The Prairie Astronomer

December, 2011 Volume 52, Issue #12

The Official Newsletter of the Prairie Astronomy Club

December Program

PAC Holiday Social

DO NOT GO TO HYDE OBSERVATORY.

Everyone is invited to come to Mueller Planetarium in Morrill Hall on the UNL Campus (just south of 14th & Vine - west door of the museum) from 6:30 PM to 9 PM to enjoy a Holiday Social get together. You are encouraged to bring your families and we'll provide snacks and drinks. You are also welcome to bring your favorite holiday goodies to share with everyone. Around 7:30 PM we'll be treated to a show in the planetarium by our host, Jack Dunn.

In This Issue:

Featured Photo

Resembling festive lights on a holiday wreath, this NASA/ESA Hubble Space Telescope image of the nearby spiral galaxy M74 is an iconic reminder of the impending season. Bright knots of glowing gas light up the spiral arms, indicating a rich environment of star formation. Messier 74, also called NGC 628, is a stunning example of a grand-design spiral galaxy that is viewed by Earth observers nearly face-on. Its perfectly symmetrical spiral arms emanate from the central nucleus and are dotted with clusters of young blue stars and glowing pink regions of ionized hydrogen (hydrogen atoms that have lost their electrons). These regions of star formation show an excess of light at ultraviolet wavelengths. Tracing along the spiral arms are winding dust lanes that also begin very near the galaxy's nucleus and follow along the length of the spiral arms. M74 is located roughly 32 million light-years away in the direction of the constellation Pisces, the Fish. It is the dominant member of a small group of about half a dozen galaxies, the M74 galaxy group. In its entirety, it is estimated that M74 is home to about 100 billion stars, making it slightly smaller than our Milky Way.

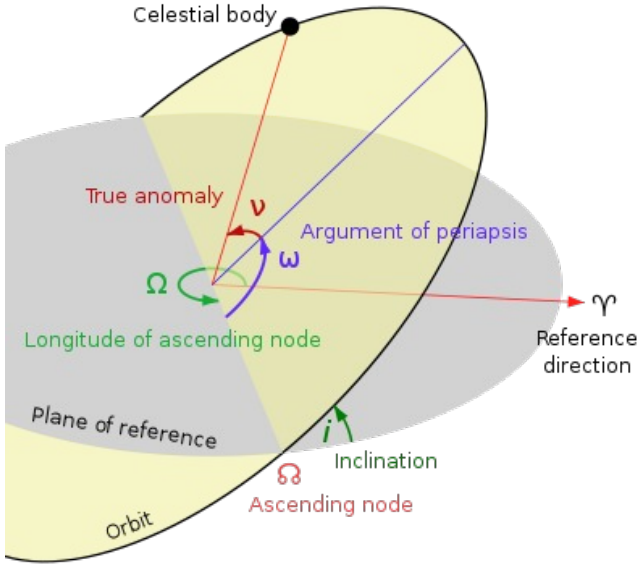
Image Credit: NASA, ESA, and the Hubble Heritage (STScI/AURA)-ESA/Hubble Collaboration

The Mathematics of Iridium Flare Prediction - Ben Rush

Over the course of the next few months I will be breaking down a general-purpose system for calculating the time and position of Iridium flares using the most basic mathematics; in the end the whole algorithm will be completed and possible to place into code form for everyday reuse. The system will not take into account various subtleties such as atmospheric drag (and so, over time, the estimates will become far less useful), but will still be useful enough for common, everyday purposes. The first part to understand however – and the purpose of this first article – is exactly what Iridium satellites are and the definitions of the basic numerical properties assigned to them.

First, what are they? Iridium satellites are a constellation of satellites owned and operated by Iridium Communications, Inc. whose primary function is to provide voice and data capabilities to satellite phones and various other transceivers across our planet. Collectively the network has been in operation since mid-1997 and, today, consists of 66 active satellites. More interestingly, however, is the side-effect of their unique shape and polished antennae: bright "flares" (upwards of -8 magnitude) of sunlight off their bodies when they fall into the right position between the Earth-based observer and the Sun.

Satellites are assigned a range of unique numerical properties with which tracking is made possible. The traditional six are known as the orbital elements, or the Keplerian elements. They each have rather odd names, but their exact definitions are not difficult to understand. Among these are the satellite's eccentricity, semi-major axis, inclination, longitude of the ascending node, argument of periapsis, and the mean epoch. The diagram below, courtesy of Wikipedia, shows a few of these elements quite clearly.



To summarize,

1. The eccentricity describes the shape of the orbit's ellipse relative to a perfect circle,
2. the semi-major axis is one half the major axis (or the longest diameter of the ellipse),
3. Inclination is the tilt or angle between the reference plane and the ellipse,
4. Longitude of the ascending node reflects the point at which the orbit crosses through the reference plane and continues "upwards",
5. Argument of peripasis describes the direction, relative to the longitude of the ascending node, in which the ellipse is "flattened",
6. And the epoch describes the position of the object along its orbit at a particular point in time.

In the next article we'll view these numbers for a particular Iridium satellite and begin to piece together how to use them to accurately describe a satellite's orbit and position along its orbit for any given time, the first step towards knowing exactly where to look in the sky for the satellite.

Club Events

Newsletter submission deadline, January 15, 2011

PAC Club Meeting
Tuesday December 27, 2011 7:30pm @ Mueller Planetarium
Program: Social Event

PAC Club Meeting
Tuesday January 31, 2012 7:30pm @ Hyde Observatory
Program: How to Use a Telescope

PAC Meeting
Tuesday February 28, 2012 7:30pm @Hyde Observatory
Program: Mars Exploration Update

2011 PAC Star Party Dates			**Lunar Party Dates:**
December	Dec 16th	**Dec 23rd**	

Dates in **BOLD** are closest to the New Moon. Lunar Party dates are possible dates and not official.

Internet Links of Interest

http://www.spacenews.com/commentaries/111111-guest-blog-apollo-spirit-alive-and-well.html

http://www.thespacereview.com

http://www.thespacereview.com/article/1945/1

http://space.flatoday.net/

http://www.spaceportamerica.com/

http://spacerefpress.com/2011/09/first-issue-of-space-quarterly-magazine-released.html

http://www.nasaspaceflight.com/

http://www.spacex.com

ON THE NET

PAC:
www.prairieastronomyclub.org

PAC E-Mail:
info@prairieastronomyclub.org

NSP:
www.nebraskastarparty.org

NSP E-Mail:
info@nebraskastarparty.org

OAS
www.OmahaAstro.com

Hyde Observatory
www.hydeobservatory.info

Panhandle Astronomy Club
Panhandleastronomyclub.com

PAC-LIST: You may subscribe to the PAC listserv by sending an e-mail message to: imailsrv@prairieastronomyclub.org. In the body of the message, write "Subscribe PAC-List your-email-address@your-domain.com"

For example:
Subscribe pac-list me@myISP.com

To post messages to the list, send to the address

pac-list@prairieastronomyclub.org

PAC can also be found on Twitter and Facebook.

Buy club apparel through the club website. Shirts, hats, mugs, mouse pads and more.

December Observing: What to View--Jim Kvasnicka

Planets

Venus: Very bright at magnitude -4.1. Look for it about 18° above the southwest horizon 45 minutes after sunset. In a telescope it is a small gibbous disk.

Jupiter: Dims a little from -2.6 to -2.4 throughout the month.

Uranus/Neptune: In Pisces and Aquarius.

Mars: Rises around 10:30 pm to start the month and by 8:30 to end the month. It will double in brightness in January from 0.2 to -0.5.

Saturn: Rises by 11:30 pm at the end of January at magnitude 0.6. The rings are opened 15° from edge on.

Mercury: Low in the dawn light and difficult to see.

Meteor Showers

Quadrantids: Peaks around 1-2 am CST on January 4th. This is a brief but intense shower with peak rates that vary from 60-200 per hour for a short period of time.

Messier List

M33: The Triangulum Galaxy, faint and difficult to see. .

M34: Open cluster in Perseus.

M52: Open cluster in Cassiopeia.

M74: Faint galaxy in Pisces.

M76: The Little Dumbbell, planetary nebula in Perseus.

M77: Galaxy in Cetus.

M103: Open cluster in Cassiopeia.

Last Month: M2, M15, M29, M31, M32, M39, M110

Next Month: M1, M35, M36, M37, M38, M42, M43, M45, M78, M79

NGC and Other Deep Sky Objects

Cr69: The Lambda Orion Cluster.

NGC 1980: Emission nebula south of M42 in Orion.

NGC 2169: The 37 Cluster in Orion.

Double Star Club List

Beta Orionis: Rigel, bright white and dim blue stars.

Delta Orionis: Mintaka, bright white and pale blue pair.

Struve 747: Equal pair of white stars.

Lambda Orionis: Pair of white stars.

Theta 1 Orionis: The Trapezium in the Orion Nebula.

Iota Orionis: Bright white and blue stars.

Theta 2 Orionis: Three white stars.

Sigma Orionis: White primary with three pale blue stars.

Zeta Orionis: Alnitak, White primary with two white secondary stars.

Challenge Object

B33: The Horsehead Nebula. Requires an H Beta filter and excellent seeing conditions.

Focus On Observing Clubs - Jim Kvasnicka

Urban Club

The Urban Club is designed to bring amateur astronomy back to the cities and suburbs, those areas affected by heavy light pollution. Amateur astronomy used to be called "backyard astronomy". This was before light pollution became such a problem. It's not uncommon today for a person living in the city to travel 100 miles to enjoy the hobby.

For the Urban Club the observer is required to observe the 100 objects on the Urban Club list from light polluted skies. Light polluted skies are defined as any area where you cannot see the Milky Way with the naked eye. You can use any telescope to observe the objects but a minimum 6 inch aperture is recommended. Previous observations of any of the 100 objects from dark sky locations will not count. You can use any method to find the objects including GO-TO and PUSH-TO.

To record your observations any log sheets can be used as long as they include: object, date, time, power, seeing conditions, telescope type, and observing notes.

There are actually two lists, one for deep sky objects and one for double and variable stars.

When you complete the Urban Club you will need to submit a copy of your observing logs to me for review. If the logs are accurate and complete I will submit your name to the Urban Club chair for approval. The chair will forward to me your certificate and pin that I will present to you at our monthly PAC meeting.

If you have any questions regarding the Urban Club or need help getting started please ask me and I would be glad to assist you.

Urban Club Awardees from PAC

Jim Kvasnicka

ANNUAL MEMBERSHIP

REGULAR MEMBER - $30.00 per year. Includes club newsletter, and 1 vote at club meetings, plus all other standard club privileges.

FAMILY MEMBER - $35.00 per year. Same as regular member except gets 2 votes at club meetings.

If you renew your membership prior to your annual renewal date, you will receive a 10% discount.

Club members are also eligible for special subscription discounts on Sky & Telescope Magazine.

Club Telescopes

To check out one of the club telescope contact **Jason Noelle.** If you keep a scope for more than a week, please check in with Jason once a week, to verify the location of the telescope and how long you plan to use it. The checkout time limit will be two weeks, but can be extended if no one else has requested use of a club scope.

100mm Orion refractor:
Available

10 inch Meade Dobsonian:
Checked Out

13 inch Truss Dobsonian:
Available

Program Chair Minute - Dave Churilla

The program for the November meeting was our annual Learn How to Buy a Telescope presentation. Dan Delzell did an excellent job of presenting general information about telescopes and a brief idea of costs and points of interest of each type of telescope. Guests were then allowed to talk to club members about their questions one-on-one. They could also go out onto the lawn to view through telescopes set up by Jim Kvasnicka, Bob Kacvinsky, Jason Noelle and John Lammers (and a big thanks to those 4 for setting up their scopes). The ability to talk to with experienced members is an important part of this program and the guests, several of whom are very interested in buying telescopes, got some valuable information.

In December we won't have a formal PAC Meeting. **Instead everyone is invited to come to Mueller Planetarium in Morrill Hall on the UNL Campus (just south of 14th & Vine – west door of the museum) from 6:30 PM to 9 PM** to enjoy a Holiday Social get together. You are encouraged to bring your families and we'll provide snacks and drinks. You are welcome to bring your favorite holiday goodies to share with everyone. Around 7:30 we'll be treated to a show in the planetarium by our host, Jack Dunn. You are welcome to come anytime during the social, but you should probably call me on my cell (402-430-1282) so someone can let you in.

To assist in getting a head count, will you please let me know that you are coming (and how many) by email at:

weber2@inebraska.com

Or call me at 402-467-1514

Following are upcoming programs that we have planned or are in the process of planning that you won't want to miss.

Jan 2012: ***How to Use Your Telescope*** This is the follow up public program to our November "How to Buy a Telescope". We will invite the public once again to bring their telescopes so we can help them learn how to use them. We'll need your help assisting guests.

Feb 2012: ***Update on Mars Exploration*** Jack Dunn will be giving us a multimedia update on Mars exploration. More to come.

Mar 2012: ***Fun Astronomy Night (still working on this program)*** The Executive Board will present a humorous look at the media, film, and astronomy supplemented with a star party if the weather cooperates. Snacks might be available. We're still working on this program so stay tuned for details.

Apr 2012: ***Astronomy and the Internet (still a working title)*** Dale Bazan is working on a presentation on astronomy and the internet. More to come as he refines the topic.

May 2012: ***Tentative: Near Star Party:*** We are considering another Near Star Party that will begin early and go until about 8:00 PM with the business meeting afterward. We'll let you know.

June 2012: ***BBQ Social (tentative)*** We are considering once again a BBQ social perhaps featuring Cajon Bob's Pulled BBQ Pork and an enjoyable evening of visiting with one another. Stay tuned for more info.

I'll try to keep you apprised of upcoming programs so you can plan to attend.

The members of the PAC Executive Committee work together to plan the monthly PAC Programs. Our goal for the programs is to provide a good mix of information, entertainment (including time to visit with one another), and to make them relevant for all experience levels as well as to hit all interests in astronomy. In addition we want to get club members involved with giving presentations as there is a lot of expertise in different areas that we all could benefit from. So we would love to have your comments and suggestions concerning what you would like see in our programs. Call me at 402-467-1514 or email me at weber2@inebraska.com.

Challenge Observing Objects for December/January

Each month I will have two objects, one for the more seasoned observer and one for the beginning observer. Each object I hope will challenge you just a little bit. I will provide you with a little bit of information about the object. It is your job to find it and if you would write a little report or draw what you see. The first person to report back on each object will have their report published in the next issue of the newsletter. Happy Hunting!

Advanced Object

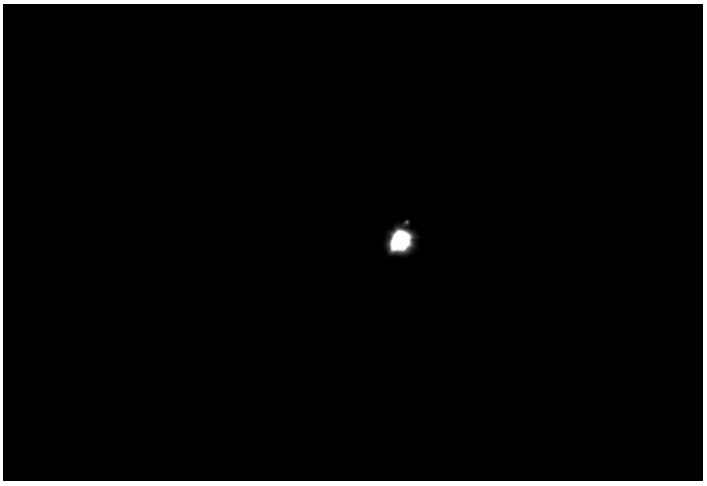
The Horsehead Nebula

Also known as Barnard 33, is a dark nebula in the constellation Orion. The nebula is located just to the south of the star Alnitak, which is farthest west on Orion's Belt, and is part of the much larger Orion Molecular Cloud Complex. The Horsehead Nebula is approximately 1500 light years from Earth and is 8x6 arcminutes in size

Beginner Object

Rigel A and B

Rigel is the brightest star in the constellation Orion and the sixth brightest star in the sky. It is a blue supergiant, at 17 solar masses, shining with approximately 85,000 times the luminosity of the Sun .Rigel has been a known visual binary since at least 1831, when it was first measured by F. G. W. Struve. Though Rigel B is not particularly faint at magnitude 6.7, its closeness to Rigel A, which is over 500 times brighter, makes it a challenging target for telescopes smaller than 150 mm. However a good 7 cm telescope will reveal Rigel B at 150x power and good seeing. At Rigel's estimated distance, Rigel B is separated from its primary by over 2200 AU, which is about 9 arcseconds of separation. Rigel A has an apparent magnitude of 0.18.



Aliens Hanging Out in the Kuiper Belt? We Could See the Light from their Cities
by Tammy Plotner of Universe Today

When it comes to searching for ET, current efforts have been almost exclusively placed in picking up a radio signal – just a small portion of the electromagnetic spectrum. Consider for a moment just how much lighting we here on Earth produce and how our "night side" might appear as viewed from a telescope on another planet. If we can assume that alternate civilizations would evolve enjoying their natural lighting, wouldn't it be plausible to also assume they might develop artificial lighting sources as well?

Is it possible for us to peer into space and spot artificially illuminated objects "out there?" According to a new study done by Abraham Loeb (Harvard), Edwin L. Turner (Princeton), the answer is yes. For gathering light, the array of Earthly telescopes now at science's disposal are able to confidently observe a light source comparable in overall brightness to a large city — up to a certain distance. Right now astronomers are able to measure the orbital parameters of Kuiper belt objects (KBOs) with the greatest of precision by their observed flux and computing their changing orbital distances.

However, is it possible to see light if it were to occur on the dark side? Loeb and Turner say that current optical telescopes and surveys would have the ability to see this amount of light at the edge of our Solar System and observations with large telescopes can measure a KBOs spectra to determine if they are illuminated by artificial lighting using a logarithmic slope (sunlit object would exhibit alpha=(dlogF/dlogD) = -4, whereas artificially-illuminated objects should exhibit alpha = -2.)

"Our civilization uses two basic classes of illumination: thermal (incandescent light bulbs) and quantum (light emitting diodes [LEDs] and fluorescent lamps)" Loeb and Turn write in their paper. "Such artificial light sources have different spectral properties than sunlight. The spectra of artificial lights on distant objects would likely distinguish them from natural illumination sources, since such emission would be exceptionally rare in the natural thermodynamic conditions present on the surface of relatively cold objects. Therefore, artificial illumination may serve as a lamppost which signals the existence of extraterrestrial technologies and thus civilizations."

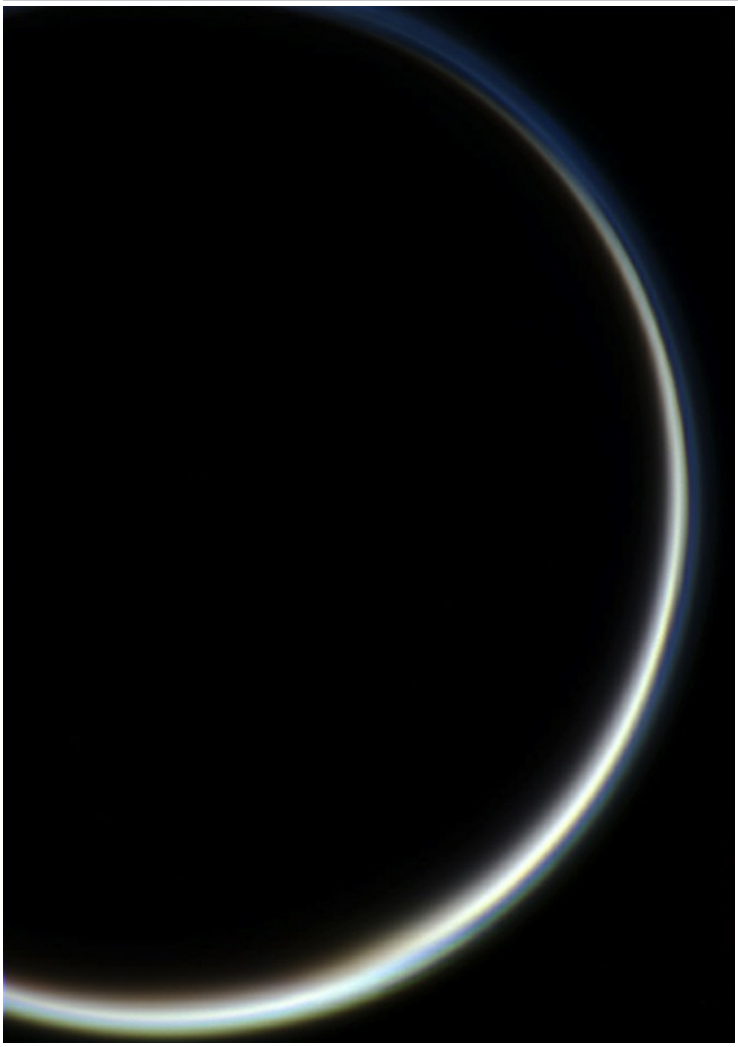
Spotting this illumination difference in the optical band would be tricky but by calculating the observed flux from solar illumination on Kuiper Belt Objects with a typical albedo, the team is confident that existing telescopes and surveys could detect the artificial light from a reasonably brightly illuminated region, roughly the size of a terrestrial city, located on a KBO. Even though the light signature would be weaker, it would still carry the dead give-away – the spectral signature.

However, we currently don't expect there to be any civilizations thriving at the edge of our solar system, as it is dark and cold out there. But Loeb has posed that possibly planets ejected from other parent stars in our galaxy may have traveled to the edge of our Solar System and ended up residing there. Whether a civilization would survive an ejection event from their parent system, and then put up lamposts is up for debate, however.

The team isn't suggesting that any random light source detected where there should be darkness might be considered a sign of life, though. There are many factors which could contribute to illumination, such as viewing angle, backscattering, surface shadowing, outgassing, rotation, surface albedo variations and more. this is just a new suggestion and a new way of looking at things, as well as suggested exercises for future telescopes and studying exoplanets. "City lights would be easier to detect on a planet which was left in the dark of a formerly-habitable zone after its host star turned into a faint white dwarf," Loeb and Turner say. "The related civilization will need to survive the intermediate red giant phase of its star. If it does, separating its artificial light from the natural light of a white dwarf, would be much easier than for the original star, both spectroscopically and in total brightness."

The next generation of optical and space-based telescopes could help to refine the search process when observing extra-solar planets and preliminary broad-band photometric detection could be improved through the use of narrow-band filters which are tuned to the spectral features of artificial light sources such as light emitting diodes. While such a scenario on a distant world would need to involve far more "light pollution" than even we produce – why rule it out? "This method opens a new window in the search for extraterrestrial civilizations," Loeb and Turner write. "The search can be extended beyond the Solar System with next generation telescopes on the ground and in space, which would be capable of detecting phase modulation due to very strong artificial illumination on the night-side of planets as they orbit their parent stars."

Titan's Colorful Crescent by Jason Major of Universe Today



Made from one of the most recent Cassini images, this is a color-composite showing a backlit Titan with its dense, multi-layered atmosphere scattering sunlight in different colors. Titan's atmosphere is made up of methane and complex hydrocarbons and is ten times as thick as Earth's. It is the only moon in our solar system known to have a substantial atmosphere. Titan's high-level hydrocarbon haze is nicely visible as a pale blue band encircling the moon.

At 3,200 (5,150 km) miles wide, Titan is one of the largest moons in the solar system – even larger than Mercury. Its thick atmosphere keeps a frigid and gloomy surface permanently hidden beneath opaque clouds of methane and hydrocarbons.

This image was made from three raw images acquired by Cassini on December 13. The raw images were in the red, green and blue visible light channels, and so the composited image you see here approximates true color.

This particular flyby of Titan (designated T-79) gave Cassini's instruments a chance to examine Titan in many different wavelengths, as well as map its surface and measure its atmospheric temperature. Cassini passed by the giant moon at a distance of about 2,228 miles (3,586 kilometers) traveling 13,000 mph (5.8 km/sec).

Color image of Titan and sister moon Dione, seen by Cassini on Dec. 10.
(NASA/JPL/SSI and J. Major)

THE *Prairie Astronomy Club*

Amateur Astronomy --
A Hobby as Big as the Universe

The Prairie Astronomer is published monthly by the Prairie Astronomy Club, Inc. Membership expiration date is listed on the mailing label. Membership dues are: **Regular $30/yr, Family $35/yr**. Address all new memberships and renewals to: **The Prairie Astronomy Club, Inc., PO Box 5585, Lincoln, NE 68505-0585**. For other club information, please contact one of the club officers listed to the right. Newsletter comments and articles should be submitted to: **Jason Noelle at oegrad2002@yahoo.com,** no less than ten days prior to the club meeting. The Prairie Astronomy Club meets the last Tuesday of each month at Hyde Memorial Observatory in Lincoln, NE.

The Prairie Astronomer
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Lincoln, NE 68505-0585

FIRST CLASS MAIL

Next PAC Meeting
Tuesday
December 28, 2011
6:30 PM
Mueller Planetarium