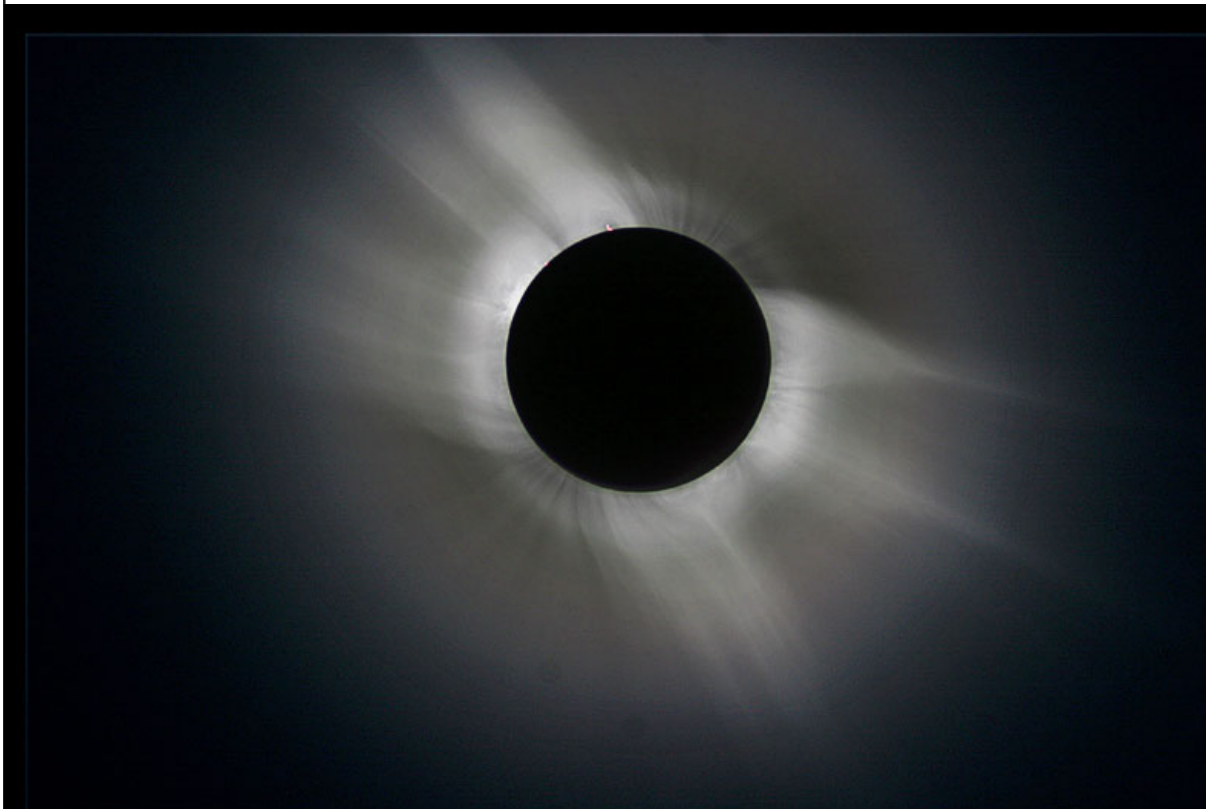


REMINDER: AUGUST MEETING RESCHEDULED TO AUGUST 4TH



OCA Member Daniel Schechter took this photo of the March 29th solar eclipse from Manavgat, Turkey. Six of Schechter's images were composited by Jim Windlinger to produce this spectacular image, which highlights the solar corona. Solar prominences are also visible at the upper left edge of the Sun's disk. More images--and Dave Kodama's exciting account of his experiences observing the eclipse from Libya--on pages 6 and 7!

OCA CLUB MEETING

The free and open club meeting will be held Friday, June 9th 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 OCA's own Chris Butler, with a presentation on the Queen Mary 2's floating planetarium!

Next General Meeting: July 14th

STAR PARTIES

The Anza site will be open this month on June 24th. The Black Star Canyon site will be open this month on June 17th. 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, June 2nd (and next month on July 7th) at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.

GOTO SIG: June 12th

Astrophysics SIG: June 16th, July 21st

Astro-Imagers SIG: June 20th, July 18th

EOA SIG: June 26th, July 24th

Dark Sky SIG: TBA (contact coordinator for details)

President's Message

By Barbara Toy

June is the month of the Summer Solstice, when the nights are their shortest and the days their longest. It also tends to be the time of "June gloom," so we may still be in for some overcast nights. The good news is that the nights are now getting warmer, so we don't need to bundle up the way we do in winter in order to enjoy a night's viewing (or imaging). Of course, with the nights so short, it's a lot easier to stay up all night when the viewing is good, whether you really intended to or not. And, with the delights of summer Milky Way coming into view earlier each night, there's a lot to look at!

Another Reminder of Work Needed at Anza...

Hopefully, by the time you read this, the weeds at Anza will be under control. After several members made a concerted effort to clear them in April – our thanks to all of those who helped in that clearance – a second round popped up in a lot of the areas that had been cleared. This, unfortunately, is the nature of the weeds out at Anza; frequently, we have to clear at least some areas more than once. Chances are that, as you read this, there are still areas where the weeds need to be cut back, even though I am writing this in the middle of May and people may have been out in the intervening weekends to clear out the new growth. Whenever you next go out to Anza, please go early and do some weed cutting – if everyone who uses the Anza site spends just half an hour cutting back the weeds and grasses, that would be more than enough to get the entire job done.

As those of you who use Anza house know, it needs regular vacuuming and cleaning, and it can use other maintenance, as well. Unfortunately, too many of the people who use it seem content to allow the cleaning and other maintenance to be done by others, even though all of that work is done by other club members as volunteers. This puts a heavy burden on the relative few who actually do the work of cleaning and maintaining the property. While you're out at Anza, please make a point of doing at least a little cleaning or other maintenance work – again, if everyone who uses the property spends just a half-hour once a month doing some maintenance, the entire job would be done.

For those who are interested in working on special projects, we have a number of those coming up. At this point, it appears that the observatory roof replacement will be seriously underway near the end of the summer and into the fall, and that will require help not only for assembling the new roof but for removing the old one. Don Lynn has kindly undertaken to do the installation of the Anza perimeter fence, which he is doing on an ongoing basis as he finds the time, and he could use assistance. There are a number of repairs that are needed in Anza house, and we eventually need to rework the warming room of the club Observatory, though not until after the roof is replaced. If you are interested in working on any of these projects, or if there are other projects around Anza that you would like to do, please let me know.

By the way, helpful people keep putting out trash cans in Anza house, and I'm sure they become annoyed when the trash cans regularly vanish. Unfortunately, we cannot get trash service at Anza, which means that everyone needs to remove their own trash when they leave. We have found repeatedly that, even though we have signs out reminding people that they need to take their trash out with them, when there is a trash can in Anza house, everyone assumes that whatever they deposit there will be taken care of by someone else. That "someone else" generally winds up being one of a fairly small group who all too often have to remove garbage left in Anza House by others, hopefully before it attracts too many of the local rodent population. The unfortunate but necessary result of this is that we cannot allow trash cans to be left for use in or around Anza House; there are holders on the wall of the main kitchen where people who are using Anza House can hang their own trash bags, and this has worked pretty well as an alternative to trash cans for the last few years.

Anza Site Development

Since I'm on the subject of Anza, here's an overview of what's been happening with the planning for further development of our Anza site.

Years ago, Riverside County approved a plan that served as the basis for the site development up until fairly recently. Unfortunately, we used up all of the building permits that were allowed in that original plan several years ago, which meant that the board could not approve any further structures on the site that would require a building permit. In order to develop the remainder of our site, we therefore needed to have a new overall plan, which was developed and submitted to the county about a year ago. The approval process took much longer than we expected, in part because the Planning Department has been swamped due to the incredible amount of development that has been taking place in Riverside County over the last few years. Our overall plan was finally approved, however, at which point the Anza Site Planning Committee started work on the specifics of how we are going to implement the overall plan.

The main area for new development is the northwestern portion of our property, which is generally the area that was burned over by the fire two years ago (although it is not the way we would prefer to do it, the fire did a good job of clearing out the undergrowth and brush, which will make clearing that area much easier). The overall plan provides for new areas for observatories as well as pads, but the area to be developed is rather steeply sloped, which means that we need to do quite a bit of grading to have enough level areas for roadways and parking as well as the pads and observatories themselves. Costs have gone up significantly since the last time we did any major grading on our site, and we are now trying to work out the best way to do the grading so that it will be affordable but will also allow us to maximize our use of the property.

Fortunately, we have a lot of practical knowledge to draw on from members of the planning committee, such as Gary Schones, who has been very much involved in the grading and other construction that has been done on our site since before Anza House was installed, Don Lynn, who has been the Anza Site Custodian for over 20 years and is intimately acquainted with all aspects of the site, Charlie Oostdyk, who was very much involved with earlier phases of development of the site and who also, as our treasurer since the 80's, knows how the financial and administrative side of past development of the site has been handled, and Leonard Vorhis, who has been a building inspector himself. The other currently active members of the planning committee are important to the overall success of the project, as well – Bob Buchheim (the chair of the group, and who was instrumental in developing plans that could be submitted to the county and in working with the county to get them approved), Tom Kucharski, John Castillo, Alan Smallbone and Jerry Floyd – and I try to help out where I can.

As part of the development process, the planning committee has been working on appropriate standards for construction on the Anza site. One of our concerns is that, as the area around us becomes more populated, we can expect more scrutiny from the inspectors than in times past, which means we need to be sure that any new buildings are up to code, and, ultimately, that any past construction is also brought up to the code where needed. As the growing number of lights around our site shows, we also have an interest in being seen as good neighbors in the growing neighborhood around us, which means, among other things, that we need all visible structures on site to be well maintained so that they are not eyesores for our neighbors or for other members using the site – besides the aesthetics, well-maintained structures signal a greater level of vigilance, which should make the site less attractive to potential troublemakers even when members are not actually around. At this point, we expect that the recommendations that the committee ultimately makes to the Board will include standards for work tables and storage on pads as well as standards for observatories and other buildings, and also timelines for completing construction once a specific construction request has been approved by the Board.

Along with construction standards, the committee has been revising and clarifying Anza site policies and procedures, particularly those related to member pads and observatories. In the past, there's been a lot of informality in the relationship between the licensees and the club, but, if all of the development shown on the plan that was approved by the county actually takes place, we will more than double the number of member pads and observatories, and the potential that such informal procedures will create problems or misunderstandings will be greatly increased. Since the membership of the Board changes over time, and licenses also change hands over time, the best way to ensure that what is expected of both sides in the license relationships remains clear is to set it down in writing. As you might expect, that is a challenging project –that is one reason our procedures have

(continued on page 8)

The Orange County Astronomers present an information-packed conference covering the latest in astroimaging and techniques.

- Presentations from well known astroimagers, including Rob Gendler, Robert Reeves, Chuck Vaughn, and others.*
- Keynote address by Tony Hallas*
- Print and Electronic image galleries*
- Tutorial sessions*
- Exhibitor displays*

For registration and updates: <http://www.ocastronomers.org/astroimage/>

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).



Who Wants to be a Daredevil?

By Patrick L. Barry and Dr. Tony Phillips

When exploring space, NASA naturally wants to use all the newest and coolest technologies—artificial intelligence, solar sails, onboard supercomputers, exotic materials.

But “new” also means unproven and risky, and that could be a problem. Remember HAL in the movie “2001: A Space Odyssey”? The rebellious computer clearly needed some pre-flight testing.

Testing advanced technologies in space is the mission of the New Millennium Program (NMP), created by NASA’s Science Mission Directorate in 1995 and run by JPL. Like the daredevil test pilots of the 1950s who would fly the latest jet technology, NMP flies new technologies in space to see if they’re ready for prime time. That way, future missions can use the technologies with much less risk.

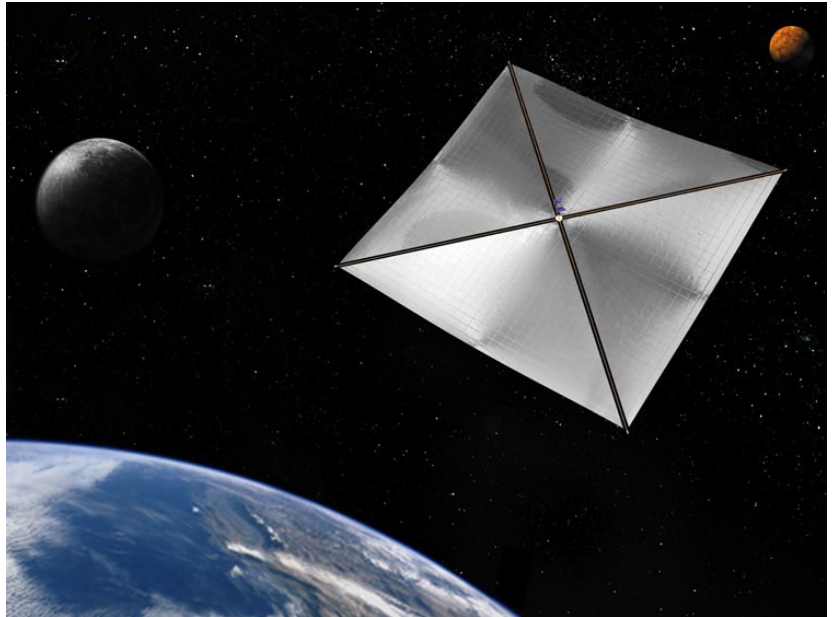
Example: In 1999, the program’s Deep Space 1 probe tested a system called “AutoNav,” short for *Autonomous Navigation*. AutoNav used artificial intelligence to steer the spacecraft without human intervention. It worked so well that elements of AutoNav were installed on a real mission, Deep Impact, which famously blasted a crater in Comet Tempel 1 on July 4, 2005. Without AutoNav, the projectile would have completely missed the comet.

Some NMP technologies “allow us to do things that we literally could not do before,” says Jack Stocky, Chief Technologist for NMP. Dozens of innovative technologies tested by NMP will lead to satellites and space probes that are smaller, lighter, more capable and even cheaper than those of today.

Another example: An NMP test mission called Space Technology 9, which is still in the planning phase, may test-fly a solar sail. Solar sails use the slight pressure of sunlight itself, instead of heavy fuels, to propel a spacecraft. Two proposed NASA missions would be possible only with dependable solar sails—L1 Diamond and Solar Polar Imager—both of which would use solar sails to fly spacecraft that would study the Sun.

“The technologies that we validate have future missions that need them,” Stocky says. “We try to target [missions] that are about 15 to 20 years out.”

A menagerie of other cool NMP technologies include ion thrusters, hyperspectral imagers, and miniaturized electronics for spacecraft navigation and control. NMP focuses on technologies that have been proven in the laboratory but must be tested in the extreme cold, vacuum, and high radiation environment of space, which can’t be fully recreated in the lab. New NMP missions fly every year and one-half to two years, taking tomorrow’s space technology for a daredevil test drive.



Artist's rendering of a four-quadrant solar sail propulsion system, with payload. NASA is designing and developing such concepts, a sub-scale model of which may be tested on a future NMP mission.

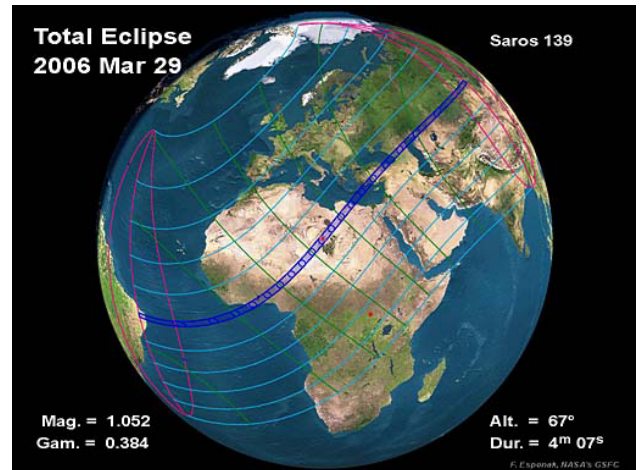
This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

The 2006 Total Solar Eclipse – An Adventure in Libya

by Dave Kodama

We OCA'ers, and indeed anyone in this hemisphere, have had it tough. The total solar eclipse of 2006, like many recent ones, was not an "easy" eclipse to get to. The eclipse started near sunrise in Brazil and raced away across the Atlantic, and into Africa and central Asia.

However, in my book, a 4-minute eclipse is a pretty decent show, and I had been anticipating going to this one for several years. But where to go? Popular possibilities were Egypt and Turkey. For me, the trip itself is at least half the adventure, and both countries fell into my BTDT (been there, done that) category. In fact, I had seen my first (successful) eclipse in 1999 from Turkey with Twilight Tours, which is run by OCA member Joel Harris. Libya, with its excellent weather prospects, stood out as a real possibility for an adventure, *if* we could get there, so when I got wind of a tour headed there (run by Spears Travel), I was signed up in a flash!



The road to Libya turned out to be a bumpy one. For many years, Libya had been marked by our government as a state that supports terrorism. Consequently neither the U.S. nor the Libyan government have allowed travel there by U.S. citizens for several decades, though citizens of other countries have visited in a small, but regular flow. Although relations were warming up again by the time the eclipse trip was offered, in late 2005, a glitch in relations occurred and U.S. citizens were again banned from entering Libya. Coupled with what seems to be normal procedure for North African government entities (based on my previous travel in Egypt), our tour visas did not get to us until just a few days before we were scheduled to depart!



Deluxe accommodations at Camp Sahara!

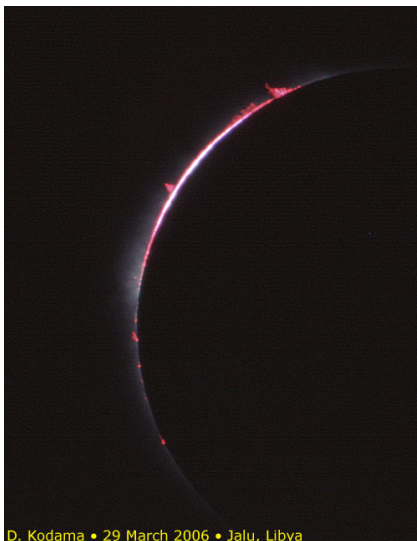
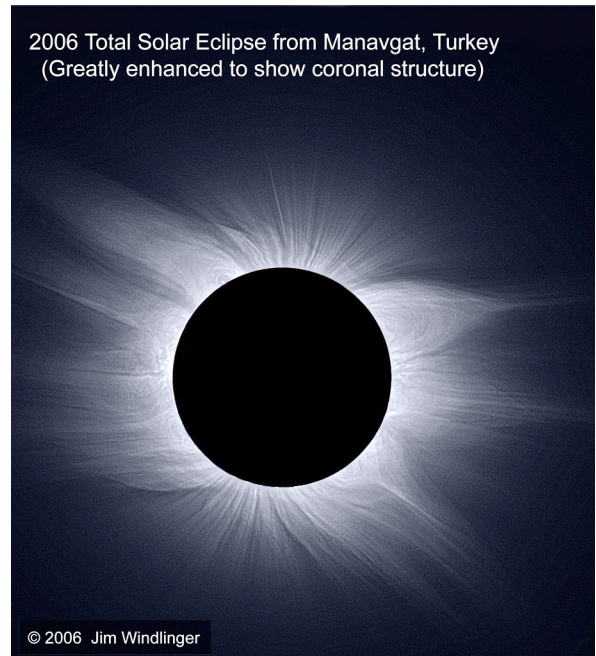
As it turned out, our little sub-group of ten U.S. citizens (on a pre-eclipse tour extension), plus two Germans, may have been the first to set foot in Libya as we arrived a week and a half early. Certainly eyebrows were raised at the international flight check-in in Chicago as well as upon entry into Libya! But it all turned out well. Both officials and ordinary citizens were very nice to us and of course curious about us. As in most places in the world, I found that official government positions don't reflect the attitudes of ordinary people. And also contrary to what you might be expecting, there was little sign of a military dictatorship. Ironically, the most fortified structure I noticed was Gaddafi's home, which I initially mistook for a prison – it had walls 15 feet high with guard towers every couple hundred feet.

Our little group was in Libya early to take a tour into the southwestern corner of the country, dominated by the Tuareg nomads. With their desert experience and uncanny navigational skills, the Tuareg have traditionally used camels to cross the desert. But since the old days, they have adapted to technology and now use Toyota Land Cruisers and cell phones! Our tour consisted of 5 Land Cruisers and a Toyota pickup truck carrying the expedition cooking gear and food. For five days we were on an adventure to cruise the open desert to see bizarre wind-carved rock formations, desert oases, and petroglyphs carved by people over 10,000 years ago when that part of the Sahara was open grassland with giraffes, elephants, and ostriches!

After our unique introduction to Libya, we joined the rest of our tour's eclipse chasers on a more traditional coastal tour where we visited numerous remnants of the ancient Greek and Roman empires that dominated the Mediterranean area for hundreds of years. But the real show was yet to come, and for that we had to travel to central/eastern Libya, south of the town of Jalu, to intercept the eclipse track.

Our target was a site prepared for us by the Libyan tour company working with our U.S. tour operator. A pre-eclipse reconnaissance by the group leaders exactly a year prior reported that it was indeed a good site with no obstructions (indeed, literally out in the middle of nowhere) and well off the two-lane "highway" that was the sole access route – at least that was the case before the Libyan company carved a road there and set up a tent city to house a reported 2000+ visitors! We were fortunately at the camp relatively early, but later reports indicate that the highway was completely clogged with additional day-trippers in buses from cruise ships that pulled in for the eclipse. A photo on the Internet showed a line of 40 buses that simply pulled over to the side for the eclipse because the highway was not passable. Coupled with helicopters flying VIP's in, satellite uplinks, a stage for nightly music, and vendor booths, I thought we had mistakenly ended up in a "Burning Man" festival!

Despite all the distractions, eclipse day went off fine. The skies were completely cloudless, there was very little wind and dust.



The eclipse occurred near noon in Libya and totality unveiled the long coronal streamers characteristic of a quiet sun, yet there were enough prominences to make the moments of 2nd and 3rd contacts very dramatic.

Totality flashed by in four all-too-short minutes, and it was no time at all before the visual observers were packing up and the hard-core eclipse chasers were already discussing the next eclipse. Only the dedicated photographers continued watching the sun until 4th contact.

Viewing was also successful for the other OCA members who traveled for this eclipse, so you will see many nice photos such as the composite at right by Jim Windlinger, who was on the Mediterranean coast of Turkey enjoying a less adventurous, but much more luxurious eclipse trip. Check the link below to a page on my web site for some of my online eclipse photos as well as links to other OCA member photos:

<http://www.eanet.com/kodama/astro/oca/tse2006.htm>

See you at the next eclipse!

To see more photos and video, come to the June 20th meeting of the Astromagers SIG (info on the OCA web site). If you're interested in eclipse photography yourself, the latter half of the meeting will be of special interest to you as Jim Windlinger and I plan to talk about what it takes to successfully come home with eclipse photos.

(continued from page 3)

remained informal in the past – but we feel that it is a necessary part of the planning process. That, by the way – to give credit where credit is due – is an aspect of the process that was initiated by David Radosevich during his presidency.

As mentioned in an earlier column, the committee has also been considering whether future observatory construction should be limited to one or more specific plans, and whether the club could or should provide a certain number of completed observatories, or make arrangements for approved kits to be used in constructing new observatories. We may be able to benefit from economies of scale if multiple observatories are built to the same design at the same time, or if we can order multiple kits for identical observatories, though that is not a certainty. We are also looking at the possibility of providing metal observatories, or kits for metal observatories, that would be along the lines of the observatory built by Dave Radosevich, Jim Hannum and John Kearns. Some of the advantages of this type of observatory are that they cool down quickly, they are easier to maintain and to keep rodent-proof, all-metal moving roofs are lighter than comparable wooden roofs, and the interior floor space is maximized because the walls are much thinner than with other types of construction; many people prefer wood because they find it easier to work with, however. At this point, we are attempting to get price estimates for the various proposals under consideration, which will help us determine how feasible they are.

Realistically, we are still several months away from breaking ground on new development. However, if you're interested in having an observing pad or observatory at Anza, and you are not yet on the pad or observatory interest list, please contact me to be put on the list. At this point, we have six people on the pad interest list, and 15 people on the observatory interest list; if you are interested, I would suggest you have yourself added to the appropriate list as soon as possible.

Starbecue in July!

On a lighter note, remember that our July star party at Anza is our annual Starbecue – that is, our big potluck party out at Anza, where everyone brings a dish or something to grill for 8-10 people, the club provides drinks, paper plates, utensils, and the barbecue, and everyone has a really great time eating and cooking and socializing as a prelude to a great night of observing or imaging (or both). This is all happening on July 22, and we'll be setting up around 5:00 behind the club observatory, where there'll be a growing patch of shade by then. The barbecue will fire up around 5:30, so people who bring things to grill can get started, and we expect people will be seriously diving into the food by 6:00. It's a good idea to bring your own folding chair if you want to sit down while eating – we can provide a few seats, but not very many.

We can always use help in setting up and in cleaning up afterwards – so please plan to lend a hand. And, if you bring something that isn't completely gone by the end of the party, please take it home with you – remember that we have a limited ability to preserve (or use) leftovers out there, and it's very discouraging to have to throw out a lot of good food that people left behind at the end of the party.

These are always a lot of fun, even when the weather isn't helping us out much – last year, our area was hit with an intense thunder storm just hours before the party, but we all had a great time anyway – so come on out for a great time at the

Starbecue, and bring your family, too!

In Closing

As I write this, I just received notice from Scope City's Orange County store in Costa Mesa that they are including promotions for the club in their Meade Day event on June 10 – that's very generous of them, and we are very appreciative of their support. If you see this before June 10, you should check that out – it looks like it will include activities like cleaning and maintaining optics on Meade equipment, help with problems you might be having with any Meade equipment, and lots of interesting demonstrations, as well as a raffle.

And don't forget to register for AstroImage 2006 – it's coming up fast! The pre-registration rate is only \$95 (the price for the imaging conference on the East Coast that same weekend is \$225 – so ours is a real bargain, and with a great speaker lineup). See you there!

© Barbara Toy, May 2006

ATTENTION READERS!!!!

Thieves broke into the three domes of the Pima College-East Campus Observatory sometime on the night of May 24th. The following equipment was stolen:

1 vintage C-14 S/C telescope and its mounting wedge

1 Coronado Solar Max 90 H-alpha solar telescope

1 Coronado Ca11 40 solar telescope

1 Losmandy Equatorial mount

3 Video cameras

1 Video monitor

Other assorted pieces of equipment were stolen as well. A complete inventory is to be made. The Ca11 solar telescope was piggy back mounted on the Solar Max and both were mounted on the Losmandy Mount. The power supply for the C-14 was not taken. If you hear of anyone wanting to sell the above-mentioned equipment please contact me and the Pima College Police at 520-206-2700.

Thanks for your help.

David Iadevaia

Pima College - East Campus

Tucson, AZ

ASTROSPACE UPDATE

June 2006

Gathered by Don Lynn from NASA and other sources

Chandra (X-ray space telescope) has imaged several supermassive black holes at the centers of elliptical galaxies, and the images have been used to study the jets of material being ejected from these. The power of the jets was calculated from how they cleared cavities in the hot gas of the galaxies. Surprisingly there is more power in the jets than is emitted in visible light or X-rays from the accretion disk about the black holes. The amount of material falling in was also measured. The black holes were found to be highly efficient in changing the energy of infalling matter into energy in throwing matter back out in the jets. The study also showed that the rate of infalling material has been fairly steady for several million years. The jets were found to be heating the gas in the galaxy tending to prevent it from cooling enough to form new stars, thus limiting the star formation rate.

HESS (Earth-based gamma-ray telescope) – All light emitted by all objects in the Universe for all time forms a diffuse sea of photons that permeates space, and is called the extragalactic background light (EBL). Scientists have long tried to measure this, but have not been very successful. HESS has observed several very distant quasars in high-frequency (high-energy) gamma-ray light to see how much the gamma rays are absorbed by collisions with EBL photons during their trip across much of the Universe. From this an upper limit was calculated on how bright the EBL is, and it is remarkably lower than previous estimates. That's good news if you are a gamma-ray astronomer, since the Universe is more transparent to high energy gamma rays than previously thought.

Neutron star seismology – Scientists used the Rossi X-ray timer and other spacecraft to monitor a large explosion, called a hyperflare, on a neutron star. This caused a massive starquake and measurements of the vibrations ringing through the star allowed the calculation of the thickness of a neutron star's crust for the first time. It's a mile thick, about what had been predicted. Theoretically neutron stars are only 12-24 miles in diameter, though the size of one has never been measured. The neutron star on which the hyperflare occurred is a magnetar, that is, a neutron star with an extremely strong magnetic field. A hyperflare is a sudden change in the magnetic field that cracks the star's crust. Starquake seismology may allow determination of many neutron star properties, such as whether quark cores exist in neutron stars, so further observations will be attempted as other hyperflares occur.

Mars Express has completed an extensive map of minerals across 90% of the surface of Mars. Analysis shows that there are 3 different types of surface that were formed at different times. About 4.5 to 4.2 billion years ago clay surfaces formed, probably in a warmer moister climate. About 4.2 to 3.8 billion years ago planet-wide volcanic activity occurred, forming lava surfaces that appear to have been altered by sulfuric acid rain. Since that time rocks mainly slowly weathered, apparently with a dry climate. Very few water-related events seem to have occurred during this time. The red color of rocks on Mars probably happened during this final period. If life formed on Mars, it would probably have been during the first period, when water was apparently more plentiful. So future landing missions looking for life should probably look in the clay areas left from this early period. The water may have disappeared by going underground, so that may be the place to look for life.

Wobbling neutron star – Scientists using the XMM-Newton X-ray orbiting telescope have been observing a neutron star (pulsar) that appeared to get hotter then cooler over the past few years. It is extremely unlikely that a pulsar could evolve this quickly, so other explanations were looked for. It is believed that pulsars, especially ones with extremely strong magnetic fields like this one, have hot spots near the magnetic poles. Computer models of a pulsar show that it would show exactly the observed change in temperature if its rotation axis is wobbling (precessing) with a period of about 8 years. The hot spots then come in and out of our direct view, changing the apparent temperature. Such precession would occur if the pulsar is not quite spherical. The extremely strong magnetic field may cause a non-spherical shape. The computer modeling shows that the two poles must have somewhat different sizes and temperatures of hot spots to match the observations. Seeing a pulsar from different directions, possible only if it precesses, can be a powerful tool in understanding the evolution, geometry and structure of neutron stars, so of course further observations are planned.

XMM Newton (European X-ray space telescope) has observed vast clouds of very hot gas whirling around the neutron stars in binary systems known as low mass X-ray binaries (LMXBs). Such systems were known to pull matter from the companion star onto first an accretion disk, then onto the neutron star itself, due to the extreme gravity of the neutron star. The newly discovered clouds form where the material falls into the accretion disk. The clouds are 10 to 100 times the size of the Earth and consist of ionized (without its electrons) iron vapor and other material at temperatures of many millions of degrees. This probably explains why some LMXBs blink on and off. This cloud periodically obscures the neutron star's emission, causing it to blink out.

What would happen if you forgot to turn off the camera while your space telescope was slewing to a new object? **XMM Newton** answered this question when the controllers intentionally started leaving the camera on. The result is that over one quarter of the sky has been randomly imaged during slewing. They expect to eventually cover the entire sky, all for free. The images pick up only brighter objects because any object remains in the field of view only 10 seconds during slewing, but that is enough to rival or exceed all surveys done in the past with less sensitive X-ray telescopes. Many new objects have been found, as well as changes in objects previously observed.

Cassini (Saturn mission) – It has been known for centuries that various latitudes of the gas giants, including Saturn, rotate at different speeds, so measuring the length of the Saturn day (time the interior takes to rotate once) is difficult. In the 1980s
(continued next page)

Voyager overcame this by measuring the rotation rate of radio emissions from Saturn, which were thought to come from deep within the planet, so would reflect the true rotation of the interior. Unfortunately, radio measurements made since then, including those by Cassini, found that the radio rotation rate keeps changing. There is no way that as massive a planet as Saturn could change rotation rate in a few years, so the conclusion was that the radio sources are not really deeply rooted in the planet. So Cassini scientists looked for features in the magnetic field that could be identified with each rotation, since the magnetic field is certainly deeply rooted. Analysis of the magnetic measurements shows that a Saturn day is 10 hours, 47 minutes, 6 seconds (+ or – 40 seconds). This is several minutes slower than any of the radio measurements.

On last day of April, Cassini made its 14th flyby of Titan, and it **radar mapped** the area known as **Xanadu**, one of the most prominent features. The image shows numerous curvy features that may be frozen fluid flows (like lava), 2 prominent circular features that are probably impact or volcanic craters, and many sand dunes. Communication was interrupted right after the Titan flyby, but a contingency plan put in place ahead of time saved most of the data. The outage has been tentatively blamed on a cosmic ray hit on a power switch. 9 more flybys of Titan are scheduled for 2006, including one in May.

Until recently, many astronomers believed that the dark smooth areas seen on Titan in infrared were oceans of liquid methane or ethane. The Cassini and Huygens spacecraft observations showed they weren't smooth enough to be liquid. New analysis of Cassini radar observations indicates that they are plains covered in **sand dunes**. The radar images are strikingly like those made of dunes in Namibia and Arabia here on Earth, even though Titan differs from Earth in many ways: denser atmosphere, lower gravity, far colder temperatures, different chemistry of surface material, and much smaller winds. In fact a decade ago, astronomers predicted that Titan would have practically no wind, since solar heating, which causes winds on Earth, is nearly 100 times weaker on Titan. Therefore it should have no wind-blown sand dunes. But recent findings show that tidal pulls from Saturn's massive gravity drive winds on Titan. Such winds are typically only about 1 mph, but with the reduced gravity and denser atmosphere of Titan, this is enough to form dunes. It is an unexpected bonus that the radar mapping of Titan is finding so many dunes that tell us much about the winds there. The question now is how the sand formed. It is proposed that erosion by flowing liquid methane can grind up the icy rocks into sand. Images of Titan taken by Huygens showed channels apparently formed by flowing liquid methane during methane rainstorms. Another theory is that organic solids result from photochemical reactions in Titan's atmosphere. This would be like smog so thick that it rained sand.

Analysis of the highest resolution Cassini images of Saturn's **A ring** has found 4 propeller shaped features, that is, 2 nearly straight lines offset slightly from a central point. Such shapes had been predicted by computer simulations of a very small moon orbiting within dense parts of the ring. The moon's gravity collects tiny ring particles into these two lines. The moons themselves were too small to see, but would have to be about 100 yards in diameter to produce these effects. Moons of this size are likely chunks of the larger body that is thought to have broken up to produce the rings. The high-resolution images covered a tiny fraction of the complete rings, and projecting the count of 4 to the whole ring system says that millions of these small moons exist orbiting within the rings. Only two moons have been seen

orbiting within rings, 19 mile wide Pan and 4 mile Daphnis. Those are too large to produce propeller features, but instead clear gaps in the ring. It is possible that these 2 are simply the largest of a huge population of small moons within the rings.

The narrow **F ring** of Saturn has been known for some time to be shepherded by the moon Prometheus, orbiting just inside the ring, and Pandora just outside. New study of Cassini images of the F ring show structure never before seen in a planetary ring. There are channels or gaps in the ring, and streamers in it. When Prometheus passes ring particles, it gravitationally pulls some of them out, leaving the channels. However, the particles later slowly move back into their positions in the rings, so the channels are temporary features. It is predicted that in 2009 Prometheus's apoapsis (far point in its orbit) will align with the ring's periapsis (near point in its orbit), and this will accentuate the channel effect. When it was first noticed that particles were moving out of the ring when Prometheus passed, some scientists dubbed the moon "the thieving moon". Now that may have to be softened to "borrowing moon". Theoretical work shows that some of the particles borrowed by Prometheus will strike the moon rather than being allowed to return. Because the moon always keeps the same side facing Saturn, any such particles striking Prometheus should hit it on the trailing side (orbital mechanics causes this), near the equator. Images will be made of this area of the moon to look for evidence of particles having struck there.

The observation of the **rings** passing in front of (**occulting**) a star made last May has been analyzed. Some places in the rings were found to be somewhat more dense (up to 35% more) than what the Voyager spacecraft found from a similar observation made in the early 1980s. The ring particles were found to be arranged in essentially parallel long stringy clumps, as large as 60 feet across, 16 feet thick and 160 feet long. Gravity of the planet, moons, and ring particles causes such clumps to form, tear apart, and reform continuously.

Mars rovers have operated more than 8 times as long as their originally planned 3-month mission, and have returned more than 150,000 images. Each has driven more than 4 miles. The rover project manager at JPL has moved to the Mars Reconnaissance Orbiter team, and was replaced by the former rover science manager.

Rover Spirit has experienced a failure of the motor in the right front wheel, so it has been driving backwards, dragging the bad wheel behind. It has slowed operation a little, chiefly in having to choose easier routes, with fewer steep slopes or soft spots, and to check for the other wheels slipping. This is the same wheel that was consuming too much power, apparently because of poor lubrication, back in 2004, but had been working well ever since controllers ran the wheel forward and back to distribute lubrication in it. When level, Spirit's solar panels will not produce enough power during the depths of Martian winter to power the rover. So as winter approaches, rover controllers have navigated Spirit to an area where it can spend the winter on a slope tilted toward the Sun to increase power. The area reached was the second choice of places with the right slope, as the route to the first choice proved to have too much soft material where the rover wheels slipped. Controllers expect to remain on the slope for about 8 months, and plan to do several long-duration studies, including mapping rocks and soils, monitoring clouds and other atmospheric changes, watching for surface changes due to wind, and tracking surface temperature changes.

Rover Opportunity is closer to the equator, and so is affected less by the low angle of the winter sun. It recently finished 4 months of observing around Erebus Crater, where it examined layered outcrops of rocks. Controllers have developed methods of dealing with the motor that sometimes stalls when moving the rover's arm, which holds the spectrometers and microscopic camera. The rover is now on a 1.2 mile journey to Victoria Crater, which will be by far the largest crater yet seen close up. This will allow examination of deeper layers of rock that were punched through when the crater formed.

Changing supernova explained – Supernovas are classified by the features in their visible-light spectra. Hydrogen features in the spectra make a supernova a Type II. Once in awhile the hydrogen features soon disappear, and these have been termed Type IIB. Normally a supernova without hydrogen features is classified Type I. Supernova 1993J was one of those that changed features, and was reclassified IIB, and it was later found to have a companion star orbiting it that disrupted the hydrogen content and therefore caused it to soon lose the hydrogen features. Supernova 2001ig was more recently one of those that lost its hydrogen features, and the question was raised whether it too had a companion star that disrupted the hydrogen. Recent images from the Gemini South 8-meter telescope in Chile found the companion star. 2001ig was discovered in spiral galaxy NGC 7424 by renowned Australian amateur astronomer Bob Evans, who spoke to OCA many years ago. Further observations will be made to learn more about this unusual type of supernova.

Venus Express (European Venus mission) has returned the first ever pictures of the planet's south pole, showing a dark vortex of clouds almost directly over the pole. A similar one was known at the north pole. Venus Express is the first Venus orbiter using a polar orbit. The spacecraft initially went into a very high orbit, from which it can take images including the entire planet. So such were taken before the orbit was lowered to its final position, from which much higher resolution images are being taken of smaller areas. The magnetometer and plasma instruments were successfully tested.

Gamma ray bursts (GRBs) are some of the most powerful explosions known, and the question has arisen whether it is likely that one will occur near enough to Earth to endanger life here. Recently it has been shown that GRBs (except the very short ones) occur as part of the supernova explosion of certain very massive stars at the ends of their lives. It has been calculated that one within about 3000 light-years would wipe out a lot of life. A new study of the galaxies in which GRBs have been seen indicates that they usually occur in galaxies that are small (our Milky Way is rather large among galaxies), irregularly shaped (the Milky Way is a regular spiral), and scarce in heavy elements (the Milky Way is fairly rich in them). It appears that smaller irregular heavy-element poor galaxies are much more likely to produce the very massive stars that end their life with a GRB. The one GRB in the study that occurred in a galaxy with moderate heavy-element content was also the least powerful burst. The conclusion is that only 1/6 of 1 percent of GRBs occurs in galaxies like ours. So it is quite unlikely that a GRB will happen in our Milky Way, much less in the 0.1% or so of it near enough to us to pose a danger. This probably rules out the theory that one or more of the mass extinctions known from the fossil record were caused by a GRB.

Lunar rocks – A new analysis of lunar rocks brought back by the Apollo missions shows that considerable amounts of rock were melted during a 100 million year period 3.9 billion years

ago. This implies that this period had a much greater incidence of asteroid impacts on the Moon than before or since. The Earth's rocks of that age have almost entirely been destroyed by tectonic movement and erosion, but it is safe to assume that Earth was similarly bombarded at that time. It was already known that several prominent lunar craters formed during this time period. This is coincidentally about the time that the oldest known fossils of simple Earth life formed. Possible explanations for this impact activity are: collisions in the asteroid belt, collision of 2 planets, scattering of comets or Kuiper Belt objects by a movement of Neptune's orbit, or scattering of objects by a passing star. About 50 different lunar rock samples were studied, and all but a few of them contained material that had melted during this time period 3.9 billion years ago. The samples contained different chemicals, indicating they were from many different impacts. The ages were determined from the trapped argon gas generated from radioactive decay of a form of potassium.

Instant AstroSpace Updates:

CloudSat & Calipso, spacecraft to measure clouds, precipitation and aerosols in the Earth's atmosphere using radar and lidar (laser radar), were launched into polar orbit in May. They are expected to improve our abilities to forecast weather and predict climate change.

NASA announced it contracted with the X Prize Foundation to run a **competition** (held in New Mexico, not on the Moon) to design, build and demonstrate a **lunar-lander-like vehicle** that will take off vertically, hover, and land on a target. A \$2 million prize is offered for the winner, similar to the X prize recently claimed for the first private spacecraft to reach space. ■

FOR SALE Desert Oasis with an eye on the sky—Custom Santa Fe and Observatory. Hill top location on 5 acres, 5000' under roof, 3 bedrms, 4 baths, spacious kitchen, family rm, great rm, formal dining, hobby & work rms; Ceilings 8' to 14', large covered flagstone patio and garden entryways, Private courtyard off master bedrm, 3 fireplaces. Detached 288 ft² observatory (12' x 12' lab with computer controls; 12' x 12' observation deck; and 12' x 12' storage area under observation deck), 10' steel ASHDOME, CELESTRON C14 (hand picked mirror) white OTA, PARAMOUNT GT-1100S, MERIDIAN SYSTEMS dome control hardware & software. See attached website & links for more details, photo gallery, virtual tours, etc. Contact Ernie Bigsby (623-826-8051); Dave Bigsby (623-826-8053) or ebigsby.mywindermere.com (MLS# 2428445).

FOR SALE Two full Starlight Xpress CCD Systems, model ICX027. 500 pixels per line X 256 useable lines. Sony chip ICX027 with interface card for frame grabber and interface box for parallel port. Also includes computer with TheSky, Adobe Photoshop, and other CCD processing programs. All documentation, cables, frame grabber monitor. Originally \$2000 each; asking only \$800 for both. Can provide assistance in learning the system once it is set up. Jim Leonard, First Light Observatory, Inyokern, CA 760-

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