SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

May 2006 *Free to members, subscriptions $12 for 12 issues* **Volume 33, Number 5**

GET READY FOR RTMC MAY 26-28TH!

This composite photo of the October 2004 lunar eclipse was made by Jim Windlinger from Fullerton, California, proving that it is indeed possible to do meaningful astrophotography from urban Orange County!

OCA CLUB MEETING

The free and open club meeting will be held Friday, May 12th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. The featured speaker this month is Ken Croswell, with his presentation 'Ten Worlds: Everything That Orbits The Sun'

Next General Meeting: June 9th

STAR PARTIES

The Anza site will be open this month on May 27th. The Black Star Canyon site will be open this month on May 20th. 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 5th at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.
GOTO SIG: May 5th, June 5th
Astrophysics SIG: May 19th, June 16th
Astro-Imagers SIG: May 16th, June 20th
EOA SIG: May 22nd, June 26th
Dark Sky SIG: TBA (contact coordinator for details)

PRESIDENT'S MESSAGE

By Barbara Toy

Well, it's hard to believe that our formal Messier Marathon was totally done in by the weather this year, considering that we had two star parties a week apart when all 110 objects could have been observed, but clouds, fog, even rain, got in the way both weekends. As I write this, we're hoping that a least a few hardy souls will try to gather as many objects as they can at the second April star party (April 29), even though not all 110 will be viewable, but the real event just didn't happen this year. I was one of a handful of people that made the trek out to Anza both Saturdays, hoping against hope that the forecasts were mistaken, only to find that they were all too accurate – there were just too many storms coming through, once our rainy season seriously started in March. Weather is certainly part of the challenge of doing the Messier Marathon – here's hoping we'll have clear enough skies next year that we'll have a fair shot at doing the entire Messier catalog in one night!

Reminder on the Weeds at Anza…

We had a pretty dry winter, up to March, but the Anza area got a lot of rain in March and April. That means that, while we didn't get much weed growth over most of what should have been our wet season, that definitely changed when the rains finally did come. So, as I said last month, we need weed clearance at Anza – anytime you are out there, please clear whatever areas you can. If you are a pad or observatory licensee, please remember to clear any additional growth around your pad or observatory, even if you have done an initial clearance. We are particularly concerned with keeping the areas around structures and around the pads clear, as that is where any fire would be most destructive – so, if you have to choose between areas to clear, please keep those priorities in mind.

My thanks to Ray Stann for volunteering to repair the two gas-powered weed eaters out at Anza. If you have been able to use them to help you clear the weeds this season, it's due to his efforts, so, if you see him, please let him know you appreciate what he did.

AstroImage SIG

As you may have noticed, we have a lot of club members who are interested in various ways of taking pictures of what's up there in the night sky. I've been told by people who have been in other clubs that this is somewhat unusual – a lot of clubs have a few people who do imaging, but not many have such a large and varied population of imagers as we do. We are particularly fortunate that we have quite a few very experienced imagers in different areas (film, CCD, general digital and video seem to be the general categories), as well as a full range of experience levels down to absolute beginners.

The last few years have seen tremendous changes in the equipment available for astroimaging, particularly on the digital side. We've become used to seeing detailed pictures of the planets and the moon built up from images taken with modified webcams, and excellent pictures of nebulas, galaxies and other deep-sky objects taken with digital cameras, especially modified digital SLR cameras. There is also an increasing array of low-priced dedicated CCD cameras, such as Meade's DSI series, Orion's new StarShoot, and others, that can capture images that used to be possible only with CCD cameras that cost thousands of dollars. One result of all of this new equipment is that even more of our members have become interested in this challenging and rewarding aspect of our hobby. You can see some of the results in the images different members post on the OCA website Image Gallery.

Our AstroImage Special Interest Group was organized several years ago as a place where imagers could share information, ideas and images, get help, learn about new equipment, techniques, software, etc., and otherwise have the pleasures and benefits of spending some time with fellow club members who shared an interest in imaging. Bill Patterson is the current Chair of the group, and works hard to keep it responsive to the needs and interests of all of the members, regardless of experience level. One of his most recent projects has been a highly successful effort to provide an in-depth training program for less experienced imagers; besides Bill, active contributors to this "AstroImaging Bootcamp" include Alan Smallbone, Dick Greenwald, Bruce Waddington and Craig Bobchin – who provided a much-appreciated meeting place for most of the sessions – and a number of experienced imagers who have helped out with advice and practical assistance at all of the "hands on" sessions as well as through the dedicated email group for the class, AstroImagingBootcamp@yahoogroups.com. We have been very pleased that a number of new people who are in the Bootcamp have started coming to the AstroImage SIG meetings, which should help them solidify the progress they are making through the Bootcamp.

So why am I bringing all this to your attention? If you are just beginning in astrophotography of any type, or thinking about it, coming to the SIG meetings can help you get through the various difficulties inherent in getting everything to work together in such a way that you can capture the photons you want, and then process what you get to optimize your results. We have a lot of people in the group who are very willing to help out by answering questions and even demonstrating what you need to do, and just being around for the discussions of various topics can help give you a better background on imaging in general. The

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ASTROSPACE UPDATE

May 2006

Gathered by Don Lynn from NASA and other sources

Possible Martian life – Just when the skeptics of Martian life thought they had explained how all the features in the Martian meteorite ALH 84001 could have been produced by non-life processes, there is now a new feature that begs the skeptics to explain. Another Martian meteorite (a piece of the Martian surface that was blasted loose by an asteroid hitting Mars, that eventually fell to Earth), this one named the Nakhla meteorite after the place in Egypt where it fell in 1911, has been found to have a series of microscopic tunnels in it similar in size, shape and distribution to the tunnels left in Earth rocks by bacteria that eat rocks. In Earth rocks with such tunnels, scientists have generally been able to find DNA of the bacteria left behind in the tunnels. Efforts to do so with the Martian meteorite have not been successful. So either the tunnels in the Martian meteorite were formed by an unknown non-life process, or something destroyed the DNA there. The Nakhla meteorite was formed on Mars by volcanic activity about 1.3 billion years ago, and was apparently exposed to water about 600 million years ago. If the tunnels were produced during this wet period, then the 600 million years that have passed would probably explain how DNA could have been lost.

WMAP (cosmic microwave background [CMB] spacecraft) scientists have released the results of 3 years of observation. Previously results were released from analyzing the first year of data, but that did not yet have polarization data. Different versions of inflation theory predicted different patterns within the CMB. The new data supports the simplest version of inflation. It is expected that more years of data will improve the quality of the polarization data, and more patterns predicted by inflation may show up. Due to the spectacular success of WMAP (it alone accounted for over 1% of all worldwide science results published in 2003), the mission was some time ago extended through 8 years of data gathering.

For those of you who would like a refresher on the **CMB**: Very soon in cosmic terms (about 370,000 years) after the Big Bang, the Universe had expanded and cooled enough to become transparent. Until that time, all the light produced by any means was trapped into bouncing locally off the matter present. The light (seen now as microwave radio waves) released by space becoming transparent is still coming to us from all directions, and is called the cosmic microwave background (CMB). There are slight ripples in the temperature of the CMB, caused by sound waves traveling through all the matter in the Universe at the time that it became transparent. As the Universe aged, these ripples became the denser areas where galaxy clusters eventually formed. Inflation theory says that during the first tiny fraction of a second after the Big Bang, the expansion of the Universe suddenly accelerated. That inflation should theoretically leave a pattern in the temperature ripples and the polarization of the CMB. When all waves of light are vibrating in the same direction, then that light is said to be polarized. Polarized light coming at you would all be vibrating up and down, none left and right (or vice versa). So to prove that inflation really happened, and which version of inflation theory is true, scientists are looking for the predicted patterns in the CMB data from the WMAP spacecraft. The patterns in the CMB also depend on the density of mass, the density of protons & neutrons, the density of mass and energy combined, the expansion rate (the Hubble Constant), and other parameters. So these can all be calculated from a very precise measurement of the ripples in the CMB. And all (except some inflation results) have been calculated and announced from previous less precise measurements, by the COBE spacecraft, earlier WMAP results, and several ground-based measurements of the CMB. Such results were strong confirmations of the measurements made with Type Ia supernovas of the Hubble Constant and that the expansion of the Universe is speeding up. They also confirmed measurements of galaxy speeds that indicated there is far more mass than can be accounted for by ordinary matter (protons and neutrons). This is called the dark matter, or missing mass problem. WMAP's latest results, essentially the same as the 1-year results, are that 74% of the matter and energy combined in the Universe is energy that is apparently what is forcing the expansion of the Universe to accelerate (called dark energy), 22% is matter that is not ordinary matter (called non-baryonic dark matter), and 4% is ordinary matter (protons and neutrons).

Dark matter – A new theory has been proposed to explain the non-baryonic dark matter. Neutrino detector observations and recent estimates of the masses of the 3 kinds of neutrinos have ruled out that there are enough neutrinos to account for the non-baryonic dark matter. The new proposal is that there is another kind of neutrino that we do not detect in any of our neutrino detectors that is much more numerous and/or massive than the known types of neutrinos. They are calling these sterile neutrinos. Computer simulations of such particles show that they might help solve other unexplained problems in astrophysics, such as the creation of stars so soon after the Big Bang, the high speeds of some neutron stars after a supernova explosion, and the excess of matter over anti-matter after the Big Bang. It remains to be seen how this theory can be tested.

Brown dwarf mass and density – Brown dwarfs are stars with insufficient mass to sustain nuclear burning of hydrogen into helium, the normal source of energy for stars. They are hard to detect, since they are rather cool compared to stars and don't give off much light, mostly in infrared. Even after they are seen, it is hard to distinguish them from certain types of rather cool stars or very large warm planets. Only hundreds of them have been found, as opposed to billions of stars, though the brown dwarfs may be as numerous as stars. A binary pair of brown dwarfs was found that eclipsed each other as they orbited, as seen from Earth. So the Hubble Space Telescope was used to observe their orbital motions. The pair are too close to resolve as two objects, even through the Hubble, but observing the changes in light as they eclipsed each other was enough to determine their orbits. The orbits were used to calculate the masses, diameters and densities of both brown dwarfs. The spectrum, during and between eclipses, was used to determine their temperatures. This is the first time mass and density have been precisely measured for any brown dwarfs, so this is the first time the theories of brown dwarfs can be tested. One of the pair was found to be 55 times the mass of Jupiter, and the other 35 times, with only 10% margin of error. It requires 80 times the mass of Jupiter to sustain nuclear burning. Theory said that both members of such a binary pair would have formed at the same time, and the smaller one would have

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cooled more since then. But the more massive one was cooler (4310 degrees F, compared to 4560). Either the theory of cooling is wrong, or they did not form at the same time. The brown dwarfs are quite large for their small masses, about 50% and 70% the size as the Sun. But this was expected, since theory says that very young brown dwarfs will be this large. They are located in the Orion Nebula, and all stars there are less than 10 million years old, relatively young for stars.

Brown dwarf neighbor – Astronomers using adaptive optics and a star-canceling camera on the Very Large Telescope in Chile have discovered the second closest known brown dwarf, only 12.7 light years from us. It is orbiting another star that is only 1/10 the mass of the Sun. Its orbit is 4.5 times the size of the Earth's orbit. It is a T dwarf, a cool variety of brown dwarf, with a temperature of only 1380 degrees F. Only about 30 of these cool brown dwarfs are known, and 2/3 of them are not orbiting other stars. The primary star of the pair is the smallest known star with a cool brown dwarf companion, and it was only recently discovered. The discoverers were searching for extrasolar planets when they stumbled on this unusual brown dwarf.

Spitzer (infrared space telescope) has found a disk of supernova debris surrounding a pulsar. The disk is about a million miles from the pulsar and contains about 10 times the mass of the Earth. The disk appears like those that can produce planets around newly formed stars. This implies that a pulsar could possibly form a new set of planets after the supernova explosion (which produced the pulsar) blew away the star's original planets. The first 3 planets ever found outside the solar system were discovered in 1992 orbiting a pulsar. Ever since theorists have been trying to explain how those planets survived the supernova, but this new discovery implies they formed after the supernova.

Stream of stars – Astronomers using data from the Sloan Digital Sky Survey have discovered a stream of stars extending nearly from Arcturus to the Big Dipper. It is centered on the globular cluster of stars NGC 5466. It was not previously noticed because it is lost in the multitude of Milky Way stars, but it stood out in the Sloan data by color and brightness different than the Milky Way stars. It is believed that the stream was formed when the globular passed close to the center of the Milky Way and tidal forces ripped out many of the globular's stars.

Integral (European gamma-ray space telescope) has observed surprisingly powerful gamma rays and X-rays emitted by a type of star known as anomalous X-ray pulsars (AXPs). Only 7 of them are known. There were 2 theories on their production of X-rays: material falling in from a companion star creates X-rays, or matter in a magnetic beam causes the X-rays. The trouble with the latter theory is that it required a magnetic field of incredible strength, billions of times stronger than has been created in laboratories. The new Integral data supports the magnetic explanation of the X-rays. Another type of star known as a soft gamma-ray repeater (SGR) was recently determined to be a magnetar, a pulsar with a magnetic field far stronger than ordinary pulsars, even though ordinary pulsars have very strong magnetic fields. Apparently the AXPs are also magnetars, but the emission of gamma rays is fairly continuous rather than the sporadic explosions of the SGRs. The energy of the magnetic fields contained in the pulsar is escaping into space, by a process called magnetic field decay, but not yet entirely understood, and that energy is producing the X-rays and gamma rays of the AXPs.

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X-ray background - Back in the late 1970s the HEAO-1 spacecraft made the first survey of high frequency (high energy) X-rays in the sky, and it puzzled scientists in that the background was about 20% less than was predicted by extrapolating previous low energy X-ray data. The X-ray background consists of X-rays that cannot be isolated to individual sources, and is found in all directions. The discrepancy was never explained. Controllers of the Integral spacecraft decided to calibrate their X-ray instruments by using an unusual technique. They allowed the field of view to drift across the Earth, causing it to eclipse all X-ray sources that direction. This required major reprogramming of the spacecraft, since it was designed to avoid pointing at the Earth, and its star trackers (used to point and stabilize the spacecraft) won't work when the Earth gets in the way of its stars. The result is that they believe the HEAO-1 results were not right, that there is 20% more high energy X-ray background than HEAO-1 reported. Of the low energy X-ray background, 80% was resolved a few years ago into a multitude of weak individual sources spread over the entire sky. But no high-energy X-ray spacecraft has yet had the resolution to do that for the high energy X-ray background.

Galaxy evolution – A team of astronomers has found, in both near-ultraviolet and far-infrared, hundreds of galaxies distributed over distances such that we are seeing them as they were back to when the Universe was about 40% of its current age. They used the Lyman-break technique of searching for distant galaxies, applied over wider wavelengths than usual. The Lyman break is the point where a galaxy's spectrum shows absorption by the hydrogen in space between the galaxy and us. The point in the spectrum where this occurs tells us how distant the galaxy is; or more precisely, it tells us the red shift of the galaxy, which is related to distance by the Hubble Law. Most were found to be spiral galaxies, similar to galaxies now. So the age of irregular galaxies, before they had built up to mostly spirals, occurred before this 40% point. The rate of star formation was measured in the newly found galaxies, and this will be used to refine theories of galaxy formation and evolution.

More galaxy evolution – Another team of astronomers studied several tens of distant galaxies and found that they had the same amount of dark matter relative to stars 6 billion years ago as they have now. The study was done with a spectrograph on the Very Large Telescope in Chile, which simultaneously takes spectra of all resolvable points of up to 15 galaxies. This allowed determination of the orbital motions of stars in all parts of the galaxies. The dark matter was calculated from the orbital motions observed. As much as 40% of the galaxies contained disturbed motions, which were probably the result of recent collisions with other galaxies. The distribution of gas within the galaxies was also measured from the spectra.

Yet more galaxy evolution – Another team of astronomers using the Gemini Telescopes in Hawaii and Chile and the Hubble Space Telescope studied populations of stars in huge galaxy clusters over a large range of distances, and therefore times (the distant ones were seen as they were back when the light left them). The most distant galaxies studied were seen at less than half the current age of the Universe. Their findings: the farther galaxies have huge variation in the abundances of elements such as oxygen and magnesium, while the closer galaxies appear much more homogenous. Massive galaxies formed nearly all their stars in the first billion years, while lower mass galaxies took about 4 billion years. Merging galaxy clusters showed a large proportion of the galaxies had undergone recent bursts of star formation.

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VOLUNTEER OPPORTUNITIES

NEEDED – NEW ANZA HOUSE COORDINATOR

As Tim Hunt is now in Tennessee, we need a new Anza House Coordinator. This person generally oversees Anza House and takes care of such things as keeping supplies in stock, determining what repairs and maintenance are needed and arranging for that to be done, collecting the money from the money box and getting it to the club treasurer, keeping the reservation sheets in stock, encouraging people to keep things tidy and to remove their trash when they leave, and dealing with the various things that inevitably crop up whenever a stream of people uses a facility over time. It's a great way to contribute to making the Anza site a better place for all of us – if you're interested in the position, or want more information, please contact Barbara Toy at btoy@cox.net or 714/606-1825.

TECHNICAL ASSISTANCE NEEDED FOR OUR WEBSITE

We need someone to handle the technical side of the OCA website. Hassi Norlen is our Website Editor, and deals with content and a lot of the day-to-day maintenance, but we need someone who can deal with the "down-and-dirty programming" aspects of the website. If you have knowledge of VBScript, JScript, Javascript, Access Databases, Microsoft IIS (Internet Information Server) and ASP (Active Server Pages), as well as HTML, and understand and are able to code dynamic web sites running under Microsoft IIS developed using ASP and Microsoft Access databases, you have the necessary skills for this, and we could really use your help.

If you can help us out with this, please contact Hassi Norlen (hassi@norlens.net or 714/710-9444) or Barbara Toy (btoy@cox.net or 714/606-1825).

DR. MARGARET GELLER AT UC IRVINE

Matthew Ota

Dr. Margaret Geller of the Smithsonian Astrophysical Observatory, a nationally known figure and one of the most popular astronomers of our time, was the featured speaker at the University of California Irvine on Monday, April 19, 2006, as part of the Chancellor's Distinguished Lecturer Series.

Dr. Geller is most well known for her work in mapping the large-scale structure of the universe with a three-dimensional map. She has published many research papers, articles and books for the lay public. She has also appeared in many astronomy related films and documentaries. Her talk, entitled "Einstein Meets Newton: Mapping Dark Matter in the Universe", was presented in a capacity-filled lecture hall on the UCI campus. Many OCA members were in attendance, along with students, teachers and members of the general public. Her program included a projected slide show on a very large screen, which included animations of large galaxy structures in motion.

She began her lecture with some basic questions such as:

"How far can we see with the naked eye?"
"How old is the Universe?"
"What is our place in the cosmos?"

One profound point she made was that time, not space, limits our view of the universe. Her work is in the mapping of structures of clusters of galaxies on a scale of millions of light years. The number of galaxies she has mapped is in the thousands, including a sheet of galaxies that was dubbed "The Great Wall", a structure over 15 million light years thick.

During her lecture she recounted the discovery story of the planet Neptune, which she called, "the first instance of the detection of dark matter." Neptune's position was determined by the gravitational perturbances in the orbit of Uranus. She explained that today dark matter is detected in the same way. Researchers observe the gravitational pertubances in the light of background galaxies as their light is distorted into arcs by powerful gravitational lensing.

Dark matter was first theorized or discovered by Fritz Zwicky, the eccentric professor of physics at Caltech in 1933. Dr. Geller gave a few anecdotes about Zwicky's (ahem) colorful personality, but then spoke of his powerful intellect and his work in the field of astrophysics. Zwicky first detected dark matter by observing and measuring the galaxies in the Coma Cluster, and released his paper on the topic in 1937. He suggested that gravitational lensing could be used as a tool for measuring mass, years before the technology was available to validate his theory.

Then she spoke about Vera Rubin, the astronomer who discovered the strange and unexpected constant rotational velocities in galaxies. Dr. Rubin found that the velocities of stars in galaxies were relatively constant from the center to the edge of the visible disks of the galaxies. This inferred that there were massive dark haloes of matter extending far beyond the visible edge of the galaxies that influenced the motions of the visible portions of the galaxies by massive gravitational forces. Enter Einstein, with a curious graphic showing him surfing on gravitational waves, as massive objects perturb the space around it. The familiar rubber sheet model of gravity was displayed, showing how not only matter, but light itself being stretched by gravity wells.

Dr. Geller displayed fascinating Hubble and ground based observatory photographs of actual arcs and entire rings of light distorted by foreground gravitational sources. The amazing thing today is that all of the predicted effects of gravity in making ring arcs agree with the previously published theories within a few percent, a triumph of modern astrophysics.

Next she presented slides that showed the Smithsonian telescope and instruments used in detecting the red shifts of 11,000 galaxies, in order to map the large-scale distribution of matter over space and time. Using fiber optic probes, the telescope imaged the sky one square degree of arc at a time.

As her lecture closed, Dr. Geller turned to the philosophical aspects of astrophysics, a topic rarely covered in the general media and the science press. "We live in an extraordinary time. As we have the ability to image the universe to its absolute visual limits, it shows the reach of the human mind," she said, adding, "the thing that makes us grand is that we have the ability to not only ask the questions about the universe, we now have the capability to answer them."

Next she made a humorous point. Photons of radiation travel for billions of years and do not hit anything until they reach the top of our heads, which she said is a waste. In closing, she wished the audience great joy in asking the questions and getting the answers, which is a great and important part of the human condition, and opened up the rest of the evening up to questions and answers.

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same is true for people who are more experienced but don't consider themselves expert (and nobody is an expert in all of the possible techniques) – spending time with other imagers, seeing and discussing what they're doing, sharing experiences, discussing problems and possible solutions – all of this helps improve the skills of imagers of all levels. Even very experienced imagers benefit from information shared at the meetings and can improve their skills through comments and helpful critiques of their own images and images taken by others. Regardless of your experience level, the camaraderie and support the group provides add a lot to the pleasures of what is often a solitary pursuit.

There's an additional reason for talking about this SIG right now. Thanks to Bill Patterson, the group met at Source Refrigeration in Anaheim for a long time, but, when Bill retired, he no longer had easy access to those facilities. We are very fortunate that Joe Busch was able to make the conference room at the Irvine office of Gibson, Dunn and Crutcher available for the meetings, and we are grateful to both Joe and his firm for doing this. The room is big, so overcrowding isn't an issue, the chairs are comfortable, the viewing screen is well placed for looking at images during "Show and Tell" and at whatever various presenters want to show us, the restrooms are close by, there's good parking, it's close to the I-405 freeway (the building is in an office complex near the intersection of Jamboree and Main) – it's really a great place for a meeting. As you might guess, a significant change like this also invites us to look at the group as a whole and evaluate what it's doing and how it's doing it – that's going on now, so this is a particularly good time to get involved with the group (or, for those who are already members, to get *more* involved with the group) so you can influence the kinds of activities we'll be doing in the next few months and for the long term.

So come on out for the AstroImagers meetings, and (even though I'm not really an imager – there's plenty to interest even non-imagers at the meetings), I'll look forward to seeing you there!

RTMC

What started as the Riverside Telescope Makers' Conference has become the RTMC Astronomy Expo, and it is one of the biggest astronomy events in Southern California. It takes place at Camp Oaks near Big Bear on Memorial Day weekend (which is May 26-29 this year). New Moon is on that Saturday, so the skies should be nice and dark for the star parties Friday, Saturday and Sunday nights. That Saturday also happens to be set as our May Anza Star Party – I'm afraid that star party will be rather lightly attended, even if the weather looks good out there, as a lot of the regulars at Anza are also regulars at RTMC.

So, for those who have yet to experience it, what is RTMC? I mentioned the star parties that are a major component of the festivities – besides giving people a chance to do their own viewing/imaging and to check out equipment used by other people, there are some interesting scopes set up for general viewing, such as the "Yard Scope" (a 36-inch Dobsonian), a custom scope that is permanently mounted on a trailer for easy transport, an exceedingly long refractor, and a restored Clark telescope on the original mount – there were a lot more than these on display in the last couple years, but these are the ones I remember most clearly. Vendors also use the observing conditions to demonstrate their equipment, particularly on Saturday night; Meade and Celestron always have big display areas and people present who can answer questions and put the displayed equipment through its paces, and a lot of smaller companies have equipment out for demonstrations, as well, so you can check out different kinds of mounts, eyepieces, etc., as well as telescopes. Most vendor demonstrations close down by midnight, but the hours before that are a great time to wander around and check out all those telescopes and other gear you may have read about or seen in display rooms but never had the chance to see in action.

Things are even more active during daylight hours – there are more vendors open selling a greater variety of things (especially Saturday), and a swap meet area for people to sell off things of their own that's most active in the early morning on Saturday and, somewhat, on Sunday morning; I'm told that there's a lot of sales action on Friday, as well, but so far I've missed that myself. A lot of commercial vendors use RTMC as a place to sell off floor models and miscellaneous items that they have hanging around and want to get rid of, and there are vendors who specialize in various bits and pieces that people who are into astronomy might find helpful – you'll see a lot of used equipment, a lot of "seconds," and other items that may be perfectly serviceable but are not in pristine condition. Clubs get in the act, too, and you'll see a number of club booths among the vendors, including the OCA booth, where we sell donated books and magazines to help support our library. RTMC is known as a place for bargain hunters, and, as you wander around, you'll undoubtedly hear a lot of wheeling and dealing, which is all part of the fun.

While all this activity is going on among the booths, there are talks on a variety of astronomy-related topics going on all day on Saturday and Sunday. Last year, there were two full tracks of interesting talks going on simultaneously, one in the main hall and one in the annex. There's a speaker schedule, and it is often a challenge to make it to the talks that interest you and also do everything else you want to do. Saturday night features a keynote talk, which this year will be given by Dr. Mike Brown from Cal Tech on the solar system objects found beyond Pluto that are the same size as Pluto or larger. And there are generally tours of the Big Bear Solar Observatory available, and various hikes and other activities for people who might want to do something

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Galaxy orientation – Analysis of galaxies in the Sloan Digital Sky Survey and the Two Degree Field Survey found that they are more often oriented across the filaments of galaxy clusters. These filaments are often referred to as the large-scale structure of the Universe. It is believed that the galaxy clusters constituting the filaments formed along concentrations of dark matter early in the history of the Universe. Theoretical work showed that galaxies should more often be oriented this way, but previous studies had been unable to show this. The Sloan and Two Degree surveys contain data on more than a half million galaxies out to a distance of a billion light years. This was finally sufficient to measure trends in the orientations of galaxies, as well as locate the filaments of the large-scale structure.

Galaxy clusters – Astronomers using the Spitzer infrared space telescope have made a survey to find very distant clusters of galaxies. The distances were estimated by the colors of galaxies, and then the candidates for distant clusters were checked by taking spectra with the Keck 10-meter telescope in Hawaii. One cluster set the record for distance: its light took 9 billion years to reach us. Three other clusters were found so distant that we are seeing them as they were over 7 billion years ago. As more spectra are taken with the Keck, it is expected more distant clusters will be added to the 25 found so far.

from inside the comet onto the surface and the Sun's heat took several days to sublime (evaporate) all that new ice. Solar wind particles hitting the water vapor produce X-rays. The total water seen in X-rays amounted to enough to fill 100 Olympic-sized swimming pools. Since the strength of X-rays depends both on the amount of water and on the amount of solar wind, calculations were made taking into account the solar wind measured simultaneously by the ACE spacecraft.

LCROSS (lunar impact mission) – It was so much fun (or perhaps produced such good science) smashing into a comet that NASA is going to do it again with the Moon. LCROSS will consist of a spent rocket that crashes into an eternally shadowed crater near the south pole of the Moon and a spacecraft that observes the plume of material thrown out by the impact, flies through the plume, and then also crashes. Plumes from both impacts will be observed by a variety of Earth-bound and Earth-orbiting telescopes. It is hoped to settle the conflicting observations of whether there is water ice near the Moon's south pole. Impacts are scheduled for October 2008. Launch is practically free, since it will share the same rocket with the Lunar Reconnaissance Orbiter.

ST5 (technology test mission) was launched in late March into highly elliptical orbits. It consists of 3 separate spacecraft of only 55 pounds each, which will monitor electric currents in the Earth's ionosphere. New technologies that are being tested for use on future spacecraft include: a low-power micro-thruster, a small version of an X-band radio, coating that can change reflectivity to control temperature, low-power half-volt radiation-tolerant computer chip, triple-junction solar cell, lithium-ion storage battery, miniature magnetometer, a new kind of instrument boom, and autonomous control that can run the spacecraft for a week without human intervention. Although these technologies should be of value in most future spacecraft, the most immediate application is seen in plans to build a swarm of tiny satellites to monitor space weather all around the Earth.

Stardust (comet sample mission) – What do you do with a used spacecraft? In the case of Stardust, which has completed its mission of returning material from Comet Wild 2 to Earth, you propose to send it over to Comet Tempel 1, to see how much damage Deep Impact made when it hit. The flyby part of the Deep Impact spacecraft did not get as good a look as hoped because the cloud of dust stirred up by the impact remained a considerable time, obscuring the view until after the flyby part went behind the comet and lost sight of the impact site. If NASA decides to accept the proposal (that is, spend money on it) we could get some spectacular pictures of the Deep Impact crater from Stardust. My guess is that NASA will do this, since several NASA personnel had bets on the size of the Deep Impact crater, and they were never able to settle those bets. That and the fact that it would get some good science cheaply, utilizing a used spacecraft. The Deep Impact flyby spacecraft is also available if someone can find a new mission for it. A return to Comet Tempel 1 is not within its fuel range however.

More preliminary **results from Stardust** comet samples: There were quite a few particles over 10 microns (1/2500 inch), larger than had been predicted. Many of the tracks made in the aerogel as it captured comet particles are longer than predicted, probably because of more mass in the particles. The longest track was almost half an inch long. Some tracks split into sprays, indicating the particles exploded on their way through the aerogel. Interstellar dust samples were also taken by Stardust, and work on analyzing them is beginning. Scientists involved are excited about the possibilities. Some say it hasn't been this exciting since the Apollo lunar samples arrived in 1969-72.

Icy asteroids – A third asteroid in the main asteroid belt has been found to be icy and act like a comet when heated. Asteroids in the main belt are generally devoid of ice, though asteroids in the outer solar system are usually icy. The first was discovered a decade ago, but the next 2 were discovered just since October. Three is enough to be considered a class by itself and get a name: main-belt comets. The early Earth was hot enough to form with probably very little water, and there have been problems explaining how comets could have brought the water that forms our oceans now. So a natural question to ask is whether the main-belt comets could have brought the Earth's oceans when they collided with Earth. To answer this we will need to know how common the main-belt comets are, how much water they have and which isotopes of hydrogen and oxygen are there. So a lot of further research needs to be done on main-belt comets.

Star formation – A team of astronomers using a large radiotelescope has produced the best map to date of the giant gas clouds in the Milky Way that serve as the birthplaces of stars. They used a radio frequency emitted by carbon monoxide with carbon 13 isotope. Traditionally such maps have been made with carbon monoxide with isotope 12, but the new frequency penetrates the clouds better and gives more detail. The distribution of the clouds proved to show the spiral arms of the Milky Way. A number of clouds were found that are not forming stars, but are believed to be in earlier stages than star formation. They appear colder and quieter than those forming stars. All clouds studied were found to have similar lumpy structure. Such lumpiness determines what size and how many stars form, so this implies all clouds will form similar distributions of stars of various sizes.

Blue ring – The outermost ring of Uranus, discovered just last year, was found to be blue. The only other blue ring known is

Saturn's outermost (E) ring. Both are blue because of the unusually small ring particle size. Each has a moon in the ring. Geyser activity on Enceladus appears to be the source of the E ring particles, but it is unlikely that Mab, a small dead rocky moon, can be supplying ring particles. It has been theorized that Mab is colliding with larger particles, while smaller particles spread out and miss colliding. This may be occurring at Enceladus also.

Xena's size – The Kuiper Belt object 2003 UB313, nicknamed Xena or the 10th planet, was imaged by the Hubble Space Telescope to get a better measure of its diameter. The previous best estimate was 30% larger than Pluto. The Hubble measurement is 5% larger than Pluto, or 1490 miles (with uncertainty of 60 miles). Previous estimates were made partly on the basis of brightness, and the Hubble observations show that the surface is more reflective than thought, so it threw off the size estimates. In fact it is the second most reflective body in the solar system, after Saturn's moon Enceladus. This implies Xena is covered with a frost layer, probably methane frost. This may have happened if Xena had a methane atmosphere when it was closer to the Sun and therefore warmer, which would then have frozen onto the surface as it approached the far point in its orbit. Methane leaking from the interior could also explain the frost layer. The Hubble will be used to measure the diameters of other Kuiper Belt objects that are thought to be almost as large as Pluto and Xena.

Recurrent nova – In February the nova RS Ophiuchus recurred, that is flared in brightness again. It has done this 5 times previously in the 108 years that it has been watched. It was the best observed recurrent nova in history. It was already known to consist of a white dwarf star orbiting a red giant star so close that material (mostly hydrogen) from the red giant is pulled onto the white dwarf. After about 20 years of accumulation, the hydrogen on the surface of the white dwarf ignites in a nuclear explosion causing the recurring nova. It becomes about 100,000 times the brightness of our Sun when this happens. A huge amount of material (many times the Earth's mass) is blown away from the white dwarf by the explosion at speeds of 1000s of miles per second. The red giant in this pair is throwing off enormous amounts of gas in a stellar wind. The exploded material from the white dwarf then slams into this wind material creating a shock heated to about 100 million degrees. While X-ray telescopes were watching this hot shock, the X-ray emission suddenly increased about a month after it began. It is believed this new X-ray emission is from continued nuclear burning on the surface of the white dwarf, which just became visible as the red giant's stellar wind material was blown out of the way. The new X-ray emission is showing pulsations every 35 seconds, and this is thought to be from instability in the nuclear burning.

Chandra (X-ray space telescope) was used to observe a known pair of supermassive black holes in the center of a cluster of galaxies known as Abell 400. Each was found to be ejecting jets of particles. By tracing the jets, their past orientation could be determined, and this showed that the black holes are spiraling around each other. They are expected to collide in the future. Apparently they were the central black holes of two galaxies that collided, and they captured each other to form orbiting binary black holes.

Aurora – Previous studies have shown that Jupiter's aurora are strongly influenced by a stream of material from its moon Io's volcanoes falling down the magnetic field lines to the planet. However a new study of ultraviolet images taken by the Hubble Space Telescope and solar wind data from the Cassini spacecraft while it flew by Jupiter in late 2000 showed that Jupiter's aurora also are strongly influenced by the solar wind. The main oval of aurora was found to respond to Io's material, while the aurora between the oval and the planet's pole responded to the solar wind. The same technique (simultaneous Hubble and Cassini observations) applied at Saturn showed that solar wind energy gets trapped in the planet's magnetic field, then later explosively releases to cause Saturn's aurora. Saturn's aurora was found to have a spiral shape rather than an oval like Earth and Jupiter have. Saturn also sometimes has blobs of aurora and storms of aurora filling half the polar region.

Instant AstroSpace Updates:

Astronomers using the **Spitzer** infrared space telescope have found a nebula near the center of the Milky Way that is shaped like two strands twisted together, similar to the shape of a DNA molecule. The shape is believed to be caused by a magnetic field anchored in a rotating disk of matter.

One of the largest **astrophysical computer simulations** ever made started with galaxies in the same shape and time (300 million years after the Big Bang) as the earliest observed and correctly evolved them into galaxies as seen now. The galaxies evolved more rapidly than theorists had predicted; for example, the chemical composition of the Milky Way was nearly the same as present within 1 billion years after its formation. Note that this disagrees with the findings of the Gemini survey reported earlier in this column.

Dawn (asteroids orbiter) has been reinstated after its cancellation in March attributed to technical problems and cost overruns. It will use electric ion propulsion to visit and orbit Vesta and Ceres after launch in July 2007.

Venus Express (European Venus mission) achieved orbit about Venus on April 11 with a 50-minute burn of its main engine. It will soon begin taking images and measurements with its 7 instruments (some were already successfully tested at Venus), including an infrared camera that will image the surface through the thick atmosphere that blocks visible light. The mission is scheduled to observe for 2 Venusian days (16 Earth months).

Mars Reconnaissance Orbiter began aerobraking (dipping into the very top of the atmosphere to slow the spacecraft) to achieve the low orbit necessary for science operations. Variations in the density of the upper atmosphere are being monitored by other Mars spacecraft to assure aerobraking is done safely. Test images have been successfully taken and sent to Earth.

A computer simulation of the **formation of the planet Mercury** showed that a very large asteroid striking the planet would explain the high content of iron, since lighter material was substantially carried away by solar radiation, some of it striking Venus and Earth.

The crew aboard the **International Space Station** was changed, using Russian Soyuz vehicles. The first astronaut from Brazil accompanied the new crew of Vinogradov and Williams on the trip up and returned 8 days later with the returning crew.

Cassini (Saturn mission) sent its 70,000th image back during April.

REMEMBER THE 2001 "OCA MEMBER SURVEY"?

by Bob Buchheim

I was cleaning out some files that were given to me by Bruce Crowe when I took over as club Secretary, and ran across the responses from our OCA "Member Survey". Of particular interest (to me) were the write-in comments that many members sent: they provide an opportunity for a sort of progress report on some of the issues that were raised at that time.

Monthly meetings: Several comments related to the planning and conduct of our monthly General Meetings, including:

"How about better audio-visual equipment?" I don't know what prompted this comment, but my impression is that the current projector system, provided by Chapman University, is a pretty nice set up. The Astro-Imagers SIG also has a nice LCD projector system for their meetings and other uses (donated by Dave Radosevich last year).

"Abolish the raffles" and *"We should have raffles more often"*. Hmm, since we now have raffles occasionally, we must have settled into a proper balance. Right?

"Too much emphasis on research, too little on observing and ATM'ing", and *"Speakers get too technical for average astronomy enthusiasts, [who want to hear about] astrophotography, amateur telescope use, finding and observing things in the sky"*, and *"Not enough visibility of the SIGs – how about each SIG take responsibility for one monthly meeting each year?"* In 2004 and 2005, we resurrected the tradition of "Member's Night" at the December meeting, an opportunity for OCA members to describe interesting projects or activities that they've been involved in. If any of you have a Telescope-making project or an interesting observing experience that you'd like to describe to the club, please contact Craig Bobchin. Craig arranges the agenda for our General Meetings, and he can put you onto the agenda for December.

"Encourage the return of "open slides". Since most of our astro-imagers have migrated into the digital age, it's now PowerPoint slides instead of 35mm silver-halide slides. If you have slides that you'd like to share with the members at a General Meeting, feel free to e-mail a JPEG file to me (rbuchheim@earthlink.net) and I'll include it in the pre-meeting slide show.

Anza Site: We received quite a few ideas related to the Anza site, such as:

"How does one join the star member program?" and *"When I've inquired about use of the Kuhn, I get nowhere"*. The club's main observatory and the Kuhn telescope are unique assets of the OCA. We have a special class of membership – the Star Members – who are authorized to open the observatory and operate the Kuhn telescope. Any OCA member who is over 18 years of age can become a Star Member by paying a one-time fee (currently $150) and being certified on the operation of the Observatory, the Telescope, and the telescope control software. Barbara Toy (Observatory Custodian) is happy to conduct Star Member Certification Training in the late afternoon of most star-party nights. If you are interested in Star Membership, send you check to Charlie Oostdyk (Treasurer), and contact Barbara to arrange for training. When you have completed your certification training, you will be given an access code for the lock on the observatory door, and a password for the Telescope Control software. This makes the Kuhn, and all of its accessories (including a CCD imager, donated by John Hoot) available for your use.

"I would like to see unused pads available to other members during star parties." This OCA member apparently was never told about the "sunset rule" at Anza. Here's the deal (from the OCA Pad Policy): If a pad holder does not arrive to use his/her pad by sunset, and not informed the adjacent pad holders of his intent to arrive after sunset, any OCA member may use that pad and its parking space on a first-come-first-served basis." So, if a pad is empty at sunset, ask the adjacent pad holders if they've heard from the licensee; and if not, then it is available for your use. Those of you who frequently use the Anza site probably have a pretty good idea of which pads are routinely unoccupied, so do take advantage of the availability of pads throughout the site. I have never owned a pad license, and only once have I had to vacate a pad because the owner arrived just before sunset.

"Large non-member groups need to be better controlled", and *"Some nights, a cage for some of the public would be useful"*. The Anza site is for the use of OCA Members and their escorted guests. Most members, most of the time, bring one or two guests; and the club welcomes these people. If you are hosting guests at Anza, then it's a wise idea to let them know about the aspects of comfort, security and courtesy that are second-nature to experienced astronomers, but are not at all obvious to first-time visitors. This includes the wide range of temperatures at Anza, the resident critters, "no white lights", and care in walking around the site in the dark.

Members may also host larger groups at Anza – school classes, scout groups, etc. We have some special guidelines for larger groups. If you are going to host a group of more than 6 guests, then please read and follow the "Rules for Groups Visiting Anza", which is available on the club's website (at http://www.ocastronomers.org/resources/anza_site/). Key requirements are: inform Charlie Oostdyk of your planned date (so that we can ensure that the site isn't overbooked with two or more large groups); be sure that all of your guests get a copy of the guidelines (so that they'll understand the comfort, security, and courtesy expectations of an astronomical site), and – if your group is kids or teens – the OCA host is responsible for assuring that sufficient adult supervision is provided. In general, large groups should be scheduled for nights that aren't star party nights.

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besides astronomy-related activities. And Saturday and Sunday evenings feature the famous RTMC raffle – everyone present gets a ticket, you have to be present to win, and there are always some really great prizes and a lot of fun had by all throughout the drawing.

For more information on RTMC, including registering and getting meal tickets (if you're going to be there all weekend, that's the best way to go), accommodations (in my humble opinion, it's usually best to plan to camp or, if you need more comfort, bring an appropriate vehicle. But a lot of people enjoy staying in the bunkhouses, though it's first come, first serve and there's no real guarantee you'll get a bed), directions, etc., check the RTMC site: http://www.rtmcastronomyexpo.org.

If you come to RTMC – and I hope you will – we have long-standing tradition of taking a club group picture on Saturday after lunch. In the past we've taken the group pictures down by the meeting hall, but this year we're going to try it by the OCA booth. So please plan to be at the OCA booth at 1:00 for the OCA group picture, and bring any club members you happen to run into along with you!

In Closing

I had the unfortunate experience recently of losing everything in my email inbox, including a number of emails that I hadn't had a chance to respond to yet, and all attempts to restore the contents have so far failed. My apologies to anyone who might have sent me an email in March or April that should have had a response but didn't get one. If you were one of those and still need some kind of response from me, please email me again. And I want to thank everyone who has been re-sending information that was lost and that I still need – your help has made dealing with the results of the loss much easier!

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"I understand that the club in investigating wireless internal and a wireless network". This was a major addition to the Anza site infrastructure done shortly after the 2001 Member Survey. We've had a few setbacks, but with the energetic leadership of Vance Tyree, we're back on-line. Thank you to Vance, and the many other members who have contributed to this project!

"Need a weather station – internet accessible". We have one! See the OCA website... Alas, the sky-view weather cam has been malfunctioning, but all of the other weather sensors and information (including the "Clear Sky Clock") are up and running. And Charlie Oostdyk, Gary Schones, and Barbara Toy are working to resurrect the weather cam.

"Anza needs general maintenance and upkeep", and *"We need to clean the restrooms"*. These two comments are true, and always will be. If you are an OCA Member, then the Anza site is your site, and you are one of the people who should take initiative when something needs a little cleaning, straightening, or simple repair. For example – in each of the restrooms (at Anza house and the Observatory), there is cleanser, sponges, and a toilet brush. Don't be shy. In the Anza House, there is a vacuum cleaner and brooms. You are encouraged to use them!

"Please add trash cans". In the words of Don Corleone, "this, I cannot do." We do not have trash collection at Anza. Each of us is responsible for taking out everything that he or she brought to Anza, including packing out your own trash. Please also take the trash of any members or guests who "forget" to deal with their own. This is out site, and we are all responsible for protecting it and keeping it attractive!

Outreach Program:

The OCA has an active, and well-respected program supporting schools and community organizations with telescopes and opportunities for kids, teachers, and parents, to see some of the celestial treasures that we all enjoy. Jim Benet has been a wonderfully energetic leader of this effort, and has been supported to quite a few enthusiastic OCA Members. We received one comment on the outreach program in the 2001 survey: *"In my opinion, the club spends too much energy on outreach. We are doing a disservice to the average kids, leading them towards science. Let them become lawyers, realtors, plumbers, etc."* Huh? There's a saying in politics that "no good deed will go unpunished." I guess it's also true in astronomy!

SIRIUS ASTRONOMER
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The Newsletter of the Orange County Astronomers

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