SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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Don Lynn created this image of the Hercules Galaxy Cluster (NGC 6050 region) using an Internet-controlled telescope based in New Mexico on 6/5-8/08 combining two 15-minute exposures. This cluster is well-placed for evening viewing throughout the summer!

OCA CLUB MEETING

The free and open club meeting will be held June 10th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, Dr. Todd Ratcliff of JPL will discuss *Solar System Extremes: A Look at the Wild and Wonderful Strangeness of Our Solar System*

NEXT MEETINGS: July 8, August 12

STAR PARTIES

The Black Star Canyon site will be open on June 25th. The Anza site will be open on June 4th. 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, May 6th at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana. Next month the class will be offered on June 3rd.

GOTO SIG: TBA

Astro-Imagers SIG: Jun. 21st, Jul. 19th, Aug. 16th

Remote Telescopes: TBA

Astrophysics SIG: Jun. 17th, Jul. 15th, Aug. 19th

Dark Sky Group: TBA

Around OCA for June, 2011

By Barbara Toy

OCA Observatory Custodian and Member Liaison

Spring this year has given us wildly fluctuating temperatures and only so-so viewing. As we head into June, the month of the summer solstice, we generally expect problems with the Marine Layer (generally referred to as "June Gloom"), which we hope will be short lived this year. It doesn't hurt to think positively, and I'm positively hoping for better viewing conditions as we get into summer.

IVC at Anza

The two astronomy professors at Irvine Valley College, Jennifer Tan and Roy McCord, are both members of the OCA, and both regularly bring their classes out to Anza for field trips, using the the Kuhn telescope and other facilities. Unfortunately, the last few scheduled field trips had to be canceled due to weather conditions, including the one for Jennifer's class in April. Our streak of bad weather luck ended – sort of – with Roy's class on the May 7th.

At sunset, the sky was reasonably clear and there was a fog bank parked over the Temecula area that gave promise of darker skies than we might otherwise expect, at least after the moon set. The moon was a crescent and we actually started viewing the moon and Saturn during twilight. As the night advanced, the sky wasn't the steadiest we've seen out there, but conditions were good enough to see some detail in the spiral arms of the Whirlpool Galaxy (M51).

It turned out that more than 100 students came out to Anza for that field trip. Very fortunately for me, Pat Knoll and Trey McGriff both came to help me out with the class, so we ran both of the 12 inch LX200s that are mounted in the observatory as well the Kuhn, and IVC brought a couple of their own telescopes, which were set up outside the observatory. While waiting for dark, Pat did some maintenance on the Kuhn, and Trey did a lot of cleaning in the observing area and warming room, so both the telescope and the observatory were in great shape when the students got there. Their help was (and is) truly invaluable, and both the observatory and the telescope would be in a lot worse shape without it.

Dealing with so many students was something of a challenge, and we had a never-ending stream of people coming into the observatory, cycling between the three telescopes, and moving out, some of them returning to see if the objects in any of the scopes had changed. In spite of the moon, we were able to show them the Eskimo nebula, which was not too far from the moon at the time, and M51 in the Kuhn, as well as Castor, a double star (actually a six-star system, though we could only see two components) that I originally slewed to so I could correct the alignment of the telescope when it got dark enough to find stars but that proved to be quite successful as an object of interest for the students. The LX200s showed them Saturn, M3, and other objects, though they kept going back to Saturn at the request of different students who hadn't had a chance to see it yet.

Even though these were astronomy students, and had been through a lot of the basics in their courses, it was interesting to see how many indicated that anything we could tell them about what we were looking at was new information to them. Most of them seem very interested in learning more about what they were seeing, and genuinely excited about having the chance to see things for themselves – and students always seem to be impressed by the size of the Kuhn, how quiet it is and how we control it to go from one location to another. The fact that, as they were looking at M51, they were able to see the spiral arms of a galaxy about 30 million light years away with their own eyes was a mind blower for many of them. As always, the chance to share views of objects I enjoy and information about them to an enthusiastic group who had never seen anything like them before through a telescope was totally exhilarating.

In the midst of all this excitement, we begin to notice uneasily that the fog bank that had been hovering to the west had moved closer, and was actually creeping up the canyon to the south of the site. Then, while he was looking for Omega Centauri along the southern horizon, Pat noticed that the corrector plate on the LX 200 he was using had suddenly dewed over, and five minutes later we were totally engulfed in fog. This was around 10 o'clock, and unfortunately was entirely consistent with the Clear Sky Chart forecast, and it brought the proceedings to a quick end. Because we started while it was still dusk, we had at least a couple of hours of viewing with the students, but it would have been nice to have more time.

Besides IVC, there are a number of groups that have benefited from using the club observatory and Kuhn telescope. These include a recent trip by the UCI astronomy club, organized by our Vice President, Reza AmirArjomand, two different scout groups hosted by Tom Munnecke, and the Biola astronomy class. Each of these group events needs at least one Star Member

(continued on page 8)

TOP TWENTY THINGS AN ASTRONOMER SHOULD SEE

4 The Moon Occulting a Planet

By Helen Mahoney

Our Solar System, like most others, formed from a swirling disk of gas and dust. It contained much hydrogen (still the most abundant element in the universe), and many elements that were formed inside of stars and sent out into the universe by solar wind and supernova explosions. Gravity, which caused the disk to form in the first place, pulled most of the matter to the center. Other spots of coalescence formed within the disk, and over time these centers of matter density swept their orbits clean and formed planets. Matter likes to stick together. Left alone, dust bunnies under the bed would eventually form planets. When gravity in the center became so great that it forced atoms to fuse, it ignited the nuclear reactions that lit up our Sun. The solar wind produced by the Sun continued the interplanetary clean-up process by blasting left over atoms outward, some of which got scooped up by the gas giants Jupiter and Saturn.

The Moon occults Venus, 4/22/2009 (Dave Kodama)

So the Earth, Sun, and the planets are pretty much in the same plane—within a few degrees of a line across the sky we call the ecliptic. Every once in a while, these bodies are going to cross over each other. When the more distant object is bigger, we call it a transit; when the more distant object is smaller, it gets hidden by the nearer one, and thus we call it an occultation. The Moon, blasted out of the Earth by a collision with a large body, falls roughly in the same plane, however the approximate 5 degree tilt of its orbit causes it a greater excursion north and south (from our perspective) than the rest of the bodies. This makes Moon and planet occultations (as well as lunar and solar eclipses) less frequent.

All of the planets eventually get occulted by the Moon. Mercury's orbit is tilted 7 degrees off of the ecliptic, so occultations with it are rarer than the others. Any time the Moon and a planet are close in the sky (a conjunction), it's a beautiful sight. When the Moon passes in front of a planet, it is really exciting. Occultations and eclipses are some of the few times when you can appreciate the actual motion of the Moon. When the Moon "rises", we are (of course) actually seeing the motion of the earth turning. But the Moon's eastward travel is subtle, and usually can only be noticed by the later rising time each night. During an occultation, you can watch the Moon slowly overtake the planet.

Occultations by the moon are not visible everywhere on Earth. You have to be within a strip on the Earth roughly the width of the moon to see the occultation; otherwise the Moon passes above or below the planet. The time of the occultation will differ, depending on where you are in the path. The predictions of where and when you can see an occultation are usually published in *Sky and Telescope* and *Astronomy* magazines.

Occultations of Uranus and Neptune (and minor planet Pluto) require magnification with large binoculars or telescopes. Those of the naked-eye visible planets Mercury, Venus, Mars, Jupiter, and Saturn can be seen with the unaided eye. The planet's light dims, and then blinks out. However, with a large telescope, it is really fun, because you can see the planet clearly.

I have seen planet occultations when the limb overtaking the planet is lit, and when the limb is dark. The lit limb occultations are easier to follow, as you can see the limb approaching the planet. When the leading limb is dark, you can't always see the moon, and it appears as though the planet is disappearing into a black hole, or crossing into another dimension.

With Jupiter, the Galilean moons are each devoured separately. With Saturn, you see the leading rings get a bite taken out of them, then the planet, and then only the arch of the trailing rings is left. That is such a weird sight!

You can even see occultations of Venus and Jupiter in the daylight. Venus and Jupiter are bright enough to see in daylight, if you know where to look—and the visible Moon is your guide.

Occultations can be viewed from your backyard. They do not require sophisticated equipment, but if you can set up a large telescope, you will get a memorable show. They are predicted well in advance so you can plan for them. When the next one occurs, take a break from sweeping up dust bunnies and get a look at the way the Moon does the job!

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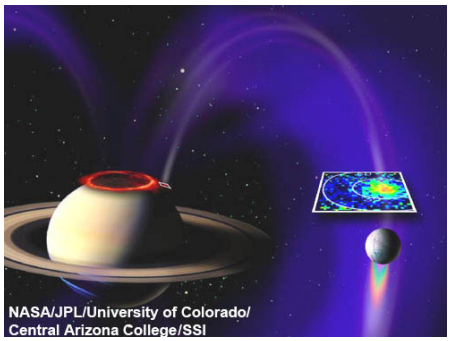
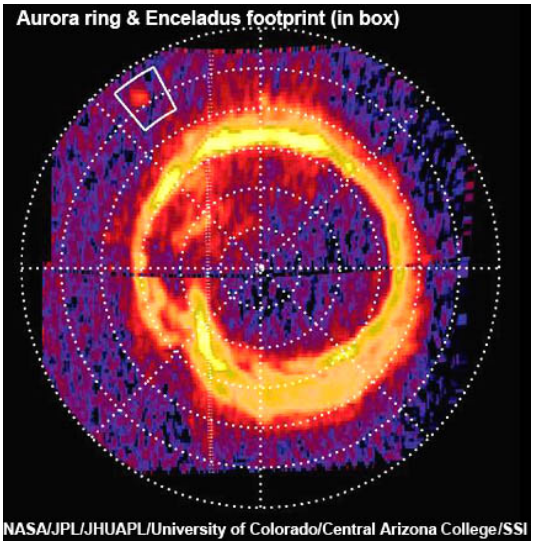
AstroSpace Update

June 2011
Gathered by Don Lynn from NASA and other sources

General Relativity – The results were announced from analysis of the data from Gravity Probe B (GP-B), which collected data in Earth orbit during 2004 & 2005. The purpose was to measure the amount that space (actually 4-dimensional space-time) was warped, as per General Relativity, by a) the Earth's mass, and b) the Earth's spin. The 2nd effect is known as frame dragging, and can be visualized as a spinning mass dragging space along with it in the direction of spin. GP-B contained 4 gyroscopes, more perfectly made and therefore more precise, than any previous ones. The hearts of the gyroscopes are spheres of quartz and silicon that vary at any given point from a perfect sphere by no more than 40 atoms. They were operated at about 2° above absolute zero, cooled by liquid helium. The satellite was made to isolate the 4 from any forces other than gravity (which is warping of space in Relativity), such as atmospheric drag, temperature changes and magnetic fields. The axes were measured by devices that don't touch the spinning spheres. Comparison was made against the location of a star in order to accurately measure the amount of movement of the axes due to space warpage. General Relativity predicts movement of 6.6061 arc seconds per year due to Earth's *mass* and GP-B measured this as 6.6018, with uncertainty of ±0.0183. General Relativity predicts movement of 0.0392 arc seconds per year due to Earth's *spin* and GP-B measured this as 0.0372, with uncertainty of ±0.0072. The conclusion is that General Relativity matched the data, and that the uncertainty was much better constrained than any previous measurements of these effects. GP-B's idea was first supported by NASA in 1963, but took decades to develop the accuracy required. The team claims to have developed 13 new technologies necessary for GP-B. Some of the team have been working on this experiment for over 47 years. The data analysis took longer than planned because such precise measurements uncovered effects never seen before, and these had to be understood and then accounted for in the data analysis.

Cassini (Saturn mission) has spotted a glowing patch of ultraviolet light near Saturn's north pole that marks the end of an electrical connection between Saturn and its moon Enceladus. Scientists previously theorized such an electric flow should exist. Enceladus is 150,000 miles (240,000 km) away from the planet. The glowing patch is located at the end of a magnetic field line connecting the moon to Saturn. The patch is separate from and far weaker than the ring-shaped glow of aurora. The patch is roughly the size of California. The patch flickers, and this may be due to changes in geyser activity on Enceladus. The geyser activity is known to produce clouds of electrically charged particles. Scientists have not found a matching footprint at the southern end of the magnetic field line. Jupiter's moon Io is known to create similar footprints near that planet's north and south poles due to electrical currents flowing along the magnetic field line to the planet. Cassini scientists have detected a radio signal that is caused by the Enceladus current.





Titan ocean – Researchers using Cassini data have found that the moon Titan is rotating with irregularities that are most likely explained if the moon is not entirely solid, that is, partly liquid. In other words, the moon likely has an ocean beneath its icy surface. How far below the surface, how deep, and what liquid are all undetermined. Methane and water are possibilities for the liquid.

Io ocean – New analysis of old Galileo (former Jupiter mission) data reveals that the moon Io must have a subsurface ocean of molten or partly molten magma. This conclusion is based on signatures seen in the magnetic field data. The ocean explains why Io is the most volcanic object in the solar system, and why volcanoes on Io occur all over the surface, not just at hot spots. Io produces about 100 times more lava each year than all the volcanoes on Earth. The magma ocean has to be at least 30 miles (50 km) thick. It probably exceeds 2200°F (1200°C).

Mars Reconnaissance Orbiter (MRO) has discovered that the amount of atmosphere on Mars changes dramatically as the tilt of the planet's axis varies. The amount of atmosphere will affect the frequency and severity of Martian dust storms and the stability of liquid water on the surface. The planet's axis is known to vary its tilt considerably over long time periods (124,000 year cycle). MRO's ground-penetrating radar found a large buried deposit of frozen carbon dioxide near the south pole that is likely to warm and become gas (sublime) during parts of the planet's tilt cycle. The volume of the deposit is about the same as Earth's Lake Superior. It holds up to 80% as much carbon dioxide as today's Martian atmosphere. Collapse pits caused by dry ice subliming and other clues suggest the deposit is dissipating, adding gas to the atmosphere each year.

Pluto's atmosphere – A team of astronomers has discovered carbon monoxide gas in the atmosphere of Pluto. The search for this gas there has lasted nearly 20 years. Pluto is the only dwarf planet known to have an atmosphere. The new results were obtained with the Maxwell submillimeter radiotelescope in Hawaii. Previously Pluto's atmosphere had been detected to extend more than 60

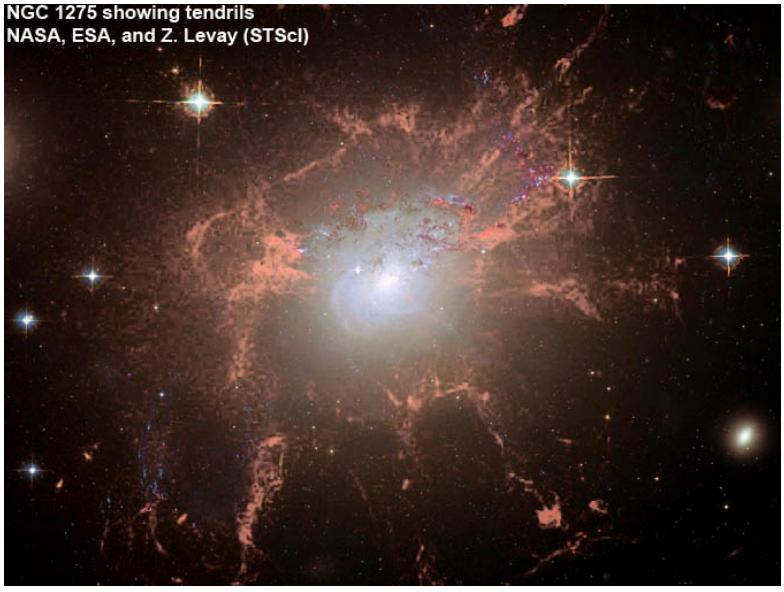
miles (100 km), but the new more sensitive observations detected atmosphere to about 2000 miles (3000 km), which is a quarter of the way to the dwarf planet's largest moon. The gas is extremely cold, about -365°F (-220°C). A surprise was that the signal is more than twice as strong as the upper limit of non-detection obtained by a previous study, implying that the atmosphere may have grown in size or that carbon monoxide abundance may have increased. Methane in Pluto's lower atmosphere has been observed to vary, so a change in carbon monoxide is plausible. Pluto reached its closest to the Sun in 1989, which is recent compared to the 248 Earth years that constitute 1 Pluto year. It is expected that solar heating should evaporate (sublime) some of Pluto's surface to add to the atmosphere during close times, but that atmospheric gas would freeze out or blow away into space during the farther part of an orbit. Methane acts as a greenhouse gas, raising the temperature on Pluto, but carbon monoxide cools it, an anti-greenhouse effect. Both are thought to be small constituents compared to nitrogen. The balance between heating and cooling effects will decide the future of the atmosphere and surface temperature.

Exoplanet magnetosphere – Evidence from Hubble Space Telescope ultraviolet observations implies that a magnetosphere exists around the exoplanet WASP-12b. The dip in the light from transiting its star occurs earlier in ultraviolet than in visible light. At first this was attributed to material flowing from the planet onto the star. But further work shows that the planet plows into a supersonic headwind and pushes a bow shock ahead of it, and this causes the ultraviolet difference. The location of the shock allows calculation of the magnetic field there. The presence of a magnetic field would protect the planet's atmosphere from its star's stellar wind. WASP-12b is one of the largest exoplanets found, at 155,000 miles (250,000 km), and completes each orbit in just 26 hours. The proximity to its star heats the atmosphere, causing it to swell to this huge size.

Dense Exoplanet – One of the 1st stars found to host an exoplanet was 55 Cancri (abbreviated Cnc), a (barely) naked-eye star. 5 planets are now known to orbit that star, and the inner most one, 55 Cnc e, was recently discovered to transit (pass in front of) the star. 55 Cnc is in a wide orbit with a companion star, and the planetary system lies far inside this orbit. When 55 Cnc e was discovered by the radial velocity method, its orbital period (year) was incorrectly measured to be 2.8 days. This was due to inadequate number of observations, or maybe just bad luck in timing those observations. The true period was later found to be about 0.74 days. This meant that the distance from its star and the estimate of its mass were also flawed. The corrected distance increased the probability that it transited its star, as seen from Earth, and indeed a search showed the transit. Observations of those transits yield much more information about the planet. Its mass is 8-9 times Earth's and its radius about 1.6 times Earth's. This puts its density at 11, about double Earth's. This density can be possible only if it is made of rock and metal. That is, such planet types as water, ice, or gas giant have been ruled out. The new distance from its star makes it likely tidally locked (one side always facing the star), with a temperature of about 3300-5000°F (1800-2800°C), depending on atmospheric conditions. That temperature would likely drive off the atmosphere, except for possibly very dense gases, such as volcanoes sometimes produce.

Retrograde exoplanets – In the last few years a few of the hundreds of known exoplanets have been shown to orbit their stars in the direction opposite to the stars' rotation. This is known as retrograde orbiting. Those few are hot Jupiters, that is, gas giant planets orbiting so close to their stars that they are quite hot. These are doubly mysterious because planet formation theory shows that gas giants can form only at much larger distances from their stars and that they form orbiting their stars prograde (the same direction as the stars' rotation). A new study shows that the process that brings planets close to their stars can sometimes reverse their rotation. The process appears to be perturbation between planets. Ones that approach each other closely enough can gravitationally over time push one or both of them into different orbits. The new study simulated a pair of planets over time, starting at distances from their star comparable to Jupiter's distance from the Sun. The inner of the 2 planets eventually is perturbed into a long eccentric orbit, then slowly shrinks to a small less eccentric orbit. Sometimes the process also flips the rotation from prograde to retrograde. This matches observations, as some hot Jupiters have been shown to orbit retrograde, and some prograde.

Galaxy tendrils – Astronomers often find massive elliptical galaxies at the centers of cluster of galaxies. In some of these, long filaments of gas and dust extend outwards from the core. One of the best examples of this is galaxy NGC 1275 in Perseus. In this galaxy these tendrils are narrow, only about 200 light-years across, but as long as 20,000 long. The structures tend to be far removed from star forming regions, which are usually the power source that causes gas to glow. The tendrils are known to contain molecules such as carbon monoxide and hydrogen (H_2). These can exist only in temperatures lower than have been measured in the gas surrounding the tendrils. The hotter surrounding gas should have dispersed the colder tendrils. A recent study appears to have solved these mysteries. The tendrils are apparently held together and protected from the hotter surrounding material by a weak magnetic field. Some of the particles from the surrounding hot plasma do penetrate the cold tendrils, heating some regions within the tendrils. This slight flow of penetrating particles pushes around the magnetic field lines, which causes turbulence and a little further heating. The new


NGC 1275 showing tendrils
NASA, ESA, and Z. Levay (STScI)

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work explains all observed aspects of the tendrils except some of the X-ray emission. Further work will be done on that remaining issue.

Galaxy growth – Galaxies are thought to grow by gravitationally attracting and merging with smaller galaxies. New data from a team of scientists suggests that this kind of growth of the larger galaxies nearly stopped about 7 billion years ago. The new study concentrated on Brightest Cluster Galaxies (BCG), those usually elliptical galaxies found near the centers of galaxy clusters, which are brighter than neighboring galaxies. Measuring sizes of BCGs is difficult as their outer regions are faint. Long Hubble exposures overcome this to record the dimmer parts. BCGs that are so distant that their light left 7 billion years ago were found to be nearly the same size as BCGs are today. Growth since 9 billion years ago was found to be no more than 30%. Without some mechanism shutting down growth by merging, BCGs should have tripled in size over the last 9 billion years.

Galaxy Evolution Explorer (GALEX) (ultraviolet space telescope) – Astronomers using GALEX may have explained why some of the most massive supernovas ever observed occur in the tiniest of galaxies. New data reveal that the stars that start out massive in tiny (dwarf) galaxies stay massive until they explode, while in larger galaxies they are whittled away as they age, and so are less massive when they explode. It has been known for many years that supernovas often occur where there seem to be no galaxies at all. More recent data show that such actually occur in dwarf galaxies, which are undetectable without long exposures with the largest telescopes. GALEX data show that these tiny galaxies produce no more than their share of massive stars, but have more massive stars than large galaxies when such stars explode as supernovas at the end of their lives. The dwarf galaxies tend to have fewer heavy atoms (those heavier than helium), and it is thought that this is what causes the difference in mass loss between the stars of dwarf galaxies and large galaxies.

Map of early Universe – Scientists have created the largest ever 3-dimensional map of the distant Universe by using light from even more distant quasars to illuminate clouds of intergalactic hydrogen. The map shows what the Universe looked like up to 11 billion years ago. As light from a distant quasar travels on its long journey to Earth, any clouds of hydrogen it passes through absorb light at the wavelengths of hydrogen spectral lines. But those lines are red-shifted by amounts depending on their distances from us, due to expansion of the Universe. So the red shifts are measured and distances found. 14,000 quasars were used for the new map. The map shows when galaxies were just starting to come together by gravity to form the 1st large clusters, 11 billion years ago. The survey of spectral lines on quasars will continue until 10 times as many quasars are used. It is 1 aspect of the Sloan Digital Sky Survey Part III. With that additional data, it is expected that the expansion rate of the Universe at a time 11 billion years ago can be calculated with an amazing couple of percent accuracy. That in turn will help scientists to piece together a history of the expansion rate, pinning down how much gravity has slowed it and dark energy has speeded it up.

Tycho's supernova – A bright arc seen in X-rays in the remnant cloud from Tycho's supernova has been identified as a shock wave created when the supernova blew material off a companion star. Previous visible light observations have shown a nearby star moving more quickly than its neighbors, implying that it was the companion star from which material was blown. The X-ray data show a shadow in debris caused by the companion star. This all adds to the evidence that Tycho's supernova was a Type Ia supernova. That type occurs when a white dwarf star pulls material from a companion star until the white dwarf exceeds the mass limits of stability and explodes. Type Ia supernovas probably also occur when 2 stars merge to exceed the stability limit, but this clearly does not apply in the case of Tycho's supernova. The astronomer Tycho observed this supernova explosion in 1572.

Fermi (gamma-ray space telescope) discovered in April an enormous flare in the Crab Nebula, 5 times more powerful than any flare seen there previously. Apart from the pulses from the neutron star at the center of the nebula, it had long been thought to be a virtually constant source of radiation. However in recent years variations in X-rays and gamma rays have been observed in the Crab. During the April flare in gamma rays, no variations were seen in X-rays. It is thought that the gamma-ray flares are caused by shifting in the magnetic field near the neutron star, but details are still hazy. If the gamma rays were caused by high speed electrons interacting with the magnetic field, as the best current theory predicts, the electrons would have to possess 100 times the energy that we can put into electrons with the most powerful particle accelerators on Earth.

Space Shuttle – A new electronic navigation system called STORRM is being tested on shuttle Endeavour's last flight (launched May 16). It consists of a flashing laser beam and a docking camera. Data will be recorded during a maneuver made at the end of the shuttle's flight, wherein Endeavour will make a huge loop about the Space Station, nearly re-docking with it about 4 hours later. The data will not be used to navigate Endeavour, but will be evaluated as a future navigation system.

Aquarius/SAC-D is scheduled to be launched in June as a joint project of NASA and the Argentina space agency. It will make the first global measurements of ocean salinity (salt concentration). Other aspects of the ocean that affect weather and climate have been measured from space, such as temperature, color, waves, wind, rainfall, water vapor, sea level and currents, but not yet salinity. Saltier water is denser and tends to sink, causing interaction with many other sea properties. Salinity is affected by melting ice, rivers and rain flowing into the ocean, and evaporation. Aquarius has 3 radiometers, which measure the salinity signal, and a scatterometer that compensates for the effects of ocean roughness. The prime mission will last at least 3 years, long enough to map year-to-year variations.

Mission proposals – NASA has selected 3 missions and 3 technologies to support through its low-cost Discovery Program, with further selection of a mission to take place after another year of research. The missions are: 1) GEMS to study the interior of Mars with a lander equipped with a seismometer, a thermal probe, and a radio tracking experiment to measure the planet's rotational wobble; 2) TiME to land (actually splash down and float) on a methane sea on Saturn's moon Titan and explore; 3) Comet Hopper to land multiple times on a comet and observe changes as it interacts with the Sun. The technologies are: 1) develop a space

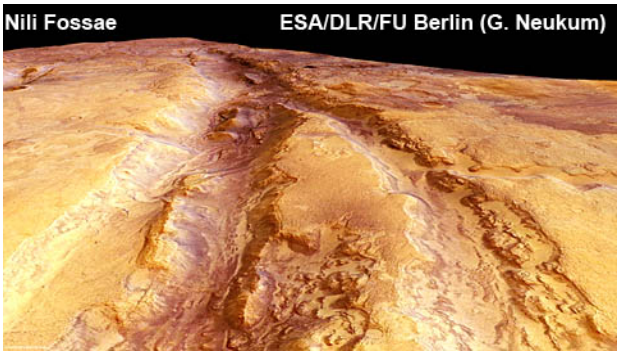
telescope to catalog near-Earth objects; 2) develop a mass spectrometer to measure the chemical composition of a comet; 3) validate blind occultation as a method to find objects in the outer solar system.

Updates Updated

Scheila (asteroid) – It was reported here back in January that Scheila had grown a comet-like glow, and so was probably a "main belt comet", that is, an asteroid in the main belt that had enough ice in it to sometimes behave like a comet. Further observations with the Hubble Space Telescope and the Swift spacecraft have shown that Scheila actually grew 2 tails in opposing directions and that the tails showed no evidence of containing water, water breakdown products, or cyanogen. Comets always show these. Comets do not show 2 tails in opposing directions. So now Scheila's behavior is being explained as a collision with a smaller asteroid that produced the clouds of waterless material. Impact at a low angle would produce the 2 tails in the directions observed.

Gliese 581d (exoplanet) – It was reported here last December that Gliese 581d was likely in the Goldilocks Zone about its star (as is its neighbor Gliese 581g), that is, in the zone where surface temperatures on the planet would allow liquid water to exist. This was based on a very simple computer simulation of the atmosphere of such a planet. Application of a sophisticated computer simulation has confirmed that under some conditions, liquid water could exist on Gliese 581d, but it could not exist if the amount of atmosphere is low. The problem is that at pressures lower than about 10 times that of the Earth's atmosphere, much of Gliese 581d's air would freeze out on the night side, resulting in the atmosphere essentially disappearing. It is believed that the exoplanet is tidally locked so that one side always faces its star, leaving the star-side quite hot, and the night side extremely cold. Simulations were run both with and without an ocean, and results were nearly the same. Since the exoplanet is a super-Earth (more mass than Earth, less than Neptune), it could well gravitationally hold on to an atmosphere 10 times or more the pressure of Earth's. The planet does not transit its star, as seen from Earth, so we have no way to verify the pressure nor the likely constituent gases of the atmosphere. So the answer now is MAYBE Gliese 581d has surface temperatures over some parts (not directly under its sun, nor directly opposite) that allow liquid water.

Instant AstroSpace Updates



Mars Express (orbiter) has imaged an area called Nili Fossae and found a system of deep fractures up to 1600' (500 m) deep. The area has known faults and graben (sunken blocks between parallel faults).

The **Kepler** spacecraft, while staring at about 170,000 stars in order to spot planets passing in front of some of them, has discovered that one of the naked-eye stars that it is watching, HD 181068, long thought to be a single star, is actually a triple, a red giant orbited by 2 red dwarfs.

A new study has shown that the radio signals from auroras on nearby Jupiter-like **exoplanets** should be detectable by radiotelescopes such as LOFAR, now under construction.

Saturn is very prominent in the evening sky throughout the summer. Look for it in the constellation Virgo. This image by Pat Knoll appears to show atmospheric disturbance in Saturn's northern hemisphere.

(continued from page 2)
who has been trained on the current control system to act as host and run the Kuhn, and the ability to organize and host these events is one of the benefits of being a Star Member.

If you're currently a Star Member and would be interested in hosting or helping to host one of these group events, please let me know. If you're not currently a Star Member but would like to do this kind of event, please think about becoming one – for a single lifetime fee of $150 and a couple of nights of training and practice, you would have the ability to reserve the Kuhn and observatory for your own use and could also use it to share the universe with a lot of folks who will be totally impressed by the telescope, your ability to control it, and what you can show them.

Weeds at Anza

The weeds at Anza may not have shown up quite as early as in other years, but, once they did, they quickly accomplished their annual takeover of the site. If left to themselves, many, particularly the grasses, will dry out shortly after reaching full growth, providing a ready fuel source for fires. They can also give refuge to snakes and other creatures we would prefer to avoid, as well as making it harder to access the viewing areas and other locations on the site. All of these are reasons why it is important to keep them under control, and to cut them back whenever we see them growing out. The biggest growth burst is in the spring, but there can be additional growth during the summer if we get monsoon rains.

When I was out at Anza for the IVC class, I was pleased to see that Rick Wiggins, who has Star Cruiser observatory next to the club observatory, had been busy up in the area around the two observatories, as that level had been almost completely cleared (no small task!), along with a couple of feet on each side of the stairway going up to the observatory level from Ten Pad Alley. It certainly made it a lot easier to get to the club observatory, and gave the students who were visiting a much better experience than they would have had without all of his hard work – thank you, Rick!

For those with ties to other areas on the Anza site – if the weeds in your areas haven't yet been cleared, please get that done as soon as you can. For those who have been hard at work doing the necessary clearing, cutting and cleaning out at Anza – thank you!

The How To Use Your Telescope Class In July

We've been doing the "How To Use Your Telescope Class" for several years now as part of our Beginners Astronomy class. The next session is on July 1, 2011, in the parking area behind the Heritage Museum of Orange County (formerly the Centennial Heritage Museum) in southern Santa Ana, near Costa Mesa. The address is 3101 West Harvard Street in Santa Ana, which is about a block west of Fairview Avenue; Harvard intersects Fairview about midway between Edinger and Warner. In the unlikely event of rain that night, we would move the session to the inside of the classroom we use for the Beginners Class, which faces the parking area.

Anyone can come to this class, whether they have attended other sessions of the Beginners Class or not, and whether they are club members or not – as with the rest of our Beginners Class, this is free and open to the general public. If you have a telescope that you would like assistance with, this is your chance to get some expert help from our volunteers.

We suggest that you try to set your telescope up yourself in daylight before coming to the class, to help you become familiar with it and also to pinpoint areas where you're having problems and need particular help. If you have a "goto" scope (one that is supposed to go to objects itself on command), put it through its paces in daylight, even though you won't be able to align it on particular stars, and play with the hand paddle to get an idea of how it works and how the information categories are organized for your system. With any scope, set it up on its mount and play around with the controls to get an idea of how it moves. Also, see if you can get the finder on the scope aligned with the telescope itself by putting the telescope on a distant object (such as a telephone pole) and centering the finderscope on the same object using the adjustment screws on the finder.

All of this will help make the class session more useful for you, as you can concentrate on the areas where you know you are having problems. Our goal is to get people more comfortable with setting up their scopes and doing some observing and, if the weather cooperates, we hope that we will be able to help you to find at least a couple of objects in your scope before the end of the evening.

We also need volunteers to help those that bring their scopes for assistance. This is always a fun and satisfying outreach event for the volunteers, combining aspects of our more traditional outreaches with a mini star party in a session where you really know that you are helping people in a way they won't get anywhere else. If you know how to set up even one kind of telescope and find objects with it, your knowledge can be very helpful to those who are at the beginning of the learning curve, and can

encourage them to get past the threshold frustrations that often turn people off from our hobby before they truly have had a chance to enjoy it. If you can help us out with this event, please let me know – btoy@cox.net.

Children's Star Party at Anza

The next Children's Star Party at the club observatory at Anza, hosted by Tom Munnecke and Kevin Nelson, is on Saturday, July 9, 2011. This event usually starts well before dark with a lot of different activities, with a new program every year. In past sessions, kids have put on lab coats and investigated topics of astronomical interest, then gave short presentations to the group on their findings. Whatever the activities during the day, they culminate in an observing session during the evening with the Kuhn telescope.

■

FOURTH ANNUAL COSMOS RESEARCH CENTER STAR PARTY AT ANZA
JULY 9, 2011

We will be holding our 4th annual star party at the Orange County Astronomers Club Observatory and the Mighty Kuhn 223 Telescope in Anza on July 9. The party is open to OCA members and their families and guests. We'll start with a BBQ, then have a science symposium to hear some presentations by young scientists, then have a wonderful evening star-gazing. The moon will be high in the sky, so we'll be studying the moon in depth, looking for craters and things on the surface of the moon at great detail. Bring your camera and become an astrophotographer! You can use anything from a cell phone camera to a high end digital single lens reflex. (We will have an adapter for Canon DSLRs, if you have one). We'll also see Saturn, and some nebula at the center of the Milky Way.

We are asking for a $5/per person donation to support the club observatory. Camping is available in the RV area near the Anza House, or arrangements may be available at the Anza House ($5 per person for the night)

Register online at http://anzastarparty.eventbrite.com

DR. ALEX FILIPPENKO SPEAKS ON DARK ENERGY

Report by Steve Short

A number of OCA members attended a lecture by noted UC Berkeley research astronomer Dr. Alex Filippenko at the Beckman Center, near UCI, on April 28th. The topic was dark energy and Dr. Filippenko gave his usual spirited talk about the subject and the research he has done regarding dark energy and the expanding universe. The OCA Astrophysics group has been watching and enjoying Dr. Filippenko's Teaching Company DVD's for many years.

At the beginning of lecture, Dr. Filippenko asked a question which an OCA member raised her hand and answered correctly. This seemed to impress our speaker as he mentioned this member several more times during his talk.

After the presentation, Dr. Filippenko answered questions in the lobby and when it came our turn, I introduced our group as OCA members and he graciously agreed to a group photograph. Terry Kirschner had a camera and took the picture Dr. Filippenko, myself, Chris Buchen and Don Lynn.

Dr. Filippenko has also agreed to be the keynote speaker at a general OCA meeting at Chapman University sometime soon when his schedule will permit.

(L-R: Dr. Alex Filippenko, Steve Short, Chris Buchen, Don Lynn)

What have you been doing in the Dark?

Have you done a project that other OCA members would be interested in? Have you participated in an astronomical activity that would entertain the other OCA'ers? For example, perhaps you have:

- Taken an astronomically-oriented expedition (stargazing at Lake Titicaca?)
- Made a telescope or an optical instrument (a handicap-friendly telescope? a solar projection viewer? an improved sidereal-drive mechanism?)
- Conducted a research project or astronomical investigation (photometry? double-stars? spectroscopy?)
- Exposed the stars at a unique "outreach" venue
- Made an unusual observation (discover a supernova or asteroid?)
- Participated in a memorable activity by one of our Special Interest Groups (visited a major observatory? Used a remotely-operated telescope?)

If you have, then it's time to start thinking about your presentation for the "Member's Presentations" night, which will be the November 11 OCA Meeting. Don't keep it to yourself: Inquiring minds will want to know what you've been doing in the dark!

The OCA is filled with inventive people doing new, intriguing, and wonderful things. We'd be delighted if you would present a 15 minute description of one of your astronomical activities at the November OCA meeting. To add your name to the presenter's list, please contact Reza AmirArjomand at reza@ocastronomers.net ■

Located low on the southern horizon in the summer sky for observers in southern California, Centaurus A is one of the closest strong galactic radio sources (between 10-16 million light-years from Earth). It's also the fifth-brightest galaxy in the night sky and worth tracking down with binoculars or a small telescope. A larger instrument will reveal the massive dust lane that appears to bisect the galaxy. (Jeff Malmrose)

FOR SALE: TeleVue 5mm Radian Eyepiece, $125.00. Contact Bill Llano at 714-255-0845 or BELMARDUK@EATHLINK.NET

FOR SALE: 5x8X4 foot, 3500 limit load, enclosed trailer with 15inch wheels, removable top, carpeted floor with 4 tie downs, and 12 volt winch that raise/lower tail gate or pulls in anything on wheels. Trailer specifically designed to transport large dobsonian telescope. $1000. Equatorial telescope tripod for 10-15 lb optical tube assembly, build-in polar align finderscope, slow motion manual axis controls and counter weight. $80. Contact Dave at 949-492-5342

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