

The Prairie Astronomer

July, 2009

Volume 50, Issue #7

The Official Newsletter of the Prairie Astronomy Club

PAC Program

“How to View a Shuttle Launch, plus High Definition Launch Video of STS-127.” Mark Dahmke will talk about the best locations from which to view a shuttle launch, plus show video of the Kennedy Space Center Visitor Complex, the Astronaut Hall of Fame, the view from the LC 39 observation gantry, and the Apollo/Saturn V center. Also included will be video from the pad viewing gantry showing lightning strikes at the pad during the storm on July 10th. If you didn't get to see this presentation last November (and even if you did - new video and photos!) - make sure to come to the July meeting.

In This Issue

Focus on Observing, Outreach Report, Black Holier than Thou? – Double the Fun with Supermassive Black Holes! (Part II)



Sharpless object, SH 2-219, by Rick Johnson. “It is a small emission nebula in western Auriga. While there's been a lot of study on this compact emission nebula associated with a larger unseen molecular cloud, the distance to it is rather vague. Best estimate is about 13,700 light years plus or minus 2000 light years. Using the 13,700 figure it would be about 12 light years across. It is thought to be very young, maybe no more than 100,000 years since the stars causing it to glow were born. Deep infrared shows a star cluster embedded in it's southwest corner. That area is bluer than the rest so may have some reflection component from this cluster though I see no sign of it at visual frequencies. The IR POSS2 plate shows some hint of it. Also there is reported to be a 2000 solar mass molecular cloud nearby but no other information about it that I could find other than it is about 24 light years long. This image is taken looking at the heart of the winter Milky Way. It's gas and dust seem to be blocking all but a very few distant galaxies. I couldn't find but a very few and only saw them after blowing up the image considerably.”

Featured Photo

Please send your astrophotos to Mark Dahmke to be added to the PAC website and the newsletter.



Saturn image courtesy NASA.

Club Business --Meeting Minutes

Club 2nd Vice-President Jack Dunn called the meeting to order, 24 members, 2 guests

Announcements:

The next PAC meeting will be Tuesday July 28, 2009 at Hyde Observatory

The next PAC star parties are scheduled for July 17 and 24 at **The Farm**

The next Mahoney Star Party will be Friday July 10 at Mahoney State Park

The 16th annual Nebraska Star Party will be July 19-24 at Merritt Reservoir.

The 7th annual Iowa Star Party will be August 20-23 at Iowa's Whiterock Conservancy.

PAC will be hosting the Mid-States Regional Convention of the Astronomical League (MSRAL) in 2010. Jack Dunn is Chairman for the event with Ron Veys as vice-chair. If you'd like to help in the planning for this, please contact Jack.

Observing Report:

Jack provided a brief review of the planets visible for the month and noted many of the observing programs offered by the Astronomical League.

Treasurer's Report:

Club President, Brian Sivill wanted to commend club treasurer, Dan Delzell for

for his work on club finances and the semi-annual report in the June issue of the newsletter. Thanks for everything, Dan.

GALILEOSCOPIES

The long-awaited Galileoscopes have begun shipping. Jack received one at the Planetarium this week.

The rest are soon to follow. Jack challenged members to be the first to successfully assemble the Galileoscope into a functional instrument. We had a few takers after the meeting.

Adjourn to the programs on LRO and LCROSS

Respectfully submitted by,

Lee Taylor

From the Archives - July, 1984

Mid States Convention Wrap-up... The convention was opened by Steve Best serving as Chairman on June 23. A series of papers were given that always prove interesting to all types of amateur and professional astronomers. Among these were the always faithful Bob Cox who demonstrated graphically in his Atari the positions of Jupiter's moons for any time during the day. Several gave talks on their trip following the May 30 solar eclipse. Tom Becker spoke on telescopes in space. The league plans for the Halley's Comet trip to South America. The banquet speaker was Dr. Doug Hall from Vanderbilt University. Talking on starspots and the light of variable stars. Representing our club were Earl Moser and his wife as they always do. Next year's convention will be held in Wichita, KS. This is close enough for a good turnout on the part of all PAC members.

Russ Genzmer informed the club that the 8" mirror we had won as a door prize at the last national convention had arrived. Thanks to Summit Instruments of Miami, Fl. The mirror was presented to Ron Veys and his committee. They are responsible for the tube and mount construction.

PAC Club Meeting

Tuesday, July 28, 2009 7:30pm @ Hyde Obsv.

7th Annual Iowa Star Party

Thursday, August 20, 2009 Whiterock Conservancy, near Co Thursday, August 20 Sunday, August 23, 2009 Guest speaker Dr. Elwynn Taylor* presenting, Standing Between Us and the Stars: A Thin Layer of Air.

PAC Club Meeting

Tuesday, August 25, 2009 7:30pm @ Hyde Obsv.

Next newsletter submission deadline: August 16.

2009 Star Party Dates

July 24th

August 14th and August 21st

September 18th and September 25th

October 16th and October 23rd

November 13th and November 20th

December 11th and December 18th

The date that is **bold and underlined** is the date closest to the New Moon.

Nebraska Star Party: July 19-24, Merritt Reservoir, Valentine, NE.

Iowa Star Party: August 20-23, 2009, Coon Rapids, Iowa.

Mahoney Star Party dates August 14th, September 11th

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.



Club Telescopes - Checkout Policy

To check out one of the club telescopes, contact Cassie Etmund at cggymnast1@aol.com. If you keep a scope for more than a week, please check in with Cassie 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.

The Long Arm of the Law - Or At least PAC Education--Dave Churilla

Every year many PAC members engage in Outreach Activities. What's that: simply put it's touching someone from the public with a piece of our hobby of Astronomy either by letting them look through your telescope or by talking to them about Astronomy. Club members reach out to the public about Astronomy in a lot of different ways too. There's the obvious – volunteering at Hyde Observatory – and the not so obvious such as talking to a guest at a club meeting.

So even though I'm going to talk about Outreach from the context of something structured it doesn't mean every one of us don't do our part or interact with someone about Astronomy all the time...that's Outreach in it's purest form.

But on a more formal level PAC actively seeks to educate people about Astronomy and Space Exploration and in particular in the Hobby of Astronomy itself. To that end the club has an Outreach Coordinator – someone who makes sure that requests for Outreach (Educational) events or projects are handled either by themselves or by other club members. For good or bad several years ago the club officers asked me to be the Outreach Coordinator (in case anyone wants know...or cares). I thought club members would appreciate a brief (I promise it will be brief) report on our Outreach Activities the past few years. I began by logging our Outreach Activities, at least the ones I was aware of. I've included the last 3 years of them here. By the way, we don't count volunteering at Hyde as an official Outreach Activity but it's a very important activity a PAC member can volunteer for and it's a lot of fun.

I think the neatest thing about our activities is the help I've received from so many volunteers. Most of the membership helps at one time or another and for that we and especially myself thank you very much. But I'd like to give a special thanks to Jim Kvasnicka, Bob Leavitt, Dan Delzell and Bob Kacvinsky who help at nearly all the events but who also plan most of them like our Astronomy Class. Without them and countless others I wouldn't be able to do this job. Thanks.

One of the neat side bars to these activities has been an increase to our membership. That's been a real plus and is showing at our meetings and especially at Star Parties (well, whenever we are able to have one) with larger attendance. That makes it a lot of fun.

The most memorable from a problematic standpoint of the activities I was involved with was when 6 of us set up 3 scopes, a laptop and a display at Waterfest for what we thought would be 300-500 people to view the sun and we had over 3,000 people at the event. But despite the crowds and heat it was fun watching people's reaction to what they saw in the telescope. And that brings to mind my nephew looking through my scope at the moon and describing what he saw as "holes". That night was the most fun...watching my 6 nieces and nephews gawk at the moon and Jupiter one summer evening and really enjoy what they saw. One is constantly wanting to look through my scope so might be a budding PAC member ☺. THAT is the fun of Outreach – of sharing our hobby and of "educating" the public about what we love. And when I say "educate" I don't mean like a professor at UNL either. I simply mean sharing our knowledge with them and to give people – like my niece – a taste of the thrill we get in the hobby. So many people that we let view through our scopes "ooh" and "ahh" at the sights they see; of Saturn and it's rings, of a distant galaxy and the appreciation they suddenly have for what they are looking at when we explain a light year or that the nebula they're looking at is a spawning place for new stars. One of the most rewarding times was at South Point this year for 100 Hours of Astronomy and IYA and watching families stick around for an hour as they enjoyed talking to us and looking through our scopes.

Ok, Ok – I said brief...so I lied. I'll end here and let you look below at the stats. But let me say just with this. For those who have helped in the past thanks so much for all your work and efforts and I'm looking forward to working with you in the future. For those who are new and would like to help just let me know. You don't have to be a scholar to help with Outreach...heck, I do it so I KNOW you can. And you'll be surprised just how rewarding it can be.

2007 Outreach Activities

Date	Length (in hrs)	Activity	# Attending
04/21/07	8.0	Astronomy Day	550
04/30/07	4.0	CF Astronomy Party	17
09/08/07	5.0	Spring Creek Audubon Twilight on the Prairie	400
10/19/07	4.0	PAC Field Class	22
10/27/07	3.0	Homestead National Monument Halloween on the Prairie	200
11/08/07	3.0	PAC Astronomy Class	16
Tot Hrs	27.0	Total Attendees	1,205

2008 Outreach Activities

Date	Length (in hrs)	Activity	# Attending
01/31/08	2.0	Learn Your Scope Seminar	21
02/07/08	3.0	PAC Astronomy Class	9
05/10/08	8.0	Astronomy Day	543
05/23/08	4.0	PAC Astronomy Field Class	10
06/14/08	3.0	Waterfest 2008 Holmes Park	3,000
06/12/08	2.0	Camp Carol Joy Holling - Ashland, NE	55
09/13/08	5.0	Spring Creek Audubon Twilight on the Tallgrass	400
10/25/08	3.0	Homestead National Monument Halloween on the Prairie	350
Tot Hrs	30.0	Total Attendees	4,388

2009 Outreach Activities

Date	Length (in hrs)	Activity	# Attending
01/17/09	4.0	IYA Kick Off at SAC Museum	270
01/27/09	2.0	Learn Your Scope Seminar	17
04/03/09	3.0	100 Hours of Astronomy @ South Pointe Pavilion	300
04/16-17/09	7.0	PAC Astronomy Field Class	28
05/02/09	8.0	Astronomy Day	475
05/09/09	3.5	Scouts in Space @ Scout Camp/Walton	250
05/28/09	2.0	Camp Carol Joy Holling - Ashland, NE	50
06/01/09	2.0	Children's Circle Montessori	25
06/23/09	2.0	Prairie Hill Learning Center	15
07/14/09	*	Prairie Hill Learning Center	
TBA	*	Spring Creek Audubon Twilight on the Tallgrass	
TBA	*	Homestead National Monument Halloween on the Prairie	
Tot Hrs	33.5	Total Attendees	1,430

* Events Planned but not yet occurred

**ANNUAL
MEMBERSHIP
DUES**

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.

August Observing: What to View--Jim Kvasnicka

This is a partial list of objects visible for the upcoming month.

Planets

Venus: Rises about 3 hours before the sun. Shines brightly at -4.0.

Mars: Rises a little past midnight. Shines at magnitude 1.0.

Uranus: Rises during evening twilight. High enough to be easily seen by midnight.

Jupiter: Comes into view early in the evening twilight. Shines at magnitude -2.9.

Neptune: The separation from Jupiter increases from 2° to 5° during August.

Saturn: Just 12° above the horizon 45 minutes after sunset to start the month. By the end of the month it may be too low to see.

Meteor Showers

Perseids: Peaks around 1:00 pm on August 12th. Watch for them on August 11th -12th.

August Messier List

M6: The Butterfly Cluster in Scorpius.

M7: Ptolemy's Cluster in Scorpius.

M8: The Lagoon Nebula in Sagittarius.

M9/M10/M12/M19: Globular clusters in Ophiuchus.

M20: The Trifid Nebula in Sagittarius.

M21/M23: Open clusters in Sagittarius.

M62/M107: Globular clusters in Ophiuchus.

Last Month: M3, M4, M5, M53, M68, M80, M83

Next Month: M13, M14, M22, M28, M54, M69, M70, M92

NGC and Other Deep Sky Objects

B86: The Ink Spot; dark nebula in Sagittarius.

NGC 6520: Open cluster in Sagittarius next to B86.

NGC 6755: Moderately rich open cluster in Aquila.

NGC 6818: Little Gem; planetary nebula in Sagittarius.

Double Star Club List

Struve 2404: Close orange pair.

57 Aquilae: Pair of white stars.

Beta Cygni: Albireo; beautiful gold and blue stars.

31 Cygni: Yellow primary with a blue secondary.

61 Cygni: Pair of orange stars.

Epsilon Lyrae: The Double-Double.

Zeta Lyrae: Two yellow stars.

Beta Lyrae: Shellak; Yellow star with multiple white stars.

Challenge Object

IC 5146: The Cocoon Nebula; faint and diffuse. Use an H-Beta filter.

Focus On Constellations - Sagittarius--Jim Kvasnicka

Sagittarius

Sagittarius, The Archer, covers 867 square degrees. Toward Sagittarius lies the center of our Galaxy and the bulk of the cool dust that lies along the spiral arms of our Milky Way. Because most of the 150+ globular clusters are congregated around the central hub of our Galaxy, Sagittarius is rich in globular clusters. Sagittarius contains 15 Messier objects, more than any other constellation. Most of the Messier objects are famous and well known. They include M8, The Lagoon Nebula; M17, The Swan or Omega Nebula; M20 The Trifid Nebula: and M22, one of the best globular clusters in the sky. Sagittarius contains a large variety of objects, enough to keep any observer busy for a while. Sagittarius is a summer constellation best seen in August.

Mythology

Two centaurs are immortalized among the stars. The centaur represented by Centaurus and the centaur Sagittarius, one of the zodiac signs. In Greek-Roman mythology, Sagittarius was the Archer-Centaur who slew the scorpion that had killed Orion.

Objects in Sagittarius Magnitude 12.0 and Brighter

Galaxies:	NGC6822, NGC6902, IC4946
Open Clusters:	M18, M21, M23, M24, M25, NGC6469, NGC6507, NGC6520, NGC6530, NGC6546, NGC6568, NGC6583, NGC6595, NGC6603, NGC6645, NGC6716, Cr347, Cr351, Cr367, Cr394, Cr469, Tr31, Tr33
Globular Clusters:	M22, M28, M54, M55, M69, M70, M75, NGC6723, NGC6544, NGC6533, NGC6624, NGC6522, NGC6569, NGC6652, NGC6638, NGC6558, NGC6717, NGC6528, Pal8, Pal9
Planetary Nebulae:	NGC6537, NGC6567, NGC6629, NGC6818, PK1-6.2, PK11+4.1, PK12-7.1, PK2-5.1, PK2-9.1, PK3-14.1, PK3-4.7, PK3-4.9, PK355-6.5, PK358-6.1, PK359-0.1, PK7+1.1
Bright Nebulae:	M8, M17, M20
Dark Nebulae:	B83a, B84, B84a, B86, B87, B90, B91, B92, B93
Named Stars:	Rukbat (Alpha), Arkab Prior (Beta 1), Arkab Posterior (Beta 2), Nash (Gamma 2), Kaus Meridionalis (Delta), Kaus Australis (Epsilon), Ascella (Zeta), Kaus Borealis (Lambda), Ain al Rami (Nu 1), Albaldah (Pi), Nunki (Sigma)

Number of Sagittarius Objects in Various Observing Clubs

Messier Club:	15 objects
Double Star Club:	0 objects
Herschel 400 Club:	18 objects
Globular Cluster Club:	Sagittarius contains 21 globular clusters, all can apply towards the 50 required by the Globular Cluster Club.
Open Cluster Club:	6 objects
Planetary Nebula Club:	12 objects
Urban Club:	5 objects

Black Holier than Thou? – Double the Fun with Supermassive Black Holes! (Part II) --Martin Gaskell

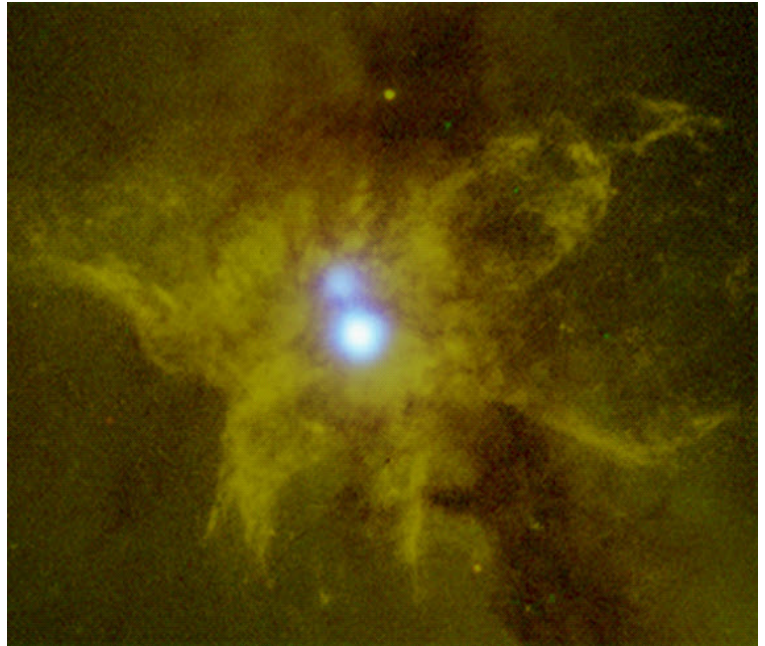
With the establishment in the mid-1990s that every large galaxy has a supermassive black hole in it, the subject of supermassive binary black holes attracted more and more attention, because the binary has a strong effect on the nature of the inner regions of the merged galaxy. We see very clear evidence that there have been supermassive binary black holes in what are called “core elliptical” galaxies. This has been shown very convincingly in an *Astrophysical Journal Letter* earlier this year by my Texas colleague John Kormendy and German astronomer Ralf Bender. In these “core ellipticals” the core of the galaxy has been scoured out by the black hole binary because the binary has flung out many of the stars from the center causing a clear deficit in the starlight in core of the galaxy compared with other elliptical galaxies.

There is no doubt that there are present day binary black holes still surviving in galaxies that have merged. There are some cases where we can clearly separate the two black holes. When German astronomer Stefanie Komossa and collaborators looked at NGC 6240 (pictured above) in X-rays in 2003 with the *Chandra* satellite, she found that the X-rays showed that there were *two* active blackholes in the merged galaxy.

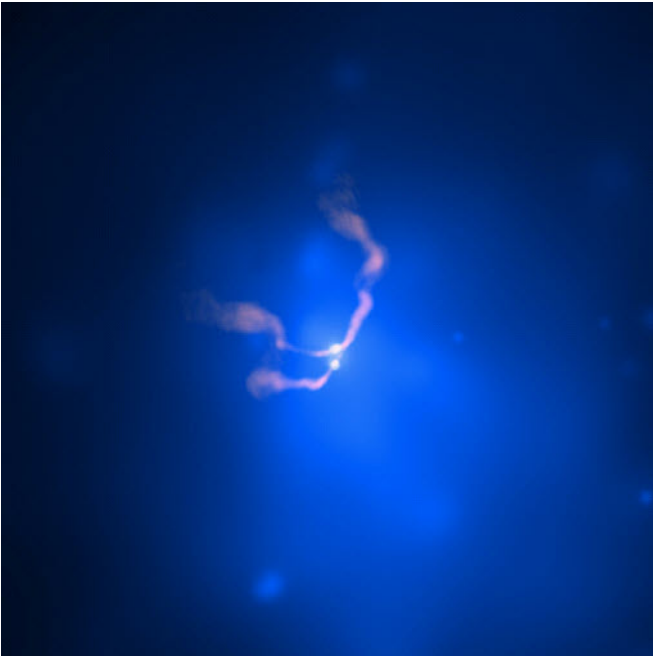
The 13th magnitude cD galaxy in NGC 1128 in Cetus (more commonly known among professional astronomers as “Abell 400” or “3C 75”) is another excellent illustration of this. In this case both black holes are AGNs and both have strong radio jets squirting out in opposite directions.

Obvious binary black hole systems, such as NGC 6240 and NGC 1128 illustrated above, have very wide separations (thousands of light years) compared with what I was considering back in 1982. What we have right now therefore is evidence for *wide* black hole binaries, and evidence from scoured out core ellipticals for *past* binary black holes that have now merged into a single black hole. What we have *not* yet observed directly is the *intermediate stage* of black hole binaries that are only a light-year or so apart. There are actually at least two problems here. The first is a practical problem of *why* don't we see them? The second is a theoretical problem of how quickly do the binaries pass through the very close phase before they merge? My University of Texas colleague Miloš Milosavljević refers to the latter problem as “the final- parsec problem”.

Although people familiar with AGNs with disk-like profiles like 3C 390.3 had thought that my binary broad-line region hypothesis had been ruled out over a decade ago, the idea has been resurrected again by Kitt Peak astronomers Todd Boroson and Tod Lauer in a letter to *Nature* published earlier this year. They suggest that an AGN called SDSS J153636.22+044127.0 (I'll be informal and just call it J1536+0441!) found in the Sloan Digital Sky Survey, and which they considered to be a very unique AGN, is an example of a supermassive binary black hole. However, a problem with being an astronomer these days is that there is so much literature to keep up with, and unfortunately Boroson and Lauer were unaware that what they were proposing was an old story! Far from being unique, J1536+0441 has a spectrum just like the very first example I published of a possible binary back in 1983! I very confident that just as objects like 3C 390.3 were shown to be discs not binaries, so J1536+0441 will be shown to be a disc and not a binary. As I've discussed above, there are some specific predictions that the two models make, so we will know which theory is correct. I've told Todd Boroson that I *hope* he and Tod Lauer are right and that J1536+0441 indeed turns out to



Chandra X-ray satellite image of NGC 6240 showing two AGNs.



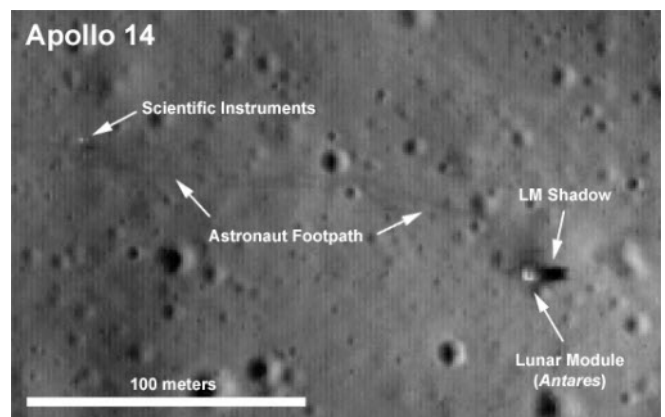
be a binary (because it would be nice to see my old 1982 theory vindicated), but if I were a betting person, I would definitely be putting my money on J1536+0441 being just an example of a disc.

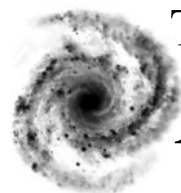
What I think the Boroson and Lauer paper has been useful for is focusing attention on *the rarity of obvious* close supermassive binary black hole candidates. This means either that the binaries do not spend long with a separation of a parsec or less, so they are very rare, or, alternatively, that such close binaries do not produce strong obvious emission lines. Personally I favor the latter explanation. I expect that we'll be learning a lot about this question before too long. There has been one meeting already this year devoted to the topic of supermassive binary black holes, and there is another one coming up in Beijing at the end of July.

Two black holes spiraling inwards in the 13th magnitude cD galaxy NGC 1128 in the Abell 400 cluster. The galaxy is located at a distance of 300 million light years in the constellation of Cetus. The blue in the image is X-ray emission from hot gas in and around the galaxy, and the red shows the twin pairs of radio jets, one from each black hole.

LRO Sees Apollo Landing Sites

NASA's Lunar Reconnaissance Orbiter, or LRO, has returned its first imagery of the Apollo moon landing sites. The pictures show the Apollo missions' lunar module descent stages sitting on the moon's surface, as long shadows from a low sun angle make the modules' locations evident. The Lunar Reconnaissance Orbiter Camera, or LROC, was able to image five of the six Apollo sites, with the remaining Apollo 12 site expected to be photographed in the coming weeks. Though it had been expected that LRO would be able to resolve the remnants of the Apollo mission, these first images came before the spacecraft reached its final mapping orbit. Future LROC images from these sites will have two to three times greater resolution. Although these pictures provide a reminder of past NASA exploration, LRO's primary focus is on paving the way for the future. By returning detailed lunar data, the mission will help NASA identify safe landing sites for future explorers, locate potential resources, describe the moon's radiation environment and demonstrate new technologies. "Not only do these images reveal the great accomplishments of Apollo, they also show us that lunar exploration continues," said LRO project scientist Richard Vondrak of NASA's Goddard Space Flight Center in Greenbelt, Md. "They demonstrate how LRO will be used to identify the best destinations for the next journeys to the moon." The spacecraft's current elliptical orbit resulted in image resolutions that were slightly different for each site but were all around four feet per pixel. Because the deck of the descent stage is about 12 feet in diameter, the Apollo relics themselves fill an area of about nine pixels. However, because the sun was low to the horizon when the images were made, even subtle variations in topography create long shadows. Standing slightly more than ten feet above the surface, each Apollo descent stage creates a distinct shadow that fills roughly 20 pixels. The image of the Apollo 14 landing site had a particularly desirable lighting condition that allowed visibility of additional details. The Apollo Lunar Surface Experiment Package, a set of scientific instruments placed by the astronauts at the landing site, is discernable, as are the faint trails between the module and instrument package left by the astronauts' footprints.





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: **Mark Dahmke, PO Box 80266, Lincoln, NE 68501 or mark@dahmke.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.

PRESIDENT	Brian Sivill (402) 325-0997 nanoamps@windstream.net
VICE PRESIDENT	Cassie Etmund
2nd VICE PRESIDENT (Program Chair)	Jack Dunn jdunn@spacelaser.com
SECRETARY	Oliver L. Taylor (402) 327-0804 otaylor89@hotmail.com
TREASURER	Dan Delzell Dand@fes.org (402) 483-4585
Club Observing Chair	Jim Kvasnicka (402) 423-7390 jim.kvasnicka@pfizer.com
Outreach Coordinator:	Dave Churilla, 467-1514 weber2@inebraska.com
Newsletter and Website Editor:	Mark Dahmke (402) 475-3150

The Prairie Astronomer
c/o The Prairie Astronomy Club, Inc.
P.O. Box 5585
Lincoln, NE 68505-0585

FIRST CLASS MAIL

{MM:TITLE} {MM:FIRSTNAME}
{MM:MIDDLENAME} {MM:LASTNAME}
{MM:CAREOF}
{MM:ADDRESS1}
{MM:CITY} {MM:STATE}, {MM:ZIP}

{MM:RENEWALDATE}

Next PAC Meeting
TUESDAY
July 28, 2009
7:30 PM
Hyde Observatory