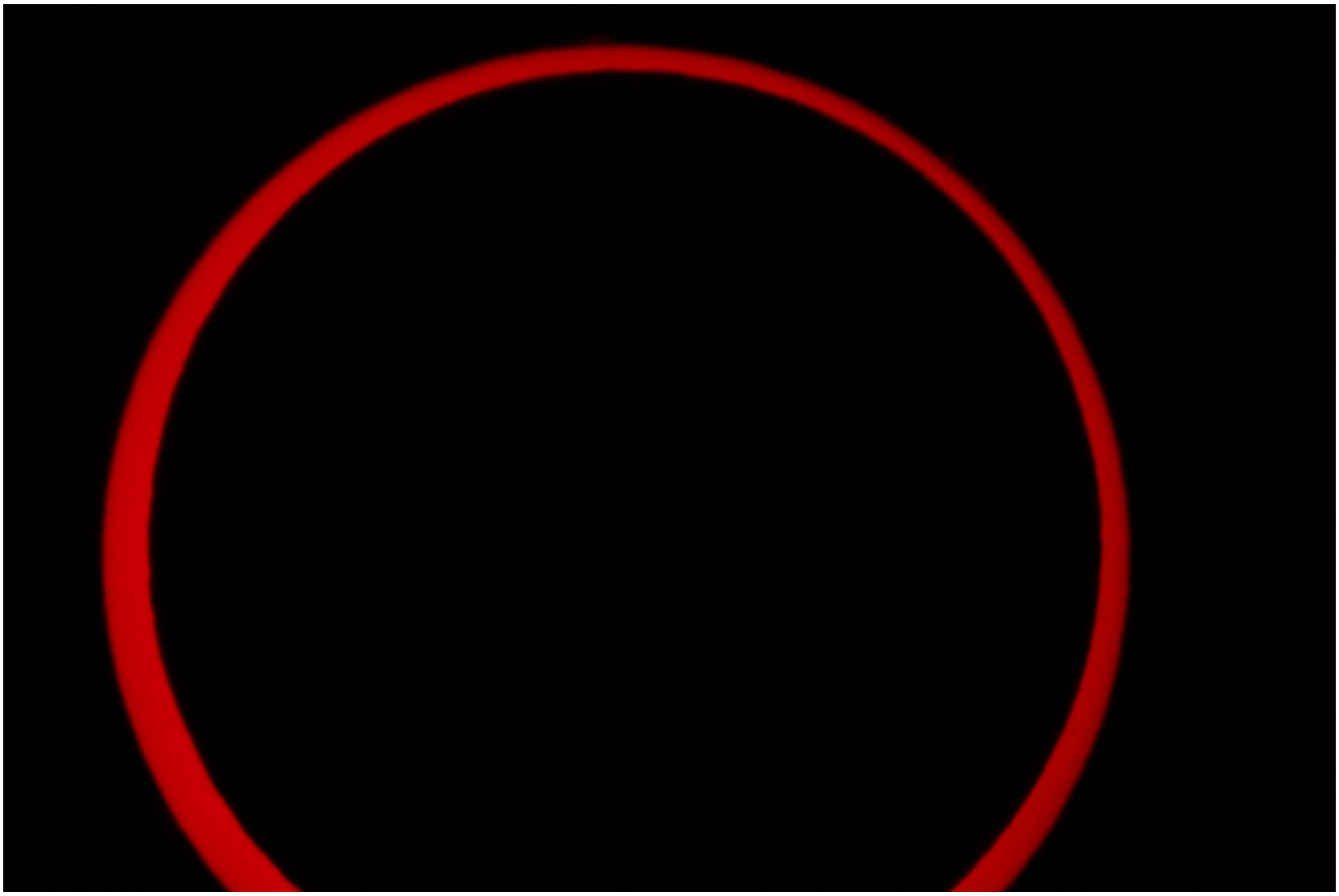
SIRIUS ASTRONOMER
www.ocastronomers.org
The Newsletter of the Orange County Astronomers

JULY 2012 *Free to members, subscriptions $12 for 12* **Volume 39, Number 7**

FIRE UP THE GRILL! ANNUAL STARBECUE JULY 14TH!!!



Jerry Floyd obtained this image of the May 20 annular solar eclipse from New Harmony, Utah using a 70mm TeleVue Pronto with a Canon EOS-30D imager at ISO 400, 1/200 second exposure.

OCA CLUB MEETING

The free and open club meeting will be held July 13 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, Tom Field will discuss 'Spectroscopy for Everyone'

NEXT MEETINGS: August 10, September 14th

STAR PARTIES

The Black Star Canyon site will be open on July 14. The Anza site will be open on July 14. 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 on Friday, August 3rd at the Heritage Museum of Orange County at 3101 West Harvard Street in Santa Ana. The next two sessions will be on September 7th and October 5th.

GOTO SIG: TBA
Astro-Imagers SIG: July 17, Aug. 21
Remote Telescopes: TBA
Astrophysics SIG: July 20, Aug. 17
Dark Sky Group: TBA

NASA's Space Place

How Many Discoveries Can You Make in a Month?

By Dr. Tony Phillips

This year NASA has announced the discovery of 11 planetary systems hosting 26 planets; a gigantic cluster of galaxies known as "El Gordo;" a star exploding 9 billion light years away; alien matter stealing into the solar system; massive bullets of plasma racing out of the galactic center; and hundreds of unknown objects emitting high-energy photons at the edge of the electromagnetic spectrum. That was just January. Within NASA's Science Mission Directorate, the Astrophysics Division produces such a list nearly every month. Indeed, at this very moment, data is pouring in from dozens of spacecraft and orbiting observatories.

Artist's concepts such as this one are based on infrared spectrometer data from NASA's Spitzer Space Telescope. This rendering depicts a quadruple-star system called HD 98800. The system is approximately 10 million years old and is located 150 light-years away in the constellation Crater. Credit: NASA/JPL-Caltech/T. Pyle (SSC)

"The Hubble, Spitzer, Chandra, and Fermi space telescopes continue to make groundbreaking discoveries on an almost daily basis," says NASA Administrator Charlie Bolden. NASA astrophysicists and their colleagues conduct an ambitious research program stretching from the edge of the solar system to the edge of the observable Universe. Their work is guided in large part by the National Research Council's Decadal Survey of Astronomy and Astrophysics, which identified the following priorities:

Finding new planets—and possibly new life—around other stars.

Discovering the nature of dark energy and dark matter.

Understanding how stars and galaxies have evolved since the Big Bang.

Studying exotic physics in extreme places like black holes.

Observing time on Hubble and the other "Great Observatories" is allocated accordingly.

Smaller missions are important, too: The Kepler spacecraft, which is only "medium-sized" by NASA standards, has single-handedly identified more than 2300 planet candidates. Recent finds include planets with double suns, massive "super-Earths" and "hot Jupiters," and a miniature solar system. It seems to be only a matter of time before Kepler locates an Earth-sized world in the Goldilocks zone of its parent star, just right for life.

A future astrophysics mission, the James Webb Space Telescope, will be able to study the atmospheres of many of the worlds Kepler is discovering now. The telescope's spectrometers can reveal the chemistry of distant exoplanets, offering clues to their climate, cloud cover, and possibilities for life. That's not the telescope's prime mission, though. With a primary mirror almost 3 times as wide as Hubble's, and a special sensitivity to penetrating infrared radiation, Webb is designed to look into the most distant recesses of the universe to see how the first stars and galaxies formed after the Big Bang. It is, in short, a Genesis Machine.

Says Bolden, "We're on track in the construction of the James Webb Space Telescope, the most sophisticated science telescope ever constructed to help us reveal the mysteries of the cosmos in ways never before possible." Liftoff is currently scheduled for 2018.

How long will the list of discoveries be in January of that year? Stay tuned for Astrophysics.

For more on NASA's astrophysics missions, check out http://science.nasa.gov/astrophysics/. Kids can get some of their mind-boggling astrophysics questions answered by resident Space Place astrophysicist "Dr. Marc" at http://spaceplace.nasa.gov/dr-marc-space.

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

SAS-2012 Symposium on Telescope Science

by Bob Buchheim

In May of every year, a gang of astronomers – some professional, some amateur, and some who are members of both communities – invades Big Bear CA to spend three days discussing small-telescope astronomical research. This year's event was a joint Symposium of the Society for Astronomical Sciences (SAS) and the American Association of Variable Star Observers (AAVSO). It provided a wonderful view of the breadth and depth of small-telescope astronomical science. Technical papers were presented on Pro-Am collaborations, Solar system Research, Variable Stars, Discovery Campaigns, Spectroscopy, and a variety of Special Projects. These all had in common the importance of data that was gathered by amateur-class telescopes. The presenters were a mix of professional astronomers, "backyard scientists", and students. Presented talks were augmented by quite a few poster-papers (most of which are summarized in the published Proceedings). The diverse participation was impressive – attendees came from the USA, Canada, United Kingdom, Belgium, Spain, Uruguay, Argentina, and New Zealand. In addition to the formal sessions, participants made good use of the hallways, lobbies, and late-night gatherings as productive opportunities for networking, planning new projects, and getting re-acquainted with old friends.

The agenda featured two half-day educational workshops – on "Small Telescope Spectroscopy" (by Dr. John Martin) and "Photometry with VPHOT" (by Dr. Aaron Price) – two days of technical papers, and a keynote presentation by Ms. Dava Sobel (author of "Longitude", "Galileo's Daughter" and "A More Perfect Heaven".

If you have ever wondered whether your observing/imaging skill and your backyard telescope could do useful science, you should check out both the SAS and the AAVSO – there is, indeed, an amazing scope of opportunities for science with "backyard-scale" equipment. The Proceedings along with videos of most of the 2012 technical presentations will soon be available for free viewing on the SAS website, so I won't give a complete summary here.

Each year, there are a few items that particularly spark my interest. This year was no exception.

During his Spectroscopy workshop, Dr. Martin noted the different capabilities of "professional" versus "backyard" spectroscopy, and offered some sage advice for the small-telescope researcher. First, "play the long game": there are a great many bright stars that are in need of long-duration spectroscopic monitoring, to search for changes that will go unnoticed if amateurs do not pay attention to them. Second, "stick with a modest number of targets": you can only do intensive monitoring of a few objects, and that is what is needed for scientific contribution from small telescopes. For example, emission lines in Rigel's spectrum change on a time scale as rapidly as one week.

Commercial spectrographs (such as the SBIG Self-Guided Spectrograph and the Shelyak LHires spectrograph) are not much more expensive than a medium-range CCD imager, and several presenters showed their successful spectroscopy projects using such equipment (or a home-made equivalent). It also turned out that some interesting projects can be done with very simple and inexpensive gear. For about $150 you can slip a "Star Analyzer" grating into the filter wheel of your CCD, and take very nice low-resolution spectra of bright stars. A group of students from Estrella Mountain Community

College studying the changing spectrum of Algol during eclipse with this grating and an 11-inch SCT recorded very clearly the Hydrogen alpha, beta, and gamma absorption lines.

Remember those textbooks that taught you that stellar evolution proceeded so slowly that it can't be witnessed on a human time scale? Turns out that might be overly simplistic – sometimes the stately evolutionary trend is punctuated by nearly-instantaneous changes. Dr. Joe Patterson (leader of the Center for Backyard Astrophysics) discussed BK Lyncis, a 14^{th}-magnitude variable star. Twenty years worth of observations had pretty definitely shown that it was a "non-eruptive cataclysmic variable"; but two years ago the pattern of its brightness fluctuations changed noticeably (to an ER UMa "dwarf novae") style.

This wasn't the only star noted to be doing odd things. Dr. Ed Guinan gave a presentation about "Cepheids behaving badly". You may already know that Polaris is a Cepheid, and that its pulsation amplitude has diminished significantly over the past few decades. It turns out that Polaris may not be unique in this regard. One of the Cepheids in M-33 has also apparently stopped pulsating (or at least its amplitude as shrunk dramatically). This is not the sort of frivolity that you want to see in a "standard candle"! Dr. Guinan suggested that other bright, long-period Cepheids deserve photometric study to confirm their characteristics. This is just the sort of project that can be done by backyard and student researchers. Are any other high-mass Cepheids changing amplitude, period, color, or the shape of their lightcurves?

Proceedings and videos from past years are freely available on the SAS website (www.SocAstroSci.org). In addition, videos of SAS educational workshops can be purchased for $53 each: Eclipsing Binary Stars (by Dr. Dirk Terrell), Remote and Robotic Observatories (by Tom Krajci and Tom Smith), and Small-Telescope Spectroscopy (by Dr. John Martin). If you would like to buy a DVD of any of these workshops, contact me at Bob@RKBuchheim.org.

For full disclosure, let it be known that I'm on the Board of the SAS, so naturally I'm enthusiastic about the organization.

5/12/12 Black Star Canyon Star Party Recap

By Steve and Bonnie Short

We opened the gate at 7:15 pm and had at least 15 cars waiting to enter the BSC star party site as the evening sky was clear. As the Sun went down, we could start to make out bright Venus with the naked eye. A telescope view showed the planet as a small crescent shape as expected. When it got dark, we had 23 cars parked below and about 50 people on site. But no one was able to spot the Iridium Flare that was supposed to show up at 8:06 pm…not even our best satellite spotter, Katie.

Almost everyone viewed Saturn in their scope and biggest moon Titan was shining bright above the big planet. The best view of Saturn and its rings I saw was on Greg's 8" scope. Later on Brad's scope, I could see even a few more of Saturn's moons.

Mars was glowing bright and Brad's nice 8" (I think) scope showed the northern white polar cap at 225X even though that planet is now 94 million miles away..

Don Stoutenger set up his scope and was again showing objects on a video screen. His view of M51, the Whirlpool galaxy, was superb when it got darker. Greg found M81 and was trying to get M82 into the same eyepiece view. Brad had a great view of the M13 star cluster with many individual stars visible at high power. Later when Vega came up, I was able to put 200X power on the Double Double and make out all four stars.

The crowd thinned out as it got later but a few stayed until closing time yet I was able to lock the gate just after midnight. We finally had another classic Black Star Canyon star party with dark skies and steady seeing all the way to midnight.

AstroSpace Update

July 2012

Gathered by Don Lynn from NASA and other sources

Cassini (Saturn mission) using its mapping spectrometer has observed methane lakes near the equator of Saturn's moon Titan. Previous searches with the radar had found lakes only near the poles. Methane rain has been detected falling near the equator only once in 8 years, so equatorial lakes were unexpected. One of the tropical lakes appears to be about half the size of Utah's Great Salt Lake, and is at least 3 feet (1 m) deep. Scientists involved believe that the lakes are essentially oases fed by methane aquifers. This would answer the question of where the atmospheric methane comes from, since it is broken down chemically by ultraviolet light, and so must be continually replenished from some large source.

Enceladus (Saturnian moon) – Observations by Cassini have shown that the plumes of material being thrown into space by the geysers of Enceladus are creating an unusual sort of plasma. Normally plasmas occur when something excites gas and knocks the electrons off of atoms, leaving positive ions and negative electrons. The plasma above Enceladus, however, contains considerable dust particles, much larger than ions, and those dust particles tend to collect the electrons, resulting in much larger negative particles than ordinary plasmas. This changes the behavior of the plasma from ordinary plasmas. Thus the region above the moon's south pole provides a kind of laboratory to study this unusual type of plasma. The geysers add about 200 lbs (100 kg) of new material into this plasma every second. Interaction with the magnetosphere charges the particles. Comets are believed to form this same kind of dusty plasma, but we rarely get a chance to sample comet plasmas. But Cassini has made several passes through Enceladus's plasma.

Asteroid mass – A scientist has accurately determined the mass of a nearby asteroid by measuring the Yarkovsky effect. This effect is named for the 19th-century Russian engineer who 1st proposed that over long periods a small body would be nudged from its orbit by re-emitting energy that it had absorbed from sunlight. The effect is hard to measure because it is extremely small. The asteroid in question is called 1999 RQ36, and the Yarkovsky force amounts to only about half an ounce (1/7 N). The asteroid was tracked extremely precisely by radar, and was found to have deviated from its calculated orbit by about 100 miles (160 km) in 12 years. The Yarkovsky effect depends on mass and temperature, so once the temperature was measured, the mass could be calculated (60 million tons). Its density was then calculated, which was about that of water. That implies that it has voids within, and is just a jumble of rocks and dust. The OSIRIS-REx spacecraft is scheduled to be launched toward this asteroid in 2016 to retrieve a sample.

Exoplanets (planets orbiting other stars) – Previous studies have found that exoplanets are more likely to be orbiting stars with high content of heavier (than helium) elements. However, those studies were done on only gas giant planets. A new study aimed at smaller planets, and found that they are commonly found orbiting both stars with high or low heavy element content. Many astronomers had thought that high heavy element content indicated that the dust disk about the star when it formed would have more heavy elements, and therefore more material out of which to make planets. The new study looked only at exoplanet candidates (many unconfirmed as planets) smaller than Neptune. In the sample of 150 stars with planet candidates, some were found with as low as 25% the heavy element content of the Sun, which is quite low.

Evaporating exoplanet – Researchers have detected a probable planet, about 1500 light-years away, that appears to be evaporating under the heat of its parent star. The light blocked as the planet passed in front of its star varied strangely, and from that the scientists inferred that a long tail of debris is following the planet. It is so close to its star that it orbits it every 15 hours. This should heat the planet to about 3600° F (2000° C). The researchers calculated that the planet should evaporate entirely within 100 million years.

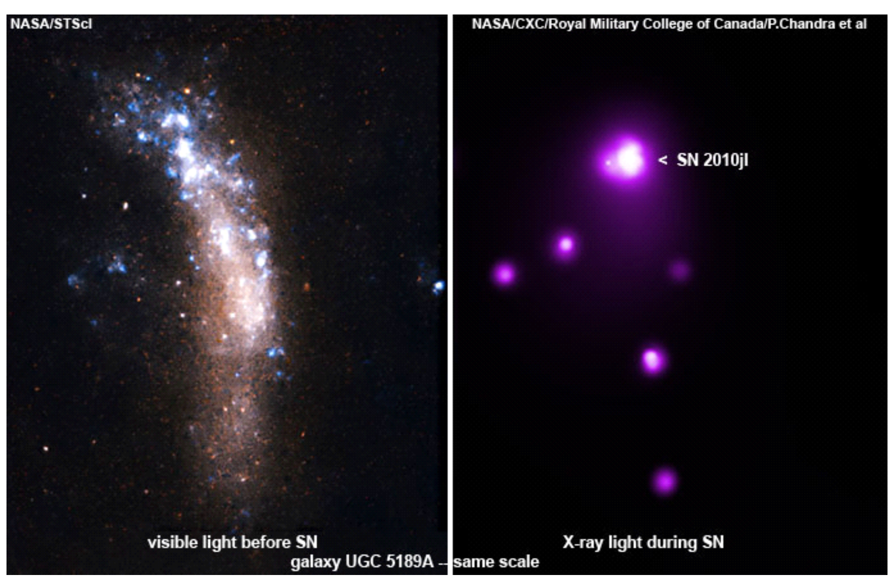
WISE (wide-field infrared space telescope) – Preliminary results have been released of WISE's search for brown dwarfs (stars with insufficient mass to sustain nuclear fusion) in the Sun's neighborhood. 33 brown dwarfs were found within 26 light-years. There are 211 stars (nuclear fusing ones) in the same volume. So about 6 times fewer brown dwarfs were found than stars. It is estimated that the new survey missed a few brown dwarfs, but not many. Allowing for this there are 4 or 5 times as many stars. Previously made extrapolations and guesses as to how brown dwarfs form had predicted as many brown dwarfs as stars. Clearly these were wrong. WISE has discovered about 200 brown dwarfs, most of them more distant than the ones in this survey.

More WISE – Observations from WISE have led to the best assessment yet of our solar system's population of potentially hazardous asteroids (PHAs), those that come with 5 million miles (8 M km) of Earth and are big enough to cause major damage if they collide with us. The asteroid-hunting phase of the WISE mission is known as NEOWISE. It sample 107 PHAs to make statistical predictions about the whole population of PHAs. The new estimate is that there are roughly 4700 PHAs, ± 1500, with diameters larger than 330 feet (100 m). So far, about 20-30% of these have been found. This roughly confirms previous estimates, and has a greater precision than that previous work. Because NEOWISE worked in infrared, it caught asteroids that would be missed in visible light because they are visibly too dark. The new analysis suggests that about twice as many PHAs as previously thought are in low-inclination orbits, that is, roughly align with the plane of Earth's orbit. This population of low-inclinations PHAs could have originated from collisions between asteroids in the main asteroid belt. The lower-inclination PHAs appear to be somewhat brighter and smaller than other near-Earth asteroids. The brightness says something about their composition: they are more likely to be either stony or metallic.

Brown dwarf – A team of astronomers has found a brown dwarf that is more than 99% hydrogen and helium. It has a temperature of only about 750° F (400° C). Since brown dwarfs are not massive enough to sustain nuclear fusion, they simply cool off over time. If a brown dwarf forms in a binary star system, it has the same initial element content as its companion star. In contrast, planets forming from a disk surrounding a new-born star typically have more heavier elements than the star they orbit. This can allow astronomers to distinguish whether a body formed as a planet or as a brown dwarf. The newly found brown dwarf was discovered using WISE and ground-based telescopes. It is 35 times as massive as Jupiter. It orbits its star at a distance of 240 billion miles (390 B km), or about 2600 times the distance of the Earth from the Sun.

Chandra (X-ray space telescope) – It has long been known that the mass of a supermassive black hole at the center of a galaxy is usually about 0.2% of the mass of the central bulge of stars in the galaxy. A lot of theories have been proposed to explain why both masses would grow together or how one would limit the size of the other, as the galaxy originally formed. A few galaxies are known to break the rule. 2 of these, NGC 4342 and 4291, having too massive black holes or too small central bulges, were observed with the Chandra X-ray space telescope. The total mass of a galaxy, including dark matter, can be estimated well from X-ray data. This is because the pressure of hot matter emitting X-rays surrounding a galaxy is balanced by the gravity of total matter. The dark matter was found to be typical of galaxies with black holes with similar mass. So it is the bulge that is too small, not the black hole too large in these 2 galaxies. One theory to explain galaxies with too small central bulges is that a past encounter with some other galaxy gravitationally stripped stars away from the bulge. However, this theory was ruled out by the Chandra observations. Such stripping is known to also strip away much of the dark matter halo, which has not occurred with these 2 galaxies. The best theory now is that something arrested the development of stars in the central bulge as the galaxy grew in its early history. It is possible that a large influx of matter into the black hole caused an outburst that blew away star-forming material. More work needs to be done to confirm this.

More Chandra – Observations from Chandra and ground-based telescopes have found an object flying out of a galaxy at a speed of at least 3 million mph (5 M kph). It is most likely a supermassive black hole. The only known way for this to happen, consistently with the observations, is for 2 supermassive black holes to have merged with the correct geometry to have given off huge gravitational waves in one direction, causing the merged black hole to recoil at such a speed. It is likely that such recoil-producing mergers are unusual, but this could still mean that quite a few supermassive black holes are shooting about space outside of galaxies. They would be undetectable some time after the merger when they ran out of material falling in, which is what causes them to be visible.

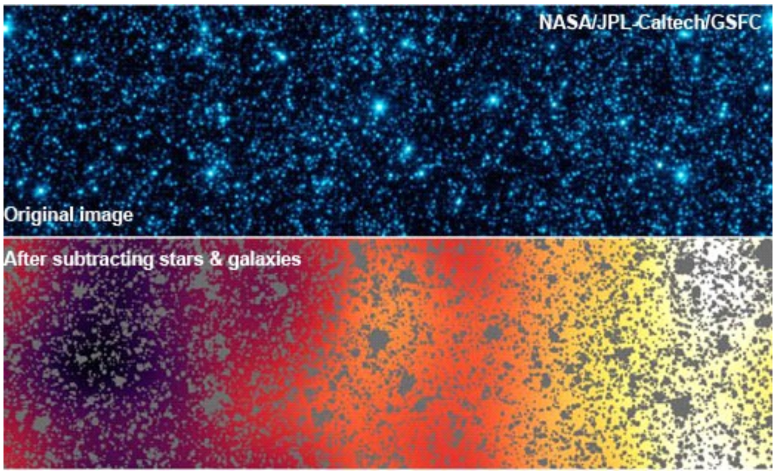


Yet more Chandra – A supernova shock wave breaking through a cocoon of gas surrounding the exploding star has been observed in X-rays by Chandra. The supernova was one of the most luminous that has even been observed in X-rays. The supernova is in galaxy UGC 5189A, located about 160 million light-years away. In visible light, the supernova, designated 2010jl, was about 10 times as luminous as a typical massive star collapse supernova. Several explanations have been proposed to explain this class of extra luminous supernova. The Chandra observations support the explanation that the shock wave interacts with a cocoon of dense gas that was left from an earlier expulsion of gas. The X-rays were initially absorbed heavily by the surrounding gas, but later were not, indicating the blast wave had emerged from the gas. The X-rays were emitted by material greater than 180 million °F (100 M °C), strong evidence of material heated by the supernova shock wave. The visible-light observations of the supernova are consistent with this explanation also. Coincidentally, the X-ray observations found a 2nd source of X-rays at almost the same location. The 2nd source is likely an ultraluminous X-ray source, possibly caused by a black hole.

XMM-Newton (X-ray space telescope) has identified for the 1st time a predicted X-ray echo off material surrounding a black hole. Matter falling toward a black hole collects into a rotating accretion disk, where it becomes heated before falling into the black hole's event horizon. It is known that some process near supermassive black holes emits X-rays that excite iron atoms in the accretion disk, which then give off a particular spectral line of iron. The new observations captured the echo of the original X-ray source bouncing off the accretion disk. The timing difference between the original X-rays and the echo tells how far the source is from the disk. No X-ray telescope has the sensitivity to detect the echo of a single flare of X-rays, but XMM-Newton caught the echo of a multiple flare in the galaxy NGC 4151. The echo lag was measured to be a little more than 30 minutes, so the X-ray light had traveled about 400 million miles before bouncing off the disk. The best guess is that the original X-ray flare is caused by a jet of material being thrown out. This observation would pinpoint the location of such a jet as being 400 million miles above the accretion disk.

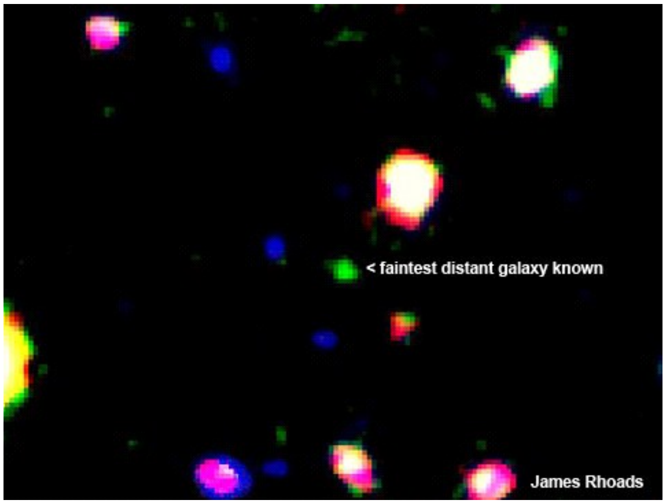
Hubble Space Telescope (HST) – It has long been known that the Andromeda Galaxy (M31) is heading toward our Milky Way. This is easily determined by measuring the blue shift with spectrographs. But measuring the sideways motion of M31 has remained elusive. So the question of whether M31 will collide with us, or will slip to one side or the other, has remained unresolved – until now. HST carefully measured the position of M31 over a period of 7 years in order to measure this sideways motion. Get ready to take a hit in 4 billion years. Simulations of the collision show that the Solar System will remain intact, but be flung into a new region of the galaxy. By 2 billion years after the collision, the Milky Way and M31 will have merged into a bigger galaxy, an elliptical one. To complicate matters, the best measurements of the Triangulum Galaxy (M33) show that it will participate too, probably eventually merging with our new elliptical galaxy.

Spitzer (infrared space telescope) has made the best observations yet of the cosmic infrared background, the general weak infrared glow between stars and other sources. Very long exposures (400 hours) were made of 2 selected patches of sky, and then the stars, galaxies and other sources were carefully removed. The background glow remaining is thought to be the light from early generations of star formation, where they are too distant to resolve them into individual galaxies or stars. The lumpiness in the background observed matched predictions for clustering of early galaxy formation. More patches of sky will be observed in this manner to learn more about the infrared background.



Fermi (gamma-ray space telescope) has detected the highest-energy blast of gamma rays from the Sun ever seen. It happened during a powerful X-ray flare in March. The Sun briefly became the brightest gamma-ray source in the sky. It also set the record for the longest gamma-ray flare from the Sun, lasting 20 hours. Flares can produce gamma-rays by a variety of processes, including pion decay, high-energy electron collisions, and recapture of electrons by ions.

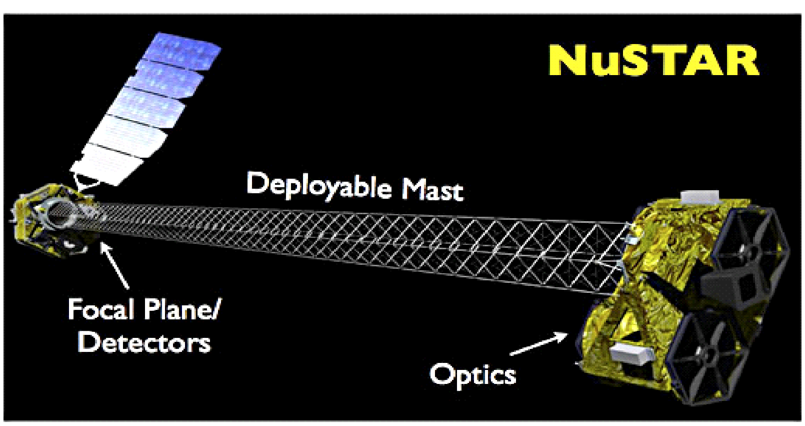
More Fermi – Twin jets shooting out the Milky Way galaxy have been observed in gamma rays. Such jets occur only when large amounts of material are falling into the central black hole. That is not happening now, so the jets must have been created in the past, recently enough that they have not yet faded entirely, perhaps a million years or more ago. The jets extend 27,000 light-years from the center, above and below the plane of the galaxy, tilted at about 15° from vertical. The question was asked as to whether there is any connection between the newly discovered jets and the gamma-ray bubbles in similar positions discovered last year. So far, the jets and bubbles seem to have different causes. However they both produce gamma rays by the same method: high speed electrons collide with low-energy forms of light and kick the photons into high energy gamma ray photons.



Faintest distant galaxy – Astronomers using telescopes in Chile have discovered an extremely distant galaxy, among the 10 most distant known, that is fainter than any others of this class. The significance is that astronomers suspected that we were only finding the brightest 1% or so of galaxies at extreme distances, and that we needed better technology to detect the as yet unseen 99%. The new technology used in this discovery was use of filters selected to pass the infrared light of galaxies at certain redshifts. The more distant galaxies are receding faster from us due to the expansion of the Universe, and so have higher redshifts. The newly found galaxy has a redshift of about 7, putting it so far away that the light we are seeing left there about 13 billion years ago.

White dwarf ages – Generally stars in the halo of our Milky Way are old. Exactly how old, and whether ages correlate to various parts of the halo, and still to be determined. A new technique has been used to determine the ages of some stars in the inner halo. The technique applies only to white dwarf stars, and determines ages more accurately than methods on other types of stars. The stars of the inner halo were found to be 11.5 billion years old, somewhat younger than the 1st stars to form in the Milky Way. Previous estimates of the inner halo age ranged from 10 to 14 billion years. The white dwarf technique takes the spectrum of the star, then estimates its mass from the spectrum, then calculates how long an ordinary star would live before burning out into a white dwarf of that mass. The technique was calibrated with white dwarfs in globular clusters of known age. It is hoped to continue applying the technique to further halo white dwarfs to build up a history of the formation of the halo.

GRAIL (lunar gravity mapping pair of spacecraft) have completed their primary mission, to map the gravity of the entire Moon, slightly ahead of schedule, since there were no interruptions in 89 days of operation. An extended mission is planned to repeat the observations from a lower, but riskier, orbit. That will occur between August 30 and December 3. That time period was chosen to allow continuous sunlight on the solar powered spacecraft. Lower altitude should allow better resolution in locating mass concentrations within the Moon. The highest lunar mountains will be cleared by only 5 miles (8 km). The MoonKAMs aboard GRAIL also have their mission extended. MoonKAM takes images of the Moon under control of students.



NuSTAR (X-ray space telescope) was launched into orbit June 13 by a Pegasus XL rocket, which is fired from a jet flying at 39,000 feet. NuSTAR is designed to cover higher energy (higher frequency) X-rays than most other X-ray telescopes, such as Chandra. It has 10 to 100 times the resolution (including spectral resolution) and sensitivity for these X-ray frequencies compared to all previous high-energy X-ray telescopes. The NuSTAR design has nested rings of mirrors at one end of a mast, and the rest of the telescope at the other end. The mast extends to its 33-foot (10 m) length in space. Objects that give off high-energy X-rays include the most energetic black holes, exploded stars, compact dead stars, clusters of galaxies, and our Sun's fiery atmosphere.

Dragon – The SpaceX company launched their Dragon capsule filled with 1014 lbs (460 kg) of supplies to the International Space Station, and then 1367 lbs (620 kg) of used equipment and experiments were brought back to Earth, splashing down in the Pacific. This was the 1st time a commercial company sent their spacecraft to the Station, much less returned material safely from space. The Russian Soyuz is the only other spacecraft that can bring material down safely (since the Shuttles were retired), and it has a very limited capacity, since people fill most of the Soyuz. Eventually SpaceX plans to qualify the Dragon to haul people, but in the mean time, they have a contract with NASA to haul supplies.

Voyager 1 (outer planet mission) has returned data that indicate the spacecraft has encountered a region in space where the intensity of charged particles from beyond our solar system has markedly increased. It is expected that leaving the solar system will also involve a precipitous drop in particles generated inside the solar system, but that has not occurred. The particles from beyond have been gradually increasing over 3 years, but in recent months there has been a rapid escalation. Scientists are saying that Voyager is approaching the edge of our solar system.

Square Kilometer Array (SKA) radiotelescope – South Africa and Australia competed to be chosen as the location to build SKA, and the choice was just announced: both. Australia will get the low-frequency and wide-field components, and South Africa the others. The total area of antennas, when complete, will indeed be about a square kilometer, making it by far the most sensitive radiotelescope. It will cover frequencies from 70 MHz to 10 GHz. Observations are expected to concentrate on pulsars, molecules in space, and events in the early Universe. The wide-field capabilities will allow all-sky surveys at some frequencies and looking for transient events like supernovas and gamma-ray bursts.

Updates Updated

It was reported here last month that a new study of the motions of stars near the Sun had failed to find the gravitational influence expected from the **dark matter** that theoretically fills and surrounds our Milky Way (and every other galaxy). Another group of scientists has explained this apparent lack of dark matter: They claim that the calculations made depended on the assumption that the average rotational speed about the center of the galaxy is constant for any given radius. But observations show that this is true within the plane of the galaxy, but is false for stars above and below the plane. Also the average speed used does not quite match what has been measured at the Sun's vicinity. When the calculations were repeated with assumptions that match these observations of rotational speed, then the gravitational influence of dark matter shows up. In fact the new calculations showed about 20% more dark matter in the Sun's vicinity than most theories had predicted.

In March I reported here that **GALEX** (ultraviolet space telescope) was turned off due to NASA budget cuts, and that Caltech had offered to take it and operate it at Caltech's expense. Well, NASA decided not to give away GALEX, but they are willing to lend it to Caltech, which will resume operations soon. Projects scheduled include further cataloging of galaxies, watching how stars and galaxies change over time in ultraviolet, and making follow-up observations from the Kepler planet-finding space telescope.

Instant AstroSpace Updates

The Byrd radiotelescope at Green Bank, West Virginia, has confirmed a suspected vast **bridge of hydrogen gas** streaming between the neighboring galaxies M31 and M33, indicating that they likely passed quite close long ago, pulling off the gas stream. It must have been billions of years ago, allowing other consequences of a close pass to recover.

The **Dawn** (asteroid mission) science team has released a video of asteroid Vesta turning, with computer-exaggerated colors applied, for use in identifying surface composition. Green material has been identified as iron, but orange material thrown out of impact craters has not yet been identified.

Planetary nebulae are formed when a dying star ejects its outer layers into space. M27, the Dumbbell Nebula, was the first planetary nebula to be discovered, and is well-placed for summer viewing in the constellation Vulpecula. Jeff Malmrose obtained this image on June 17th using a Vixen VC200L with a modified Canon XT imager.

FOCUS ON OCA SPECIAL INTEREST GROUPS

Astrophysics SIG
Run by Bob Sharshan

Our Astrophysics group meets to discuss and learn about how the universe works as a seminar group that bases its discussions on topics of interest introduced by the participants and the videos that are shown during the meetings on different aspects of astrophysics.

The meetings are held in the classroom at the Heritage Museum of Orange County, located at 3101 W. Harvard Ave., Santa Ana. The museum is located about a half-block west of Fairview; Harvard is about two miles north of the 405 Fwy, between Warner and Edinger. The driveway is at the western end of the museum property; follow it around to the back of the property to the parking area; the classroom faces the parking area.

Attendees of the September 2011 meeting of the Astrophysics SIG

Don Lynn's presentations have been a regular part of these meetings.

GoTo Interest Group
Run by Mike Bertin

The purpose of the GoTo-ETX interest group is to help users of GoTo Scopes get the most they can out of their observing experience using these telescopes. Our informal format is based on the concept of users helping users. We meet every 2 to 3 months, for an evening at the home of one of our members (usually Mike Bertin's home in Irvine, not far from UCI). Our group first met in January 2002, and was focused (hahaha) on ETX telescopes. In January 2004 we expanded our scope (hahaha) to include all types and brands of GoTo telescopes. Our members and meeting attendees span the spectrum from experienced amateur astronomers to brand new beginners. It's a good mix.

Group meetings begin with introductions, typically include a user-to-user exchange of tips and information, and follow with a discussion or presentation on a particular subject. They culminate with a short, urban observing session. The presentations are usually made by group members; some of these have included how to choose eyepieces for small scopes, favorite objects to look at, an introduction to taking pictures with small scopes, a discussion of power sources for our telescopes, and favorite books and resources for amateur astronomers.

The meeting notifications are sent by E-mail, and often include useful tips for using your telescope.

The coordinator for the group is Mike Bertin [MCB1@aol.com, (949) 786-9450] and our preferred method of communication is E-mail. Contact Mike to get on the GoTo-ETX mailing list.

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