has observed the atmosphere of a brown dwarf, creating the most detailed "weather map" yet for these stars that are not quite big enough to sustain nuclear fusion. The brown dwarf has wind-driven, planet-sized clouds enshrouding it. Light from the brown dwarf varies with time, brightening and dimming about every 90 minutes as the body rotates. The timing of this change in brightness depends on what wavelength of light was being observed. These variations are the result of different layers or patches of material swirling around the brown dwarf in windy storms as large as a planet. Spitzer and Hubble see different atmospheric layers because certain infrared wavelengths are blocked by vapors of water and methane high up, while other wavelengths emerge from much deeper layers. Unlike Earth's or Jupiter's clouds the brown dwarf clouds are composed of hot grains of sand, liquid drops of iron, and other exotic compounds. The observations show the brown dwarf to be 1100-1300°F (600-700°C). These objects appear more similar to gas planets than to stars. Further observations of dozens of other nearby brown dwarfs are planned.

Martian meteorite NWA 7034
NASA

WMAP (cosmic microwave background [CMB] space telescope) science team has released its report from analyzing 9 years of data. This is the final report, using all data that WMAP produced. Previous reports using less data have determined to a high degree of accuracy the age of the Universe, the density of atoms, the density of all other matter, the epoch when the 1st stars started to shine, the lumpiness of the Universe and how that lumpiness varies with size. The Big Bang and Inflation were solidly supported. The CMB was emitted when the Universe was only 375,000 years old, a tiny fraction of its current age of 13.77 billion years. WMAP data supports the simplest version of Inflation, and shows that the Universe is geometrically flat (no curvature over large distances). The final report numbers are that the Universe is 4.6% atoms, 24% matter that is not atoms, and 71% dark energy. The 1st stars shone about 400 million years after the Big Bang.

Galaxy formation – Astronomers using telescopes in Hawaii have been amazed to find a group of dwarf galaxies moving in unison in the vicinity of the Andromeda Galaxy. The structure of these small galaxies lies in a plane. This presents a serious challenge to our ideas for the formation and evolution of galaxies. The study revealed almost 30 dwarf galaxies orbiting in a solar-system-like plane. The expectations had been that these smaller galaxies should have formed and still be buzzing around randomly like bees around a hive. It appears unlikely that a galactic collision could have caused this motion. No computer simulations of galaxies forming have resulted in such motion. Previous work has hinted that the Milky Way also has a plane of dwarf galaxies.

Mapping the Milky Way – Astronomers have discovered hundreds of previously unknown sites of massive star formation in our Milky Way galaxy using the Green Bank and Arecibo radiotelescopes. The radio data confirmed a large number of star birth candidates found in infrared data from the Spitzer and WISE space telescopes. Only those 2 radiotelescopes are sensitive enough for this work, and the infrared data told astronomers exactly where to look. Such star birth areas are used to map out the shape and structure of our galaxy, a difficult task when we can only observe from the inside. The radiotelescopes are not only mapping the locations, but also the gas cloud constituents. Since heavier elements accumulate from earlier stars, knowing the constituents can allow learning the histories of the parts of the galaxy. Preliminary data showed more variation in constituents than expected.

SOFIA (flying infrared telescope) has captured new images of a ring of gas and dust 7 light-years across surrounding the supermassive black hole at the center of the Milky Way, and images of a neighboring cluster of extremely luminous young stars embedded in dust cocoons. The ring is known as the circumnuclear ring and the cluster is being called the quintuplet cluster. Neither has been seen by ground-based or space telescopes. The quintuplet cluster, as well as 2 other nearby clusters, all seem to have been triggered by some event within the past 4-6 million years.

Bone – Astronomers have found long skinny features jutting between spiral arms of some galaxies, particularly in infrared, which they are calling bones. New observations have found a bone in our own Milky Way. It was 1st spotted in Spitzer infrared data, but the full extent was not seen until radio observations were made. Radio confirmed that it is a real feature, not a chance projection on the sky. It is more than 300 light-years long, but only 1 or 2 light-years wide. It contains a mass exceeding 100,000 suns. Further observations will be made to locate other bones in our galaxy.

Instant AstroSpace Updates

Mars rover Curiosity has completed its 1st use of its brush to sweep rocks clean for analysis, and a rock has been selected as a target for its 1st use of the hammer drill, which will retrieve samples from inside rocks. The rover is in a shallow depression informally named Yellowknife Bay, which contains many light-colored rocks.

NuSTAR (X-ray space telescope) has observed 2 black holes in the galaxy IC 342, also known as Caldwell 5, and has observed the supernova remnant Cassiopeia A. NuSTAR is sensitive to shorter-wavelength (higher-energy) X-rays than previous X-ray telescopes.

The **Siding Springs Observatory** in Australia has suffered major damage from wild fires, losing the Visitor Center, astronomers' lodge and other buildings, though all staff were evacuated safely, and it is believed that all telescopes have been saved. It was 10 years to the week since the Mt. Stromlo Observatory, also in Australia, was destroyed by wild fires.

FOR SALE

Skywatcher 100ED f9 Refractor with Celestron CG-4 mount. Scope comes with a hard case, 8x50mm finder; 2 LET eyepieces, 2-inch dielectric diagonal; Baader solar filter. CG-4 mount has motor drives on both equatorial and declination axes. All in excellent shape for $650 or best offer.

Celestron Sky Prodigy 90mm Maksutov with all attachments, $375.

Vixen Porta II Altazimuth Mount, $100; Telrad finder, $25.

Contact Val Akins (949) 382-1869

Trip Report – Arizona Science and Astronomy Expo (ASAE)

By Don Lynn/photos by Tim Hogle

The First Annual ASAE (apparently they plan to repeat this) was held Saturday and Sunday, November 10 and 11, at the Tucson Convention Center. I carpooled with a fellow OCA member, and we made the drive in about 7 hours. One person I know took Amtrak, which cost less than gas, though it takes all night each way. I arrived late Friday afternoon, and checked into the Super 8, which was inexpensive and only about 2 miles from the Expo. Another carload of OCA members had checked into a nearby motel, and we all met up for dinner in a nearby Mexican restaurant. Next morning we all headed over to the convention center for 9:00 opening. We guessed wrong about which side of the building to park on, and almost attended some other function being held there.

One of the four aisles of display booths representing over a hundred astronomical entities.

Admission tickets were only $10 per day (but actually cost $11, due to an apparently unavoidable fee). If you have seen PATS, then you know what ASAE looks like: booths from most astronomy-oriented companies and organizations, and nearly continuous talks held in a nearby room. It appeared that there were even more booths than PATS. There were roughly 100 of them. By the way, ignore the "Science" in the Expo name; other than microscopes, I saw nothing non-astronomical.

Some of the booths were information only, and others sold products. OPT and Woodland Hills, as usual, had many bargains and large selections to sell.

The Expo had door prize drawings at the end Sunday, drawing from tickets from entrants on both days. So 2-day attendees had twice the odds. Winners did not have to be present. At least 2 OCA members won gift certificates. Some of the booths, such as OPT, held their own drawings, though most required you to be there at the drawing.

The talks were really top quality, except for lack of organization. The schedule handed out was wrong in many respects. But it was closer to reality than the online schedule I had printed before leaving home. The talk times were changed, speakers added and removed, and the schedule (both online and printed) had half the talks listed as the date after the Expo ended. Eventually they put up an easel with the correct talks and times listed, but you had to keep checking it for changes. Even trying hard to keep up with the changes, I missed two talks I would have liked to hear. In addition, the first talk Sunday was scheduled for the minute that they began admitting people to the Expo. Fortunately I missed only part of the introduction. All the talks scheduled time for questions, and many questions and their answers were quite good.

Probably the best talks were the keynotes Saturday and Sunday, by astronaut (and amateur astronomer) Don Pettit, and by the star of the TV series "Meteorite Men", Geoff Notkin. Pettit showed a lot of pictures of the International Space Station (ISS), including the Russian zero-G toilet, of the Earth from the Station, of stars, of aurora, of the physics of weightlessness, and more. And he explained how he took them. A lot of them have been put together into time-lapse videos that are awesome. To take sharp images of the Earth under low light conditions he needed a barn-door tracker to compensate for the station's movement, rather than the usual Earth's rotation. He built the tracker out of "spare" parts he found laying around ISS (like a Hasselblad film camera [after ISS went digital] and a presumably structural bolt from a Progress spacecraft). His latest expedition to ISS set the record for images taken, at about a half million. I was so impressed that after the talk I went up and shook his hand and thanked him for doing that great astrophotography from space. He replied that as an amateur astronomer he could not have possibly gone to space without doing astrophotography.

Speakers ran almost continuously during the 2 days, just upstairs from the display booths.

Notkin related some of his adventures looking for meteorites around the world. One that stood out was when a flash flood came up between his meteorite search location and where the rest of his crew was. He drove through water up to the middle of the windows on his vehicle, and somehow made it back in time to meet the search party being sent out for him. Then there was the time he got permission (after long negotiations) to search the area on a military bombing range where observations showed meteorites had landed. In spite of warnings, his costar kept picking up unexploded bombs, but nobody blew up. Another time he used the world's strongest permanent magnets dragged behind a truck to pull iron meteorites right out of the ground. After one search session, some unthinking assistant put the magnet assembly in the bed of a pickup truck, and it stuck. The magnets were guaranteed to lift about 2 tons when in contact with iron. He claimed they never got the magnet assembly unstuck.

Other notable talks were Adam Block on his observing/imaging/education programs at Mt. Lemmon, Phil Plait (author of "The Bad Astronomer") telling us why the world won't end when the Mayan calendar hits its "end" December 21, Pamela Gay on citizen participation astronomy, a panel discussion on what we are learning about the formation of the solar system from meteorites, and Steele Hill on orbiting solar observatories. I missed the talk by OCA's own Wally Pacholka (due to late schedule change), but I know he had great images.

Solar scopes for public viewing. The sun cooperated with sunspots, prominences, and a flare.

Lunches turned out to be an issue. The snack bar inside the Expo had limited choice, expensive prices, and ran out of many items. So much of the OCA group went out to nearby restaurants for lunch. This worked fairly well Saturday, though it was time-consuming, but on Sunday many area restaurants were closed, so choice was quite limited. The people who did best were ones who brought lunch with them.

There was an imaging workshop associated with the Expo, I believe including shooting your own images, given by Adam Block, but I did not sign up for this (at considerable expense), so I can't report on how that went. I can say from hearing him speak (here and previously) that Block really knows his stuff.

Solar telescopes were set up outside, including white light, hydrogen alpha, and calcium light. Viewing was good, with one huge prominence and a good-sized sunspot, as well as the usual little stuff. Allegedly a large solar flare went off, but it wasn't while I was watching.

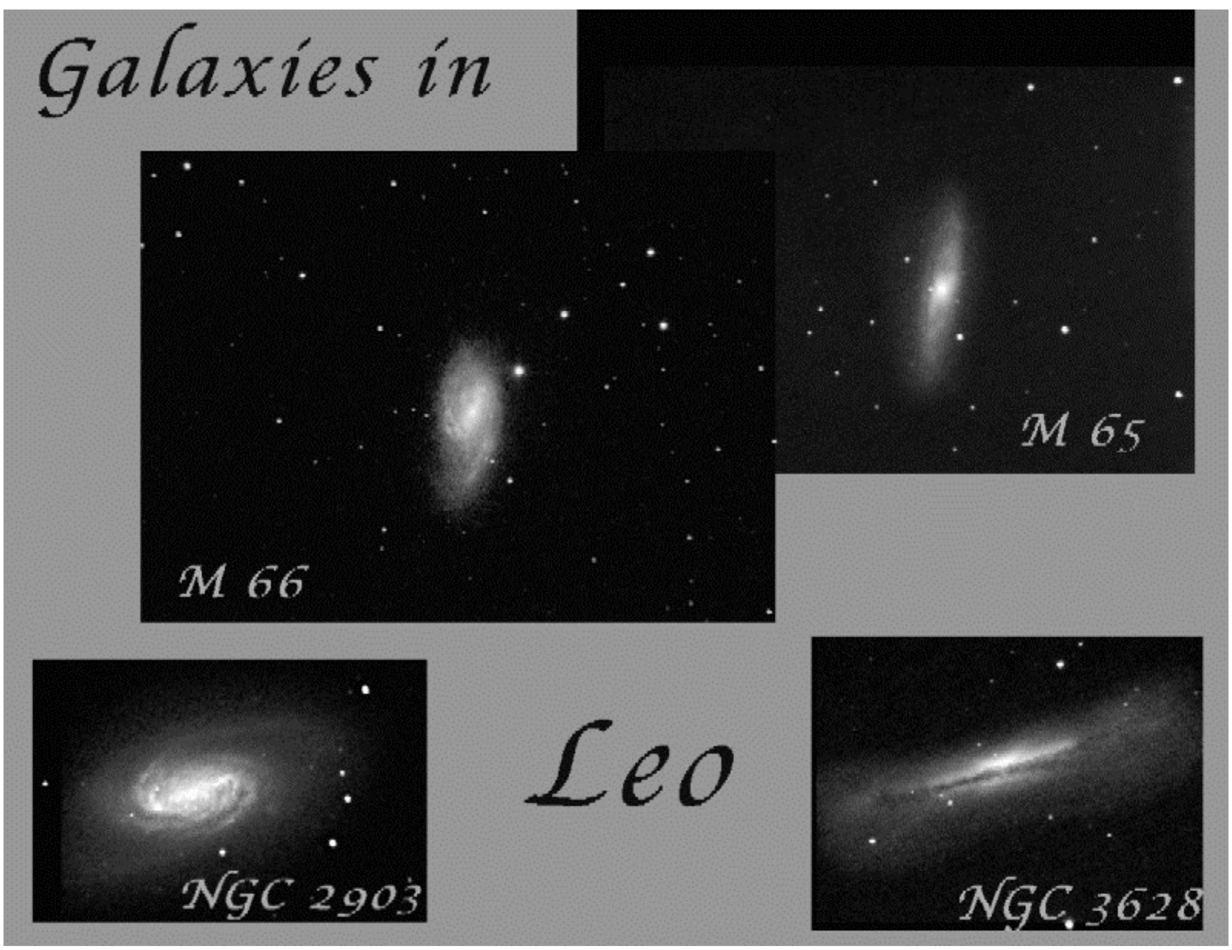
There was a star party Saturday evening at a site provided by the local astronomy club. It was some distance away from town, so I didn't make it.

OCA was well represented at ASAE. I saw over a dozen members that I recognized, including some long-time members who now live in Arizona (Wayne Johnson and Steve Eubanks). Ten of us got together for Saturday dinner. Most of us stayed for both days of the Expo, as there were talks both days that we wanted to hear.

Sunday night several of us went to a pancake house for dinner. It was close enough to walk to, and we were tired of driving by this time. Next morning we drove back to California, as most of us had commitments the following day. If we had another day or two, we could have taken in some astronomical sights of Tucson, such as Kitt Peak, Mt. Hopkins, the 8-meter mirror-making lab, or Flandrau Planetarium. Maybe next time.

Bottom line, I really enjoyed the experience, and likely will attend in the future. The others I talked to also considered the trip worthwhile.

Now I just have to look through the huge pile of literature that I collected in the shopping bag that each attendee was given.



The Messier Marathon is rapidly approaching! Bill Hall created this handy recognition guide to the galaxies of Leo in November to get us all prepared.

SIRIUS ASTRONOMER

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