SIRIUS ASTRONOMER

www.ocastronomers.org

The Newsletter of the Orange County Astronomers

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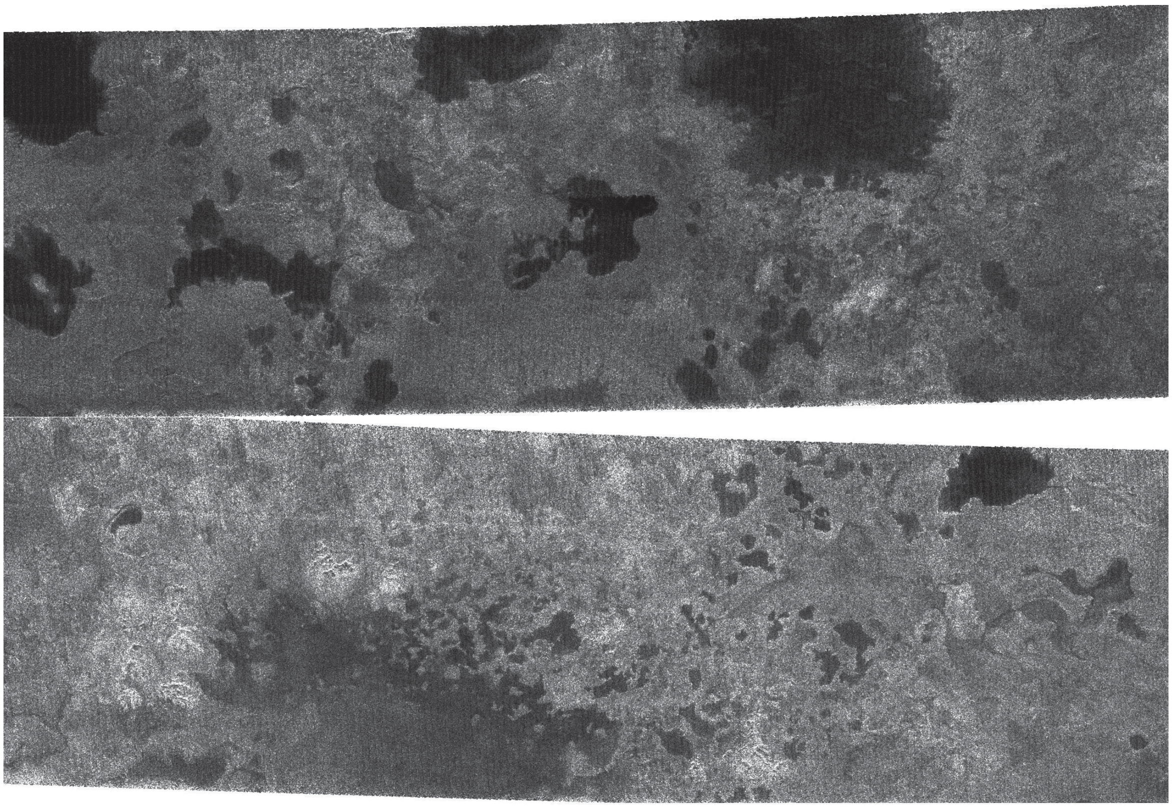
REMINDER: AUGUST MEETING RESCHEDULED TO AUGUST 4TH



The Cassini spacecraft, using its radar system, has discovered very strong evidence for hydrocarbon lakes on Titan. Dark patches, which resemble terrestrial lakes, seem to be sprinkled all over the high latitudes surrounding Titan's north pole. These radar images were acquired on July 21st by Cassini from a distance of 900 km (590 miles) above Titan's surface. (NASA/JPL)

OCA CLUB MEETING

The free and open club meeting will be held Friday, August 4th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. The featured speakers this month are Joel Harris, Helen Mahoney, Doug Millar, and Dan Schechter, OCA members with accounts of the March 2006 solar eclipse from different locations!

Next General Meeting: September 8th

STAR PARTIES

The Anza site will be open twice this month on August 19th and August 26th. The Black Star Canyon site will be open this month on August 26th. 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, September 1st at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana. NOTE: There is no Beginners Class in August!

GOTO SIG: TBA (contact coordinator for details)

Astrophysics SIG: Aug. 18th, Sept. 15th

Astro-Imagers SIG: Aug. 15th, Sept. 19th

EOA SIG: Aug. 28th, Sept. 27th

Dark Sky SIG: TBA (contact coordinator for details)

President's Message
By Barbara Toy

Well, we are certainly experiencing the full heat of summer – very notable out at Anza, particularly for those who attempt to do things outside during daylight hours. The good news is that we haven't had as much "June Gloom" as in the last couple years; the bad news is that June and July still brought us a lot of overcast skies from weather conditions other than the usual marine layer. One reason for this is that the summer heat has generated some pretty intense thunderstorms as well as baking us, so don't be surprised if you find ruts and other damage to the dirt roads out by our Anza site from summer rain, and don't make yourself a target for lightening if you're out there during a storm or while one is building up in the vicinity.

The fire season is also well underway, and, as I write this, there is a fire burning not far from the town of Anza itself – not a very big fire, but another reminder that the brush on the surrounding hills and on our site itself is highly flammable, and we could all too easily have another fire that could do a lot more damage to our site than the last one. So, please make an extra effort whenever you visit the site to cut back any brush or weeds you see, especially any that is near any of the buildings or pads. People did a good job of clearing sensitive areas in May and June, but we've had additional growth since then – any help you can give to keep the weeds under control is very much appreciated.

Reminder – The August General Meeting is the *First*, not the Second, Friday in August!
Just in case you see this before August 4th – that's the date of our August meeting, *not* August 11, which would have been the usual date for it. It'll feature a special presentation by Joel Harris, Helen Mahoney and Doug Millar, and Dan Schechter, giving three different perspectives on viewing the total eclipse of the sun in the Mediterranean region last March. It should be a great program, and I look forward to seeing you all there!

Another Reminder – AstroImage 2006 is August 11th and 12th!
There's still a chance to attend AstroImage 2006 – assuming you're reading this before August 11th, of course! The price is higher after August 1 ($110 instead of $95), but it's still a bargain, considering it gives you the chance to hear some of the most respected astroimagers around talk about aspects of the field that are uniquely theirs in addition to all of the other features of the conference. So, if it's before August 11 and you haven't registered yet – grab this last chance to be a part of a conference you'll remember with pleasure for a long, long time!

Good News – We Have a New Website Technician *and* an Anza House Coordinating Team!
We've been looking for someone to handle the technical side of the club's website for quite some time. There have been several different people who volunteered but then had to drop out of the position for various reasons – fortunately, Liam Kennedy has been willing to step in when urgent action was needed, but he no longer has the time to take care of the website on an ongoing basis.

Well, I'm very happy to say that the search for our website technical person is now over. Rob Carr has volunteered for that position, after spending time familiarizing himself with the website, and he has already been able to deal with a couple of technical issues that had been frustrating us. The more visible one to most members was the rating system that was an automatic part of the program used for the website Image Album (these appeared as one to five stars below the pictures, which viewers were supposed to use to indicate how they rated the picture).

Whatever the merits of the original concept, there was never any established set of criteria to be used in rating pictures, and no way to be sure that the ratings were applied fairly – and whether or not a particular picture received any rating at all was pretty arbitrary. There was no oversight of the rating system at all, and so, unfortunately, there were people who used it for purposes that had nothing to do with the merits of any particular picture. A number of times, unjustifiably low marks were given to certain pictures – whether it was intended as a joke or an insult, it wasn't an appropriate use of the system. Over time, there were enough abuses of the ratings that some people decided not to post pictures in the Image Album at all, which was a loss to all of us. This became a significant issue for a number of people in the AstroImagers group, and was raised as a topic for discussion at on of their meetings. After that discussion, I was asked if anything could be done about it, and I relayed the request to Rob. In very short order, he figured out how to turn that part of the program off, and did so. Even though I've heard some teasing comments about "losing our stars," the overall response to the change has been positive, so we'll be leaving that feature turned off – with thanks to Rob for providing this tidy solution.

We have also been looking for a new Anza House Coordinator since Tim Hunt moved to Tennessee. This is the person who takes care of getting supplies for Anza House, picks up the money from the overnight stays for Charlie Oostdyk, takes care of basic cleaning (hopefully with help from other volunteers – the position, after all, is "Coordinator," not "Maid Service"), and otherwise keeps Anza House running smoothly.

Sandy and Steve Condrey have now generously volunteered to take on this position, in addition to Steve's other responsibilities as the editor of the Sirius Astronomer and as a Trustee on the Board. I had noticed that, when Steve joined the Board, we benefited by getting two participants instead of just one, as Sandy comes to the Board meetings with him and has given us the benefit of her comments on a number of different topics that have come before the Board. The Condreys have now taken on the job of Anza House Coordinator as a team, which I hope will make the job easier for them, and it will certainly benefit all of us who use the Anza Site.

Our profound thanks to Rob, Steve and Sandy for taking on these positions!

…But Now We Need a Refreshment Person for the General Meetings…

Leonard Stein has handled making the coffee, getting the other drinks, ice and donuts, and running the refreshment table at the general meetings for years now. Unfortunately, he's now finding it too hard physically to handle the job, particularly carrying the coffeepots full of water from where he fills them to the area of the refreshment table. He has therefore reluctantly concluded that it's time to turn that position over to someone else. However, he tells me he's still willing to help out, especially while the new person gets familiar with what's involved.

If you can help us out in this position, we'd be very grateful. If you're interested in the position, please contact me. If you want more information on what's involved, you can email me with your questions, or plan to talk to Leonard about them at the August General Meeting (which is August 4 – see above).

The July "How to Use Your Telescope" Class Revisited…

First some background – we set up our first "How to Use Your Telescope" class after Christmas about three years ago, and it was such a success that Antonio Miro, who taught the Beginners Class at that time, decided to incorporate it as a regular feature of the Beginners Class. We now do these particular classes twice a year, currently on the first Friday of January and of July. Those dates aren't set as arbitrarily as it might seem – our Beginners Class is a six-session cycle, with one cycle each year starting in September and the other in March. The "How to Use Your Telescope" classes are set as the fifth session of each cycle. We like having one in January, which is convenient for people who get telescopes for Christmas and need some help setting them up and using them. The July session seems to attract more people who have had their telescopes for a while but don't use them, generally because they ran into problems, got frustrated, and put the telescope away until they had more time to figure it out but never got around to it. The goal of this particular class is to help people through those initial frustrations so they will be more likely to continue using their telescopes to see the wonders of the surrounding universe for themselves.

The basic format of these classes hasn't changed much from our first session – we get the word about the class out to the telescope-owning public through flyers distributed through local telescope vendors (Oceanside Photo and Telescope, Scope City and the Discovery Stores have been very helpful in getting the word out for all of our Telescope classes, and Samy's Camera, which recently became a Meade vendor, also agreed to distribute them for the most recent class), through the Santa Ana Register's regular calendar notices, through the club's website, and through the Beginners Class itself. People with telescopes who need some help with them then bring them to the class, and we have a crew of volunteers from the club who work one-on-one with them to help them set up, align their scopes, and find some objects. The club's GoTo Group has been very generous in making this class a regular group function, and we also get volunteers from Jim Benet's Outreach group as well as some other club members. The Beginners Class meets in the classroom behind the main buildings of the Centennial Heritage Museum, and we usually hold the Telescope classes in the parking area in front of the classroom; the classroom is available if someone needs to do something that requires tables or more light, such as assembling a telescope or attempting a repair, and we've even had a surprisingly successful Telescope class inside the classroom when it was raining.

Part of the fun for the volunteers who help out at these classes is that we never know exactly what telescopes people will bring – there are usually a number of popular "goto" scopes (Meade ETXs, Celestron NexStars, and Newtonians or refractors that use the same control systems are the most common), a few Dobsonians, some scopes on equatorial mounts (some motorized, some not), sometimes some bigger scopes (we had a couple 10-inch LX200s, including a GPS model shortly after they were introduced), and sometimes examples of inexpensive "department store" types of scope that will always be frustratingly unsteady and hard to view through no matter how carefully they are set up. One couple brought one of the "department store" types to one of our earlier sessions, and after two or three volunteers worked with them on it and after they had a chance to see some of the other scopes in action, they told us that they'd decided to take the telescope back to where they'd bought it and get a better scope – that, from our point of view, was an excellent result and one that made it a lot more likely they'd continue viewing. The more usual result of our efforts is that people have a better understanding of how to use the telescope they brought and (in many cases) a more realistic idea of what they can expect from it – and those of us helping them usually learn (or relearn) things as well.

(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

Another group photo of OCA members at RTMC in May. Can you spot the differences between this photo and the cover photo of the July issue?

Celebrating 40 Years of Intent Listening

By Diane K. Fisher

In nature, adjacent animals on the food chain tend to evolve together. As coyotes get sneakier, rabbits get bigger ears. Hearing impaired rabbits die young. Clumsy coyotes starve. So each species pushes the other to "improve."

The technologies pushing robotic space exploration have been like that. Improvements in the supporting communications and data processing infrastructure on the ground (the "ears" of the scientists) have allowed spacecraft to go farther, be smaller and smarter, and send increasingly faint signals back to Earth—and with a fire hose instead of a squirt gun.

Since 1960, improvements in NASA's Deep Space Network (DSN) of radio wave antennas have made possible the improvements and advances in the robotic spacecraft they support.

For over 40 years, the "Mars" 70-m Deep Space Network antenna at Goldstone, California, has vigilantly listened for tiny signals from spacecraft that are billions of miles away.

"In 1964, when Mariner IV flew past Mars and took a few photographs, the limitation of the communication link meant that it took eight hours to return to Earth a single photograph from the Red Planet. By 1989, when Voyager observed Neptune, the DSN capability had increased so much that almost real-time video could be received from the much more distant Planet, Neptune," writes William H. Pickering, Director of JPL from 1954 to 1976, in his Foreword to the book, *Uplink-Downlink: A History of the Deep Space Network, 1957-1997*, by Douglas J. Mudgway.

Mudgway, an engineer from Australia, was involved in the planning and construction of the first 64-m DSN antenna, which began operating in the Mojave Desert in Goldstone, California, in 1966. This antenna, dubbed "Mars," was so successful from the start, that identical 64-m antennas were constructed at the other two DSN complexes in Canberra, Australia, and Madrid, Spain.

As Mudgway noted in remarks made during the recent observance of the Mars antenna's 40 years of service, "In no time at all, the flight projects were competing with radio astronomy, radio science, radar astronomy, SETI [Search for Extra-terrestrial Intelligence], geodynamics, and VLBI [Very Long Baseline Interferometry] for time on the antenna . . . It was like a scientific gold rush."

In 1986 began an ambitious upgrade program to improve the antenna's performance even further. Engineering studies had shown that if the antenna's diameter were increased to 70 m and other improvements were made, the antenna's performance could be improved by a factor of 1.6. Thus it was that all three 64-m DSN antennas around the world became 70-m antennas. Improvements have continued throughout the years.

"This antenna has played a key role in almost every United States planetary mission since 1966 and quite a few international space missions as well. Together with its twins in Spain and Australia, it has been a key element in asserting America's pre-eminence in the scientific exploration of the solar system," remarks Mudgway.

Find out more about the DSN and the history of the Mars antenna at http://deepspace.jpl.nasa.gov/dsn/features/40years.html. Kids (and grownups) can learn how pictures are sent through space at http://spaceplace.nasa.gov/en/kids/phonedrmarc/2003_august.shtml .

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

A Visit to the Center of the Universe

By William Hepner

I left this earth from Los Angeles on June 14th of this year at 6:15 am via a sleek spaceship made by the European Consortium. Before you continue reading this article, I must warn you that I am not on some hallucination drug and I am not a member of the 4400 nor have I ever been a UFO abductee. Now with that taken care of let me continue with this adventure to THE CENTER OF THE UNIVERSE.

My spaceship was an Airbus 330-700 operated by Air Canada. Destination: Vancouver, British Columbia. I landed at Vancouver's International Airport three hours later. My trip to my point of interest was only 75% complete as the Center of The Universe is located on Victoria Island. Yes the Center of the Universe is right here on the planet called Earth! It is situated on a hill only 700 some feet above sea level. Still it was a good drive up a winding narrow road not unlike driving up to Palomar.

To get to Victoria Island from Vancouver International I rented a car and drove 17miles south to the BC Ferries landing at Tsawwassen. After one leaves the airport you get on Highway 99 heading to Seattle and then take highway 17 to the end. If you travel between the hours of 9 am and 4:30pm you'll find very little traffic until you get near the ferry terminal. If you time it right you will see a huge line of cars approaching on a otherwise empty highway lane going toward the direction from which you came. That line of cars approaching is the cars from the ferry. I was able to catch the Queen of Saanich, which holds 360 cars and has the length of 426 feet. We sailed through the San Juan Islands to the Swartz Bay terminal on Vancouver Island, travel time 90 minutes. It was a pleasant trip, very peaceful and the ferry cafeteria had excellent food at reasonable prices, a gift shop, and a game room where kids were playing video games.

After exiting the ferry I drove down to the capitol city of British Columbia…. Victoria and to my hotel. The Center Of The Universe is located at the Dominion Astrophysical Observatory of Victoria. It is a short twenty minute drive from downtown Victoria (8.3 miles) via Highways 17 and 17A (West Saanich Rd.), which puts it only 4 miles from Vancouver Island's most famous tourist attraction, the famous and beautiful Butchart Gardens. You'll find the drive there a real pleasure. We experienced little to no traffic. No cars with loud radios and earth shaking bass being emitted. The most interesting observation was the absence of trash along the roads and highways.

Everywhere you look there are shades of green. Vancouver Island gets about the same amount of rain we would get in a good year, 30 inches. The difference is that it is spread out during the year and the moist sea air also helps. The people of Vancouver Island are very environmentally conscious of their habitat and living style.

Now getting back to my destination. Driving along 17A heading north just after passing the sign to Elk & Beaver lake recreation park you'll notice a silver dome poking out a sea of green atop a low-lying hill. That's our destination. On the map, it shows as the Dominion Astrophysical Observatory. It is atop a 760 feet above sea-level hill known as Little Saanich Hill. It is the home of the Plaskett Telescope, the NRC Herzberg Institute of Astrophysics, and the Center Of The Universe, which is an interpretive center about Astronomy. The hilltop is actually the home of three telescopes, the Plaskett (1.8 meter), and a 1.2-meter telescope named after McKellar who was the Canadian astronomer that discovered hydrocarbons in interstellar space in the 1930s. Along side the center is a small dome housing a 0.4-meter reflector used for public viewing during the spring-summer and fall seasons when weather conditions permit viewing. On selected nights the public gets to look through the 1.8 meter Plaskett. The Plaskett and the McKellar are used also for research. The center has very good displays showing the milky way studies on double stars . star orbits and the motion of the solar system through the galaxy. Also are some photos and explanations of the various types of nebulas seen. A model of the CFH telescope can be seen. It resides on Manua Kea in partnership with France and Hawaii. It is a design similar to that of Palomar.

Before continuing describing the telescopes operated by the Hertzberg Institute of Astrophysics who now is the owner of the Dominion Observatory let me give you a brief history of the Observatory.

John Stanley Plaskett, who also performed most of the design work, initiated the Planning for the construction of this telescope in 1910. Grinding and polishing of the optics in Pittsburgh, Pennsylvania by John Brashear started in

1914 and was completed in 1918. Work on the mechanical components of the telescope and dome in Cleveland, Ohio, began in 1915 and was completed in 1916. First light was May 16th 1918.

For a very short time it was the largest telescope in the world. Its main purpose was to study the motions of stars through the use of its spectrograph, for the purpose of studying the structure of the Milky Way and the masses of stars. Early studies of stellar motions led to the discovery of one of the most massive stars known, Plaskett's Star, and showed the orbital motion of our solar system about the center of the Milky Way Galaxy. Understanding of the orbital motion of the solar system, combined with studies using the telescope estimating the amount of interstellar material, led to size and mass estimates for the Milky Way. Recent upgrades to its instruments and detectors in recent years have increased its sensitivity by a factor of about 10,000 over its original capabilities. Nowadays, the telescope is used to determine the orbits of comets and asteroids, study the nature of stars, learn more about distant objects like quasars and galaxies, and carry out many other research projects.

The telescope is 15 meters long and has both a Newtonian (Focal length of 30 feet,F5) and a Cassegrain (Focal length of 108 feet,F15) view ports. The tube has a diameter of 7 feet 4 inches. Each section of the tube has diagonal supports consisting of cables tensioned to 2000 lbs. The tube itself weighs in at 15 tons. Its secondary mirrors are 20 inches in diameter. Each mounted on it's own supporting structure in a way that it can be placed for use in as little as 10 minutes. The optical tube is mounted in the English Yoke fashion. The moving parts weigh in at 42 tons. The two concrete and steel piers weigh in at 400 tons. McAlpine-Robertson Company of Vancouver built the observatory building for the price of $75,000. Both the building and the dome are double walled steel structures. Warner & Swasey Co made the dome. The mirror weighs 1,960 pounds and was made by St. Gobain in Antwerp, Belgium and shipped only a week before the start of World War 1. The mirror was ground in the United States by John A. Brashear Company of Pittsburgh. The mirror was ground twice, once when a mysterious scratch and the second time due to a flaw in the first regrind. The mirror was hauled up Little Saanich Mountain by horse and wagon.

The site of Little Saanich Mountain was selected because of the seeing conditions and the temperature stability of the area. The site was investigated by using a 4.5" Cooke photo-visual telescope and was chosen over the following locations: 1) Ottawa (which at the time had a 15" reflecting telescope on a German mount.) 2) Medicine Hat 3) Banff 4) Penticton . In 1905 Canada based on the success of the 60" telescope on Mt. Wilson decided that the country needed a large telescope. On the average the Victoria site gave 200 nights of good seeing. This location has proved to be the best place in Canada for a large diameter telescope.

The right ascensions motion is through a 9 feet diameter worm gear connected to a spur gear driven by a Warner & Swasey clock. The telescope moves so accurately that periodic error is for all practical purposes zero. The drive mechanism is still the original one. The telescope is so accurately balanced that it could be easily moved by hand, however it is placed into position by motors. Its huge right ascension setting circle is accurately graduated to the minute and easily interpolated to the 10th of a minute. The declination-setting circle likewise is graduated to the minute of arc. The control room of the telescope is very stark. No big console, just 5 computer stations, each one having a 286-type processor, nothing newer. They have modernized the spectrograph, put encoders on the right ascension and declination. After getting to their reference star, the movement is controlled by a piece of software like THE SKY.

The McKeller telescope located in a separate dome down the hill slighty behind the Herzberg facility. Unfortunately the telescope is off-limits to the general public. Built in England in 1961 and modified prior to its placement here in Victoria. It has a diameter of 1.2 meters and is only 4 meters in length. Its focal ratio is F5. It has a series of mirrors which pass the light to a coude focus point. The telescope is equipped only for spectroscopic studies. Presently its main use is for studies of binary star systems in order to determine basic information about stars such their masses, motions, and chemical compositions.

The 0.4-meter telescope is a reflector as well. As previously noted it resides in a small dome next to the CENTER FOR THE UNIVERSE. It was built in the 1970's for a research instrument to test sites for larger telescopes and gas clouds of the Milky Way. Now days, it's use is primarily for public star parties.

I asked one of the telescope operators who fortunately was present about viewing conditions there. I asked about light pollution in particular. Much to my surprise, his answer was "light pollution is very slight here, even though the population of the Island has grown and we are only 8 miles from the city. " "We here on Vancouver Island are very much concerned with all kinds of environmental pollution."

It was a delight to visit this place, which is so famous in Canadian astronomy history. I would very like to return one evening when it would be possible to view though it. And by-the-way even if you go there and get a brief look though the Plassket, the center also has a 15" available and 5 8"F6 dobs for their night time visitors.

While the visit to the CENTER OF THE UNIVERSE and DOMINION ASTROPHYSICAL OBSERVATORY was not my main destination on this trip, so now off to the land of the MIDNIGHT SUN, Alaska! Oh, by the way, I was in Juneau on June 21st and at midnight the sun was only 8 degrees below the horizon and yet it appeared as though it not even set yet. I looked out into a turquoise blue sky nearly bright as a dense cloudy southern California sky.

(continued from page 3)
No matter how many of these classes we do, there are always surprises. Our class in July presented us with a bigger surprise than usual – it turned out that there was a large wedding going on at the museum when we arrived. Weddings are a major source of funding for the museum, but they are generally on Saturdays. There have been times when there were wedding rehearsals going on while we've had the Beginners Class, but this was the first time we had seen a Friday night wedding there.

Because of the wedding, there were more cars in the parking area than usual, even though the wedding guests all parked in a different lot, and there was a large catering truck blocking the road that circles around the parking area (which is dirt covered with wood chips). All this meant that we were far more restricted in where we could have people set up than usual. The nice thing is that everyone adjusted remarkably well – most of the scopes that people brought this time were smaller GoTo scopes that were very portable, and they just carried them over to where everyone was gathering near the classroom. While we were still figuring out where we were going to have people set up, some of the volunteers gave impromptu presentations that were very well received by the people attending. I noticed Don McClelland giving them the basics and fielding a lot of questions, and Steve Short talked to them about the Black Star Canyon star parties and general star party basics, and other volunteers seemed to be chiming in at various times. That proved to be a good way to get people oriented, and got the session off to a good start in spite of the disruptions in our original plans because of the wedding.

I don't know if the people attending the wedding were ever really aware of our activities, but their caterers were. They were working hard most of the evening, but found time to come over and check out the scopes and look at a few objects – and they shared the leftover cake with us (I'm told it was excellent). The people who brought their telescopes all said they'd learned a lot about how to use them and what they could reasonably see with them, several were given ideas on what they should do to make their scopes easier to use, and it seemed that a number of them were planning to bring their scopes out to one of our star parties so they could do some viewing under darker skies (and get more help if they needed it). All in all, it was a very successful, fun and interesting evening, and showed the benefits of approaching these events with flexibility – which our volunteers do really well!

In Closing

The summers seem to be attracting more great astronomical activities as time goes on – I hope a lot of you were able to make it to OPT's "Southern California Astronomy Exposition" during the final two weeks of July. And there are the star parties (we have two at Anza in August, the 19th and the 26th, as New Moon is on a Wednesday), outreach events at different parks around Orange County, lectures, and so on – whatever your particular interests in our hobby, I hope you're finding a lot of ways to enjoy it as the summer speeds by! And, if you happen to be at loose ends looking for something fun and a bit out of the ordinary to do for August 19, September 16, or October 21, Explore the Stars (the outreach program at Palomar Mountain) is alive and well and could use more volunteers!

What have you been doing in the Dark?

Have you done or participated in a project that other OCA members would be interested in learning about? For example, have you been involved in:

- An astronomically-oriented expedition (stargazing at Lake Titicaca?)
- A telescope-making or instrument-making project (a handicap-friendly telescope?)
- A research project or astronomical investigation (photometry? double-stars? spectroscopy?)
- A unique "outreach" venue
- An unusual observation (anyone discover a supernova or asteroid?)
- A special activity by one of our Special Interest Groups (Observing at a major observatory? Using a remote observatory?)

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

The OCA is filled with inventive people doing new, intriguing, and wonderful things. If you'd like to give a 10-15 minute description of one of your astronomical activities at the December meeting, please contact Craig Bobchin by e-mail at ETX_Astro_Boy@sbcglobal.net

MEMBERS ASSISTING THE LIBRARY

The OCA library would like to thank our members for their contributions last month. Kenneth Renk donated a set of astronomy slides, a stack of books and many videos to the library. Matt Ota helped out last month when I was on vacation, by opening and running the library at July's meeting. Thanks to both of you! Karen

FOR SALE Meade Autostar Suite / LPI. Used only twice. In original box with all cables, camera, and installation CD. $50.

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

August 2006

Gathered by Don Lynn from NASA and other sources

Galaxy formation – A study using the Spitzer infrared space telescope gives evidence that a clump of dark matter is necessary before a galaxy can form. The dark matter clump must exceed a certain mass before the stars of the galaxy can form. The result came from analyzing data from a survey of hundreds of galaxies in a class called ultraluminous infrared galaxies, all at distances of billions of light-years. Because they are so far, we are seeing them as they were at an early time in the history of the universe, when most galaxies were forming. The clumping of these galaxies is related to how much mass is present, and most of this mass is known to be dark matter. The dark matter calculated had a lower limit (about 10 trillion solar masses) among all galaxies studied, which implied that limit is the amount of dark matter necessary before the stars of a galaxy can form.

Fizzing space – The European Cluster and Double Star spacecraft (4 in total) have encountered bubbles of superheated gas growing and then popping in the region where the Earth's magnetic field meets the solar wind. The bubbles are less dense than surrounding gas, but much hotter (100,000 to 10,000,000 degrees). The bubbles last about 10 seconds, and expand to about 600 miles across before bursting.

Gas giant moons – The total mass of the moons of each of the gas giant planets in our solar system has been known for some time to be about 1/10000 the mass of the planet. The masses of the moons of the rocky planets (non-gas-giants) vary greatly from this. An explanation for the consistency of the gas giant moons has been proposed. It is believed that the larger moons of gas giants formed at the same time the planet formed (some smaller moons were captured later). So gas and dust were falling into the planet at the same time that the moons were growing by collecting dust and ice. Orbiting through the infalling gas and dust would cause the moons to slowly spiral in toward their planet. So quite likely there was a continuous process of forming moons and then having them spiral into the planet to be destroyed. The new theory is based on a moon formation simulation which showed at any given time about 1/10000 of the mass of the planet has formed into moons so recently that they have not spiraled into the planet yet. When the gas and dust to form the planet and its moons were finally exhausted, only the last few moons to form were left. The simulation also showed that as moons grow, they spiral inward faster. This places an upper limit to how large moons of gas giants can become. Indeed there are 6 moons orbiting gas giants that are about 2-3 thousand miles across, but none larger.

Integral (European orbiting gamma-ray observatory) was designed with a lead protective shield around the gamma-ray detectors to allow gamma rays to enter only through the telescope aperture. It has been found that the most powerful gamma rays penetrate the shield anyway, messing up the images of objects being observed. Astronomers have developed a technique that uses two detectors within Integral to pinpoint where the leaked gamma rays are coming from, and so can computer generate images of these objects. So now the stronger bursts are imaged regardless of whether the telescope is pointed at them. Solar flares and gamma-ray bursts have been imaged by this technique. This is especially useful for gamma-ray bursts, since they come from random directions at unpredictable times, so Integral is almost never pointed at one when it occurs.

Beta Pictoris – Some years ago the disk of material surrounding the star Beta Pictoris was found to have a warp in it. One theory explaining the warp is that it was actually a second ring tilted slightly with respect to the main ring. Recent images made with the coronagraph in the ACS camera of the Hubble Space Telescope finally showed that indeed such a second ring exists, tilted 4 degrees from the main ring. The coronagraph was used to block the light of the star, enabling fainter detail in the ring to be imaged. The second ring is likely caused by a planet of about 1-20 Jupiter masses orbiting with a slight tilt with respect to the main ring. The planet drags dust from the main ring into its orbital plane when it crosses the main ring.

XMM Newton (X-ray orbiting observatory) has been studying a supernova remnant named RCW103 that is known to be the ejected matter from a supernova that occurred about 2000 years ago. It has a neutron star at the center, which often remains from a supernova, but the new observations showed that X-rays vary strongly with a period of 6.7 hours. All neutron stars less than many millions of years old rotate far faster than once every 6.7 hours. The formation process for a neutron star gives it far faster spin, and then magnetic field braking takes millions of years to slow down the spin. It was calculated that the most powerful magnetic field ever seen could not slow the rotation to 6.7 hours in only 2000 years. Another problem is that the X-ray spectrum and the pattern of emissions over time have changed since observations only 5 years ago. Neutron stars should have rather constant properties. 2 possible explanations have been proposed: 1) the 6.7 hour period is the period of a companion star revolving about the neutron star, not the rotation period of the neutron star, or 2) a combination of magnetic field and debris disk act together to slow the rotation of the neutron star far faster. The problem with the first proposal is that the pattern of emission of X-rays does not match that of any known binary system. It may be that the neutron star is accreting material from the companion in ways that have not been seen before. More observation is needed to determine which theory is correct.

Neptune Trojans – There are hundreds of asteroids known that orbit in Jupiter's orbit, either 60 degrees ahead or behind the planet. These are 2 of the Lagrange points, where Jupiter's and the Sun's gravity combine to form a stable area. They are called Trojans because the first few discovered happened to be named after heroes in the ancient Trojan War. Only one such asteroid was ever found at the Lagrange points in Neptune's orbit (it was found 5 years ago), but now 3 more have been discovered using the 6.5-meter telescopes in Chile and the 8-meter Gemini North telescope in Hawaii. One of the new Neptune Trojans has a steeply inclined orbit, that is, tilted with respect to Neptune's orbit. This was unexpected. Searches for Trojans, particularly those beyond Jupiter, have concentrated on the planet's orbit, not above or below. So if there are many Trojans with highly inclined orbits, they would likely have been missed by such searches. Further search needs to be done for highly inclined Trojans. If many

(continued next page)

are found, it would have implications in the debate as to whether Trojan asteroids formed there at the time the planets formed or were captured later. Those 2 possible formation methods would produce different numbers of highly inclined orbits.

Pluto's moons – The 2 small moons discovered orbiting Pluto last year have been officially named Nix and Hydra (outer moon). Nyx is the goddess of darkness and night, and mother of Charon (the name of the previously known moon of Pluto), and Hydra is the 9-headed mythological monster, appropriate names for moons of Pluto (god of the underworld). The Egyptian spelling of Nix was used because the spelling Nyx was already used for an asteroid. The initials N and H were chosen to honor the New Horizons spacecraft, on its way to observe Pluto and its moons. This is reminiscent of the naming of Pluto, where PL were chosen to honor Percival Lowell, who began the search for a ninth planet that indeed found it, though after Lowell's death.

Planethood – The International Astronomical Union has announced that it will decide at its August conference on the definition of a planet. The 2 leading proposals are 1) to include both Pluto and Kuiper Belt object 2003 UB313 (which is slightly larger than Pluto) as planets, or 2) to include neither as planets, respectively resulting in 10 or 8 planets in our solar system. Proposals include defining planets by roundness (which includes the most massive asteroids), various arbitrary diameters, various masses, the possession of moons, only gas giants, possession of an atmosphere, and defining subcategories of planets (gas giant, rocky, icy) each with their own definition. The issue being pressed is whether small objects such as Pluto qualify as planets. It will be interesting to see if the official definition also defines the upper limit of a planet, in order to distinguish planets from brown dwarfs.

Cassini (Saturn mission) has imaged a bright strip or arc on the inside edge of the G ring. It is probably at a point where the gravity of Mimas concentrates ring particles through a resonance. It is possible that the remainder of the G ring is simply particles that slowly escape from the bright arc. Cassini also imaged the E ring, this time exactly edge-on. It can be seen that the ring is actually 2 rings, one above the other, like a stack of 2 CDs, with little ring material in between. It is believed that this is caused by most particles having orbits with slight inclination to the rest of the rings, so that particles spend most of their time just above or just below the ring plane. This could either be caused by the source of the E ring particles (the geysers of Enceladus are the source) throwing them out with an inclination, or by some gravitational effect that pushes ring particle orbits into a slight tilt.

Quasar jets – 2 teams of astronomers studying quasars in infrared, radio, visible and X-ray light concluded that the light given off by jets, those streaks emanating from quasars, is produced from synchrotron radiation. Astronomers have long debated how jets generate light. This was not the most favored theory for light from jets, so jet theory will have to be modified. Synchrotron radiation occurs when charged particles, such as electrons or protons, encounter a magnetic field while traveling nearly the speed of light.

Black holes – Data from the Chandra X-ray space observatory show that magnetic fields play a substantial part in drawing matter into black holes. It has long been known that material falling into a black hole often forms a disk around (and outside) the black hole, where the material is in orbit. In order to fall out of orbit and into the black hole, a force must act on the material, and it was previously thought this force was friction between the particles in the disk. The Chandra data showed that more material was falling from the disk into the black hole than friction could explain. The X-ray spectrum also matched computer simulations of a magnetic field forcing particles out of the disk and into the black hole. The magnetic field causes turbulence in the disk, which drives a wind from the disk, which carries away orbital energy from disk particles, so more disk material falls into the black hole.

V838 Monocerotis is a star that flared up in 2002, briefly becoming one of the brightest stars in the Milky Way galaxy. One of the most puzzling aspects of this was that it flared 3 times in succession. Images of the star taken with the Hubble Space Telescope since have shown an expanding sphere of light from the flareups illuminating material that had been ejected over long periods of time before the flareups. A number of explanations for the triple flareup have been proposed, but a new theory seems to match the data better than other theories. The new theory is that the outer envelope of the star touched a Jupiter-sized planet orbiting the star, which slowed the planet until it fell into the star. Temperatures in the star would be hot enough to ignite fusion of the deuterium (heavy hydrogen) in the planet. This would result in the first flare, which expands the star, which then similarly swallows 2 further planets in succession, resulting in 2 more flares.

Possible pre-galaxy – Astronomers have imaged a blob of hydrogen gas, twice the diameter of our Milky Way galaxy, at a distance so far that its light took 11.6 billion years to get here. We are seeing it as it was when the light left there. It is so far redshifted from the expansion of the Universe that we are seeing hydrogen spectral lines normally well into the ultraviolet redshifted to visible light. Efforts to find stars in the object in infrared, visible light, ultraviolet, and X-rays have been unable to detect anything. The most probable explanation is that we are seeing primordial gas falling onto a clump of dark matter, before any stars had a chance to form. It may later have become a galaxy.

Cosmic ray observatory – Funding and permits were obtained for an array of telescopes spread over western Utah that will be used to detect light high in our atmosphere resulting from cosmic rays hitting the air. Cosmic rays are atomic nuclei, stripped of their electrons, that hit us from space at very high speed. Their sources remain unknown, except that some lower energy cosmic rays are now known to come from supernovas. Possible sources include the nuclei of active galaxies, colliding galaxies, radio emitting galaxies, cosmic strings, or decay of massive subatomic particles. The indirect observation method is used because the cosmic rays themselves are stopped by collisions with air molecules long before they reach the Earth's surface. The system, to begin observations next year, will be 10 times more sensitive than previous cosmic ray observatories. It will observe both the ultraviolet light given off by collisions with nitrogen, and the showers of secondary particles caused by atmospheric collisions. Some of the telescopes will be helicoptered into place in order to protect endangered life in the area.

Instant AstroSpace Updates

Data from the Hayabusa spacecraft (Japanese asteroid mission) shows that the Itokawa, the smallest asteroid seen close-up, at 2300 feet across, is a very loose compilation of rock and gravel, barely held together by its own gravity. If this is typical of small asteroids, they pose **less risk** than thought, since they would break up on collision with our atmosphere or could easily be dispersed or deflected.

The 15-meter Maxwell submillimeter telescope was used to track clumps of matter rotating in the disk surrounding the star **Epsilon Eridani**, showing they orbit in 130 years, and are farther from their star than Pluto is from the Sun. They are probably protoplanets, that is, planets in the act of forming.

Smart 1 (European lunar mission) raised its orbit slightly to move its impending impact with the Moon from the far side to the near side, so that it could be observed from Earth. This moves the date of impact from August 17 to September 3. The main propulsion, an ion engine, had run out of fuel, so the orbit adjustment had to be made with a combination of the attitude thrusters and the reaction wheel.

The **Hubble Space Telescope** on June 19 had a failure in the power supply of the ACS camera, and automatically shut down the camera. Spacecraft controllers were able to restore full functionality of the camera by July 3.

Cassini (Saturn mission) reached the halfway point in its planned 4 years of orbiting Saturn. The next 2 years will include tilting the spacecraft orbit to enable observations over Saturn's poles and face-on ring observations. Discoveries so far include the planet's rotation period, Titan landing and images, 3 new moons, the equatorial ridge on Iapetus, geysers on Enceladus, and new ring detail.

The Mileura widefield **array of radio telescopes** has been funded, to be built by the United States in a radio-quiet region of Australia. It will have 500 "tiles" each containing 16 antennas, spread over a circle nearly a mile across, with computer control of aiming by phasing the tiles, without moving any antennas.

NASA has reversed its earlier decision to cancel **SOFIA**, the 2.5-meter infrared almost-space telescope that flies above most the Earth's atmosphere in a specially equipped 747 aircraft. Construction is almost complete, but some budget shuffling must still get approved before it will fly.

The Crew Vehicle being developed to replace Shuttle flights has been named **Ares** I, and the cargo rocket to replace shuttle flights has been named Ares V, similar to the Saturn I and V rockets of the Apollo days.

The **Space Shuttle** Discovery launched July 4 and successfully reached the International Space Station, with very little damage to the Shuttle from debris during launch. This is only the second mission since the Columbia disaster, caused by debris during launch.

NASA is offering a prize of ¼ million dollars to any team that can develop a **robot** that can assemble a pipeline to a storage tank in simulated Mars terrain. This includes a 20 minute delay in transmitting commands to the robots, since radio signals typically take 20 minutes to reach Mars.

New Horizons (Pluto mission) tested its instruments by tracking a passing asteroid, 2002 JF56. Next flyby is a gravity slingshot at Jupiter next February.

French astronomers have proposed building a test interferometer of 3 optical 16-inch telescopes at **Dome C**, a remote research station in Antarctica that allegedly has the best seeing on Earth, occasionally attaining the resolution of the Hubble Space Telescope. If the test system works, plans will be developed for an array of 36 60-inch telescopes. ■

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