SIRIUS ASTRONOMER

www.ocastronomers.org

The Newsletter of the Orange County Astronomers

December 2002 *Free to members, subscriptions $12 for 12 issues* **Volume 29, Number 12**

The most prominent and most often imaged winter objects are those located in the Constellation Orion, including the famous Orion Nebula. However, *The Horsehead Nebula* is an intriguing and devilishly difficult dark nebula to image, much less see. It is found just between zeta Orionis (the eastern star in Orion's belt, and sigma Orionis (a beautiful multiple star system). It is visible in medium to large telescopes given the right sky conditions. This image of the horsehead Nebula and the Flame Nebula, by OCA Member Gregory Pyros, was taken through a William Optics Apochromatic refractor at our Anza site on October 5th.

OCA CLUB MEETING

The free and open club meeting will be held Friday, December 13th at 7:30 PM in the Science Hall of Chapman University in Orange. Featured speaker will be our own Chris Butler with a new presentation focusing on the Moon. This seems very appropriate considering the weather has been most favorable during full moon periods.

STAR PARTIES

The Star Party this month, was on the 30th of November based upon the cycle of the New Moon. But really, it still does count! However the next Star Party is on Saturday, January 6th at Anza. Good new! We anticipate the Kuhn will be up and running for the January Star Party. Naturally, the members will have access to the club's 10" and 12" LX200's. The Black Star Canyon site will be open on December 28th. Check the website, calendar, and Anza Webcam for the latest updates on star parties and other events.

COMING UP

The Astrophysics SIG will not be meeting this month due to the close proximity of Christmas. The Astro-Imagers' SIG will meet December17th. A special presentation from Arnie Rosner on his remote observatory will be the main topic. The EOA SIG will meet December 18th. For those that plan ahead, a complete list of Star Party dates has been provided this month by Don Lynn. Thank you Don!

President's Message
by Liam Kennedy

Leonids Storm is a bit of a yawn!

I don't want to seem ungrateful – but I guess I was expecting a little bit more from the last-in-a-lifetime opportunity of seeing the Leonids at their best. Don't get me wrong – I really enjoyed sharing the last big storm of the 21st century with all the other members who went to Anza on the night of November 18th. In total there must have been around 40-50 members there to experience the event. I spent most of my observing time on the "football" field next to a group who were lying flat on their back waiting for things to happen. Very little activity of any merit occurred until around 2:45am when there was a marked increase to perhaps 10-20 meteors per minute (my very unscientific guess).

On Tuesday, the following evening, we had the monthly AstroImagers meeting where two of the members showed the group some freshly developed photographs taken that morning. Jim Windlinger had one photo in particular with at least 6 faint Leonid meteors visible. Check the web site for photos and other information and experiences from our members.

Cement work at Anza

During the day of the November Anza star party, many members helped with pouring of cement for the stairs between the member's observatory and the 'last-members-in' areas. The cement for the stairs to the EOA's MOCAT development near Anza house was also poured at that time.

Thanks to all who helped; especially Don Lynn for his continued dedication in keeping the Anza site such a quality resource for all of us.

OCA Elections 2003

The nominations for board members were formally opened at the November OCA general meeting. So far the line-up for voting is as follows (subject to change)

President: Barbara Toy, Vice President: Joel Harris, Secretary: Bruce Crowe, Treasurer: Charlie Oostdyk
Trustees: Bob Buchheim, Carol Copp, Tim Hogle, Anthony Obra, Dave Radosevich, Gary Schones, Russell Sipe, Liam Kennedy.

Although I am not standing for the president's position next year, with your vote, I am looking forward to continuing service in a trustee role.

The December meeting will be the last opportunity for nominations for board positions. At this meeting we intend to provide an opportunity for each candidate to give a short representation of their credentials and reasons for standing for a board position.

Please check out the very helpful article by Barbara Toy (page 7) in this newsletter and on the web site about being a board member.

"Every day we are connecting ever more photons of light from distant galaxies to the eyes, hearts, minds and imaginations of our members and others in our community." -- Liam Kennedy

As the Worm Turns....

The next OCA AstroImagers Special Interest Group meeting will be held at 7:00pm on Tuesday December 17. OCA club member Arnie Rosner will give an in-depth presentation on setting up a remote-controlled observatory, and provide a door prize of 6 hours (a $300 value!) of remote imaging time at the observatory! You must be present to win.

Arnie will discuss the hardware, software, and issues involved when his remote Arizona observatory was constructed. Take a look at his web site: http://www.arnierosner.com/are/index.htm

You do not have to be an AstroImagers group member to attend the meetings, you just need to have an interest in taking pictures of the sky - film, CCD, video, scope, camera lens, whatever.

The AstroImagers group meets on the third Tuesday of every month at 7:00pm at the offices of Source Refrigeration, Inc. at 800 E. Orangethorpe Ave., Anaheim CA 92801. Come check us out!

NASA's Space Place

Enlightened by Darkness

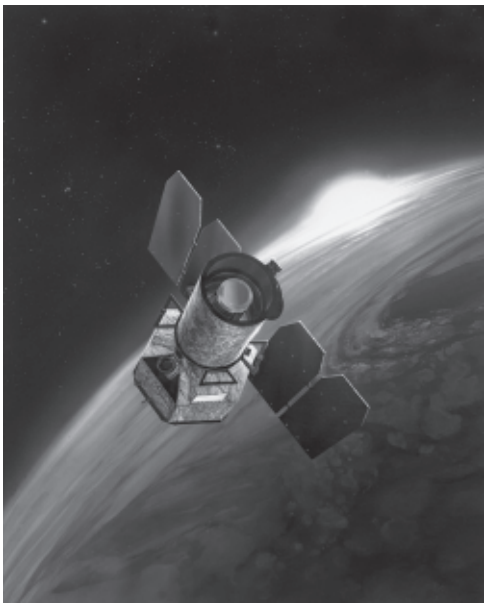
by Diane K. Fisher

On the clearest of nights, I may see a dozen stars from my suburban backyard near Los Angeles. Unfortunately, my studies of space and astronomy have been confined to books and the pictures taken by others. Seldom have I experienced for myself a truly dark, clear, moonless sky.

One of those rare times was a summer camping trip in Bryce Canyon, Utah. I lay on my sleeping bag in an open area away from trees. I saw millions of stars (so it seemed) and the cloud of the Milky Way streaking across the sky. Nothing of planet Earth was in my view. It was then I glimpsed my true situation in the universe, a speck of dust clinging to a tiny stone hurtling through the darkness of a cold, infinite universe. I was awestruck by the beauty of the stars and the darkness; yet I was terrified.

In the light of day and a more "down-to-Earth" state of mind, I wondered: With around 100 billion galaxies out there, why is it still so dark out there?

Until the 20th century, astronomers thought the universe was infinite. They were perplexed though, because in an infinite universe, no matter where you look in the night sky, you should see a star. Stars should overlap each other and the sky should be blazing with light and hot as the sun. This problem became known as "Olber's Paradox."



The GALEX (Galaxy Evolution Explorer) mission will do a broad survey of galaxies in various stages of evolution and identify interesting objects for further study by the Hubble Space Telescope.

Astronomers now realize that the universe is not infinite. A finite universe-that is, a universe of limited size-even one with trillions of stars, just wouldn't have enough stars to light up all of space.

Although a finite universe is enough to explain the darkness, the expansion of the universe also contributes. As light travels from a distant galaxy to us, the space through which the light is traveling is expanding. Therefore, the amount of energy reaching us dwindles all the time, thus causing the color of the radiation to be "redshifted." (The wavelength is stretched out due to cosmic expansion.) The more distant the galaxy, the more redshifted the light. The largest redshift astronomers have measured comes from radiation that was emitted when the Universe was only 300,000 years old. This radiation has taken over 12 billion years to reach us and although it began as infrared radiation, it is now seen as microwave background radiation.

GALEX (Galaxy Evolution Explorer) is a NASA space telescope that will survey the universe, including galaxies with redshifts that indicate their light has been traveling for up to 10 billion years (or 80% of the history of the universe). Read about GALEX at www.galex.caltech.edu/ . For budding astronomers, print out The Space Place New Millennium Program calendar at spaceplace.nasa.gov/calendar.htm to identify great sky watching opportunities.

Diane K. Fisher is the developer and writer for The Space Place web site.

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

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Black Holes: Feeling the Ripples

Astronomers have finally confirmed something they had long suspected: there *is* a super-massive black hole in the center of our Milky Way galaxy. The evidence? A star near the galactic center orbits something unseen at a top speed of 5000 km/s. Only a black hole 2 million times more massive than our Sun could cause the star to move so fast. (See the Oct. 17, 2002, issue of *Nature* for more information.)

Still, a key mystery remains. Where did the black hole come from? For that matter, where do *any* super-massive black holes come from? There is mounting evidence that such "monsters" lurk in the middles of most galaxies, yet their origin is unknown. Do they start out as tiny black holes that grow slowly, attracting material piecemeal from passing stars and clouds? Or are they born big, their mass increasing in large gulps when their host galaxy collides with another galaxy?

A new space telescope called LISA (short for "Laser Interferometer Space Antenna") aims to find out.

Designed by scientists at NASA and the European Space Agency, LISA doesn't detect ordinary forms of electromagnetic radiation such as light or radio waves. It senses ripples in the fabric of space-time itself—gravitational waves.

Albert Einstein first realized in 1916 that gravitational waves might exist. His equations of general relativity, which describe gravity, had solutions that reminded him of ripples on a pond. These "gravity ripples" travel at the speed of light and, ironically, do not interact much with matter. As a result, they can cross the cosmos quickly and intact.

Gravitational waves are created any time big masses spin, collide or explode. Matter crashing into a black hole, for example, would do it. So would two black holes colliding. If astronomers could monitor gravitational waves coming from a super-massive black hole, they could learn how it grows and evolves.

Unfortunately, these waves are hard to measure. If a gravitational wave traveled from the black hole at the center of our galaxy and passed through your body, it would stretch and compress you by an amount far less than the width of an atom. LISA, however, will be able to detect such tiny compressions.

LISA consists of three spacecraft flying in formation-a giant triangle 5 million km on each side. One of the spacecraft will shoot laser beams at the other two. Those two will echo the laser signal right back. By comparing the echoes to the original signal, onboard instruments can sense changes in the size of the triangle as small as 0.0000000002 meters (20 picometers).

With such sensitivity, astronomers might detect gravitational waves from all kinds of cosmic sources. The first, however, will probably be the weightiest: super-massive black holes. Will "feeling" the ripples from such objects finally solve their mystery, or lead to more questions? Only time will tell. Scientists hope to launch the LISA mission in 2011.

Anza Star Party Calendar

by Don Lynn

For the year of 2003

Star Parties	New Moons
Jan 4	Jan 2
Feb 1	Feb 1
Mar 1	Mar 2
Mar 29	Apr 1
May 3	May 1
May 31	May 30
Jun 28	Jun 29
Jul 26	Jul 28
Aug 23	Aug 27
Sep 27	Sep 25
Oct 25	Oct 25
Nov 22	Nov 23
Dec 20	Dec 23

Note: New Years weekend coincides with the Jan 4 star party, so the club telescope may not be open that night.

Note: Aug 30 has a good moon, but coincides with Labor Day weekend, so is not a star party.

For the year of 2004

Star Parties	New Moons
Jan 17 & 24	Jan 21
Feb 21	Feb 20
Mar 20	Mar 20
Apr 17	Apr 19
May 15	May 18
Jun 19	Jun 17
Jul 17	Jul 17
Aug 14	Aug 15
Sep 11	Sep 14
Oct 9 & 16	Oct 13
Nov 13	Nov 12
Dec 11	Dec 11

Beginning 2005

Star Party	New Moon
Jan 8	Jan 10

High Resolution Solar System Imaging using Video

by Patrick Stocker, OCA member

My first image of a solar system object was a picture of the moon, taken through a Edmond Scientific 4 ¼" reflector using a fixed lens box camera that my uncle had given me for Christmas. I was about twelve at the time and I don't know whatever happened to the print, but in my mind's eye, clouded by the fog of many years past, that picture was probably one of the highest resolution images of the moon ever taken from a ground based telescope. Today I still enjoy imaging solar system objects, but the fixed lens box camera has long since disappeared and has been replaced by a video camera. Many amateur astroimagers are producing extraordinarily detailed images of the moon, sun and planets using nothing more than household video equipment and small aperture telescopes. One of the great things about video astrophotography is that you don't have to spend a lot of money to get into it. In fact, most people probably already own the basic equipment that is needed to start taking high-resolution images. If you own a camcorder, a VCR and an old TV that can be used as a monitor, then you already have all of the basic equipment needed to do video astrophotography. I have found that video is a great equalizer for poor seeing conditions. The standard video frame rate is 30 images per second. However theses 30 images are actually made up of two images that are interlaced to create the one image. In effect you are shooting 60 images per second with a video camera. The implications of this high speed imaging are that even when you have marginal seeing conditions, there will be fleeting instances when the seeing is steady, and you will be able to capture the undistorted images on tape. Using an inexpensive frame grabber, you can transfer the best images onto your computer and use image-processing software to further enhance them. In this article I will be discussing the equipment that I utilize and the image processing steps that I use to do tricolor planetary imaging. However, as I said before, you don't need any special equipment to get started and to obtain outstanding results with a video camera. A good place to start would be to read John Sanford's article in the August 1999 issue of the *Sirius Astronomer.* John provides detailed instructions on how you can use your home camcorder along with your telescope to image solar system objects.

My current imaging setup consists of an Astrovid 2000 video camera, a JVC Super VHS deck, and a old Commodore 64 monitor. Since I like color images, I also use a True Technology flip mirror/filter holder and a True Technology RGB filter set in order to get the color components to combine a RGB or LRGB image. For fast rotating planets like Jupiter and Mars, I usually shoot a LRGB sequence of 2 to 2 ½ minutes. I usually shoot through the luminance filter for about 40-50 seconds and the RG&B filters for about 30 seconds. This gives me more frames to choose from for the high resolution luminance channel. As I'll explain later, you really don't need high resolution frames for the color channels. When I start to process the final image, I single frame the tape through the video recorder and transfer the best images to my computer using a FlashBus MV frame grabber. The two telescopes that I use are a Celestron f/10 8" SCT and a Cave f/6 10" Newtonian reflector. In order to get the magnification that is required for high resolution work it is necessary to use either eye piece projection or a Barlow lens. I prefer the Barlow route and I mount it in front of the flip mirror which places the Astrovid 2000 camera chip about 185 mm in back of the Barlow lens. Thus with the C8 in this configuration, I can use a 2x Barlow and image f/35.

The images to the left are actual video frames from a LRGB sequence that I shot of Saturn on 11/24/2000. The images were shot through the Cave 10" Reflector with the Astrovid 2000 video camera working at f/20.8. The seeing was fairly typical for my backyard and was about 4-6 during the 3 minute sequence. 4-6 seeing is characterized by almost continuous distortions with brief moments of good seeing.

I single framed through the tape to get at those brief moments of good seeing and grabbed the best images for assembly into the final image. There are several freeware programs that allow you to automate the selection, alignment and stacking of video images.

One of the best is a program called Registax (http://aberrator.astronomy.net/registax/). This program will also allow you to deinterlace either AVI or BMP image sequences and it has it's own set of image processing tools.

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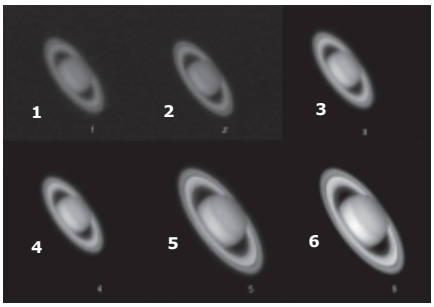
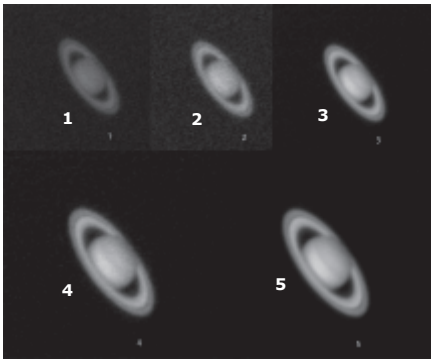
Processing of the Luminance Channel



1. This is what a typical frame looked like when reviewing the luminance portion of the tape. Fortunately, the luminance sequence had more moments of good seeing than did the RGB sequences so I was able to grab enough images to get a fairly decent final image.
2. It is one of those brief instances of steady seeing that I was looking for when single framing through the tape. This is a semi-frame image where I split the full interlaced frame into it's odd and even fields and then selected the best semi-frames for stacking.
3. Eighteen semi-frames were aligned and stacked to produce this image.
4. MaxIm DL's Maximum Entropy Deconvolution was run on the stacked images produced in #3 to get this image.
5. The image produced in #4 was then resized from 640 x 480 pixels to 900 x 675 pixels and given a mild unsharp mask.
6. This is the final image used for the luminance channel and is the result of stacking fourteen "stacks" produced in #5. I adjusted the contrast and brightness on this image later on when I combined it with the RGB image.

Processing the Color Channels



1. This is a full frame image shot through a red filter. Notice how much more noise there is compared to the #2 luminance image. Also, you can see that the seeing had deteriorated somewhat. The noise is the result of turning up the gain/gamma on the camera to shoot through the color filters. I usually set the gain/gamma for the red filter and leave it at the same setting for the green and blue filters.
2. Normally I use a full frame image for stacking the three color channels, but because the seeing had deteriorated and there was significant blur in the interlaced frames, I spilt the frames and realigned them using MaxIm DL.
3. This image is the result of stacking 20 semi-frames from #2.
4. The #3 image was resized from 640 x 480 pixels to 900 x 675 pixels and given a mild unsharp mask.
5. This is the final image for the red channel and is the result of stacking five "stacks" produced in #4. Notice how soft this image is compared to the final luminance image. The beauty of the LRGB technique is that you only need a really sharp image for the luminance channel. In fact, I usually end up applying a gaussian blur to the RGB image to reduce noise/ artifacts when doing the final LRGB assembly in Photoshop.

Finishing up the image

The green and blue channels were processed the same way as the red channel. I like to use Photoshop for combining the RGB channels and then layering in the luminance channel. MaxIm DL has provisions for doing this, as well as a number of other color combination techniques, but I find Photoshop a little easier to work with.

The final color image can be seen on the back cover of the new OCA brochure, or you are invited to visit my website at http://home.earthlink.net/~pjstok/wp11a_planet.html where you can view several other planetary images shot and processed using the same equipment and basic techniques that I've described.

The Orange County Board of Directors, your questions answered.

This is another in my intermittent series of unofficial answers to questions of general interest, this time about the OCA Board of Trustees. If you have a question about the club, its facilities, its activities, etc., please email me at btoy@cox.net, or send by snail mail to P.O. Box 1762, Costa Mesa, CA. If I don't know the answers, I can probably find someone who does. Comments or additions to responses are also welcome.

What exactly is the OCA Board?

Though most people aren't this direct, over the time I've been on the Board, people have asked me questions about it that boil down to this, or made comments showing they have a lot of misconceptions about what the Board is and how it works. Since we are now in the annual Board election season, this is a good time to explore the topic, especially if it encourages members to run for office, or just get more involved with the operation of the club.

Have you ever wondered who the Orange County Astronomers belongs to? The answer is: the members, and nobody. As a non-profit corporation, we don't have stockholders and we don't have an "owner." We members are a group bound together by our interest in astronomy. In order to promote that interest, we as the club have acquired assets (such as the Anza property), incurred expenses (such as buying books to keep our Library up to date), and made commitments (such as the insurance required by our permit for use of the Silverado/Black Star Canyon site). The Board of Trustees – members elected by the membership – is the governing body of the club. It has the primary responsibility for managing club assets, and for ensuring that any expenses incurred or commitments made are in the best interests of the membership.

If you check the back of any issue of the Sirius Astronomer, you will see the current Board members listed – there are four officers (President, Vice President, Treasurer and Secretary) and seven Trustees. Any member in good standing who's been in the club for at least a year can run for a Trustee position, and any member who's been a Trustee for a year can run for President or Vice President. The officers for 2002 are: Liam Kennedy, President; yours truly, Vice President; Charlie Oostdyk, Treasurer; and Bruce Crowe, Secretary. The 2002 Trustees are Bob Buchheim, Carol Copp, Stephen Eubanks, Tim Hogle, Tony Obra, Gary Schones and Russell Sipe. You can email the entire Board at once by using the address ocaboard@ocastronomers.org.

Board terms are one year, and nominations for the next year's Board open at the November general meeting and close at the end of the December general meeting. They can be made at these two meetings or by email to the Board between the November and December meetings. Voting can be done by snail mail (ballots will be available on the website, and will also be sent with the January Sirius Astronomer), or at the general meeting on January 10, 2003.

What does the Board do?

The Board decides club policies and procedures, deals with problems facing the club, and deals with funding, monitoring and assisting various club projects. A lot of our work is very practical, such as organizing clean-up days at Anza, getting septic tanks pumped, arranging for the storage container by the club observatory, dealing with delivery problems with the Sirius Astronomer, figuring out how to fill positions that have been left vacant (such as the editor of the Sirius Astronomer, the OCA Librarian, the Anza House Coordinator and the Observatory Custodian, to list some recent examples), and other day-to-day business that keeps the club functioning. We also have to approve (and usually fund) any significant project done in the club's name, so we get a ringside seat for most of what goes on here, such as the Anza broadband project, the AstroImage conferences, the building of the MOCAT observatory, and repairs and modifications to the Kuhn. And the Board itself initiates projects as needed, such as the current effort to develop a comprehensive site plan for the Anza site.

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How do things actually get done?

Realistically, the Board as a body can only obtain information, discuss issues, decide between alternatives, authorize action and allocate funds. We use email a lot between meetings to discuss issues and share information, but actual decisions are generally made only at formal Board meetings, as any action without meeting needs unanimous approval by all Board members. The formal meetings are set every other month, beginning in January. We sometimes have to call an emergency session, such as when the Kuhn broke down last August, or a special workshop session, such as when we met to go over the results of the survey we did in 2001. Members can attend any Board meeting except executive sessions (which are very rare), but, since they are held in private facilities, please give advance notice to the Board if you plan to attend a meeting.

The way things actually get done is that whoever is authorized by the Board does them. These can be the club members who bring a specific proposal to the Board for approval, or members who agree to take responsibility for a project that the club needs to accomplish. An example of a project being presented to the Board is the AstroImage 2002 Organizing Committee and its proposal early last year for a very ambitious – and, as we saw in August, very successful –conference. Once it was authorized, the committee members themselves did the work to put the conference together, periodically reporting back to the Board on the status. An example of members agreeing to take responsibility for a necessary project is the refurbishment of the Kuhn telescope's drive system. Dave Radosevich and John Hoot had the necessary expertise, and at the request of the Board agreed to take on this critical project.

But, by necessity, we have a "working" Board; most often the people who do the actual work are Board members who understand a particular need, and are willing to put in the special effort needed to meet it. Gary Schones, for example, got us the much-needed storage container near the club observatory, arranged for its installation, and even built shelves in it, which then allowed us to clear out the observatory warming room and observation deck and make the observatory much more usable As another example, Liam Kennedy got the Anza weather station and WeatherCam working after the project was dormant for several years. Liam also located a provider and negotiated the contract for broadband Internet access at Anza.

What about those stories of battling factions on the Board?

Fortunately, that is ancient history, though there are a lot of people who remember more contentious times. To help keep meetings more orderly, while he was president, Russell Sipe instituted such things as regular use of Robert's Rules of Order and a more businesslike focus, and that has continued during Liam's presidency. As one result, Board interactions in recent years, and certainly in the two years I've been on it, have been characterized by a high level of courtesy and professionalism, and by a general focus on issues more than personalities. That doesn't mean we don't have differences of opinion – we do, and there have been some pretty hot arguments on occasion. One of the Board's real strengths is that we have a wide range of backgrounds and expertise represented among the Board members, and, not too surprisingly, we don't always see eye to eye on the issues we consider. The resulting discussions usually give us all a more complete understanding of the issues in dispute, so we can reach a better overall decision. Interestingly, even where people start out with very different views on an issue, we almost always reach a consensus by the time the issue is put to a vote, and most of our decisions have been unanimous or close to it.

Do the meetings run really late?

It's true that meetings at times are long (though far from boring), especially if we have a lot of member presentations on top of a full agenda, or if we have several complex or controversial issues that need a lot of discussion. We need to give each issue the attention it deserves, and sometimes that simply takes time. We try not to waste much time, and in this last year, in particular, Liam adopted several measures to help keep the length of meetings under better control, including setting a target ending time and more careful monitoring of how much time is taken on individual issues, which help keep the meetings focused and moving faster. We also moved the meetings up an hour, so they start at 5:30 p.m. now, to make it easier to finish at a reasonable hour. The meetings are usually on Sunday evenings, and most of us have to go to work the next morning, so we have incentive to finish up and get home to bed. The current aim is to finish by around 9:30 – but it's amazing how fast that time goes by!

Do you have to be part of the "inner circle" of the club to get on the Board?

When I first joined the club, which was only about three years ago, and sat in the audience at the general meetings watching the interplay between those mysterious people who obviously knew each other well and were very involved in the club, it certainly seemed to me that there was an "inner circle," and I had no concept that I could join it. When I was first nominated to run for Trustee, the only person in that "circle" who knew me at all was the person who convinced me to run, Jim Benet (to whom I owe eternal thanks) – and he only knew me from a few Outreach events. As it happened, there was a shortage of candidates that year, and I was elected even though I was a stranger to pretty much everyone in the club. When I showed up for my first Board meeting, nobody on the Board knew me, but they made me feel very welcome, and I quickly learned that all I needed to do to join that "inner circle" was – to volunteer.

So, I offer my own experience as evidence that you don't have to be part of any "inner circle" to be elected to the Board, or to contribute once you're there.

As to joining the "inner circle" – in the last two years, I've learned a lot about the "inner workings" and "power structure" of the club. I don't think I'm revealing any deep secrets when I tell you that the "power structure" is just the core of people who consistently volunteer to do what the club needs done. And all you need to do to join the "inner workings" of the club is to take on some of those jobs. Come out for Anza clean-up days. Help Stephen Eubanks out with maintenance or renovation jobs at Anza House. Let Don Lynn know that you're available for other Anza projects. Get on Jim Benet's list for notice of Outreach events, and come out for some. Tell Darren Thibodeau if you'd like to contribute an article or help out with the Sirius Astronomer. Help us out at the general meetings by stepping in to sell raffle tickets or anything else that's needed. And that's just scratching the surface – the club runs solely by volunteer efforts, and there is always more that needs doing than the active volunteers can do.

And the benefit of doing that? As I learned when I started volunteering for Outreaches, you'll discover aspects of the club you never suspected and, if you're like most of us, the more you do the more of a stake you'll feel in the club, the more club members you'll meet and the more you'll find out about club activities that interest you. And all of that makes being a club member a whole lot more fun.

Which, by the way, is also the greatest reason for running for the Board – serving on the Board can be a lot of work, but, believe me, there's no better way to enrich your club experience.

AstroSpace Update

Gathered by Don Lynn from NASA and other sources

Anomalous Cosmic Rays

Cosmic rays, extremely fast moving charged atoms, come in 2 varieties: high energy and low energy. The low energy ones have become known as Anomalous cosmic rays. It has been known for some time that they form near or in the Solar System, while the other variety form elsewhere in our galaxy or in other galaxies. An explanation has been discovered for how some of the Anomalous cosmic rays form. The Kuiper Belt of icy asteroids in orbit beyond Neptune is known to produce considerable dust from collisions between the Kuiper Belt objects. It was found that solar wind striking the Kuiper Belt dust sputters atoms off the dust, and then sunlight strips off electrons, leaving the atoms positively charged. The magnetic fields in the solar wind accelerate any charged particles, including these, to very high speed, forming the cosmic rays. It is hoped that now that we know how these cosmic rays are formed, measurements of the cosmic rays can be used to study the properties of the Kuiper belt and its dust.

Population III star found

Stars have been classified for decades as Population I or II, according to the amount of heavy elements (those heavier than helium) in them. The Sun and most stars in the plane of our galaxy are Population I, having 1 to 2% of these heavier elements, the rest being hydrogen and helium. Population II stars, having 10 to 1000 times less of heavy elements, are common in globular clusters. It has been proposed that there should be a Population III, with even less of the heavy elements, essentially devoid of them, which formed directly from the material left after the Big Bang. The equations describing nuclear reactions say that the Big Bang should have produced no heavy elements, except a touch of lithium. All the heavy elements are formed by the nuclear reactions in stars at some point in their lives, and are recycled to be used in future generations of stars by stellar winds and supernova explosions.

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Thus the Population II stars formed early in the galaxy's history, before much material had been recycled, but after some generations of stars formed directly out of the matter from the Big Bang. A spectrum of a star (designated HE 0107-5240) taken by the VLT (8-meter telescope in Chile) has shown it to have 200,000 times less of heavy elements than the Sun, the lowest ever found, and so could be considered a Population III star. The star was located during analysis of the Hamburg/ESO survey, which took spectra of the entire southern sky using a 1-meter Schmidt camera. This is producing thousands of candidates for heavy-element-poor stars, which must then each be checked with a more precision spectrum, and so far this star is by far the record-holder for low heavy elements. Thus the Population II stars formed early in the galaxy's history, before much material had been recycled, but after some generations of stars formed directly out of the matter from the Big Bang. A spectrum of a star (designated HE 0107-5240) taken by the VLT (8-meter telescope in Chile) has shown it to have 200,000 times less of heavy elements than the Sun, the lowest ever found, and so could be considered a Population III star. The star was located during analysis of the Hamburg/ESO survey, which took spectra of the entire southern sky using a 1-meter Schmidt camera. This is producing thousands of candidates for heavy-element-poor stars, which must then each be checked with a more precision spectrum, and so far this star is by far the record-holder for low heavy elements.

Binary star planet

The first planet has been discovered that orbits about one star of a relatively close (to each other) binary star, Gamma Cephei. The separation of the 2 component stars is closer than the distance of Neptune from our Sun. This discovery implies there may be more planets than thought, because most stars are in binary systems. Many astronomers had thought that close binary stars would not form planets, or would disturb them out of orbit if they did form. The newly found planet is 1.76 times as massive as Jupiter, and orbits a little farther from its star than Mars does from our Sun, taking about 2.5 years. Like most other planets discovered in recent years, this one was detected spectrographically by the wobble it induces in its star as it orbits. The star has been monitored for 20 years for wobble, but it took this long to rule out any other causes for the wobble found.

Star orbiting supermassive black hole

Astronomers using the VLT have observed in infrared a normal star orbiting the supermassive black hole at the center of the Milky Way Galaxy. Its orbit approaches the black hole to within 3 times Pluto's distance from our Sun, and at that point the star is moving over 3000 miles per second. The orbital period is about 15 years. This gives the tightest bounds of any observation on how much mass is concentrated in how little space at the center of our galaxy. It is this concentration of mass that rules out other sources of great mass, such as star clusters, leaving us with only the black hole explanation. The mass has been known for some time to be about 2.6 million times that of the Sun, and even before this observation, most astronomers accepted that it must be a black hole. However, this new observation ruled out even all the unlikely ones, including clusters of neutron stars, clusters of individual black holes, and clouds of neutrinos.

Star formation

One of the unsolved mysteries of star formation theories is why galaxies produce new stars at a relatively slow pace. It has been suggested that turbulence in the clouds of gas keep stars from forming as fast as theory says they should, but the source of turbulence has not been found until now. Clusters of very large bright stars give off ultraviolet light strong enough to stir up the gas clouds over a significant part of a galaxy. This tends to keep it too stirred up during the lifetime of the bright cluster to slow formation of further stars. This leads to fairly regular repetitions of forming a few large clusters, then slowing down star formation rate for perhaps 10 million years. Simulations of this appear to produce shapes (filaments, etc.) in the gas clouds that match what is observed.

Galileo (Jupiter mission)

started its final orbit about Jupiter and made its first and only pass by Amalthea, one of the small moons that orbit inside the 4 large Galilean moons. This orbit also approaches the giant planet closer than any other so far, and flies through one of the planet's rings for the first time. The spacecraft has endured more than 4 times the radiation it was designed for, but is still mostly working. It is close to the end of its fuel supply, which is the principal reason the mission is being ended. At the end of this orbit, the spacecraft will be aimed at Jupiter, where in September it will enter the atmosphere at very high speed and probably melt. The intentional crash into Jupiter will prevent the spacecraft from hitting any of the moons and contaminating them for future missions.

To find out more on these topics, or those of past months' columns, through the World Wide Web, send your Web browser to our OCA Web site (http://www.ocastronomers.org), select Space Update Online, and the topics are there to click on

Virtual Astronomy
by Dave Kodama

Leonids 2002

Early reports from Europe and the U.S., both optimal for the 2002 Leonid peaks were much like our November California governor's race – met expections, which were not high to begin with. In reality, my impressions were that we were probably getting a good shower, but we just couldn't see many meteors due to the full moon's interference. I was lucky enough to be in Sedona, AZ, where the vacationing OCA member Greg Pyros invited me to crash his little observing party (thanks Greg!). Despite the full moon, we were seeing more activity than a typical regular meteor shower like the Perseids and when the moon set behind a nearby ridge, I could see the ground lighting up as meteors flashed by. Unfortunately the moon setting was perhaps a half an hour later than it could have been as the moon perversely managed to set in a big dip in the ridge! http://www.comet-track.com/meteor/leonids02/leonids02.html

The early visual reports on the web included descriptions from across the U.S., Canada, and Europe. These were similar to my experience, and I found only one photographic report at this early point (2 nights after the Leonid peak):

The presence of the full moon meant that photographers were limited to relatively short exposures of just a few minutes to avoid moonlight fogging the film. Maintaining this rate of picture taking all night is taxing, so perhaps many astrophotographers did not take their cameras out. However, I do expect to see a few more results in the near future, hopefully by some OCA members. By the time you read this, I'll have a collection of the links on the OCA's site here http://www.ocastronomers.org/e-zine/virtual_astronomy/

Please send me a note if you see that I've missed a site with a photo of a 2002 Leonid meteor.

Astronomy Screen Savers

Whenever the cloudy seasons roll in, discussions on the Internet turn to cloudy day topics. On the sci.astro.amateur newsgroup a recent topic of discussion was that of astronomy-oriented screen savers. Here were some suggestions:

http://www.stoff.pl/ Orbitron

Orbitron is an interesting screen saver written by Sebastian Stoff in Poland. It displays the current position of satellites on the screen saver display. Sebastian is distributing this program as "cardware." He asks for nothing but a postcard from your home town for his collection! Be patient when accessing this page. I've found it unavailable at times. His server probably can't handle the load his program has attracted.

Also very popular with the SAA crowd is freeware from the home page of John Walker, founder of AutoDesk.

http://www.fourmilab.ch/homeplanet/homeplanet.html	Home Planet
http://www.fourmilab.ch/skyscrsv/	Sky chart
http://www.fourmilab.ch/slidescr/	Slide show

His Home Planet screen saver shows the earth in various views (now with the well-known satellite photo mosaic of a cloudless earth). Sky Chart shows the sky in a planetarium view. And finally, his generic Slide Show screen saver allows you to assemble your own collection of astrophotos for use in an automatically sequencing slide show. Other generic screen savers (some freeware, some shareware) are also available from download sites such as these:

http://www.download.com/
http://www.tucows.com/

These are great for making your own customized screen saver displays, but remember to respect copyrighted images. Most image owners will allow you to use their images for your personal use, but keep the copyright in mind if you plan to distribute your collection.

*You can also get **weekly email notices** of what's going on in the OCA by sending a request to me at: kodama@alumni.cal-tech.edu.*

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