SIRIUS ASTRONOMER

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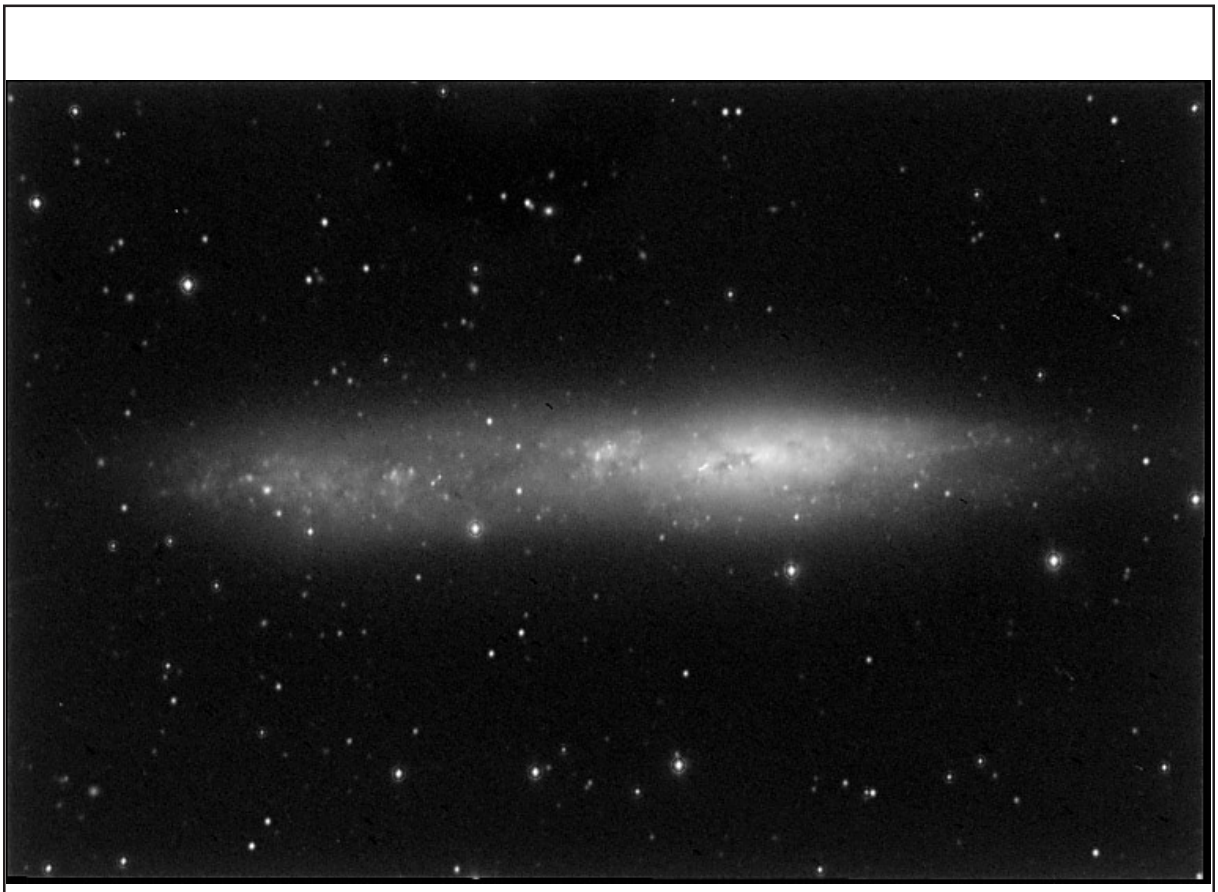
The Newsletter of the Orange County Astronomers

February 2010 *Free to members, subscriptions $12 for 12 issues* **Volume 37, Number 2**



NGC 55 is a barred irregular galaxy located 7 million light-years from Earth in the constellation Sculptor. Bill Hall created this image of NGC 55 on October 17th, 2009 using a 6-inch f/5 Newtonian with an ST-402ME imager and a total exposure time of 36 minutes. At about 25 minutes of arc across at magnitude 7.8, this galaxy is a challenging object for smaller telescopes and high-quality binoculars.

OCA CLUB MEETING

The free and open club meeting will be held February 12th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, cinematographer Gary Palmer will discuss his latest film 'The Sun in Motion'.

NEXT MEETING: March 12th

STAR PARTIES

The Black Star Canyon site will be open on February 6th. The Anza site will be open on February 13th. 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, February 5th at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.
GOTO SIG: TBA
Astro-Imagers SIG: Feb. 16th, Mar. 16th
Remote Telescopes Feb. 24th, Mar. 24th
Astrophysics SIG: Feb. 11th, Mar. 19th
Dark Sky Group: TBA

President's Message

by Craig Bobchin

Welcome to the start of a new administration for the board of the OCA. There have been some changes in the board as you may or may not be aware of. We had the annual election in January, and I was elected President.

For those of you that are not familiar with whom I am, I'll give you a synopsis. Those that are familiar with me and my association with the OCA over these past eight years feel free to skip ahead in this column.

I've been involved in astronomy as a hobby for almost 40 years. I started like many of us with a Tasco 60mm Refractor. In the mid 1970's in Central New Jersey (where I was growing up) there were no astronomy clubs, no internet and very few people who shared my obsession for looking at the sky through pieces of glass. Every object I found was my own and I would drag my friends and family out to see what I had found. Of course with an Alt-Az mount that had no tracking I had to frequently spend some time re-finding the object that caught my eye. In the winter it made for some cold people and frustrating observing sessions.

In 1980 I moved to Orange County and had to leave my scope behind. I was disappointed when I saw the horrible grayish skies of my new home. I was used to some light pollution, but compared to where I was living in Jersey Southern California was like day light. I could not see very many stars and I dispired my observing days were over. I still kept up with the hobby and science, but had no clue that the OCA was here. I had no friends that were into the hobby and wound up getting out of active observing.

Fast forward 20 years I drag head out in search of a dark area in Orange County to see the 2001 Leonids. I did not know about the area around Blackstar/Santiago Canyon and wound up in the cul-de-sac outside Irvine Regional Park. There was a good sized crowd there and one gentleman had an ETX-70 set up on the hood of his car. I spent as much time looking at Saturn and other objects as I did at the meteor shower which was spectacular even from O.C. That Christmas I received an ETX-105 as a present. It was leaps and bounds above my old 60mm department store telescope. I then found the OCA via search on the Internet and attended my first meeting. I joined the club and quickly became involved in the Outreach program headed up by Jim Benet. Through the Outreach program I met and became friends with Liam Kennedy (then President) and Barbara Toy (then VP). Both Liam and Barbara convinced me to run for the Board of trustees. I did and somehow won a seat. After my first year on the board, My friend and fellow Board member Matt Ota nominated me for the Vice President's position. I was hesitant, but ran and was elected to serve the club in that capacity.

I've been the Club's Vice President for the past 5 years and had fun doing it. I met some wonderful people in the Astronomy world, both amateurs and professionals. I was able to bring in some good speakers and on occasion some that did not work out as well as we had hoped. When Barbara decided to step down as President (after 6 terms), it was suggested that I take the role. Again I was hesitant, after all I had to follow her exceptional terms as President of this amazing club. But never one to shy away from a challenge I decided to take it on.

Which brings me to today. As I start my term as President of the OCA I have a few things to consider. First and foremost is the old maxim "If it ain't broke don't fix it.". From where I sit the club and current policies work. I have no intentions of coming in and trying to change the way things are done (not that my fellow board members would allow that anyway; we are pretty good at self policing). Every administration has a ideas of what they would like to see the club do/get more involved with. I'm no exception. For me one of my biggest concerns about the OCA and it extends to the entire hobby as well, is the lack of younger members. I would like to see us as a club do more to bring in younger members. I do not have any firm ideas on how yet, but I do know that it is vital for us as a club if we are to grow and an important area of education for the youth of today.

I will continue to be involved with the special interest groups I've been attending for the past few years (Go-To group, Astroimagers, and the occasional beginner's class), But I also intend to learn what I can about the other SIGs I have not been involved with. So I'll be attending the Remote Telescope, and Astrophysics groups on occasion.

I look forward to working with the new board and it will be a bit strange not to have to find the speakers each month and I look forward to see who Reza brings in and what he brings to the table.

I know I have a lot to learn about running the club, and I'm glad that Barbara is still there for me to ask questions of and offer me her knowledge as I navigate the waters. I can be reached at (714) 721-3273 or via e-mail at ETX_Astro_Boy@sbcglobal.net.

Here's hoping you have Clear Dark Skies and I'll see you next month.

How to Make $1000 with Your Telescope

By Tom Koonce

Antelope Valley Astronomy Club, Inc.

Lancaster, California

So…You've observed the Moon and the planets in detail. You've awed your family with close-up views of craters, rings, and subtle hues of color. You've used your observational successes to justify "investment" in the purchase of a bigger, better telescope and sharper eyepieces with wider fields of view so that you can observe deep-sky objects like remote galaxies and faint nebulae. You know what a SCT is and know and understand cool down times, stellar magnitude, seeing, and why every serious amateur needs a Telrad. Perhaps you invested in imaging equipment and are starting to produce night sky pictures like those in the magazines. Does this fit you?

Now you're asking yourself, "How can I make some money with my telescope to recoup my investment? …*How can I make $1000 with my telescope?*"

The weather will be warming up soon, and the opportunity to feel that sense of sustained excitement you always get as you head back out under the stars. More importantly, you'll soon have opportunities to interact with others who don't have your knowledge of astronomy, and certainly don't have the kind of telescope equipment you've put together! Sharing nighttime views with others is the key to getting a big payoff from your telescope. No, not by *charging* people to view through your eyepiece, but instead by getting a charge out of someone's first spectacular view through your telescope!

How can you make $1000 from your telescope? If you want *fast* cash, I suggest that you start out with a telescope worth *$2500* and offer it for sale on AstroMart.com. But by offering views of the night sky to people who have never had the opportunity, you'll easily get $1000 of value for every adult who gasps in astonishment when seeing the Ring Nebula or a distant galaxy, comprehending their physical significance. You'll get a million dollars of satisfaction each child that sees the craters on the Moon and the rings of Saturn for the first time and cries out with joy.

How can you make money in amateur astronomy? The truth is, if you're involved in this hobby to make cash, you can either sell your amazing astrophotos, meteorites that you found, or maybe invent the next Telrad. But if you want the real payoff, then share your love of astronomy with others as the weather turns warmer. You will provide them inspiration and enrichment worth $1000 and more. ■

Bob Stephens Announced As Chambliss Award Winner

Brian Warner (as relayed to Bob Buchheim)

Congratulations to Robert D. Stephens, winner of the 2009 American Astronomical Society's Chambliss Amateur Achievement Award, announced at the AAS winter meeting banquet on January 5 (as announced in the AAS electronic announcement #204 released today). The citation, to appear in the next upcoming AAS newsletter, reads in part:

The AAS awards the 2009 Chambliss Medal for Amateur Achievement to Robert D. Stephens for his extensive contributions to the understanding of asteroids through collection and analysis of asteroid photometry. Over the last ten years, Stephens has published more than 200 asteroid lightcurves in the *Minor Planet Bulletin*. His careful and diligent work on lower-numbered asteroids without well-determined lightcurve parameters has revealed slow rotators - a group of objects which are critical to understanding the importance of solar radiation torque on small asteroids. His success in decoding the lightcurves of these objects required that he perfect techniques that allowed him to put the data from runs that spanned periods of up to two months onto a common system and to deal with the possibilities that the asteroid was not in simple, single-axis rotation, but might be "tumbling" and so present a highly-complex and non-repeating lightcurve. Stephen's work has been the foundation for papers published in *Icarus* and *Astronomy & Astrophysics* and he has been the author of more than 100 publications.

He has served the amateur astronomy community in many leadership roles in the Riverside Astronomical Society and the Riverside Telescope Maker's Conference. He is an avid eclipse chaser and, in 2002, had the asteroid 1998 FA3 named (39890) Bobstephens after him.

■

TOP TWENTY THINGS AN ASTRONOMER SHOULD SEE

By Helen Mahoney

#20 The International Space Station

The International Space Station (ISS) is actually a bonus item. The ISS isn't a natural astronomical object, but it is a space object, and it is really cool to see it. You don't need to go anywhere, because it is bright enough to be seen even in light polluted skies. You also don't need a telescope or even binoculars, as it is clearly visible with the naked eye.

Now that it has had several arrays of solar panels added to it, it is very bright, often the brightest object in the night sky (apart from the moon). On a good pass, it can be as bright as *minus* 2! (The brightest, or First Magnitude stars are *plus* one).

The ISS orbits the earth with an orbit time of about 90 minutes. The earth turns below its orbit, so we are periodically in position to see it. We are able to see it best when the sky is darkened after sunset, but the ISS is still in sunlight, sailing over the earth at an altitude of about 200 miles (340 km). It is possible to see it in daylight, but very difficult, and you can't see it later on in the night when it is in the earth's shadow.

Track of ISS passing northeast to southwest through the constellation Taurus (Dick Greenwald)

There are several good websites that can give you the information to help you see it. I usually use www.heavens-above.com. You don't have to know your latitude and longitude to use this web site, just plug in the nearest large city to your observing site, and it will let you know when a pass will be visible, and where in the sky to look for it. You can also use the Satellite Flybys link from Spaceweather.com.

Some people have managed to track the ISS with telescopes, and see its shape clearly. There have been some phenomenal photos taken of the ISS, including some taken with solar filters so that the ISS is silhouetted against the disk of the sun. Some of these can be seen in the archives of Astronomy Picture of the Day (APOD) or Spaceweather.com.

It's fun to see the ISS appear in the sky and sail overhead. I drag people outside to see it, and everyone enjoys it. Most of them are amazed that you can see the ISS, and that there are astronauts and cosmonauts aboard it. (They are also amazed that I knew where to find it.) I often send a text message to my friends and family shortly before a good pass to alert them. Afterwards, I get texts back from several of them with "Wow", "That was great", and other delighted comments.

Probably the best sighting was one night in 2008 when the Space Shuttle had just undocked from the ISS, and the Jules Verne supply ship was also in the vicinity. Traveling along approximately the same path in the sky came the Jules Verne, followed by the Shuttle, and then the very bright ISS. That was quite a treat for everyone who saw it!

The web sites can also inform you when you can see Iridium flares and the Hubble Space Telescope passing over. The Iridium flares occur when one of the Iridium communication satellites is in a position such that the sun glints off of its solar panels at just the right angle to make them flare in brightness tremendously. Kind of what happens when the sun reflects off a car window into your eyes. The brightest one I've seen was minus 7! The Hubble Space Telescope is not nearly as bright as the ISS, or even the space shuttle, so it is only easily seen in a dark sky. I did see it once in Anza Borrego.

I hope you investigate the web sites, and take the opportunity to go outside and see a real space station with your own eyes.

For Sale: Meade ETX 125 PE Astro with Meade 5000 eyepiece kit. Barely used, must sell! $500. Contact Mark Hunter at 949-370-9300 or mrplant2000@yahoo.com.

Wanted: Old style 84-key AT keyboard for DOS/Windows PC (the kind with the function keys on the left instead of above the other keys). Tim Hogle timhogle@aol.com, (626) 357-7770.

For Sale: Celestron C8-SGT 8" Advanced Series Telescope (the C8 has XLT optics) with the latest version of hand control computer and includes a Telrad and the Celestron Auxiliary Port Accessory for firmware upgrades. $975. Contact: Vance Tyree at 626-355-7210 or tyree@isi.edu

Appreciation for the Don Lynn Perimeter Fence

by Barbara Toy

Those of you who have been in the club long enough to remember the wildfire that burned over about a third of our Anza site several years ago may also recall that, as a result of that fire, the fence around the top and one side of our property was pretty much gone. If we contracted with someone to put in a replacement fence, we were looking at an expense of several thousand dollars. Well, that option proved unsatisfactory to Don Lynn, our extremely capable Anza Site Custodian, and he advised the Board that he could put it in himself (ideally with some help from other concerned club members) if given some time to do it.

Month after month, he put in fencepost after fencepost every time he was out there, working his way slowly around the top and side of the property down to the entrance gate. Driving them into the ground was all done by hand, using a specialized hammer for the job (it looks like a heavy metal tube with handles on the sides). He then ran three strands of barbed wire around all those posts, and added appropriate spacers and other finishing touches – a mighty fine, very professional installation over some pretty rugged terrain.

What brought all of this to mind again for me was something that caused me to hike across the undeveloped area between the road going up to the club observatory and the road that runs along the top of our property – a route that was intersected by Don's fence. This gave me a great opportunity to admire his handiwork, as I attempted to go under it without suffering too much personal damage. I can attest to the fact that it is standing strong, unaffected by what the weather out there has thrown at it in the years since he installed it, at least as of early January. Where I crossed it was fairly open, but there are areas I could see where the fence dives into ravines and makes its way through rocks – it's a testament to Don's determination that the line of the fence continues its steady march through these and all of the other interesting surface features found around those sides of the property. Fences generally become part of the background once they're in, but this fence deserves some limelight, along with the man who put it in. There aren't many people who would put in that kind of hard work over many months and temperature extremes (he literally worked on it summer and winter). We know there aren't many people who would do this because Don essentially did it all himself with only a bit of intermittent help from others, in spite of efforts to get him more volunteers to help out.

There are a lot of reasons to celebrate Don in the club, such as his regular articles for the Sirius Astronomer, his other work at Anza that helps keep the site running smoothly, the pictures and information he brings to the general meetings and Astrophysics meetings about the latest discoveries about our solar system and the cosmos beyond it, his outreach efforts – just to name a few. That fence is something to celebrate, too – when you are at Anza, do take notice of it and admire its quality. And, when you see Don Lynn, do let him know that you appreciate all the hard work he put into installing it.

Local Dark Sky Surprise

By Barbara Toy

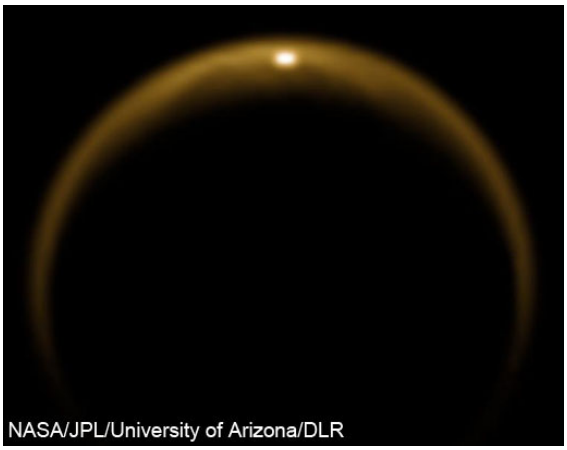
In January, I had occasion to attend a Laguna Beach City Council meeting, and discovered that one of the agenda items that was scheduled before the one I was primarily interested in had to do with preserving the darkness of the night sky in Laguna Beach. Wow! I had no idea that we had so many people in that community, apparently including at least one council member, who are passionate and eloquent advocates for eliminating excess light and preserving the night sky to, among other things, see the stars (one described his regret that it had been so long since he could see the Milky Way over Laguna the way he could as a child growing up in the area). This is something that the city's environmental committee is supposed to look at, and a Dark Sky ordinance may be in the works. Needless to say, I'm very interested in what happens with all this.

As you might have noticed if you peruse the "contacts" section on our website, we do have a Dark Sky group in our club, though it hasn't been particularly active in recent times. We need to become more active in this area as a club, both to reduce light pollution in Orange County itself and to help protect our Anza site from increasing light pollution in Riverside, Orange and San Diego counties. Even if we only take on the issue one light at a time, there is a lot we can accomplish over time. And now's a great time to bring these concerns to the attention of inadvertent light-polluters - among other considerations, a lot of people should be pretty receptive these days to saving money by only illuminating the outside areas they really want or need to illuminate as opposed to trying to light up everything in sight, getting better illumination with much less energy cost and giving us all darker skies in the process.

Although we have a Dark Sky group, so far there has not been much interest in getting together for meetings. We do have our dark sky e-mail group: OCAdarksky@yahoogroups.com, which is the main way the group communicates and shares information. If you are interested in improving the night sky, light pollution, light trespass and any of the related issues (which impact human health and wildlife as well as views of the night sky), please join the e-mail group. If there's enough interest, we may start scheduling other meetings and activities as well. Please also contact me, either directly or through the e-mail group, about particular dark sky issues or projects you might be interested in. If you know of any actions that your local governments are taking or discussing as possibilities in this area, I'd be interested in learning about that, too. I look forward to hearing from you!

AstroSpace Update

February 2010
Gathered by Don Lynn from NASA and other sources



Cassini (Saturn mission) has imaged a flash of sunlight reflecting from a lake (of methane) on Saturn's moon Titan. Scientists have been waiting to take this image to allow the seasons to change at the planet, causing sunlight to strike far northern areas of both Saturn and its moons. The image was taken in infrared, since it penetrates Titan's clouds, while visible light does not. Astronomers were able to pinpoint the reflection seen to the southern shoreline of a lake called Kraken Mare, which covers an area larger than the Caspian Sea on Earth.

A new paper using data from Cassini says that blobs of warm ice periodically rise to the surface of Saturn's moon **Enceladus** and churn the ice crust. The claim is that we happen to be exploring there during one of those periods, which explains the strange hot spots of the Tiger Stripe region of Enceladus, and possibly explains the cracks and geysers too. The study shows that the heat release and argon gas release currently measured cannot be sustained over geological time periods, so we must now be in an unusual time. Such behavior probably occurs only 1-10% of the time.

Lunar Reconnaissance Orbiter (LRO) has found an unexpected lunar radiation source and detected the coldest known location in the solar system. Since June, LRO has been mapping the moon, in part to find suitable landing sites for suture human expeditions. The Sun's sunspot and related activity expand the protection of the solar system from cosmic rays. Since we are at a solar activity minimum, more cosmic rays than usual penetrate the solar system. LRO found that apparently cosmic rays hitting the lunar surface interact with surface material to produce a secondary source of radiation emanating back into space. LRO also found that one crater near the lunar south pole, Hermite Crater, reaches minus 415 °F, the coldest temperature yet measured in the solar system. This occurs deep within the crater where sunlight never penetrates.

Kepler (planet-searching space telescope) has discovered 5 exoplanets (planets outside our solar system), which have now been confirmed with ground-based observations. All are substantially less dense than gas giant planets in our solar system. One is the least dense planet known, about the density of styrofoam. Another of the 5 is quite similar to Neptune in size. All are close to their stars, and orbit about them in rather short periods (3.3 to 4.9 Earth days). All orbit stars hotter than our Sun. Their stars, being so close and hot, are heating the planets to temperatures of 2200 to 3300 °F, which is hotter than molten lava. They were all found in data taken during the first 6 weeks of operation. The Kepler data contains about 100 planetary candidates so far that are being further analyzed to confirm that they are indeed exoplanets. Also a number of binary stars, oscillating stars, and pulsating stars are showing up in the data. So we should see many more discoveries in coming months.

Kepler also found some **Jupiter-sized objects** orbiting stars where the planet-like object is hotter than its star. The Kepler science team has no idea what these objects are.

Small exoplanet – Astronomers have detected an exoplanet that is only 4 times the mass of Earth, making it the 2nd smallest exoplanet known. It orbits the star HD156668 every 4 Earth days and is about 80 light years from us in Hercules. It was found using the radial velocity method: measuring the wobbles of its star caused by its gravity.

Exoplanet spectrum – Astronomers have obtained the 1st direct spectrum of an exoplanet. The few times that an exoplanet spectrum has been previously obtained, it was done by subtracting the spectrum of the planet's star (taken during eclipse of the planet) from the spectrum of the combined star and planet. Until now, technology did not permit separating a planet and its much brighter and very close star. The planet is 1 of 3 gas giants known to be orbiting the star HR 8799. All are farther from their star than Uranus is from our Sun; that distance helped separate the planets in the new observations. The spectrum was made using the Very Large Telescope in Chile with adaptive optics to increase resolution. The spectrum did not fit theory of a gas giant atmosphere. The first guesses are that the spectrum might be explained with less methane, more carbon monoxide, and the presence of dust clouds.

Possible exoplanet – The exoplanet known as TrES-2b (so-named because the TrES planet search program found it 2nd) has the plane of its orbit almost exactly in our line of sight. Careful observations, started back in 2006, of the planet covering a tiny portion of its star's light (transiting) have allowed determination of the size of the star, size of planet, its period of revolution, and the inclination of the orbit. Continued observations showed that the inclination and period are changing. Of the various factors that could cause these changes, a new paper suggests the most likely is that another planet is also orbiting the star, and is perturbing TrES-2b. A planet of about Jupiter's mass and a period of 50 to 100 days would cause perturbations of the size seen.

Exoplanet frequency – Astronomers (and philosophers) have long wondered how common are planetary systems resembling our solar system. Even after finding more than 400 exoplanets, we still can't answer this. The methods used to find exoplanets are

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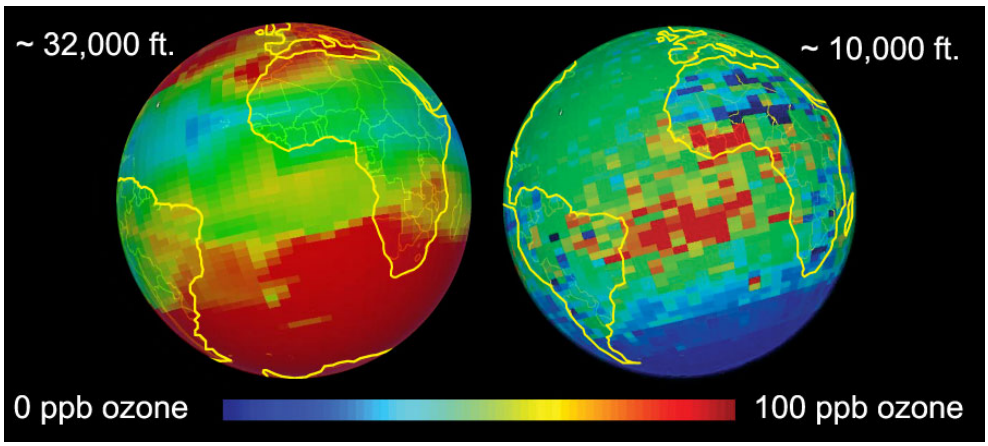
Building a Case Against Ozone

by Patrick Barry

When it comes to notorious greenhouse gases, carbon dioxide is like Al Capone—always in the headlines. Meanwhile, ozone is more like Carlo Gambino—not as famous or as powerful, but still a big player.

After tracking this lesser-known climate culprit for years, NASA's Tropospheric Emission Spectrometer (TES) has found that ozone is indeed a shifty character. Data from TES show that the amount of ozone—and thus its contribution to the greenhouse effect—varies greatly from place to place and over time.



These images are TES ozone plots viewed with Google Earth. Colors map to tropospheric ozone concentrations. The image on the left shows ozone concentrations at an altitude of approximately 32,000 feet, while the one on the right shows ozone at approximately 10,000 feet. The measurements are monthly averages over each grid segment for December 2004.

"Ozone tends to be localized near cities where ozone precursors, such as car exhaust and power plant exhaust, are emitted," says Kevin Bowman, a senior member of the TES technical staff at the Jet Propulsion Laboratory. But the ozone doesn't necessarily stay in one place. Winds can stretch the ozone into long plumes. "Looking out over the ocean we can see ozone being transported long distances over open water."

Unlike CO_2, ozone is highly reactive. It survives in the atmosphere for only a few hours or a few days before it degrades and effectively disappears. So ozone doesn't have time to spread out evenly in the atmosphere the way that CO_2 does. The amount of ozone in one place depends on where ozone-creating chemicals, such as the nitrogen oxides in car exhaust. are being released and which way the wind blows.

This short lifespan also means that ozone could be easier than CO_2 to knock off. "If you reduce emissions of things that generate ozone, then you can have a quicker climate effect than you would with CO_2," Bowman says. "From a policy standpoint, there's been a lot of conversation lately about regulating short-lived species like ozone."

To be clear, Bowman isn't talking about the famous "ozone layer." Ozone in this high-altitude layer shields us from harmful ultraviolet light, so protecting that layer is crucial. Bowman is talking about ozone closer to the ground, so-called tropospheric ozone. This "other" ozone at lower altitudes poses health risks for people and acts as a potent greenhouse gas. TES is helping scientists track the creation and movement of low-altitude ozone over the whole planet each day. "We can see it clearly in our data," Bowman says. Countries will need this kind of data if they decide to go after the heat-trapping gas.

Ozone has been caught red-handed, and TES is giving authorities the hard evidence they need to prosecute the case.

Learn more about TES and its atmospheric science mission at tes.jpl.nasa.gov. The Space Place has a fun "Gummy Greenhouse Gases" activity for kids that will introduce them to the idea of atoms and molecules. Check it out at spaceplace.nasa.gov/en/kids/tes/gumdrops.

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

(continued from page 6)
sensitive to only certain types: massive, nearby, close to their star, large diameter, or other characteristics. So the planets found are not a representative sample. 2 characteristics of our solar system are 1) that it has 4 gas giants, and 2) those are spread from 5 to 30 AU from their star (an AU is the Earth's distance from the Sun). One planet-finding technique is sensitive enough to find multiple gas giants at these kinds of distances from their stars, that being microlensing. In this technique, the brightening is detected that is caused when a massive object (such as stars or planets) pass in front of a more distant star, and focus the distant light through their gravity (a relativistic effect). The MicroFUN survey has now examined enough microlensing events that statistically it should have discovered 8 systems with multiple gas giants in roughly the range of distances as our solar system if every star in the galaxy had such planets. But it has discovered only one such case. Now one data point isn't much on which to base an estimate, but that says that 1 star in every 8 has multiple gas giants at the distance range of our solar system. It is thought that multiple gas giants at those distances protect rocky smaller planets closer in to their star, at such distance as to be the right temperature for life. But no method of planet discovery is yet sensitive enough to find rocky planets about 1 AU from its star, so we will have to settle for now for an estimate of gas giants similar to our solar system.

Planets around massive stars – A team of astronomers examined more than 500 massive stars in one star forming region in Cassiopeia, using Spitzer and ground-based 2MASS data, to look for planetary dust disks. The stars were spectral type A or B, which generally are 2-15 times as massive as our Sun. About 10% of the stars had dusty disks, and about 1/3 of those had a central gap, characteristic of a Jupiter-class planet sweeping up part of the disk. This shows that planetary systems are reasonably common among this class of star. Most planet searches have looked around lower mass stars, more similar to our Sun. The research team suggested that all massive stars may begin their life with a sizeable dusty disk, but that they blow away the disk by light and stellar winds after just a few million years. This implies that planets must form fairly quickly around massive stars, or miss the window of opportunity for planets.

Hubble Space Telescope (HST) has broken the distance record for galaxies and discovered a population of compact ultra-blue galaxies. The newly found galaxies are so distant that their light left there 600 to 800 million years after the Big Bang, that is, about 13 billion years ago, so we are seeing them as they appeared long ago. They were found in the Hubble infrared ultra deep field image taken a few months ago. The faintest galaxies were found to be quite blue, apparently due to large numbers of massive stars, which shine blue-white, or due to the lack of dust, which reddens starlight. When the first galaxies formed, the gas out of which stars were made was essentially all hydrogen and helium (which the Big Bang produced) with extremely little heavier elements. It is believed that such gas deficient in heavier elements will form more massive stars than the gas clouds with even a sprinkling of heavy elements. Those heavy elements are made inside stars and supernovas, and are distributed into interstellar gas by stellar winds and the force of supernova explosions, but the distribution process is thought to take a billion years or longer. The newly found galaxies show that galaxies had started to form by about 500 million years after the Big Bang, at latest. The time when the first galaxies formed has long been in contention. The blue galaxies found are compact: as small as 1/20 the diameter and 1/100 the mass of our Milky Way galaxy. The masses were calculated and ages confirmed from observations made with Spitzer (infrared space telescope). The compact galaxies are the building blocks out of which later and larger galaxies formed. Finding earlier (more distant) galaxies and more precisely dating them will probably have to wait for the much larger James Webb space telescope, scheduled for launch in 2014.

Luminous Blue Variables (LBVs) are a rare class of extremely massive stars. Eta Carinae is perhaps the best-studied LBV. Many LBVs are shrouded by nebulosity because they throw off large amounts of mass. This makes it hard to discover LBVs. A new study of LBV nebulas in Spitzer space telescope data showed that they emit in 24 micrometer wavelength of infrared, but not other wavelengths that Spitzer uses. So the proposal is that looking for nebulas that show up in only that wavelength will be an easy way to locate more LBVs.

Blue stragglers are stars that should be the same age as the other stars in their cluster, but are too blue, hot and massive to be that age. The class was recognized more than a half century ago. Eventually it was concluded that a blue straggler is created by gaining mass later in the star's life. But the controversy continues over how the mass is gained. A new study of blue stragglers in the globular cluster M30 concluded that some gained mass by sucking hydrogen from close companion stars, and some did so by colliding with another star. The 2 methods apparently produce slightly different properties in the stragglers. It appeared that a collapse of the core of the cluster 1 or 2 billion years ago led to collisions that produced stragglers. The core collapse also disturbed enough binary stars to start a family of stragglers due to hydrogen sucking. Another study, done on open cluster NGC 188, concluded there was evidence of both methods of producing blue stragglers, and of a third method: a star passes close to a binary, and causes the stars of the binary to merge. This study noted a strange case of a binary star, of which both components are blue stragglers. They can't both have gained mass from the other, so how did this binary form? The study concluded the stragglers formed individually in separate binaries, and then a close encounter between the 2 pairs caused a swapping of partners. The blue stragglers in NGC 188 were found to spin much faster than average, so the study will continue to determine what the spin tells us.

Epsilon Aurigae is currently undergoing its binary star eclipse that occurs every 27 years. Because the eclipse takes far longer (about 2 years) than other binaries, it has long been believed that the eclipse is caused by a huge dust cloud, not by a star. Also, a brightening in the middle of the eclipse implies there is a hole in the dust cloud. But some of the details of further observations have not been explained. The 2 best theories (and there are more than 2) are: 1) the bright star is a massive supergiant, and the dusty disk surrounds a close pair of stars, 2) the bright star is less massive, and the dusty disk surrounds a single star. New observations from the Spitzer space telescope support the 2nd theory. It requires that the primary star is in its dying stages in order to get the observed spectrum with a less massive star. The Spitzer observations were tricky to make, since Epsilon is too bright for Spitzer's camera. The minimum exposure was made (1/100 second) and the star was positioned across 4 pixel boundaries so as not

to overload a single pixel. The eclipsing disk was detected, and the infrared signature implies that the particles in the disk are gravel-sized, surprisingly large for a circumstellar disk. The diameter of the disk was found to be 8 AU.

Xavier Haubois (Observatoire de Paris)

Betelgeuse – Using interferometry (combining light from 2 or more telescopes) a team of astronomers generated an image of the surface of the supergiant star Betelgeuse. It showed 2 huge bright spots and other features. The bright spots indicate convection, where hot regions rise up to the surface. They are about 900 °F hotter than average. The diameter of the spots is about the distance of Mars from the Sun. Though the star has been imaged before, this is the highest resolution yet obtained. Two different computer programs were used to generate the image from the interference patterns produced by the interferometer, and the resulting images agreed.

Supernova by merger – Research simulating the merger of 2 white dwarf stars showed the results matched a few previously observed supernovas (those favoring Latin plurals will use the term supernovae) with odd characteristics, particularly supernova 1991bg. That and others were curiously less luminous than is expected for a Type Ia supernova. Type Ia normally occurs when one star in a close binary pair dumps matter onto its companion white dwarf until it explodes. Most of the visible light from a Type Ia supernova is known to come from radioactive decay of nickel 56, which is produced during the explosion. The new simulations showed less nickel 56 is produced from the merger than from the material-dumping scenario, explaining the lower luminosity. The researchers believe that merger situations represent 2-11% of all Type Ia supernovas. Since Type Ia supernovas are used as the brightness standard for many cosmic distance measurements, it is important to know when one of them is not the standard brightness.

Suzaku (Japanese orbiting X-ray observatory) has discovered evidence of high-temperature fireballs in 2 supernova remnants, the Jellyfish Nebula (IC 443) and W49B, that should have cooled and lost the evidence of the high temperatures. The nebulosity left from supernovas that occurred thousands of years ago has cooled from its temperature of about 100 million °F that was generated by the shock wave of the supernova. But Suzaku's observations found completely ionized (lost all electrons) silicon and sulfur atoms, and ionizing those requires much higher temperatures than exist there today. The scientists concluded that soon after the supernova, when the completely ionized silicon and sulfur had just formed, the cloud expanded so fast that by the time the elements had cooled enough to recapture electrons, the remnant was so thinly spread that the ionized atoms never again collided with any electrons. So the ions were left long after heat that produced them.

Particle ribbon – It was reported here in December that the IBEX spacecraft had discovered a ribbon of particle emission coming from beyond the solar system that wraps around much of the sky. The source has now been identified. It is simply a reflection. Particles from the Sun reflect off the magnetic field of the interstellar space outside the solar system. Inside the solar system, the Sun produces the predominant field. Charged particles from the Sun, when they leave the solar system and encounter the different magnetic field, go into orbit about magnetic field lines. Whenever a particle loses its charge (from colliding with an oppositely charge particle), it flies off perpendicularly to the field lines. Thus we see these particles coming at us perpendicularly to that field, which appears as a ring about the sky. The recent result from the Voyager spacecraft that indicates the magnetic field outside the solar system is stronger than previously believed was necessary to explain the strength of the particle ribbon.

Magellanic Stream is a flow of gas that stretches from the Magellanic Clouds (small satellite galaxies) to our Milky Way. It was discovered over 30 years ago. A team using various radiotelescopes has examined the Stream more deeply than before and found that it does not have gaps as was believed from older observations. It is 40% longer than previously seen, and is older (2.5 billion years) than previously thought. The newly determined age puts its beginning at about the time the 2 galaxies are believed to have passed close to each other. That event probably gravitationally created star formation, and the stellar winds and supernovas from the new stars threw material out that became the Stream.

Milky Way halo – Though our Milky Way galaxy is shaped like a flat spiral, its larger halo has long been known to be roughly spherical. About 70% of the mass of the halo is thought to be dark nonbaryonic (not protons and neutrons) matter. A new study of the streamer of material from the Sagittarius Dwarf Galaxy shows that the Milky Way halo must be a rather squashed sphere in order for the streamer to have acquired its current shape. Surprisingly the sphere is squashed in the directions near the Milky Way spiral arms, and is longer in the direction of the poles. The amount of squashing calculated was also found surprising. The researchers plan to apply similar calculations to other dwarf galaxies near the Milky Way to confirm their results.

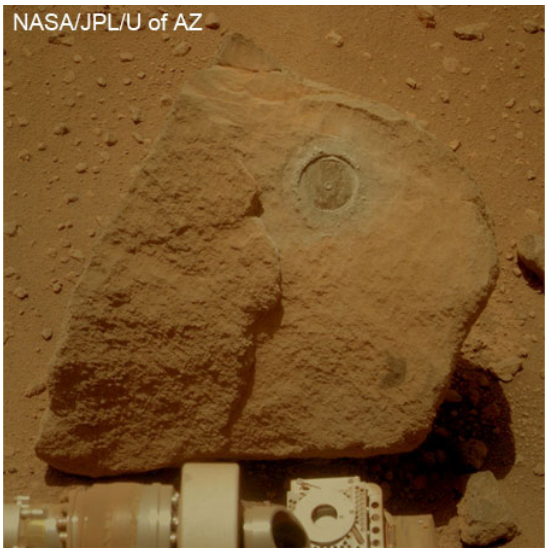
Earth's magnetic field – A new study has confirmed previous theoretical predictions that the churning of molten metals that make up Earth's liquid outer core is slowly being stirred by a complex but predictable series of oscillations. Scientists believe Earth's magnetic field results from movements of molten iron and nickel within the outer core. This study used historic surface magnetic field data from back as far as 1840, combined with the latest satellite magnetic data. A model was proposed that the outer core

(continued on page 10)

(continued from page 9)
rotates as a series of cylinders, with oscillations originating at the outside of the core and traveling inward. Then a computer program tried the model with different oscillation frequencies until the predicted field matched the observations. 4 robust frequencies were found, with periods ranging from 28 to 85 years, with weak indications of 2 more frequencies.

Interstellar cloud – The solar system is passing through an interstellar cloud of hydrogen and helium that differs in density from what theory predicts should occur. A study of data from Voyager showed that the magnetic field in interstellar space, outside the Sun's magnetic zone, is stronger than predicted. In fact it is just strong enough to support the density found in the cloud that we are passing through, solving the mystery.

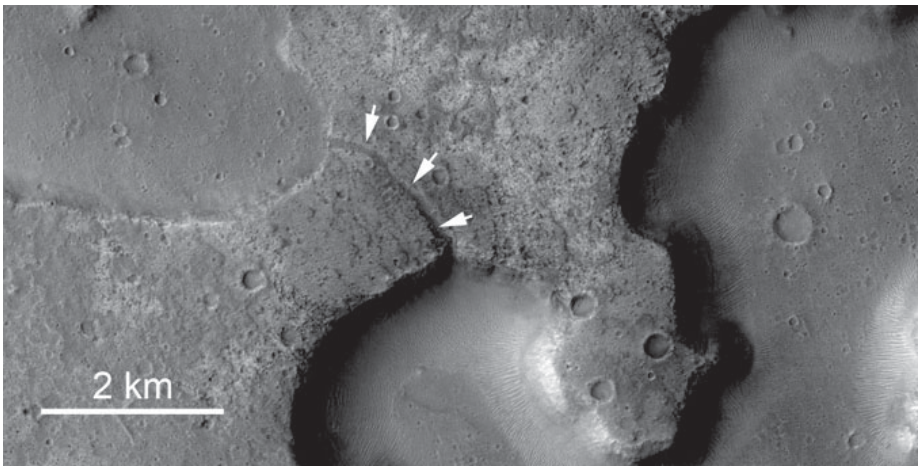
Spirit and Opportunity (Mars rovers) celebrated 6 years of roving Mars during January. Spirit is still stuck in soft soil. Rover controllers are considering a plan to dig one end in deeper, thus tilting it toward the winter Sun, to improve its chances of getting enough power from the solar panels to survive the oncoming Martian winter. Further efforts to spin out of the soft soil (early such efforts did not succeed) are also being considered. Plans are being made for what types of science Spirit can continue doing even if it is not freed from the soft soil.



Opportunity has been sitting by a rock called Marquette Island since early November. The rover has been conducting a thorough examination of the rock, including drilling a shallow hole in it to see and measure below the surface. When finished, the rover will resume driving toward Endeavour Crater, still several miles away. Near the end of December the odometer read 11.76 miles traveled since landing.

Phoenix – Beginning Jan 18, Mars Odyssey orbiter began listening for possible radio transmissions from the Phoenix Lander, which completed 5 months of studying an arctic Martian site in November 2008. Its mission was ended when it got too cold and dark for the lander to operate. It is expected that the severe Martian winter permanently damaged Phoenix, but in case the lander survived Odyssey is listening. It is now light and warm enough for Phoenix to operate (if it were freshly landed). In February or March, Odyssey will send operating commands to Phoenix in case it is listening.

Joint Mars plan – The new joint Mars exploration program of NASA and ESA (European Space Agency) is planning a Trace Gas Mission (TGM) orbiter to be launched in 2016. Its purpose is to study gases found in small concentrations in Mars's atmosphere, in particular methane. The most likely sources of methane involve water or bacteria, and finding either of these would be a major discovery. Methane is known to be emitting from Mars, and TGM will try to pin down where and how much. TGM will be a combination of NASA's previously planned Mars Science Orbiter and ESA's ExoMars mission. If budget allows, a smaller lander will piggyback on the TGM launch. It would have few science instruments, but would principally test landing technology for future missions.



Mars Reconnaissance Orbiter (MRO) – A study of images from MRO has found areas near the Martian equator that appear to have been lakes about 3 billion years ago. Previous evidence of liquid water on the surface of Mars has been dated at 3.8 to 4 billion years ago. The new discovery implies that wet conditions on the planet persisted almost a billion years later than thought. The MRO images show depressions that in previous images could have been several things other than lakebeds. But MRO's better resolution showed channels between some of the depressions, indicating water flowed, making lakebed the most probable interpretation of the depressions. The lakebeds and channels resemble similar features found in Alaska and elsewhere on Earth that are known to be caused by melting permafrost. The lakebeds were dated by counting craters that were caused by meteorite impacts. The researchers plan to continue examining MRO images of equatorial regions to see how widespread these lakebeds are.

SOFIA – Would you open the door to a jumbo jet while flying at 250 mph? NASA did. Under the door was their 2.5-meter (98-inch) SOFIA infrared telescope, and they wanted to test if the plane would fly and the telescope would withstand the experience with the door open. All went well. First light through the telescope while flying is scheduled for April, and full operations are to begin in the fall. Most wavelengths, or colors, of infrared are blocked by the Earth's atmosphere, but when SOFIA flies at 40,000 feet, it will be above essentially all of that problem. Engineers believe that they have designed the telescope mounting so that it will track stars

perfectly during a bouncy airplane ride with the door open. They also believe that the baffles around the door will produce smooth airflow past the telescope so that turbulence will not interfere with the image quality. Testing of this is proceeding.

Instant AstroSpace Updates

An extremely **metal-poor star**, with only 0.00025% of the iron found in the Sculptor dwarf galaxy. Very metal-poor stars are believed to be among the first stars formed after the Big Bang.

Fermi (gamma-ray space telescope) has continued to find millisecond pulsars (those spinning more than 100 times per second), due to their often emitting brightly in gamma rays. It has been proposed that continuous monitoring of the timing of pulses from millisecond pulsars would be able to detect gravitational waves.

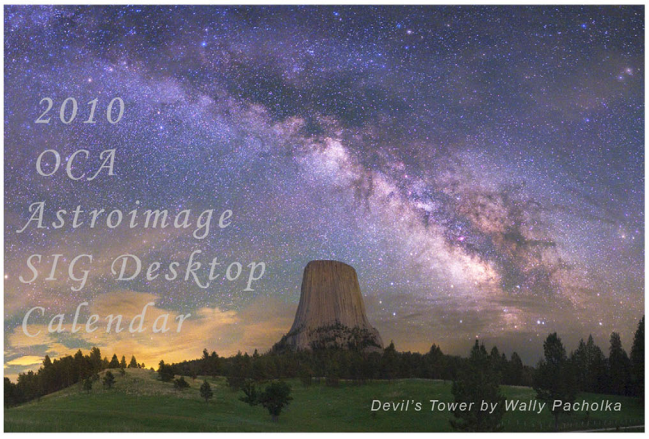
A new computer program simulated the **development of the universe** over 13 billion years and for the first time produced the variety of galaxy types in the right relative numbers as seen in actual observations of the nearby universe. The simulation used dark energy and dark matter in its behavior.

New Horizons (Pluto mission) moved closer to Pluto than Earth on December 29; the halfway point along its orbit to Pluto will be reached February 25, and the halfway point in travel time in mid-October. Pluto flyby is summer 2015.

Scott Parazynski, retired astronaut, borrowed a **moon rock** from NASA that came from the Sea of Tranquility (Apollo 11 mission), and carried it to the top of Mount Everest, highest point on Earth. That moon rock and a rock from the Everest summit will be taken to the International Space Station for permanent display there in the Tranquility Module.

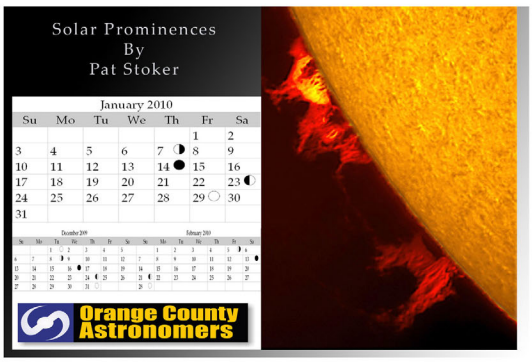
NASA has selected 3 proposals as candidates for their **next mission** in the solar system: 1) a probe of Venus's atmosphere and crust, 2) a sample return from a near-Earth asteroid, 3) a sample return from the Moon's south polar region. After further study, one of these will be selected for launch by 2018.

2010 OCA Astroimage SIG Desktop Calendar - Now Available!



With Images by Jeff Malmrose, Craig Bobchin, Pat Stoker, Jim Windlinger, Gary Carlson, Ronald Royer,Sam Saeed, Gary Schones, Dave Kodama, Bill Warden, Jon Mayfield, John Castillo, Bruce Waddington, Alan Smallbone and Wally Pacholka!

14 months of images by OCA members to enjoy!



ONLY $10!!!

See Charlie Oostdyk at the general meetings, or contact Barbara Toy or Alan Smallbone for information about ordering and picking up at other OCA meetings! Great Gift Idea!

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