The Prairie Astronomer

March 2015 Volume 56, Issue #3

March Program:

Getting Started with Astronomical League Observing Programs - Jim Kvasnicka

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Cover Photo:
GN 21.00.4
An Orange Reflection Nebula
by Rick Johnson

Night Sky Network

The Newsletter of the Prairie Astronomy Club

NEXT PAC MEETING

Tuesday March 31, 2015 7:30 PM
Hyde Observatory

Program

Jim Kvasnicka will describe the observing programs offered by the Astronomical League. He'll talk about what is required for your observing logs and give some examples. He'll also cover how to get started and what to do when you complete an observing program. He'll also present a list of observing programs completed by PAC members.

Upcoming Programs (tentative):

April: Deep Sky Observing (Dave Knisely)
May: PAC Dinner
June: Solar Observing Party
July: Review of Nebraska Star Party
August: The Sky is Falling (Michael Sibbernsen)
September: Beginning Astrophotography (Brett Boller)

Pac-list Has Moved

The old pac-list listserv has been moved to Google Groups. The new email address is pac-list@googlegroups.com Everyone who was subscribed to the old list has been added to the new list. This list is open to anyone, not just PAC members. To subscribe click here: GoogleGroups.

Buy the book! The Prairie Astronomy Club: Fifty Years of Amateur Astronomy. Order online from Amazon or lulu.com.

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, P. O. Box 5585, Lincoln, NE 68505 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.

Events

PAC Meeting
Tuesday March 31st, 2015, 7:30pm
Hyde Observatory

Astronomy Day April 12 @ Morrill Hall

PAC Meeting
Tuesday April 28th, 2015, 7:30pm
Hyde Observatory

PAC Meeting
Tuesday May 26th, 2015, 7:30pm
Hyde Observatory

Newsletter submission deadline April 18, 2015

Club Officers

President	Jim Kvasnicka (402) 423-7390 jim.kvasnicka@yahoo.com
Vice President	Brett Boller proboller86@yahoo.com
2nd VP (Program Chair)	Dave Churilla dchurilla@neb.rr.com
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Treasurer	John Reinert jr6@aol.com
Club Observing Chair	Jim Kvasnicka jim.kvasnicka@yahoo.com
Outreach Coordinator	Dan Delzell dan@delzell.net
Website and Newsletter Editor	Mark Dahmke Mark@dahmke.com

Night Sky Network

Club Membership Info

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.

STUDENT MEMBER - $10.00 per year with volunteer requirement.

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 telescopes, contact Dave Churilla. If you keep a scope for more than a week, please check in 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: Available

13 inch Truss Dobsonian: Available

Internet

PAC: www.prairieastronomyclub.org
Night Sky Network: https://nightsky.jpl.nasa.gov/
CafePress (club apparel) www.cafepress.com

www.hydeobservatory.info
www.nebraskastarparty.org
www.OmahaAstro.com
Panhandleastronomyclub.com
www.universetoday.com/
www.planetary.org/home/
http://www.darksky.org/

PAC Star Party Dates

Dates in bold are closest to the new moon

2015 Star Party Dates
Jan 16,**23**, Feb 13,**20**
Mar 13,**20**, Apr 10,**17**
May 8,**15**, Jun 12,**19**
Jul 10,**17**
NSP **Jul 12-17**
Aug 7,**14**, Sep 4,**11**
Oct **9**,16, Nov 6,**13**
Dec 4,**11**

Lunar Party Dates
Mar 27, Apr 24, Jul 24, Aug 21

(Lunar party dates are tentative, sites to be determined.)

PAC E-Mail:

info@prairieastronomyclub.org

PAC-LIST:

Subscribe through GoogleGroups. To post messages to the list, send to the address:

pac-list@googlegroups.com

Club Apparel

Order club apparel from cafepress.com:

Shop through Amazon Smile to automatically donate to PAC:

Address

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

PAC Meeting Minutes

President Jim Kvasnicka called the meeting to order. 15 members, 7 guests.

Jim reviewed upcoming events for the club, including the Behlen Observatory open house on the 27th.

The next PAC meeting will be Tuesday March 31 at Hyde.

Astronomy Day will be Sunday April 12, 2015 at Mueller Planetarium. If you would like to help, contact Dan Delzell.

NSP will be July 12-17 at Merritt Reservoir.

Club membership dues are:
$30.00 for an individual membership
$35.00 for a family membership
$10.00 for a student membership, with volunteer requirements
If you would like to join the club, contact John Reinert

Jim provided his March observing report.

Club business

Thanks to everyone who helped at the January meeting, for the new 'scope user's night.

Treasurer's report:

John has been busy converting our accounts to a business account at the bank. The audit has been performed.

Jim introduced, via Skype, Jack Dunn to open tonight's program on the Orion Spacecraft.

Lee Taylor

The new LED sign at Hyde Observatory

Nova in Sagittarius Brighter Than Ever – Catch it with the Naked Eye!

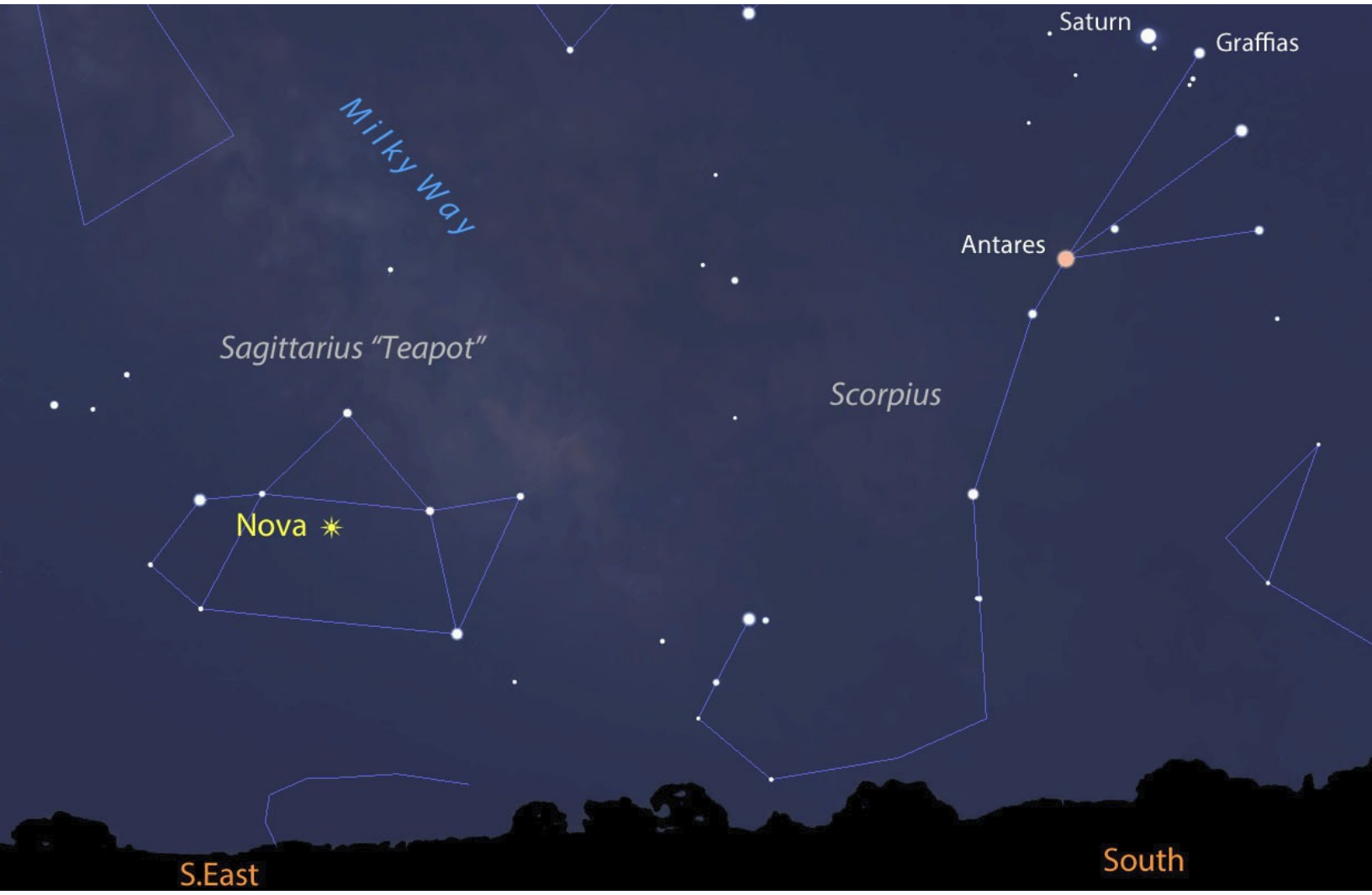
Bob King, Universe Today

Great news about that new nova in Sagittarius. It's still climbing in brightness and now ranks as the brightest nova seen from mid-northern latitudes in nearly two years. Even from the northern states, where Sagittarius hangs low in the sky before dawn, the "new star" was easy to spy this morning (March 21) at magnitude +4.4.

While not as rare as hen's teeth, novae aren't common and those visible without optical aid even less so. The last naked eye nova seen from outside the tropics was V339 Del (Nova Delphini), which peaked at +4.3 in August 2013. The new kid on the block could soon outshine it if this happy trend continues.

Now bearing the official title of Nova Sagittarii 2015 No. 2, the nova was discovered on March 15 by amateur astronomer and nova hunter John Seach of Chatsworth Island, NSW, Australia. At the time it glowed at the naked eye limit of magnitude +6. Until this morning I wasn't able to see it with the naked eye, but from a dark sky site, it's there for the picking. So long as you know exactly where to look.

The chart and photo above will help guide you there. At the moment, the star's about 15° high at dawn's start, but it rises



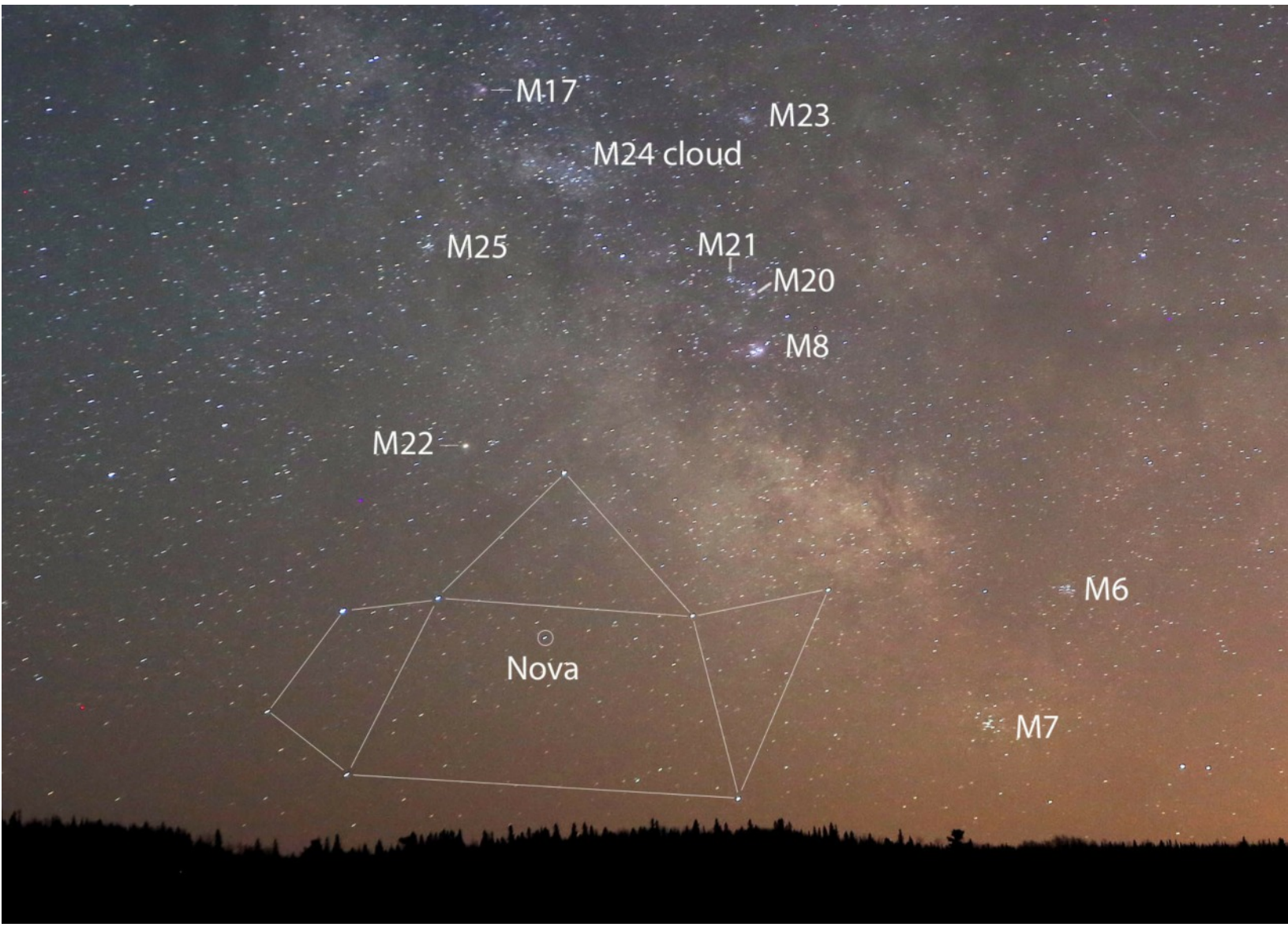
This view shows the sky facing south-southeast just before the start of dawn in mid-March from the central U.S. The nova's located squarely in the Teapot constellation. Source: Stellarium

a little higher and becomes easier to see with each passing day. Find your sunrise time HERE and then subtract an hour and 45 minutes. That will bring you to the beginning of astronomical twilight, an ideal time to catch the nova at its highest in a dark sky.

To see it with the naked eye, identify the star with binoculars first and then aim your gaze there. I hope you'll be as pleasantly surprised as I was to see it. To check on the nova's ups and downs, drop by the American Association Variable Star Observers (AAVSO) list of recent observations.

Seeing the nova without optical aid took me back to the time before the telescope when a "new star" in the sky would have been met with great concern. Changes in the heavens in that pre-telescopic era were generally considered bad omens. They were also thought to occur either in Earth's atmosphere or within the Solar System. The universe has grown by countless light years since then. Nowadays we sweat the small stuff – unseen asteroids – which were unknown in that time.

Novae occur in binary star systems where a tiny but gravitationally powerful white dwarf star pulls gases from a close companion star. The material piles up in a thin layer on the dwarf's hot surface, fuses and burns explosively to create the explosion we dub a nova.



Nova Sagittarii 2015 No. 2 in the Sagittarius "Teapot"was easily visible with the naked eye at magnitude +4.4 when this photo was taken today March 21. The nova has been steadily brightening since its discovery less than a week ago. Credit: Bob King

Spectra of the expanding debris envelope reveal the imprint of hydrogen gas and as well as ionized iron.

Shortly after discovery, the nova's debris shell was expanding at the rate of ~1,740 miles per second (2,800 km/sec) or more than 6.2 million mph (10 million mph). It's since slowed to about half that rate. Through a telescope the star glows pale yellow but watch for its color to deepen to yellow orange and even red. Right now, it's still in the fireball phase, with the dwarf star hidden by an envelope of fiery hydrogen gas.

As novae evolve, they'll often turn from white or yellow to red. Emission of deep red light from hydrogen atoms – called hydrogen alpha – gives them their warm, red color. Hydrogen, the most common element in stars, gets excited through intense radiation or collisions with atoms (heat) and re-emits a ruby red light when it returns to its rest state. Astronomers see the light as bright red emission line in the star's spectrum. Spectra of the nova show additional emission lines of hydrogen beta or H-beta (blue light emitted by hydrogen) and iron.

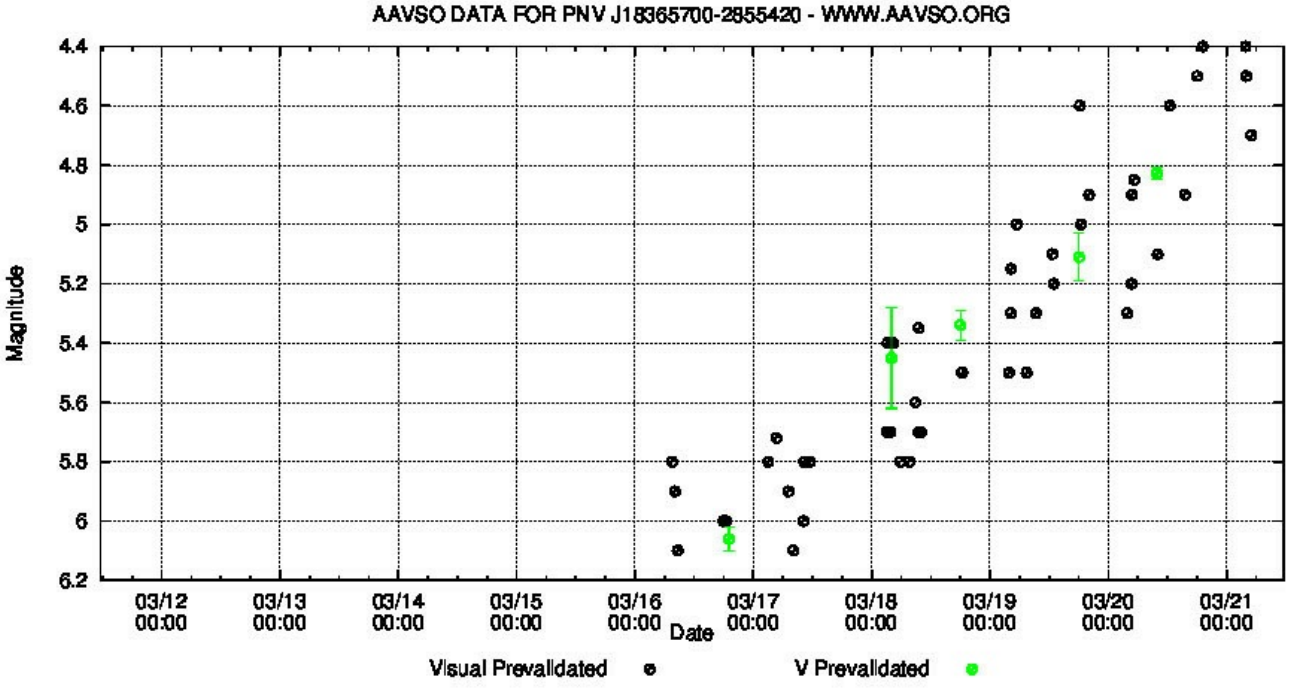
There are actually several reasons why novae rouge up over time, according to former AAVSO director Arne Henden:

"Energy from the explosion gets absorbed by the surrounding material in a nova and re-emitted as H-alpha," said Henden. Not only that but as the explosion expands over time, the same amount of energy is spread over a larger area.

"The temperature drops," said Henden, "causing the fireball to cool and turn redder on its own." As the eruption expands and cools, materials blasted into the surrounding space condense into a shell of soot that absorbs that reddens the nova much the same way dusty air reddens the Sun.

Nova Sagittarii's current pale yellow color results from seeing a mix of light – blue from the explosion itself plus red from the expanding fireball. As for its distance from Earth, I haven't heard, but given that the progenitor star was 15th magnitude or possibly fainter, we're probably talking in the thousands of light years.

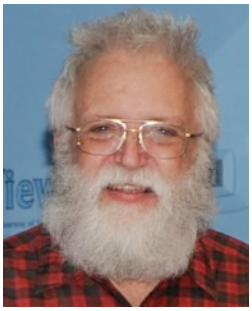
In an earlier article on the nova's discovery I mentioned taking a look at Saturn as long as you made the effort the get up early. Here's a photo of the Sagittarius region you can use to help you further your dawn binocular explorations. The entire region is rich with star clusters and nebula, many of which were cataloged long ago by French astronomer Charles Messier, hence the "M" numbers.



AAVSO light curve showing the nova's brightening since discovery. Dates are along the bottom, magnitudes at left. If the trend continues, Nova Sgr #2 could outshine the 2013 nova in Delphinus very soon. Credit: AAVSO

Cover Photo: GN 21.00.4
An Orange Reflection Nebula

Rick Johnson



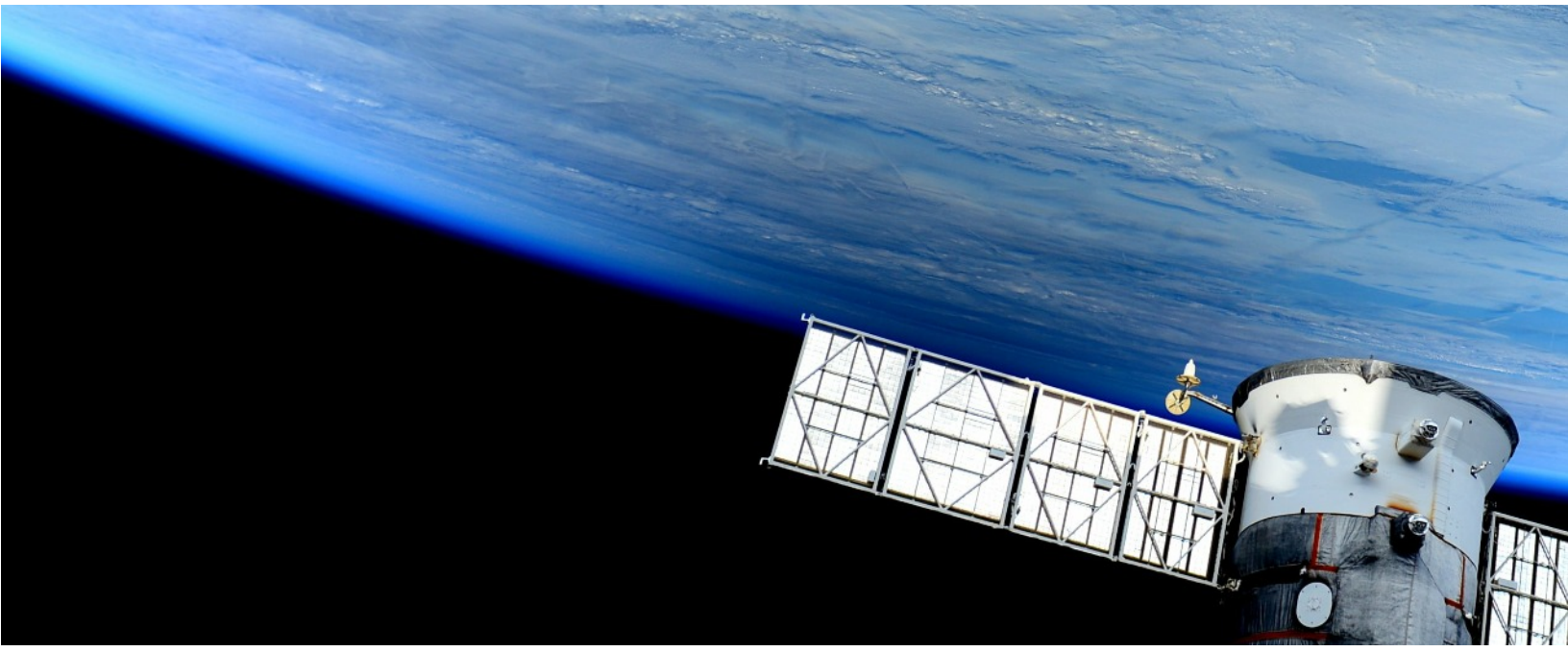
GN 21.00.4 is an orange reflection nebula in a molecular cloud [KTK2006] 175. The area is sometimes known as LBN 552 though that is the nebula to the upper right. I've seen the reflection nebula called Cohen 129 though SIMBAD doesn't seem to know of that object. The only high resolution image I know about of it under the Cohen 129 name is at [URL] and I seem to have a bit more detail even though I used a smaller scope but more exposure time (rare that someone uses less exposure than I do). Tom Davis' wide field image of the area caused me to put this object on my to-do list.

In the center of the reflection nebula is a faint orange star. This is listed in SIMBAD as a young stellar object, a star still contracting to form a main sequence star. Of the three bright stars making sort of a line just left of the nebula, the bottom one is also listed as 3 YSO's all with the same coordinates. One entry likely refers to the other two. A near infrared POSS image shows a faint star beside the central YSO that isn't seen in visual wavelengths. It's likely other new stars are hiding behind the dust.

I originally took this in August. Seeing was good that night but unfortunately transparency was poor so I put it on the reshoot list. I reshot it in October but when I went to process it I found its seeing so bad it was unusable even for color data. Weather this year has been awful for getting good images. When I have good seeing, transparency is poor and when transparency is good seeing is awful. Too late to retake it I went back and managed to make the August data work.

This field is less than 12 degrees from the pole in Cepheus. I was unable to find any distance estimates for these nebulae.

The area must be rather obscured as I find only a very few faint, apparently very distant background galaxies. Only one of those is listed in NED and that without any useful information. It is the very small round galaxy near the right edge a bit below center. It has enough 2 micron radiation to make the 2MASS while the other fuzzies in the image apparently didn't. [URL for full size image]



Expedition 43 Flight Engineer Samantha Cristoforetti took a series of photographs of the March 20, 2015 solar eclipse from the International Space Station.

April Observing: What to View

Jim Kvasnicka

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

Planets

Venus: The Gibbous phased planet shines at magnitude -4.1 for April.
Mars: Very low in the west.
Mercury: To the lower right of Venus after April 10th.
Jupiter: Shines at magnitude -2.1 with a disk 38" wide in Cancer.
Saturn: Rises by 9:30 at the end of April. Saturn's rings are tilted 24° from edge on.
Neptune and Uranus: Not visible in April.

Meteor Showers

Lyrids: Peaks the night of April 22-23. Expect a rate of 15 meteors per hour.

Messier List

M40: Multiple star in Ursa Major.
M65/M66: Galaxies in the Leo Triplet Group.
M95/M96: Galaxies in Leo that fit in the same FOV.
M105: Galaxy in Leo.
M108: Galaxy in Ursa Major.
M109: Galaxy in Ursa Major

NGC 4874 on the right. This is a filter-combined SDSS image at the center of the Coma cluster.

Last Month: M41, M44, M46, M47, M48, M50, M67, M81, M82, M93
Next Month: M49, M51, M61, M63, M64, M85, M94, M101, M102, M104

NGC and other Deep Sky Objects
NGC 4435/4438: "The Eyes", part of Markarian's Chain.
NGC 4449: Galaxy in Canes Venatici.
NGC 4490: Cocoon Galaxy in Canes Venatici.
NGC 4565: The Needle Galaxy in Coma Berenices.
NGC 4631: The Whale Galaxy in Canes Venatici.
NGC 4656: The Hockey Stick Galaxy in Canes Venatici.

Double Star Program List
Alpha Leonis: Regulus, white and yellow stars.
Gamma Leonis: Algieba, pair of yellow stars.
54 Leonis: Yellow primary with a greenish colored secondary.
Alpha Canum Venaticorum: Cor Caroli, blue-white and greenish yellow stars.
Zeta Ursa Majoris: Mizar, white pair of stars.
Gamma Virginis: Porrima, close pair of yellow stars.
24 Comae Berenices: Yellow primary with a pale blue secondary.
Delta Corvi: White and rose colored pair.

Challenge Object
NGC 4874: The second brightest galaxy in the Coma Galaxy Cluster 400 million light years away. Several fainter galaxies surround NGC 4874 including NGC 4871, NGC 4872, NGC 4873, NGC 4869, NGC 4875, and NGC 4876.

NGC Objects: NGC 4490

Jim Kvasnicka

NGC 4490 and NGC 4485 are a pair of interacting galaxies in Canes Venatici. The two galaxies have passed through each other and they have left a trail of stars 24,000 light years between them. The two galaxies are known as the Cocoon Galaxy and together they make up Arp 269.

The Cocoon Galaxy was discovered by William Herschel in 1788. The two galaxies are 40-50 million light years away and shine at magnitude 9.8. NGC 4490 is the larger of the two and in a ten inch telescope has an apparent size of 5 x 2 arc minutes.

NGC 4490 is a member of the Herschel 400 list.

Even a small backyard telescope shows the fairly bright Cocoon Galaxy which lies 40-50 million light years away in the constellation Canes Venatici.

Observing Awards

Congratulations to Bob Kacvinsky for completing the Caldwell Observing Program and the Herschel 400 Program. This is Bob's 5th and 6th observing awards having already completed the Messier Program, Double Star Program, Globular Cluster Program, and the Lunar Program. Congratulations again to Bob.

March 13th Star Party Report

Dan Delzell

Mark Fowler, Zack Moore, Rhoda Priest and I attended the March 13th star party. At the beginning of the evening, just before sunset, we were concerned about the sky. It seemed to be filling with cirrus clouds. But we ventured out anyway and we're glad we did.

After sunset, the southern sky was nice to the horizon and the eastern sky was good above 30 degrees.

We started to view Jupiter and Venus just after sunset. Jupiter showed good detail with all four Galilean moons visible to one side. Venus danced do to the less than ideal seeing.

We took turns finding objects in Mark's binoculars, Zack and Rhoda's 90mm Newtonian and my 12" Lightbridge. These are the objects we observed:

Jupiter
Venus
Polaris' companion
M42 - The Orion Nebula
M41
M79
M31, M32 and M110 - The Andromeda Galaxy and companions
M44 - The Beehive
M105
M95
M96
M65- M66 NGC 3628 - The Leo Triplet
NGC 3190
M51, M5195 - The Whirlpool
NGC 2392 - The Eskimo Nebula

The winds picked up and the temperatures dropped so we packed up by 10:30 and headed home.

We had a lot of fun observing together. I was reminded that the sky doesn't have to be perfect to have a great night of observing.

22nd Nebraska Star Party - 2015

Join us this summer as we gather families from all over the US and around the world in the sparsely populated sand hills of North Central Nebraska to spend a good week under a galaxy of stars.

Early registration deadline is June 15th.

NSP Schedule of Events (July 12-17):

Sunday: registration and check-in, optional dinner.

Monday: registration and check-in, field school, optional dinner.

Tuesday: registration and check-in, swap meet, field school, free “Cattle Country” hamburger dinner.

Wednesday: (All at Valentine High School) field school, registration, swap meet, speaker program, children’s program, dinner on your own.

Thursday: Brewer’s Niobrara Canoe or tube float, optional dinner.

Friday: public star party at 9pm.

For more information see the NSP website.

What to expect when you're expecting a flyby: Planning your July around New Horizons' Pluto pictures

Amy Lakdawalla, The Planetary Society

New Horizons is now closer to Pluto than the Sun is to Earth: 1 astronomical unit, or 150 million kilometers. A tiny course correction burn steered them closer to their goal today. As New Horizons begins to approach Pluto, there's a single question everybody keeps asking me: when will we get the first pictures? The trivial answer to that question is that we already have them. But as exciting as it is to know that New Horizons has sighted Pluto, a teeny dot wobbling among stars is not what people mean when they ask about New Horizons' pictures. What people want, of course, is the portrait photo, the one we're going to be seeing on magazine covers and in textbooks for years to come.

As New Horizons approaches, every image of Pluto and Charon that each instrument returns will be the best it has ever taken. They will be thrilling to see. But until mid-July, all the images will still be pretty small. In the days leading up to the July 14 flyby, with only one exception, all of the images that we will receive of Pluto and Charon will be lower-resolution than the best Ceres pictures we have received from Dawn to date.

In this blog entry I'll try to explain when we'll get the images that you're hoping for. First, the executive summary:

- Closest approach is at 11:50 UTC / 07:50 EDT / 04:50 PDT on Tuesday, July 14, 2015.
- New Horizons gets 1.2 million kilometers closer each day. As of today, it is 1 AU -- 150 million kilometers -- from Pluto.
- New Horizons has two cameras. The Long-Range Reconnaissance Imager (LORRI) has a field of view of 0.29 degrees and a pixel scale of 4.94 microradians and takes black-and-white ("panchromatic") images. The Ralph Multispectral Visible Imaging Camera (MVIC) has a field of view 5.7 degrees wide and a pixel scale of 19.77 microradians and takes both panchromatic and color images. It has panchromatic, near-IR, red, blue, and methane filters, but no green filter.
- Through June 24, Pluto and all five of its known moons will fit comfortably within a single LORRI photo.
- Through July 12, New Horizons will take regular LORRI photos of Pluto, Charon, Nix, and Hydra, which will mostly be returned soon after acquisition because they are used for optical navigation.
- Pluto will appear larger than the LORRI field of view for less than 24 hours around closest approach.
- Since Pluto and Charon rotate slowly (once every 6.4 days), all of the best fully-lit images will show the same hemisphere. The other hemisphere will be imaged at a best resolution of about 38 kilometers per pixel, 3.2 days prior to closest approach.
- Pluto's axis is highly tilted, like Uranus, and it is currently summer in the northern hemisphere. All approach images will contain the sunlit north poles of Pluto and its satellites.
- There are few data downlinks near closest approach, so we will not receive many images in real time. But the ones we get will be great.
- The mission has promised to release LORRI images (higher-resolution, black-and-white) in near-real-time, but not MVIC (lower-resolution, color) images.
- Only 1% of the science data from the flyby will be returned to Earth during the period around closest approach, including images that the mission has selected for their high science value as well as high public interest. They will be releasing captioned and processed

versions as fast as their small team can manage.

- The rest of the image data will be downlinked beginning in September, about 2 months after encounter. It will take 10 weeks to download the full data set.

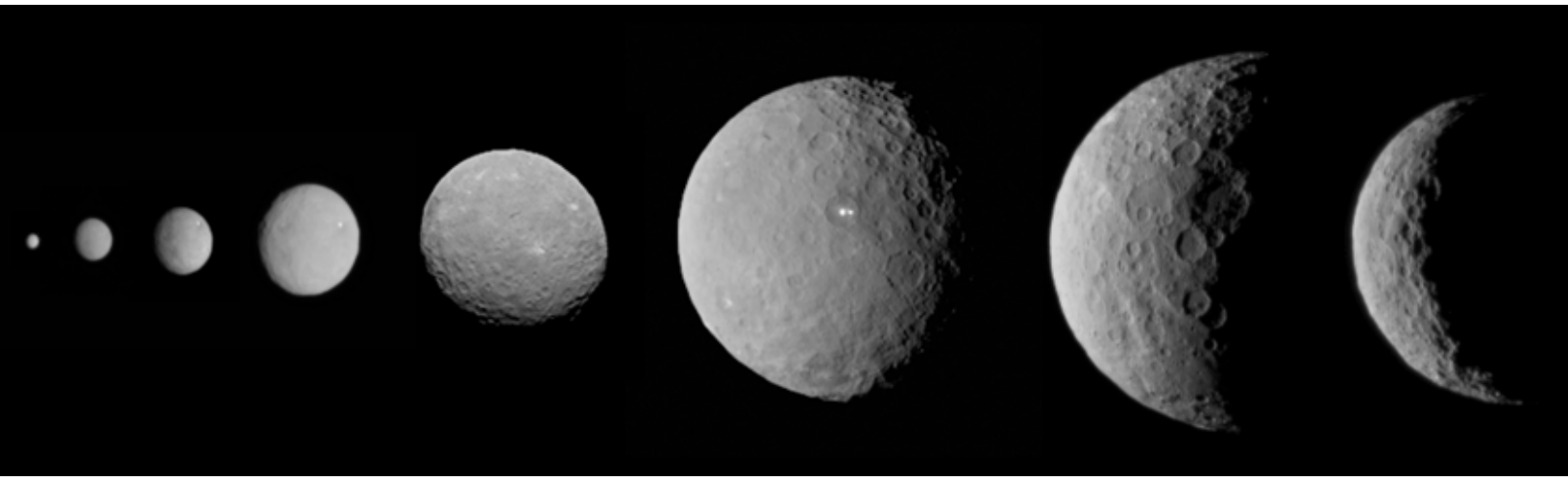
"Only 1% of the science data from the flyby will be returned to Earth during the period around closest approach."

It's hard to get data from Pluto

Data will arrive on Earth in a series of downlinks. Downlink sessions can last as long as about 8 hours, but are usually somewhat shorter. Whenever New Horizons is downlinking data, it can't take new photos, so the downlinks get shorter and less frequent as the spacecraft gets close to the time of the flyby, when it concentrates on collecting as much data as possible. Because data downlinks are slow, there will be much less data downlinked than New Horizons has stored on board. After data is downlinked, it must be processed before posting online. How long that will take is not yet known.

On Sunday, July 12, New Horizons will transmit the last of its optical navigation data. These images will have lower resolution than the images we have already received from Dawn at Ceres. Then, on Sunday and Monday, July 12 and 13, there will be a series of four "Fail Safe" downlinks. These are designed to return a minimum set of data from all instruments, just in case New Horizons does not survive the flyby. A last downlink ending overnight Monday July 13, called "E-Health 1," will include one last pre-closest approach photo of Pluto.

Then there is a nail-biting 24-hour period of waiting while New Horizons concentrates on flyby science and does not communicate with Earth, followed by the much-anticipated beep of the "Phone Home" downlink on Tuesday night, July 14. Following closest approach, on Wednesday and Thursday, July 15 and 16, there will be a series of "First Look" downlinks containing a sampling of key science data. Another



NASA / JPL / UCLA / MPS / DLR / IDA / collage by Emily Lakdawalla

Approaching Ceres

Dawn took this series of images of Ceres before it was captured into its first orbit. Dawn approached Ceres from the direction of the Sun and passed to its night side before orbital capture. In order from left to right, the images were taken December 1, 2014 (camera calibration); January 13 and 25 and February 4 (optical navigation images 1, 2, and 3); February 12 and 19 (Rotation Characterizations 1 and 2); and February 25 and March 1 (optical navigation images 4 and 5). The next images will be taken in April.

batch of data will arrive in the "Early High Priority" downlinks over the subsequent weekend, July 17-20. Then there will be a hiatus of 8 weeks before New Horizons turns to systematically downlinking all its data. Almost all image data returned during the week around closest approach will be lossily compressed -- they will show JPEG compression artifacts. Only the optical navigation images are losslessly compressed.

The transmission of the High Priority data set will be complete on July 20, and then image transmission will pause. For nearly two months, until September 14, New Horizons will switch to near-real-time downlinking of data from instruments that generate low data volumes (like SWAP and PEPSSI) while it transmits just housekeeping information for all of the rest of the data. No new images will arrive on the ground during this time.

On September 14, New Horizons will begin downlinking a "browse" version of the entire Pluto data set, in which all images will be lossily compressed. It will take about 10 weeks to get that data set to the ground. There will be compression artifacts, but we'll see the entire data set. Then, around November 16, New Horizons will begin to downlink the entire science data set losslessly compressed. It will take a year to complete that process.

What to expect, when

Here is a graphical summary of all of the LORRI data that New Horizons is expected to downlink in the two weeks surrounding closest approach. I used Voyager images of Jupiter and Saturn moons to stand in for Pluto, Charon, Nix, and Hydra: Ganymede for Pluto, Tethys and Rhea for Charon, and Janus and Hyperion for Nix and Hydra. Don't take the comparisons between the moons and Kuiper belt objects too literally -- this comparison is just meant to give you a sense of the scope of the near-encounter data set at a glance.

Following is a complete list of all the planned downlinks of image data during the highest-intensity period around closest approach. The times given are planned downlink end times. Downlinks containing LORRI images, which should be released automatically, are in bold. It is not yet known how long it will take the pipeline to run that will send these images to the Web. When I find out more precisely how long it will usually take to generate images from the raw data, I will update this post. Also, the times and ranges of the images may change by as many as 7 minutes and 6000 kilometers as navigators update their knowledge of Pluto's position; I will update this post as necessary. Therefore, I do not recommend the copying and reposting of this text, because it will become out of date!

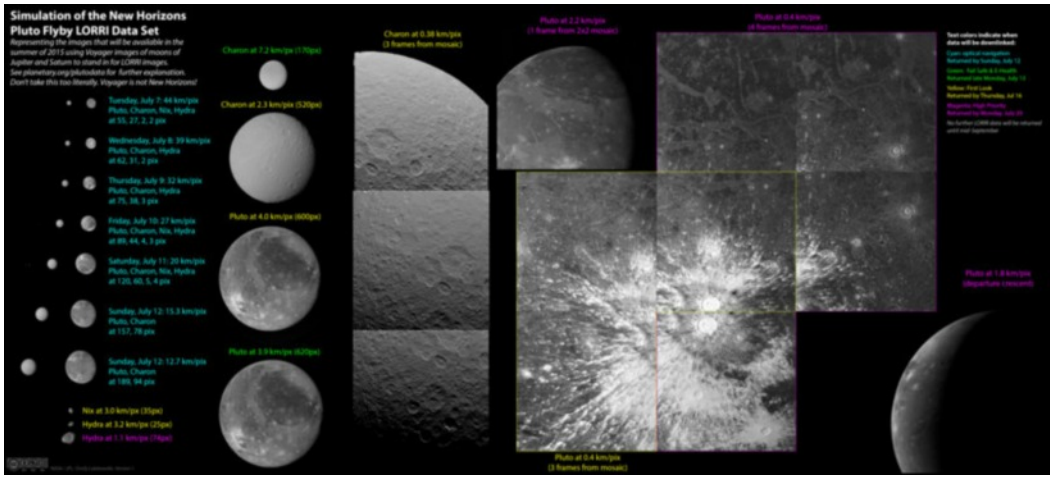
[For updates see this URL]

For even more detail on the images that will be acquired and downlinked during the near-encounter phase, you may enjoy this New Horizons team "Playbook".

Many thanks to Alan Stern and Kim Ennico for helpful comments!

Voyager images: NASA/JPL. Chart by Emily Lakdawalla.

Simulation of the New Horizons Pluto flyby LORRI data set



In the two weeks surrounding New Horizons' flyby of Pluto, only 1% of the science data that it acquires will be downlinked to Earth. This chart uses Voyager images of Jupiter's and Saturn's moons to stand in for the images that New Horizons' highest-resolution camera, LORRI, is expected to downlink in the summer of 2015. Visit planetary.org/plutodata for futher explanation.

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THE Prairie Astronomy Club

NE SCIFEST

Lunar Orbiter Image Recovery Project Last Mile

Dennis Wingo

In 1966-67 NASA sent five spacecraft to the Moon to map it in preparation for the Apollo Moon landings. These high resolution images, hundreds at 1 meter resolution, provided the first closeup look of the Moon in human history. The images were recorded on 70mm high resolution film, processed on the spacecraft in lunar orbit, scanned with a light beam and sent back to the Earth via radio.

The images that the world saw in the 1960's were from the 35mm film and were grainy, with low dynamic range, and with striping. The recordings on the tape were preserved in their most pristine form and were stored for over 40 years by NASA. In 2007 we found, from retired NASA employee Nancy Evans, the last four remaining tape drives in the world that could play the images, stored for decades in a barn in Los Angeles with Nancy hoping for the day that the tapes could be read.

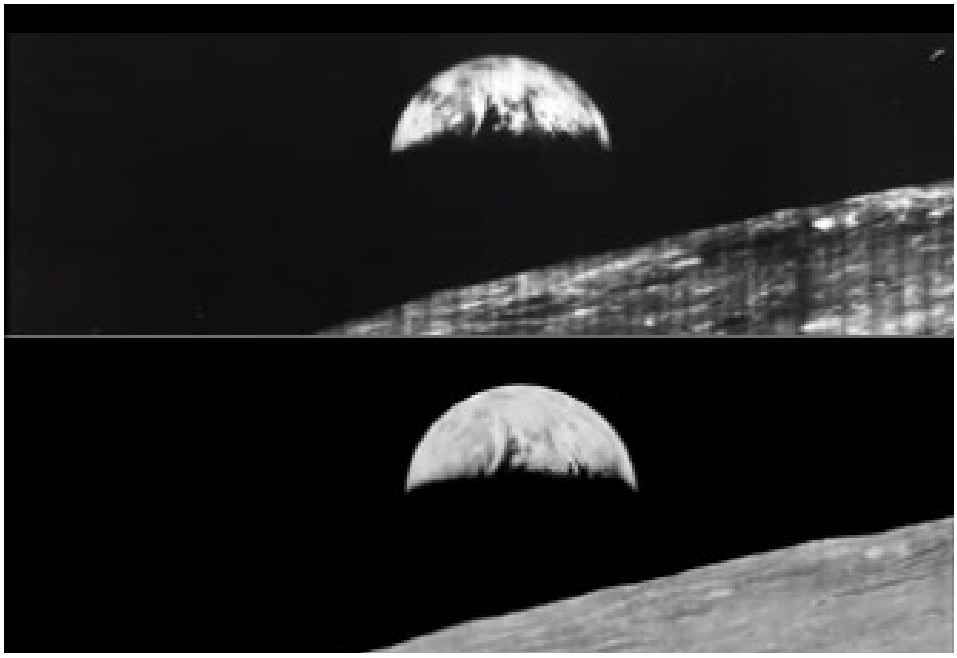
The Lunar Orbiter Image Recovery Project (LOIRP) was kicked off in 2008 with $120k in NASA funding and $15k from the Odyssey Moon Google Lunar X Prize Team. We were able to get of the four 40+ year old Ampex tape drive running and produce in stunning quality, the remastered first image of the Earth first seen from lunar orbit. This image, along with many others that we have produced have received worldwide acclaim.

Between further NASA funding and $62k raised by crowd funding in 2013 we have completed the process of digitizing almost 1500 tapes, the entire tape library from lunar orbiter. This has created tens of terabytes of data, and over 1700 images. Each medium resolution image is broken into 28 strips or framelets. Each high resolution image is made from 98 framelets. Each framelet is a file. We have over 107,000 of these files.

Our task is to complete the processing of these files and publish them to the NASA website where they will be free for everyone to enjoy. We are also doing the paperwork to get the raw data and images to the National Space Science Data Center. We had estimated the cost to NASA to complete this at about $400,000 dollars, of which they provided $300k after we finished the work from the 2013 crowd funded effort. We originally thought that we were only going to get Lunar Orbiter II and III, but because of our previous crowd funded effort, we were able to leverage the additional $300k. That puts us at about $100k short of what we needed to finish, and that is what we are asking you, the crowd funding community to help us with. This gets us our very last mile to finish everything. To see what we have done so far, here is our gallery at NASA Ames Solar System Exploration Research Virtual Institute web site.

Our task is to complete the processing of these files and publish them to the NASA website where they will be free for everyone to enjoy.

See the project page on Indiegogo for more information.



New Desktop Application Has Potential to Increase Asteroid Detection, Now Available to Public

A software application based on an algorithm created by a NASA challenge has the potential to increase the number of new asteroid discoveries by amateur astronomers.

Analysis of images taken of our solar system's main belt asteroids between Mars and Jupiter using the algorithm showed a 15 percent increase in positive identification of new asteroids.

During a panel Sunday at the South by Southwest Festival in Austin, Texas, NASA representatives discussed how citizen scientists have made a difference in asteroid hunting. They also announced the release of a desktop software application developed by NASA in partnership with Planetary Resources, Inc., of Redmond, Washington. The application is based on an Asteroid Data Hunter-derived algorithm that analyzes images for potential asteroids. It's a tool that can be used by amateur astronomers and citizen scientists.

The Asteroid Data Hunter challenge was part of NASA's Asteroid Grand Challenge. The data hunter contest series, which was conducted in partnership with Planetary Resources under a Space Act Agreement, was announced at the 2014 South by Southwest Festival and concluded in December. The series offered a total of $55,000 in awards for participants to develop significantly improved algorithms to identify asteroids in images captured by ground-based telescopes. The winning solutions of each piece of the contest combined to create an application using the best

NASA's Asteroid Data Hunter contest series was part of NASA's Asteroid Grand Challenge, which is focused on finding all asteroid threats to human populations and knowing what to do about them.

Image Credit: NASA

algorithm that increased the detection sensitivity, minimized the number of false positives, ignored imperfections in the data, and ran effectively on all computer systems.

“The Asteroid Grand Challenge is seeking non-traditional partnerships to bring the citizen science and space enthusiast community into NASA’s work,” said Jason Kessler, program executive for NASA’s Asteroid Grand Challenge. “The Asteroid Data Hunter challenge has been successful beyond our hopes, creating something that makes a tangible difference to asteroid hunting astronomers and highlights the possibility for more people to play a role in protecting our planet.”

Catalina Sky Survey telescope

The Big Dipper rising behind the Catalina Sky Survey 60" telescope.

Image Credit: Catalina Sky Survey, University of Arizona

The data hunter challenge incorporated data provided by the Minor Planet Center (MPC), at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, and images provided by the Catalina Sky Survey, an astronomical survey project run by the University of Arizona, Tucson, and focused on the discovery and study of near-Earth asteroids and comets.

“We applaud all the participants in the Asteroid Data Hunter challenge. We are extremely encouraged by the algorithm created and it’s already making a difference. This increase in knowledge will help assess more quickly which asteroids are potential threats, human destinations or resource rich,” said Chris Lewicki, president and chief engineer at Planetary Resources. “It has been exciting for our team to work with NASA on this project, and we also look forward to future space-based systems leveraging these results.”

Astronomers find asteroids by taking images of the same place in the sky and looking for star-like objects that move between frames, an approach that has been used since before Pluto was discovered in 1930. With more telescopes scanning the sky, the ever-increasing volume of data makes it impossible for astronomers to verify each detection by hand. This new algorithm gives astronomers the ability to use computers to autonomously and rapidly check the images and determine which objects are suitable for follow up, which leads to finding more asteroids than previously possible.

“The beauty of such archives is that the data doesn't grow stale, and with novel approaches, techniques and algorithms, they can be harvested for new information. The participants of the Asteroid Data Hunter challenge did just that, probing observations of the night sky for new asteroids that might have slipped through the software cracks the first time the images were analyzed,” said Jose Luis Galache of the MPC. “Moreover, this software can now be used to analyze new images and is available to any observer who wants to use it. The Minor Planet Center applauds these efforts to provide superior tools to all, and looks forward to receiving new asteroid observations generated with them.”

The Asteroid Grand Challenge is seeking non-traditional partnerships to bring the citizen science and space enthusiast community into NASA’s work.

The desktop software application is free and can be used on any basic desktop or laptop computer. Amateur astronomers may take images from their telescopes and analyze them with the application. The application will tell the user whether a matching asteroid record exists and offer a way to report new findings to the Minor Planet Center, which then confirms and archives new discoveries.

Through NASA's asteroid initiative, the agency seeks to enhance its ongoing work in the identification and characterization of near-Earth objects for further scientific investigation. This work includes locating potentially hazardous asteroids and identifying those viable for redirection to a stable lunar orbit for future exploration by astronauts using NASA’s Space Launch System rocket and Orion spacecraft. The Asteroid Grand Challenge, one part of the asteroid initiative, expands the agency's efforts beyond traditional boundaries and encourages partnerships and collaboration with a variety of organizations.

The algorithm contests were managed and executed by

NASA's Center of Excellence for Collaborative Innovation (CoECI). CoECI was established at the request of the White House Office of Science and Technology Policy to advance NASA's open innovation efforts and extend that expertise to other federal agencies. CoECI uses the NASA Tournament Lab (NTL) for its advanced algorithmic and software development contests. Through its contract with the Crowd Innovation Lab at Harvard University, NTL uses Appirio's Crowdsourcing platform powered by Topcoder to enable a community of more than 750,000 designers, developers and data scientists to create the most innovative, efficient and optimized solutions for specific, real-world challenges faced by NASA. Data storage of the Catalina Sky Survey data was provided by Amazon Web Services.

The new asteroid hunting application can be downloaded at:

http://topcoder.com/asteroids

From the Archives: April, 1971

The President's Report

April 27, 1971

One night recently, Brian Rugg and Dan Cowell came out to my place to do some Messier observing. Brian brought along his recently purchased 6" telescope. This is the same instrument that I had bought new long ago, and it served me well as I went though the Messier catalog in 1963.

I became very interested in their progress when I was asked to confirm their location of the "pretty finder double, Rho Virginis." I now began to recall fond memories of my own adventures down the starry paths of Virgo, that are so well mapped out by Dr. Holyoke in his Observe book. Once again I went "2 degrees north to find M59 and M60 in the same field." I then took complete possession of the telescope and found M58, which is "1 ½ degrees west and very little north." I would have probably continued on the entire evening, but I had been a bit under the weather and the chill evening air soon got to me. I reluctantly gave the scope back to Brian and Dan.

I still contend that my excursion through the Messier objects was one of the most rewarding pleasures among my astronomical experiences.

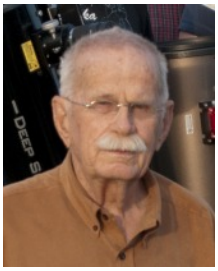
I hope that more of our members will try for the Astronomical League Messier Award. It certainly would be well worth your while. Don't let the lack of a telescope stop you. My

6 and 8 inch telescopes are always available and of course there is the club's 12 ½ inch for everyone to use.

There have been a lot of requests recently for a star party, so we'll have one. Friday May 21st is the date and the place is my home near Hickman. If the weather is bad then we'll have it on the following night which is Saturday May 22. Mark your calendar and come out for a good show one and all. And don't forget to bring your telescopes.

Earl Moser

Harlan Franey, 1927-2015



PAC founding member Harlan Lincoln Franey, 88, of Lincoln, passed away March 17, 2015. Born February 12, 1927 on a farm one mile west of Hickman, NE to Lloyd and Mamie (TeSelle) Franey. Attended school at Milford through the tenth grade and graduated from Lincoln High School in 1943. Served as B-29 mechanic with Army Air Forces in Pacific theatre. Graduated from University of Nebraska in 1952 and employed by United Airlines, retiring as Lincoln manager of station operations in 1982. Survived by wife of 57 years, Charlene (Moller) Franey; son Paul; grandsons Jason, Jared, and Robert. Preceded in death by son Lloyd. Memorials in lieu of flowers to the Capital Humane Society or Toys for Tots.

See the Roper and Sons website.

Remembering Harlan Franey

Rick Johnson

Tuesday, March 17, 2015 the club lost another of its 17 founders, Harlan Franey. Due to poor health that last 10 years or so he was not able to attend club functions very often so likely many members don't know of him. He is very obvious in the photo of club members in front of Hyde used for the cover of the book on club history standing in the front left with his cane helping him. For decades he was a fixture at our meetings though his work schedule as operations manager for United Air Lines at the Lincoln Airport made attending star parties a rare occurrence. He was an avid observer, just that he had to do it mostly at his home in case he was called back to work. Due to light pollution he was the only club member to be totally reliant on setting circles to find his way. Even when he came to Earl Moser's farm home he'd come only with a list of positions not a star atlas. I challenged him one night to a competition of right angle sweep versus setting circles. It came out a tie. Circles in those days weren't driven so he had to make time adjustments as we went along. I never could get the knack of using circles and a vernier scale. Since scopes rarely had that necessary item he made his own. When Earl's eyes were failing him he sold his 8" Criterion reflector to Harlan who used it as his main scope for years.

When Hyde came to be he was a regular on the floor of the observatory and one of our best as he had a knack for working with the public. Probably due to working with angry, jet lagged passengers. He was sad when his health made it almost impossible for him to continue. Besides air travel he was an avid sailor. After retirement he and his wife literally sailed the world in his sailboat. This before GPS so he was an excellent celestial navigator. Though that didn't stop him from switching to GPS when it replaced the stars. Still he honed his celestial skills as GPS units could fail so it was a backup. He gave several club programs on all types of navigation though I'll admit some of it went right over my head.

With Harlan's passing another piece of club history has passed as well. This makes Mark's book on the first 50 years even more important. Only by knowing where we came from can the club remain true to its roots and commitments. It should be required reading for all in the club, especially officers.

Rick Johnson, Harlan Franey, Pete Schultz and Earl Moser,

October 26, 2007

"Ten Little Indians"

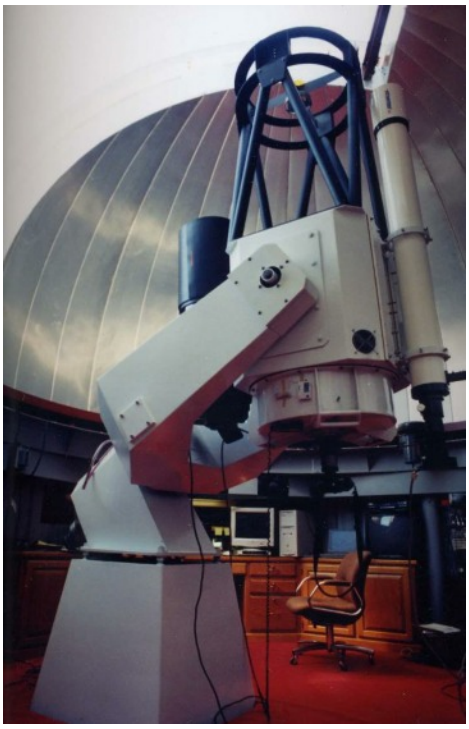
Rick Johnson

Back in 1961 17 amateurs formed the Prairie Astronomy Club, I was one of the 17. Over the years, while the club has grown, the number of living founders has steadily decreased. Tom Pansing, our first president was also the first founder we lost. As of mid March there were three living that we knew about, Harlan Franey, Pete Schultz and me plus one we lost track of, Jim Hoskins. Pete Jim and I were in Lincoln Southeast High at the time. Pete and Jim were a grade ahead of me. About 20 years ago Jim had tried to contact the club through the Hyde website but the webmaster at the time didn't realize who he was and never passed on the info. I happened to learn of it several years later but the email had been discarded so contact was impossible. I tried then to find him but the Internet lacked social sites of today and I came up empty.

Then on March 17, the oldest remain founder, Harlan Franey's death was reported. Suddenly we were down to two or three and I was feeling like I was living a version of Agatha Christie's Ten Little Indians. This spurred me to resume the hunt for Jim Hoskins. With the advent of so many social sites on the Internet I thought I might have a chance though Jim was never one I'd have thought would participate in such sites. I was right as I failed to find him. But then I recalled a paper I'd seen when researching a near earth asteroid a couple years ago. It thanked a J. Hoskins for the use of his private observatory. At the time I'd looked up the observatory, Nubbin Ridge Observatory, but the website had only a few pictures of it and no contact information. I tried email info@ the website. I got no reply, I can't recall if it bounced or just wasn't answered. I'd forgotten about this until now. I finally turned up the paper on the Internet and it did have contact info for the lead author. I emailed him asking if the J. Hoskins was a Jim or James Hoskins. It was. But that didn't mean it was the same Jim Hoskins. After a couple email exchanges to be absolutely certain we were talking about the same person (age, build, home town and middle name matched) I learned he had died March 1, 2011. I was 4 years late. Pete and I are now the last two founders left. It's a sad week. Suddenly I feel very old.

I suggest you look up his observatory's website *http://www.nubbin.darkhorizons.org/* . His is many times what mine is. Heck one of his finder scopes cost nearly as much as my entire observatory. The other finder is a C14. Though I should have recognized Jim's work. The way he put a very basic ST-2000 on a scope that deserved a far better camera and in such a way the exhaust heat of the cooler went right across the aperture was a typical Jim Hoskins trait. He could have a super expensive Linhof camera costing thousands and something else costing $20 hooked together in some makeshift system. I should have realized the connection but even then he had been gone 2 years so it wouldn't have mattered. I'd have loved to talk observatories with him though my budget was obviously humble compared to his. This makes me wonder how many club members over our more than 50 year history that we no longer have contact with have their own observatories and are helping the pro's out like Jim did.

I'm told the observatory is sitting mostly unused and still in the family. They are looking for a new home for it likely at a college. I imagine the lead author of the paper would love to get it for his school.



Replacing the Meade LightSwitch with a New Celestron at Hyde Observatory

Photos by John Reinert

Hidden in Plain Sight: the Milky Way's New Companions

Reprinted from:
THE CONVERSATION

Geraint Lewis,
Professor of Astrophysics at University of Sydney

Something new discovered near our Milky Way. Flickr/Luis Calçada, CC BY-ND

When we think of cosmology, we often imagine the largest telescopes peering into the deepest space, collecting the feeble light from exploding stars or the first galaxies.

But for some cosmologists – like the Galactic Archaeologists – the focus is the local universe, asking if we can learn about the evolution of our own Milky Way from what we see around us.

While this local universe is, well, local, how little we know about it can come as quite a surprise; we simply haven't scanned the immensity of the entire sky in enough detail to reveal its secrets. But new surveys with new telescopes are opening up the sky, and what they are revealing is quite surprising.

Our new cosmic friends

So, what have they discovered?

Two new papers appeared just this month – one from a team based in the US and another by an independent group in the UK – announcing the discovery of new "dwarfs" of the southern sky, small galaxies with only a few hundreds of millions of stars. (Our Milky Way is thought to have several hundred billion stars.)

In fact, both papers presented the discovery of the same eight dwarf galaxies, with the British team identifying potentially one more.

How did two disparate teams identify the same galaxies at the same time? And just what do these observations tells us about the universe? It's an interesting tale!

Thinking theoretically

Let's start with the formation and evolution of galaxies.

Over the past 30 years, with the explosive growth of computing

power, our cosmological understanding has been revolutionized with synthetic universes revealing how galaxies are born from the featureless cosmic soup of the Big Bang.

Unlike the real universe, through our universe-within-a-computer we can accurately track the motions of mass, watching both dark matter and gas flow together, building galaxies over cosmic time. In these synthetic universes, we would expect the Milky Way to be surrounded by many thousands of smaller dwarfs.

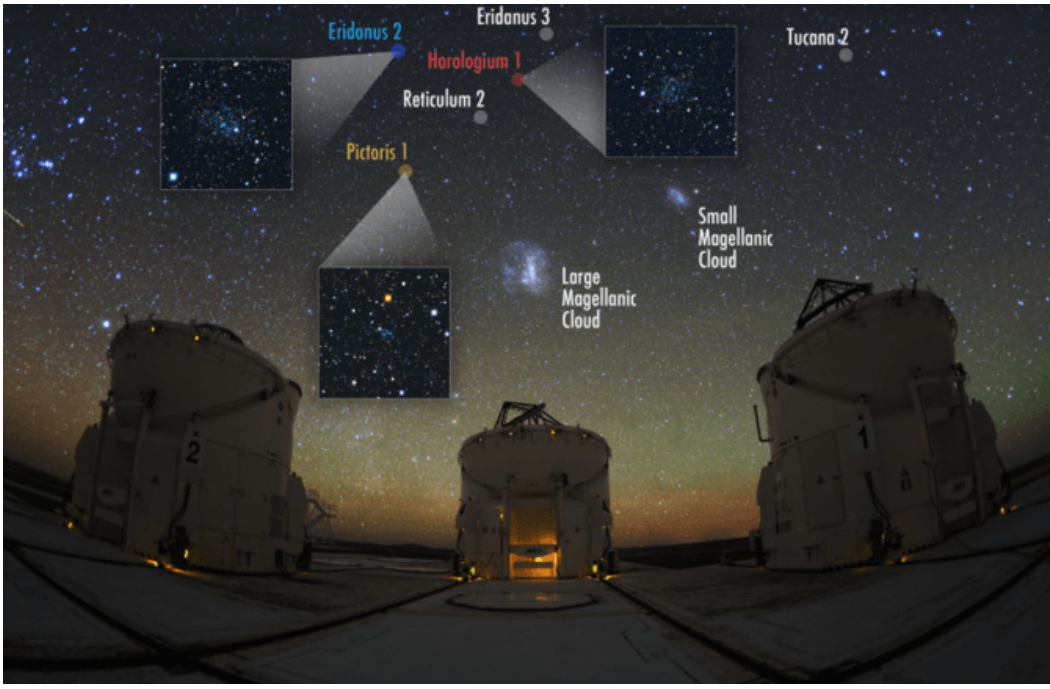
If the Milky Way is really accompanied by such a wealth of smaller galaxies, it would be strong evidence that our ideas of galaxy evolution are pointing in the right direction. So, are they there?

The sky's the limit

The problem with finding dwarfs is that there is a lot of sky to look at. Dedicated survey telescopes with specialized optics are required.

Over the last few decades, the Sloan Digital Sky Survey (SDSS) has patiently imaged a huge swath of the northern sky, finding many millions of distant galaxies.

But Sloan also yielded many more dwarf galaxies in our own backyard, some reasonably large, with billions of stars, as well as some so puny, with a thousand stars or so, that it is difficult to know whether it is really a galaxy or just an errant bunch of stars.



The Magellanic Clouds and the Auxiliary Telescopes at the Paranal Observatory in the Atacama Desert in Chile. Only six of the nine newly discovered satellites are present in this image. V. Belokurov, S. Koposov (IoA, Cambridge). Photo: Y. Beletsky (Carnegie Observatories)

And are the huge numbers of dwarf galaxies predicted by our model universe within a computer actually there? The simple answer is: no!

Instead of many thousands, SDSS saw only a handful. This missing satellites problem has significant implications for our understanding of galaxy evolution. But to know just how bad the problem is, we need to know just how missing the dwarfs really are!

While a spectacular success, SDSS, based in the US, has only stared at the northern sky. Before we can fully answer the question, we need a complete census. We need to survey the southern sky!

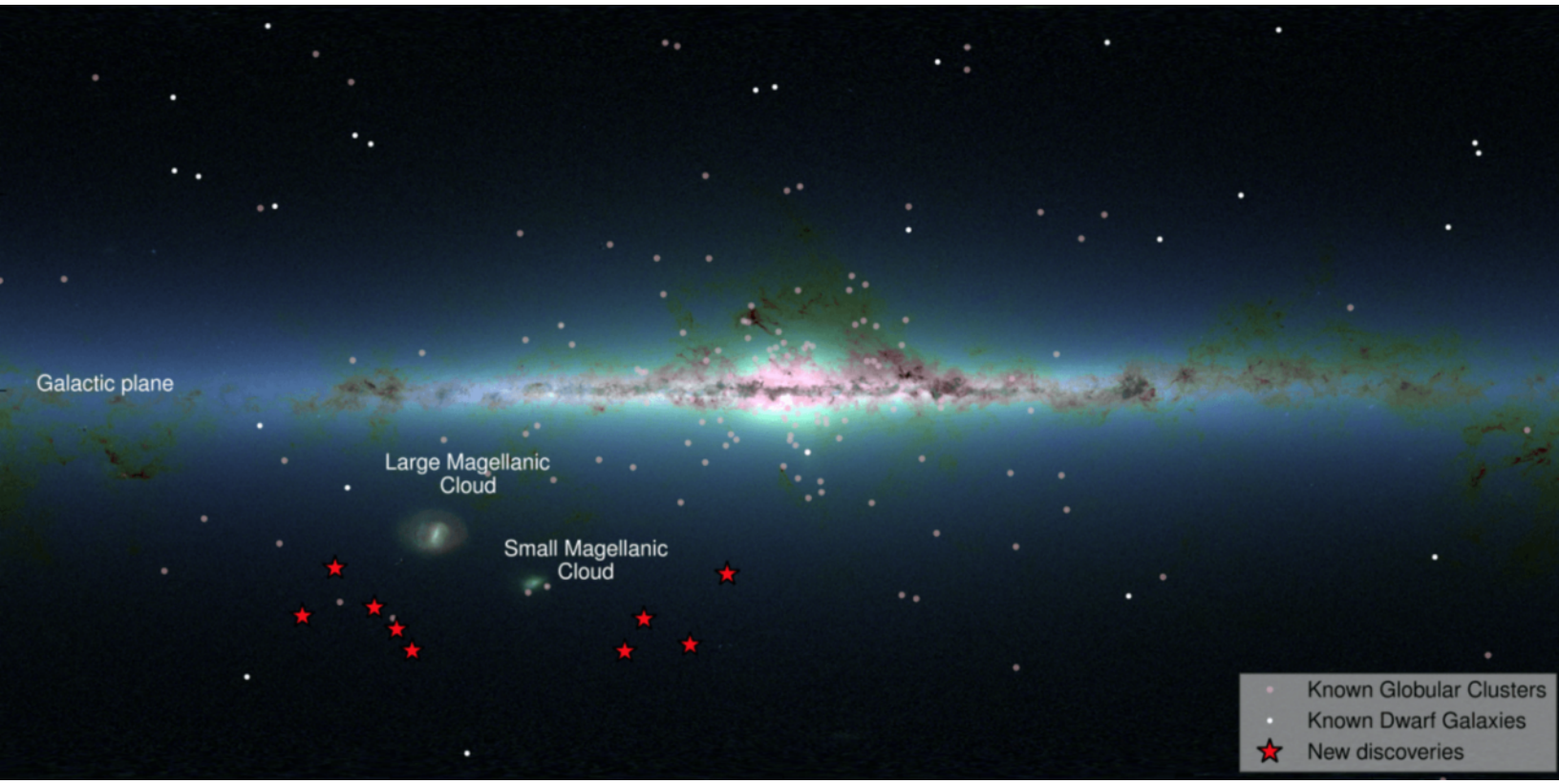
There is a steadily growing army of survey telescopes in the south, including VISTA in Chile and SkyMapper here in Australia. But, at the moment, out in the lead is a survey that is not focused on local universe at all.

The Dark Energy Survey

The discovery of dark energy has revolutionized our view of cosmology, revealing that the expansion of the universe is accelerating. But the fact that we don't really know what dark energy is means it remains one of the biggest astrophysical mysteries.

Astronomers have planned new observational approaches to uncover the secrets of dark energy. Currently, a new camera, DECam, on the Blanco 4m Telescope in Chile is on the case.

Its goal is the Dark Energy Survey (DES), a search for the subtle influence of dark energy on our observations of the distant universe. To do this,



Distribution of the galactic satellites on the sky. The underlying background image is the Infrared Map produced by the 2MASS survey. S. Koposov, V. Belokurov (IoA, Cambridge). Background: 2MASS

DECam will survey a huge swath of the southern sky.

Collateral science

As DECam stares into the distant universe, it also captures all the things in between, so its data will be a goldmine for a broad range of science. Within the DES collaboration are astronomers primed to reap the scientific rewards on offer.

So why two papers on the same objects at the same time? As DECam collects data, chunks are periodically given away to the entire astronomical community, allowing as much science as possible to be squeezed from the observations.

Astronomers outside the DES collaboration are equally hungry to search for DECam dwarf galaxies. The act of sharing data does maximize the science, but even the astronomers taking the data cannot hang around as there is a good chance they will be scooped.

What did we learn?

The discovery of these new dwarfs does not solve the missing satellite problem, but is providing clues to bridge our gap between the observed and theoretical universe.

The clustering of these dwarfs around the Magellanic Clouds may point towards all of these galaxies having fallen together into the Milky Way as a small group. If this really is the accretion of a group, it opens an exciting window onto galaxy evolution.

But it's important to remember that these new galaxies were found in the first year's worth of data from DECam, with more data becoming available on a yearly basis.

With more and more sensitive eyes pointing at the sky, we can expect many more dwarfs of the southern sky to be revealed.