SIRIUS ASTRONOMER

www.ocastronomers.org

The Newsletter of the Orange County Astronomers

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REMINDER: AUGUST MEETING RESCHEDULED TO AUGUST 4TH

OCA members invade the Riverside Telescope Makers Conference (RTMC) in May. If you didn't make it this year, be sure to join us next year!!!!

OCA CLUB MEETING

The free and open club meeting will be held Friday, July 14th 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 Scott Roberts of Meade Corporation, discussing exciting new products!

Next General Meeting: August 4th

STAR PARTIES

The Anza site will be open this month on July 22nd for our annual Starbecue. The Black Star Canyon site will be open this month on July 29th. 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, July 7th at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.
GOTO SIG: TBA (contact coordinator for details)
Astrophysics SIG: July 21st, Aug. 18th
Astro-Imagers SIG: July 18th, Aug. 15th
EOA SIG: July 24th, Aug. 28th
Dark Sky SIG: TBA (contact coordinator for details)

President's Message

By Barbara Toy

It's hard to think of July as a month when the nights are getting longer, especially when dawn shows up so fast when the viewing is good, but that is truly the case – the Summer Solstice in June marks the longest day and the shortest night of the year, and after that the days get shorter even as they get hotter with the full heat of summer. On the brighter side, the heat of summer makes July and August months when we can observe comfortably all night without bundling up in anything heavier than a light jacket (if that), which feels almost luxurious compared to winter.

If you've ever thought that spending a night viewing celestial delights is something that only the physically hardy can enjoy, you'll be pleasantly surprised by a summer night of viewing out at Anza, where the comforts of indoor plumbing, Internet access and ready access to such conveniences as refrigerators and microwaves on top of comfortable night temperatures make viewing a good experience for even the least hardy among us. So I hope all of you who haven't yet made it out to Anza will plan to give it a try this summer – and be sure to visit the club observatory at some point when you're out there!

Meeting Alert! The August General Meeting will be the *First* Friday in August!

If you are one of those people who goes on autopilot when it comes to club meeting dates – please reset that autopilot for the August general meeting! We usually have our meetings on the second Friday of the month, but, unfortunately, that conflicts with our AstroImage 2006 Conference (which is August 11-13). The first and second weekends in August were our best options for the conference (we didn't want to conflict with dark sky weekends), and the Curtis Theatre in Brea, where we're holding the conference, wasn't available for the first weekend in August – so we had to take the weekend we could get, even though that meant moving the general meeting. I'm sorry for the inconvenience, but for those of you who will really miss going to a meeting on the second Friday in August – the conference makes a very nice alternative!

So, the schedule for August is: General Meeting on August 4, 2006; AstroImage 2006 Conference on August 11-12, with the optional Palomar tour on August 13. The August star parties and the Special Interest Group meetings will remain on their regularly scheduled dates.

Please note, however, that the August session of our regular Beginners Class, which would normally be held on August 4, has been cancelled because of this change of schedule.

Why You Really *Want* to Attend AstroImage 2006!

Back when we were ramping up for AstroImage 2004, members of the planning committee came up with a list of reasons people should come to the conference – it didn't include every possible reason, of course, but we did come up with a bunch of good reasons and had fun doing it. I was looking at that list recently, and found that (Big Surprise!) it basically applies to our 2006 conference, as well. So, here's an updated list, with commentary, of some excellent reasons to come to AstroImage 2006:

- Ø Seven great speakers – talks from some of the best in the field to help hone your skills!
- Ø Learn advanced Photoshop techniques from Tony Hallas Friday night – his class at RTMC sold out early, with reason!
- Ø Learn the basics on using DSLRs for astrophotography along with DSIs and other new low-cost CCD cameras at the Beginners' session Friday night!
- Ø Reception and social hour Friday night to kick things off!
- Ø Great pictures! (We're expanding the print gallery, which was spectacular in 2004, and we'll also have a digital gallery slideshow running continually on multiple computer monitors.)
- Ø Show your stuff in the gallery, see what others are doing! And reserve space for your own prints early – though expanded, space is limited!
- Ø Chance to meet "big name" speakers in person! (Ron Dantowitz, Tony Hallas, Rob Gendler, John Laborde, Robert Reeves, Chuck Vaughn – they don't get much bigger in astrophotography circles!)
- Ø Talk "shop" with new imaging buddies over lunch and dinner! (And meet people in person you know from imaging email groups at the reception Friday night!)
- Ø Catch up on what your tried and true imaging buddies are doing! (RTMC isn't the only place to catch up with old friends!)

- Ø Demonstration display of telescopes and imaging equipment – see how it all goes together! (And this time we'll be giving you a chance to ask the owners about their setups – check your program for times!)
- Ø CD of conference proceedings – catch what you missed the first time through! (With speakers covering so much information, it's hard to catch it all – and don't forget, thanks to Liam Kennedy, we'll have a DVD of the talks available for purchase, as well!)
- Ø Great vendors of scopes, mounts, cameras and other fun equipment! (We've got a great set of sponsors who'll be there demonstrating their products, with great things for you to look at, talk to them about, and to buy – our thanks to Quantum Systems, Astro Hutech, Oceanside Photo and Telescope, Diffraction Limited, Yankee Robotics, Advanced Telescope Systems, SoCal Astro and WAA for helping to make this conference possible!)
- Ø Show specials! (Thanks to our great sponsors!)
- Ø Good food! (We're working with the same caterer as in 2004 – their food was really great! And this time we're arranging for vegetarian meals, as well.)
- Ø Special astroimaging tour of Palomar, with Scott Kardel – only a limited number can go, so register and reserve your spot early!
- Ø Order your own size of conference Astro-wear – T-shirts, polo shirts and baseball caps (but do that by 8/1!)
- Ø Free parking! (And it's even covered!)
- Ø Doorprizes!
- Ø Show support for your club!
- Ø "Early bird" discount – sign up by 8/1 and save $15! (almost 15% off the price at the door!)

And, best of all – **it's *fun*!**

That, of course, is just a short overview. For more information on the speakers, their talks, and the other aspects of the conference, and to register, sign up for the Palomar tour, order conference Astro-wear, etc., please check out our conference webpage – http://www.ocastronomers.org/astroimage/2006/ (or you can link to it from the club's homepage by clicking on the banner at the top of the homepage). If you have questions about the conference, feel free to email me or ask any of the members of the conference planning committee. And, if you'd like to volunteer some time to help out with the refreshment table, the club's booth, setting things up or taking things down, or for any of the other areas where we find a helping hand is needed, please let me know!

We've still got a ways to go and a lot to do before the conference, but I'd like to thank the other members of the AI 2006 Planning Committee for all of their hard work in putting this conference together – Dave Kodama, Garth Buckles, Jim Windlinger and Tom Kucharski. Dave has been instrumental in getting our speakers, Garth has done a wonderful job working with our sponsors, Jim made the arrangements for the Astro-wear and has put tremendous amounts of hard work and creative energy into improving the equipment for the print gallery, and Tom has been working hard at getting information about the conference out to other clubs – and they've all done a whole lot more than that to make this conference a reality.

In addition, I'd like to thank the group who might be considered "sleeping" members of the planning committee – Charlie Oostdyk (who has provided a lot of information and advice and handled such things as mailing out the conference flyers, and who deals with all of the registration matters, among other things), Liam Kennedy (who will be videotaping the conference and setting up the video streaming), Alan Smallbone (who is the speaker for the Beginners session and who has contacted potential sponsors, helped with publicity, and drafted the conference ads for the Sirius Astronomer, among other things), and Bill Patterson (who chaired the planning committee for 2004, and who has provided information and advice, as well as his support as the Chair of the AstroImage SIG). As you can see, organizing this conference is a joint effort by a lot of talented and very helpful people!

So – another good reason to come – seeing all of you there, learning and having a good time, is what makes the effort worthwhile. So, get your registrations in, and I look forward to seeing you all out by the Curtis Theatre in Brea on August 11, for a truly great AstroImaging conference!

Pad and Observatory Lists

Now for a complete switch in topics – for the past three or four years, I've been the keeper of the club's Pad and Observatory Interest lists. These are the lists of people who are interested in building pads or observatories when we are finally able to open new areas of the Anza site for construction. In case there are people who think they are on the list but who have somehow been missed, I am setting out both of the current lists below; if you want to be added to (or deleted from) either list, please email me at btoy@cox.net.

(continued on page 8)

See us at **ASTROIMAGE 2006**
Register Now! August 11-12, 2006 • Curtis Theater, Brea, CA
Orange County Astronomers

Come to Orange County Astronomers' information-packed conference covering the latest in astroimaging and techniques!

- *Presentations from well known astroimagers, including Rob Gendler, Robert Reeves, Chuck Vaughn, Ron Dantowitz John Laborde and others.*
- *Keynote address and Advanced Photoshop class by Tony Hallas*
- *Print and Electronic image galleries*
- *Tutorial sessions*
- *Exhibitor displays - and More!!*

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

Our thanks to our generous sponsors:

Quantum Systems; Hutech Astronomical Products; Oceanside Photo and Telescope; Diffraction Limited; Yankee Robotics; Advanced Telescope Systems; SoCal Astro and Western Amateur Astronomers

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.

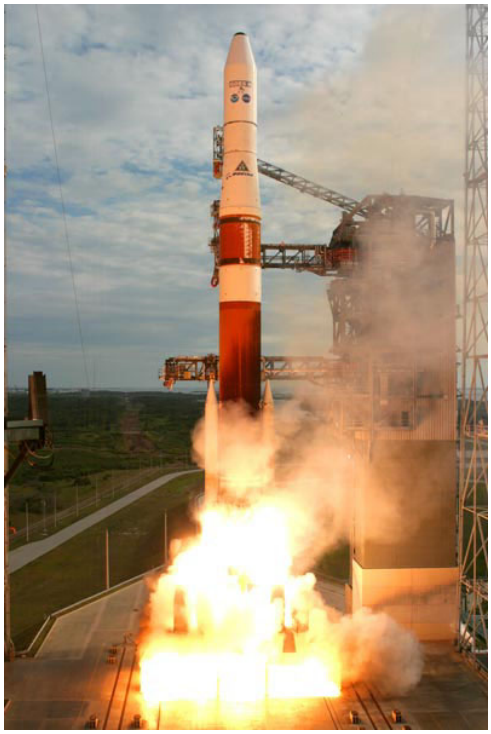
TECHNICAL ASSISTANCE NEEDED FOR OUR WEBSITE

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).

From Thunderstorms to Solar Storms...

by Patrick L. Barry



New GOES-N satellite launches, carrying an imaging radiometer, an atmospheric sounder, and a collection of other space environment monitoring instruments.

When severe weather occurs, there's a world of difference for people on the ground between a storm that's overhead and one that's several kilometers away. Yet current geostationary weather satellites can be as much as 3 km off in pinpointing the true locations of storms.

A new generation of weather satellites will boost this accuracy by 2 to 4 times. The first in this new installment of NOAA's Geostationary Operational Environmental Satellites series, called GOES-N, was launched May 24 by NASA and Boeing for NOAA (National Oceanic and Atmospheric Administration). (A new polar-orbiting weather satellite, NOAA-18, was launched May 2005.)

Along with better accuracy at pinpointing storms, GOES-N sports a raft of improvements that will enhance our ability to monitor the weather—both normal, atmospheric weather and "space weather."

"Satellites eventually wear out or get low on fuel, so we've got to launch new weather satellites every few years if we want to keep up the continuous eye on weather that NOAA has maintained for more than 30 years now," says Thomas Wrublewski, liaison officer for NOAA at NASA's Goddard Space Flight Center.

Currently, GOES-N is in a "parking" orbit at 90° west longitude over the equator. For the next 6 months it will remain there while NASA thoroughly tests all its systems. If all goes well, it will someday replace one of the two active GOES satellites—either the eastern satellite (75°W) or the western one (135°W), depending on the condition of those satellites at the time.

Unlike all previous GOES satellites, GOES-N carries star trackers aboard to precisely determine its orientation in space. Also for the first time, the storm-tracking instruments have been mounted to an "optical bench," which is a very stable platform that resists thermal warping. These two improvements will let scientists say with 2 to 4 times greater accuracy exactly where storms are located.

Also, X-ray images of the Sun taken by GOES-N will be about twice as sharp as before. The new Solar X-ray Imager (SXI) will also automatically identify solar flares as they happen, instead of waiting for a scientist on the ground to analyze the images. Flares affect space weather, triggering geomagnetic storms that can damage communications satellites and even knock out city power grids. The improved imaging and detection of solar flares by GOES-N will allow for earlier warnings.

So for thunderstorms and solar storms alike, GOES-N will be an even sharper eye in the sky.

Find out more about GOES-N at goespoes.gsfc.nasa.gov/goes . Also, for young people, the SciJinks Weather Laboratory at scijinks.nasa.gov now includes a printable booklet titled "How Do You Make a Weather Satellite?" Just click on Technology.

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

Kaurna Night Skies

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Before Europeans first came to colonise the Adelaide Plains of South Australia in 1836, the night skies would have been truly dark by today's standards. There was no street lighting, no security lighting and no industrial pollution to obscure the view of our galaxy. However, within a short period of time of just over 150 years South Australians have managed to create a large metropolis of approximately 1 million people with industries, communities and lots of street lighting. And although Adelaide's skies are still quite good by world standards, this light pollution has managed to obscure the faint light, which has often been travelling for aeons from reaching the Earth and the Adelaide Plains.

Sadly few people now give thought to the original inhabitants of Adelaide Plains the Kaurna People. Before European occupation, the Kaurna (pronounced gar-na) had been living on the Adelaide Plains for thousands of years. They were comprised of a number of different clan groups who were united by a common language. According to records the Kaurna lived as far north as the township of Port Wakefield (about 1-hours drive north of Adelaide) near the coast and inland to Crystal Brook, and as far south as Victor Harbor (note: many Kaurna and their descendants still live in the Adelaide region). Their traditional boundary to the east is the Adelaide foothills and to the west the Adelaide coastline. The Kaurna were bordered by the Peramangk People in the Mount Lofty Ranges to the east, by the Ngarrindjeri and Ramindjeri Peoples to the southeast and by the Ngadjuri People to the north.

There were 650 Kaurna People on the South Australian Register in 1842. However, before Europeans began the occupation of the Adelaide area on mass in 1836, many of the diseases of the west which had been brought by the convicts and colonists from Europe were to decimate many Indigenous Australian populations. For example, it is believed that through the interaction of Aboriginal Groups in the eastern states with invading Europeans that many diseases such as smallpox had migrated down through the Murray-Darling Aboriginal Nations who unwittingly spread the disease. Once Europeans first started arriving at Holdfast Bay on the Adelaide coastline many of these diseases had already impacted upon the Kaurna People, therefore, it is hard to say with certainty how many Kaurna People may have already fallen to these pathogens.

Karuna Elder Steve Goldsmith playing the *Yitake* (digeridoo)

The Kaurna People still occupy the Adelaide Plains. However, over time, and through brutal government policies they were displaced and moved on to other lands. Resurgence and interest in Kaurna Culture has recently been taking place, as it has been for many other Aboriginal Cultures around Australia. For example, similar to the nomenclature now used in the Northern Territory where Ayers Rock is usually called *Uluru*, many notable Adelaide place names now share dual naming. For example, the main river which runs through Adelaide the River Torrens is now also known as Karrawirraparri (*karra*=Red Gum, *wirra*=forest and *parri*=river).

Today, because of the endeavours of a few thoughtful individuals about 3,500+ words of the Kaurna language survive. Unfortunately, little is now known of the astronomy and cosmological beliefs of the Kaurna. However, these same people responsible for the recording of Kaurna linguistics also documented snippets of Kaurna knowledge of the night sky in addition to their cultural and spiritual beliefs.
Most notable of these recorders were two Lutheran missionaries who had arrived from Germany in the colony in 1838. Clamor Schürmann and Christian Teichelmann had come to Adelaide fleeing the religious persecutions of their homeland in the interest of greater freedom and converting the local Anglo and Indigenous populations to their own faith. Schürmann and Teichelmann established the first 'native school', as it was then called, on the banks of the River Torrens *Karrawirraparri* at a place that is known as *Piltawodli*, which means 'possum's house'. It is here that the two missionaries likely recorded some of the Kaurna cosmological beliefs.

Somewhat similar to some ancient Egyptian beliefs, the Kaurna believed that celestial bodies such as the stars formally lived on the earth. They believed that while on the earth these celestial bodies lived their lives partly as men, and partly as animals. Eventually, they exchanged this existence for a higher level and ventured into the heavens. Thus, the Kaurna applied names given to beings on the earth to celestial objects and there was a close connection between the lower and upper realms of existence.

In many ancient and primeval cultures the sun is nearly always seen as male and the moon is viewed as female. For example, to the ancient Greeks the sun was the god Helios who daily drove his fiery chariot across the sky westward and the moon was the goddess Selene. In addition, in ancient Egypt the sun was known as the supreme god *Ra* and to the Aztecs of Mexico as *Huitzilopochtli* both male deities. However, in many but not all Aboriginal Australian cultures, our sun is often viewed as female and the moon as male. For the Kaurna People this is also the case. The Kaurna called the sun *Tindo* and the moon was named *Kakirra.* Although, Wyatt (1879) claims that *Kakirra* is male, not female. When the moon was full it was called *Kakirramunto*. *Kakirra* was believed to have a benevolent affect on human affairs, however, *Tindo* (sometimes written as *Teendo*) was considered to be more malevolent in nature.

Accordingly during the hours of darkness the Kaurna believe that *Tindo* sat in her *Wodli* (wurley) and ate fish. Furthermore, the Kaurna People believe that *Tindo* was originally created by an ancestral being named *Monaincherloo,* who was also known by

the name *Teendo yerle* which meant 'sunfather'. Wyatt (1879) had recorded that the Kaurna believed that *Teendo yerle* had created the sun, moon, stars, men and "plenty of things."

The Kaurna called the constellation of Orion *Tiinninyarra* (also sometimes written as *Tiinninyarrana*), and the *Tiinninyarra* are a group of young men who are hunting emu, kangaroo and other game of the celestial plain known as the *Womma*. They are hunting this game by the banks of a river, which they called *Wodliparri* (*wodli*=hut and *parri*=river). Therefore the band of the Milky Way from the Southern Cross through to the constellations of Orion, Auriga and Taurus is seen as a giant river in the sky world, and along the edge of the river are reeds and huts. Neighbours of the Kaurna to the south the Ramindjeri People who live around the Encounter Bay area also saw the band of the Milky Way as a river in the sky world with huts along the edge.

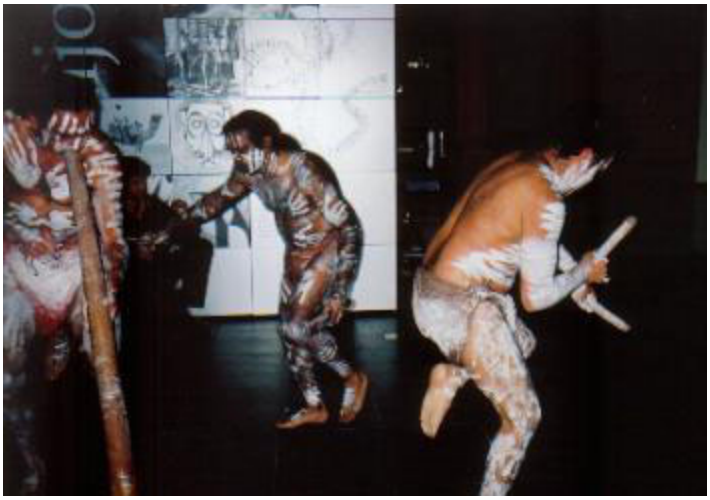
Additionally, along the edge of the *Wodliparri,* a group of women are collecting reeds and berries and they are known as the *Mankamankarrana* who many astronomers know today as the 'Seven Sisters' or the 'Pleiades' cluster. The Pleiades are an open cluster of stars which formed approximately 50-60 million years ago and are located some 378 light years away from our sun.

In addition, the dark patches along the band of the Milky Way are known as *Yurakauwe* (*yura*=monster or magnificent creature and *kauwe*=water). These dark patches are seen as waterholes, lagoons and billabongs where a very dangerous 'being' is said to reside. The Kaurna believe that if you were to wander too close to - or swim in these areas you would be dragged down under the water and killed by this creature.

Prominent in the skies of Australia is the majestic Wedged-tailed Eagle *Aquila Audax.* Eagles and other Australian Birds feature strongly in many stories told by Indigenous Australians and the Kaurna have an eagle constellation known as *Wilto*. Unfortunately, there do not seem to be ethnographical recordings of which particular stars that the constellation of *Wilto* was comprised. However, I personally believe the Kaurna were referring to the Southern Cross as *Wilto*. I have a number of reasons for believing this.

The Ngadjuri People who lived in the Barossa Valley and Clare Valley region north of the Kaurna People had a constellation they called *Wildu*. The Ngadjuri People viewed the Southern Cross as the footprint of the Wedge-tailed eagle *Wildu*. Furthermore, there are many words that are similar in the Ngadjuri and Kaurna languages in addition to some similar stories. To me, *Wildu* and *Wilto* are very similar in sound and they both refer to an eagle. Furthermore, one needs to be mindful that the Aboriginal Peoples of Australia did not use a written language, so many of these names have been recorded by early ethnographers who often spelt the word the way it sounded to them.

Accordingly, as we journey further north through the different Aboriginal Groups in South Australia other peoples also saw the Southern Cross as a Wedge-tailed eagle. Like the Ngadjuri People, the Adnyamathanha People of the Flinders Ranges also called the Southern Cross *Wildu* and it was seen as the footprint of the Wedged-tailed Eagle *Aquila Audax*. In addition, the Aranda People who come from the far north of South Australia and part of the Northern Territory saw the Southern Cross as a Wedged-tailed Eagle that they called *Waluwara*. The two pointer stars alpha and beta Centauri are his throwing stick and the Coalsack Nebula



Karuna dancers at the South Australian Museum

is his nest in the sky. The four brightest stars in the Southern Cross are *Waluwara's* talons.

The Aboriginal Groups of Australia shared a close relationship with their environment and the natural world for 45,000+ years. Today we are left with just a taste, of the incredibly complex knowledge and understandings that the Kaurna People and other Aboriginal Peoples of Australia have developed over these thousands of years. This early drive to understand the night sky still fires the passions of many contemporary astronomers. Hopefully, efforts will continue to preserve these remaining snippets of stellar knowledge for future generations of Indigenous descendants and night sky enthusiasts.

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(continued from page 3)

Observatory Interest List

1. Ashton Kaidi
2. Tom Kucharski/John Castillo
3. Dan Bonis
4. Jim Windlinger
5. Jerry Floyd
6. Joe Culver
7. David Pearson
8. Kyle Coker
9. Mike Cater
10. Leonard Vorhis
11. Alan Smallbone
12. Paul Brewer
13. Chuck Edmonds
14. Bill Hall
15. Kyle Coker
16. Bruce Waddington
17. Ted Ishikawa

Pad Interest List

1.Alan Smallbone
2.Ray Stann
3.Tim Arden
4.Tom Houseworth
5.Joe Culver
6.Bill Patterson

Being on either list doesn't commit you to anything at this stage, but it lets us know who among our members is interested in taking advantage of the upcoming chances for new construction on our Anza site. Since one has to be a member in good standing to hold an observatory or pad license, we take people off the list if their membership expires and is not reinstated within a reasonable period – if they later rejoin, they could choose to go back on the list, but their names would go to the end of the list (in other words, they would lose any priority they might have had on the list). So, if you are seriously interested in having a pad or observatory out at Anza, it's a good idea to keep your membership current!

RTMC

As I write this, RTMC was only a couple of weeks ago – and a fine event it was! The weather posed some challenges, as it was really windy Friday night through Saturday (and it was still breezy on Sunday), and clouds moved in for the early parts of Friday, Saturday and Sunday nights, though things cleared up later on. It was nice being so high under moonless skies, and a certain amount of imaging did take place (as you might have noticed from pictures posted on the website).

Karen Schnabel came up with a great addition to our usual book-selling activities in the club booth – an astronomy-related beanbag pitching game that proved to be harder than it looked. A lot of people apparently enjoyed the challenge, and it looked like there were a number of repeat customers (if you got a certain score, you got a prize, and she had different prizes for different scores). Besides some revenue, it added a lot of interest to the booth, and was certainly different from what anyone else was doing!

We got a bigger group together this year than last for the club's annual RTMC group photo, which we set up in front of the club's booth this time instead of down by the meeting hall. For fun, copies of the final version of the group photo and of the precursor photo should be somewhere in this issue – how many changes can you find? Our photographer this year, Alan Smallbone, responded to a complaint from one of the participants that he wasn't looking toward the camera in the precursor photo by doing some serious editing work, taking advantage of having multiple exposures and knowing how to use Photoshop…

In Closing

Just a reminder – both Anza and Black Star Canyon harbor a lot of local wildlife. This includes poison-delivering creatures such as rattlesnakes, black widows and scorpions, as well as a full range of creatures that can bite or scratch or be otherwise unpleasant, such as rats, mice, squirrels, skunks, rabbits, coyotes, and so on. So please exercise reasonable caution – stick to open roads and paths, especially when walking around the sites at night, keep a wary eye out for critters (and other hazards) whatever time you walk around the sites, don't put your hands, feet, or any other part of your body into holes, crevices or anywhere else that you haven't checked first for occupants, don't leave clothing or bedding where the local wildlife can take refuge in them and check them for occupants before using them if they've been left in the open or on the ground where something could have crawled in. A bit of caution is all it takes to be safe in both locations, so be safe and have a really good time whenever you go to either viewing site!

And don't forget the Starbecue at the Anza star party in July – see you there!

© Barbara Toy, June 2006

AUGUST CALENDAR CHANGES!

The August General Meeting at Chapman University will be held on the first Friday of August, 8/4, not on our usual second Friday of the month.

The August session of the **Astronomy Beginners Class** is **cancelled** because of the change in the general meeting date.

ASTROSPACE UPDATE

July 2006
Gathered by Don Lynn from NASA and other sources

Triple Neptune – Using the radial-velocity technique with the 3.6-meter telescope in Chile, a star has been found to be orbited by 3 planets, each roughly the mass of Neptune (much smaller than Jupiter, but much larger than Earth). The star is in Puppis at a distance of 41 light-years from us. The planets orbit in 8.67, 31.6 and 197 days. The one closest to its star is probably rocky, the middle one probably rocky with a gas envelope, and the outer one probably rocky/icy with a massive gas envelope. These are based on the temperatures at those distances. The outer planet may lie in the zone where temperatures allow liquid water to exist. The system definitely does not have any more massive planets, such as Jupiter-sized ones. The Spitzer space telescope recently discovered that this same star probably has an asteroid belt. No other known planetary system has anything like 3 Neptunes and an asteroid belt.

New exoplanet – A team of professional and amateur astronomers has found a new exoplanet (one outside our solar system) by measuring the light drop caused when it transits (passes in front of) its star. The professionals have designed a telescope made of relatively inexpensive parts, including 2 camera telephoto lenses, which scans thousands of stars from atop Haleakala, the highest mountain on Maui. When computer analysis of the data shows a drop in the light of a star that appears to match that caused by a planet transit, the amateur astronomer team is called in to follow up with further observations on the suspect star. This plan yielded its first discovery recently. Follow up was done with huge University of Texas telescopes to measure the wobble induced in the star by the gravity of the planet orbiting it, the so-called radial velocity method, which has been used to discover most of the over 180 exoplanets known. The mass and size can be determined from the combination of transit and wobble observations. The new planet is orbiting a sun-like star 600 light-years away in Corona Borealis. The planet is quite close to its star and orbits in only 4 Earth days. The planet's mass is 90% that of Jupiter, but is much larger in diameter than Jupiter. The planet would be much hotter than Jupiter because it is so close to its star, and that may be contributing to the large size. It is hoped to follow up the discovery with observations by the Hubble and Spitzer space telescopes. They could better measure the star's (and planet's) distance from us, refine the planet's size, image the planet directly, and measure the eccentricity (ellipticalness) of the planet's orbit. Refining the size would allow more accurate calculation of the planet's density. Further observations of the transits and the radial-velocity wobbles could find other planets that might orbit the same star. Only 10 exoplanets have been seen to transit their stars. Transit observations are the only means to measure the diameter of an exoplanet and the best means to measure the mass. The search will continue for other planets by this team of professional and amateur astronomers.

Planet cores – The mass and density were studied of the 10 known exoplanets that transit their stars. All are in a class known as hot Jupiters, since their masses are roughly that of Jupiter (the 10 range from 35% to 135% the mass of Jupiter) and all are in orbits quite close to their stars, resulting in high temperatures. The density tells us whether a planet is just a gas ball or has a substantial core of rock and/or metal. The metal content of the host stars for these planets was determined spectroscopically. As predicted by theory, the stars with larger metal content had planets with larger densities and therefore larger cores. Stars with metal content like our Sun had planets with little or no core, while stars with 2 or 3 times the metal content had large-core planets.

Milky Way and its companion galaxies – A new map of stars in the Milky Way Galaxy, constructed with data from the Sloan Digital Sky Survey shows the sky is criss-crossed with streams of stars, left behind by satellite galaxies and star clusters being torn apart by tidal forces of the Milky Way. Dominating the streams is an enormous arching stream from the Sagittarius dwarf galaxy. That galaxy was discovered more than a decade ago, and its long stream of stars was previously known. But the new data shows far more streams exist, showing that the Milky Way is continuing to disrupt several smaller companion galaxies and star clusters, slowly tearing them apart. Data also showed that the Sagittarius stream made multiple wraps around our Milky Way, implying this disruption had been going on for multiple orbits of the companion galaxy. Analysis of this stream shows that the halo of dark matter about the Milky Way must be spherical, not flattened as some theories predict. A flattened shape for the halo would have distorted the multiple wraps of the Sagittarius stream. Analysis also shows that the dark matter halo has to be cold dark matter rather than hot dark matter, as hot dark matter would have dissipated most of the star streams by now.

More star streams – Two astronomers announced finding another stream of stars, again found in the Sloan Digital Sky Survey data. It is at least 30,000 light-years long (it continued out of the field of the survey), is 30,000 light-years away, and is moving at half a million mph. It is not associated with any existing cluster, so apparently represents all that remains of a cluster that was completely torn apart by tidal forces of the Milky Way. There are only about 150 globular clusters orbiting the Milky Way now, but galaxy formation theory says that far more globulars should have formed. So there may be hundreds of streams of stars remaining from those clusters being torn apart. The difficulty is in picking out the streams from the vast numbers of foreground stars. This new stream was found by computer analysis of the survey data. The stream is very narrow, which indicates a slow gentle tearing apart rather than a violent one. The original cluster must have contained 10,000 to 100,000 stars. The smoothness of the stream implies that there are no large concentrations of dark matter within 30,000 light-years.

Companion galaxies – The Sloan Digital Sky Survey announced the discoveries of 2 new very faint companion galaxies to the Milky Way, one in Canes Venatici, the other in Bootes. The first is about 640,000 light-years distant, making it one of the most remote of our galaxy's companions. The second has a distorted structure that suggests it is being disrupted by the Milky Way's gravitational tides. It is the faintest galaxy yet discovered, with a total luminosity of only about 100,000 Suns. The previous record holder for dimness was found last year in Ursa Major, also using Sloan data. The leading theory of galaxy formation predicts that hundreds of such dwarf galaxies should have formed about the Milky Way, but only about 10 have been found. More work needs to be done to determine if the theory is wrong, or the dwarf galaxies are just too dim to see, or that they have been destroyed by some process.

Largest 3-D map – A team of astronomers has published that largest 3-dimensional map of the universe ever constructed, a wedge-shaped slice of the cosmos that spans a tenth of the northern sky, contains 600,000 luminous red galaxies, and extends 5.6 billion light-years deep into space. It was constructed from data taken by the Sloan Digital Sky Survey, but is extends far deeper into space than previous Sloan maps because of a new technique in measuring distances. This used the brightness of a class of galaxies known as luminous red galaxies to estimate distance, where previous maps used the red shift found in spectra of galaxies. The new technique can be used on far more distant galaxies than the spectral method can. The luminous red galaxy technique was checked by sampling 10,000 of those galaxies and checking their red shift from another survey (the Australian Two-Degree Field survey). First analysis of the structures found in the new map shows that they are consistent with an expanding universe whose expansion is accelerating, and which contains large amounts of dark matter.

(continued next page)

Enceladus – Astronomers believe they have explained why Saturn's moon Enceladus has geyser activity near its south pole, an area that should be much too cold for that. The only plausible explanation of the heat source presented so far is that tidal forces are heating the moon internally. New simulations of internal heating show that it could form a large volume of hotter and therefore lower density material, which would tend to rise to the surface. This would disrupt the rotation of the moon, which would cause it to wobble in a way that moves the rotational axis closer to the low density region. In simple terms, the moon rolled over. More measurements of Enceladus will be made by the Cassini spacecraft in a flyby scheduled for 2008, attempting to confirm this theory.

XMM Newton (European X-ray space telescope) has made deep observations of 2 X-ray bright clusters of galaxies, allowing a group of astronomers to measure the chemical compositions of the clusters with unprecedented accuracy. Most of the atoms in galaxy clusters are in the form of hot gas emitting X-rays, so observation by X-ray more truly finds the chemical composition of all the matter in such clusters. Much of the heavier elements in galaxy clusters came from supernovas. Type Ia supernovas, those occurring when matter from a companion star accumulates on a white dwarf star until they explode, produce lots of nickel and iron. Core collapse supernovas, those where massive stars reach the end of their lives and explode, produce lots of oxygen, neon and magnesium. So measuring the relative abundances of these elements in a galaxy cluster tells the proportion of supernovas that were Type Ia. The 2 newly observed galaxy clusters each had about 30% of Type Ia supernovas in order to produce the elements measured. This is higher than the 13% Type Ia measured in the Milky Way, but lower than the 42% Type Ia observed in the Lick Observatory Supernova Search project. The new XMM Newton observations found much more calcium than can be explained by supernova theory, and a different abundance of nickel than theory. These will be used to revise supernova theory. The locations at which elements were found within the 2 observed clusters give hints about the history of the clusters. One cluster appeared to be undergoing a merger. The other appeared to have more of its Type Ia supernovas more recently, but only in the core of the cluster.

Galaxy formation theory says that the first galaxies to form were small – about 10,000 times less massive than the Milky Way. They produced many hot massive stars, which then blanketed their surroundings with ultraviolet light, which heated and ionized nearby gas. It is far more difficult for heated ionized gas to collapse into galaxies, so formation of small galaxies nearly ceased at this point. A new observation provides direct support of the shutdown of forming small galaxies. Astronomers observed the spectral lines imposed on the light of very distant quasars by the gas that the light passed through on the way to Earth. The distance, and therefore the time the light passed through the gas, can be determined by the red shift of the lines. Analysis of the spectral lines allows calculating the size of the galaxies of which the gas clouds are parts. This analysis showed that by a billion years after the Big Bang, formation of new small galaxies had ceased.

Triton – Neptune's moon Triton is the only large moon in the solar system that revolves retrograde (clockwise seen from the north) and the only one inclined highly to its planet. The way that planets and their moons formed should have given all moons the same direction of revolution, and their inclinations should match their planet's rotation. Three explanations for Triton have been proposed: collision with another moon, drag from a disk about Neptune captured Triton, or a close encounter of Neptune with another planet stole Triton from that planet. New simulations show that the first 2 theories are very unlikely, but that stealing Triton could likely have happened and resulted in the present orbit. This probably happened very early in the history of the solar system.

FUSE (far ultraviolet space observatory) has discovered abundant carbon gas in the dusty disk long known to surround the young star Beta Pictoris. The presence of any gas at all was a surprise, since theory predicts that gas will have been blown out of the disk by the intense light of this star. It is not known yet whether the presence of carbon indicates that this system is much different in carbon content from our solar system, or whether planetary systems go through a carbon phase as they form. If the former, then Beta Pictoris may be forming graphite planets with methane atmospheres.

Planetary systems – In recent years disks of gas and dust that can form planets have been found surrounding brown dwarfs, stars so small that they fail to shine by nuclear fusion, as ordinary stars do. New observations show such disks around planemos, which are even smaller planet-sized bodies that formed by themselves, not as part of a planetary system around a star. So a system of planets can form around almost any size object, from stars much larger than the Sun down to planet-sized bodies.

More planetary systems – A new theory has been proposed for how "super-Earths" form, those planets with masses larger than Earth, but smaller than about Neptune. The theory has intense ultraviolet radiation from a star stripping away the gas envelope from a gas giant planet, leaving the huge rocky core with little atmosphere. The proponents of this theory believe it happens more often than the previous theory, which is that Earth-like rocky planets just continue to grow over a longer period of time than Earth did. Recent discoveries have found both super-Earths and gas giants orbiting red dwarf stars, so a super-Earth theory must work at a red dwarf star, and must allow gas giants to sometimes form instead of super-Earths. The new theory indeed does this. Red dwarfs themselves do not produce sufficient ultraviolet to strip a planet, but the majority of red dwarfs form in clusters that include massive O stars, which emit immense amounts of ultraviolet. But since some red dwarfs are not in clusters with O stars, those can proceed to form gas giants without stripping from ultraviolet. Microlensing surveys are discovering more super-Earths and more planets orbiting red dwarfs than other planet discovery techniques. So astronomers hope that microlensing surveys will lead to further evidence as to which theory is correct.

Infrared galaxies – Astronomers are studying nearby galaxies in a class known as "luminous infrared galaxies" because they are thought to resemble a class of galaxies found only during the early history of the Universe. Although some of those long-ago galaxies can be seen, by virtue of their light taking so long to reach us from billions of light-years away, they are so distant that little detail can be seen. Luminous infrared galaxies are ones that emit most (90 – 99%) of their light as long wavelengths of infrared, rather than visible light or other wavelengths. These galaxies contain gas and dust crashing together at their centers, fueling bursts of star formation and/or bursts of material falling into the central black holes. Some of these have as much gas as the entire Milky Way crammed into the central region, only 2% the diameter of our galaxy. A recent study measured the gas and dust in 5 luminous infrared galaxies. Even though they have much more gas and dust than the Milky Way, the ratio of gas to dust was the same (about 100 times as much gas as dust). A comparison was made to the little information we have on infrared galaxies in the early history of the Universe, and some differences were noted: the long-ago galaxies had more gas, the gas moved faster, and the galaxies were larger.

Spitzer (infrared space telescope) has discovered nearly 300 clusters of galaxies, with almost 100 of them as far as 8 to 10 billion light-years away. Although many distant galaxy clusters were already known, this represents a 6-fold increase in those known farther than 8 billion light-years. Many astronomical studies require large numbers of objects, and this discovery will supply those numbers of distant galaxies. Because distant galaxies are subject to severe red shift, their visible and even ultraviolet light get shifted into infrared. So using infrared was known to be a good way to look for very distant galaxies. The problem was in distinguishing the distant ones from the nearby ones that happen to give off a lot of infrared. This survey with the Spitzer didn't look for the distant galaxies, but instead was compared with visible light images from Arizona telescopes that identified nearby galaxies, which were then discarded to leave only distant ones. A small sample of the distant galaxy clusters was then verified by taking spectra for red shift with the Keck telescopes in Hawaii.

Weak sunspot cycle predicted – The Sun has a north and a south conveyor belt, each of which transports hot gas toward the Sun's equator, then returns it poleward in a deeper layer. These conveyors move at the speed of a slow walk, so take about 40 years to make a complete loop. It has been found that the speed of the conveyors is related to the strength of the sunspot activity 20 years in the future. Fast movement within the conveyors is followed by strong sunspot and flare activity 20 years later, and conversely. The reason this occurs is that the movement of material bunches magnetic field lines, and bunched magnetic field lines eventually cause sunspots. The conveyors, particularly the southern one, have

been for a few years at their slowest movements in more than a century, so the sunspot cycle of 2022 is predicted to be very weak. Using the same method, the sunspot cycle of 2011 has long been predicted to be quite a powerful one (the conveyors were moving faster around 1990).

Tau Scorpii's magnetic field – A team of astronomers has discovered that the star Tau Scorpii unexpectedly hosts a complex network of magnetic field lines over its surface. The magnetic field was detected by looking at the polarization of star light, using the CFH Telescope in Hawaii. The star has been known for some time to emit X-rays at an unusually high rate and to rotate more slowly than most otherwise similar stars. The newly discovered magnetic field goes some way in explaining both characteristics. Some field lines form loops, returning to the star's surface, while others extend out into space. The stellar wind of charged particles, millions of times stronger than the Sun's wind, follows the magnetic field lines. Where loops of field lines brush each other, stellar wind particles collide, producing tremendously energetic shocks, heating the material to a million degrees, and emitting huge amounts of X-rays. It is thought that the magnetic field also slowed the rotation of the star, but the exact mechanism is not yet known.

Supernova too dust-free – For some time astronomers have been puzzled by observations of supernova remnants that show far less dust than theory predicts should result from the supernova. One hope was that the lack of dust was a local (to the Milky Way) anomaly, and that measurements of dust in supernovas outside our galaxy might be in better agreement with theory. Recently the Spitzer space telescope measured the dust in a supernova remnant in the Small Magellanic Cloud, and unfortunately it was found to be about 100 times smaller than predicted by theory, so the lack of dust is probably a problem everywhere. Three possibilities have been presented: the theory of dust production needs to be revised, the dust is produced but then destroyed by shock waves, or the dust is there but not showing up in the infrared wavelengths we are using to observe (possibly because it is colder than expected). If either of the first 2 possibilities is true, then astronomers will have to revise the theory of how heavier elements are spread into successive generations of stars and their planets, since that relies mostly on supernova dust.

More dust – Less than a week after the announcement in the previous paragraph, other astronomers announced finding large amounts of dust in a Type II supernova that occurred in the galaxy M74 in 2003. Observations of the dust were made with the Spitzer and Hubble space telescopes and the Gemini North 8-meter telescope in Hawaii. Further work needs to be done to find out why observations of supernova in the Milky Way and the Small Magellanic Cloud did not show significant amounts of dust. Astronomers involved in the M74 observations believe that the amount of dust seen is enough to explain the growth of dust in galaxies during the early history of the Universe. Lots of dust has been observed in galaxies as early as 700 million years after the Big Bang. Sources of dust other than supernova (outflows from old Sun-like stars and condensation of molecules in deep space) have been shown to not produce enough dust to explain the observations of the very early galaxies. The lack of dust seen in supernovas was leaving astronomers in a quandary, but the M74 observations may begin to solve this.

GRACE (pair of gravity satellites) have discovered a circular mass concentration (mascon) buried beneath the East Antarctic Ice Sheet. Radar observations penetrating the ice then showed that it is a huge impact crater. Mascons form when an asteroid impact breaks through the crust, and a plug of denser material from the mantle pushes up into the broken crust. Mascons on the Moon remain pretty much forever in the "seas", which are huge impact craters, but on Earth geological activity allows mascons to sink back into the mantle within hundreds of millions of years. The condition of the newly discovered Antarctic mascon shows that the impact occurred about a quarter billion years ago, but this date is very approximate. It does require further study because the crater is over twice the diameter of the Chicxulub crater, which has been associated with the extinction of dinosaurs and much other life 65 million years ago, and there was also a mass extinction 250 million years ago. The crater could also be associated with the splitting of Australia from Antarctica

Gaia – The European Space Agency has approved the contract to build the Gaia spacecraft, for launch in 2011. Gaia will continuously scan the sky for at least 5 years from the L2 Lagrangian point, a million miles farther from the Sun than the Earth is. This is an excellent place for stable precise observations. The goal is to measure the position (including distance), color and motion of a billion stars to far greater precision than ever before. It is predicted that in doing this it will discover several tens of thousands of new asteroids and comets. This is a follow-on to the Hipparcos spacecraft that mapped over 100,000 stars in the late 1980s. The detectors in the Gaia telescope will cover half a square yard and contain a billion pixels. A huge sunshade and a micro propulsion system are among the new techniques used to stabilize the telescope for extremely precise measurements.

Deep Impact follow-ons – Two missions have been proposed to NASA to follow up the success of Deep Impact, which hit a comet and analyzed the material thrown out by the impact. DeepR would send spacecraft identical to Deep Impact to Comet Churyumov-Gerasimenko, colliding in 2015. DIXI would retarget the still-operating Deep Impact flyby craft to encounter Comet Boethin in late 2008. Some of the data recently obtained on various comets has been conflicting with each other and with theory, so it is felt that observations of 2 more comets would help settle which are the rules and which are the exceptions. Also they could help decide which characteristics comets form with primordially, and which are the result of individual comets' histories.

Instant AstroSpace Updates:

Mars Rover Opportunity got stuck in soft sand again, but spacecraft controllers were able to free it in a few days rather than the weeks that it took last time. The rover continues moving toward huge Victoria Crater.

The 4 **Cluster** spacecraft, flying in formation, flew through the electron diffusion region, the boundary where the Earth's magnetic field hits the Sun's magnetic field, getting the best measurements of this area. Because this region is buffeted by solar wind, the spacecraft actually crossed the region 19 times within one hour.

XMM Newton (European X-ray observatory) has discovered the most distant cluster of galaxies known, containing hundreds of galaxies and a mass 500 trillion times that of the Sun, so distant that its (X-ray) light took 10 billion years to get here. The distance was confirmed with the 10-meter Keck telescope in Hawaii. The discovery was part of a survey expected to find many more distant clusters.

Venus Express has been lowered to its final polar orbit, instruments were checked out, and in early June observation began of the Venusian atmosphere, the surface, and the planet's interaction with the solar wind.

AKARI, the recently launched Japanese infrared observatory, in April saw first light through its far-infrared surveyor and near-mid-infrared cameras. The spacecraft will spend 6 months surveying the entire sky in 6 different infrared wavelength bands, and then start targeting thousands of individual targets for detailed observation.

SOHO (solar observatory) has been approved for yet another extension of its mission, through 2009. SOHO has provided unprecedented observations of the Sun since 1995.

Lunar Reconnaissance Orbiter has been approved by NASA for launch in October 2008. It will use 6 instruments to map the moon from 30 miles altitude, finding potential landing sites, measuring temperatures, searching for water and assessing radiation.

Asteroid 2003 YN107 is one of a class (of 4 known so far) that almost get captured by Earth during close flybys, corkscrewing around the Earth for a period, then moving on. On June 10 it moved on, having spent the last 7 years looping nearby. It's only 20 yards in diameter, and will return to Earth's vicinity in about 60 years.

A new simulation of **colliding galaxies** shows that gas content is the key to how the collision proceeds. Gas-rich galaxies will always merge into one galaxy, and their central black holes will merge, while gas-poor galaxies often will not merge after their collision.

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