NWASNEWS

Volume20, Issue 02

October 2014

Newsletter for the Wiltshire, Swindon, Beckington Astronomical Societies and Salisbury Plain

OF COMETS AND PROBES

In the September meeting the Wiltshire Astronomical Society held its AGM and reported steady account balance through the year with a reserve that means we will not be upping fees for membership or attendance.

We elected a new vice chairperson, Keith Bruton, and agreed to elect Jon Gale and Tony Vale as observing coordinators. I thank them all for standing, and wish them a fruitful period in the committee and hope we will all support them as the need arises.

One chap (ple) who has to do a lot of sorting when things go wrong at the last minute is our speaker secretary, Peter. He was let down last week by the listed speaker but has made alternative 'A' plans:

Due to circumstances outside our control Gemma Lavender has dropped out of speaking to us (again).

So on Tuesday Nick Howes will be giving us a presentation on "The Greatest Scope on Earth" the Square Kilometre Array.

I have included part of the Wikipedia article on the SKA (as Nick will doubtlessly abbreviate it), in the newsletter.

There is also quite a large piece about comets in various forms, with Rosetta announcing it has chosen the landing target on the memorably named peanut shaped comet Churyumov-Gerasimenko.

Then there are the two missions arriving at Mars orbit in the last weeks, the Indian MOM orbiter and imager that is showing the dust storms breweing surface wide across Mars at the moment. The first images are in and Indian Space Agency must be congratulated on their successful mission to Mars. Not many can claim that, and they did it on a comparative shoe string budget. NASA and the ISA are already in agreements about future combined missions.

NASA also inserted the Maven probe and both will be at Mars ready to image the 19th October close pass by comet Siding Springs of the planet Mars. The closest 'miss' to a planet we have witnessed.

Comet Panstarrs is also still showing lots of promise as a 40,ooo year long period comet but has ducked to the southern skies. What is the difference between a long period comet and a short period comet? Well I have included some definitions within the full newsletter. The bottom line is a rough cut off of 200 years to orbit the Sun. This sends comets on their highly elliptical orbit to outside Neptune for short period comets. Long period comets are the more likely to produce great comets, and many are only coming round for the first time in recorded history. (Halley's could be called the exception, passing close enough to Earth to be a spectacular sight in its 79 year orbit of the Sun.

Our last observing session got clouded out as we arrived. It was bright at 6pm when we made the GO decision, and forecasts were fair, but got steadily worse through the evening. We used 4 different forecasters to give the shout but were defeated. Here's to a better October, and we are due two meteor showers.

Clear skies Andy

The North American nebula and the Pelican near bright Deneb in Cygnus.

This is a picture taken using an 85mm lens on a 3/4 frame DSLR (Nikon D300), 2 minute exposure, tracked using Vixen Polaris mount.

The dust regions looking into the Milky Way stars obliterate the light from many stars behind giving is the dark patches to the mid lower edge of this picture.

Occasionally stars are born in the region and they light up the dust cloud around them to give this pink glow in the hydrogen range.

Andy Burns

Wiltshire Society Page

Wiltshire Astronomical Society

Web site: www.wasnet.org.uk

Meetings 2007/2008 Season.

NEW VENUE the Pavilion, Rusty Lane, Seend

Meet 7.30 for 8.00pm start

Beginners session for 15 minutes before each talk

2013/2014 Season

7th October: Nick Howes, The Greatest Telescope on Earth
4th November: Dr Stuart Eves, The Future is out of this World.
2nd December: Andrew Lound, Apollo - A Moon Odyssey.

2015
6th January: Richard Fleet, Glows, Blows & Haloes.
3rd February: Dr Susanne Schwenzer, The Mars Science Laboratory Rover - Curiosity at Gale Crater.
3rd March: Dr Leigh Fletcher, Jupiter Revealed: Exploring the Archetypal Giant Planet.
7th April: Dr Andrew Morse, Meteorites.
5th May: Dr Sarah Roberts, Dwarfs in the Backyard.
2nd June: Martin Griffiths, Exoplanets + AGM.

Membership Changes in fees to be discussed. Could be lowered!

Meeting nights £1.00 for members £3 for none members

Wiltshire AS Contacts

Andy Burns (Chairman, and Editor) Tel: 01249 654541, email: anglesburns@hotmail.com

Vice chair: Keith Bruton

Bob Johnston (Treasurer)

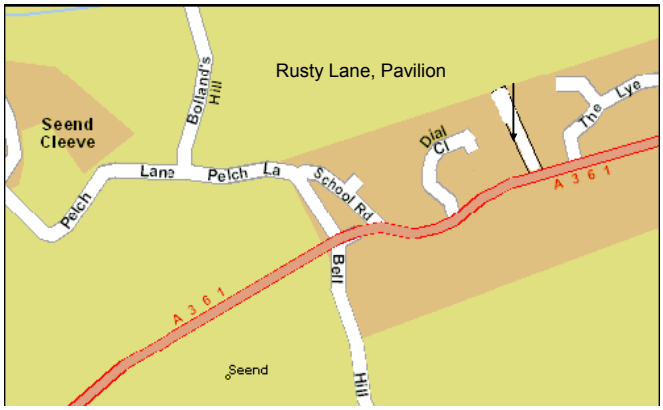
Philip Proven (Hall coordinator)

Peter Chappell (Speaker secretary)

Nick Howes (Technical Guru)

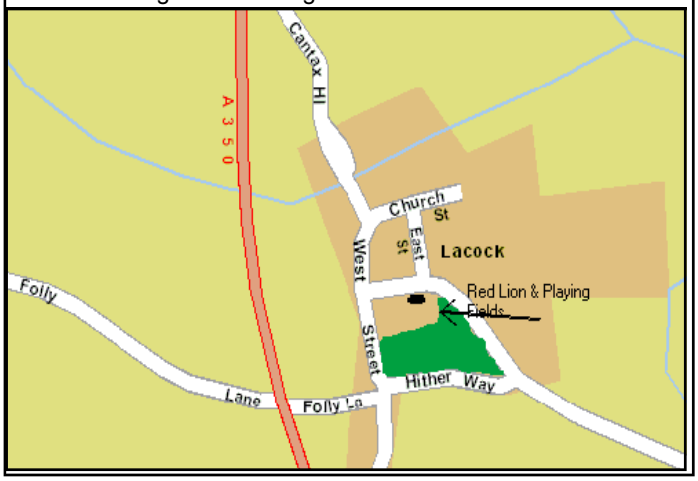
Observing Sessions coordinators: Jon Gale, Tony Vale

Contact via the web site details. This is to protect individuals from unsolicited mailings.



Observing Sessions

The Wiltshire Astronomical Society's observing sessions are open, and we welcome visitors from other societies as well as members of the public to join us.
We will help you set up equipment (as often as you need this help), and let you test anything we have to help you in your choice of future astronomy purchases.
Please treat the lights and return to full working order before leaving. With enough care shown we may get the National Trust to do something with them!
October 24th next viewing evening.
PLEASE see our proposed changes to the observing sessions, contacting and other details. Back Page



Nick Howes

Nick will be giving his World Space Week talk at Wiltshire Astronomical Society tomorrow night on the remarkable SKA Telescope. It's a project he was proud to work on for over a year, redeveloping the entire (and vast!) website. Writing a book's worth of content, and gaining a vastly bigger grasp of the scale of this mammoth telescope. The event is 8pm tomorrow night (*Tuesday 7th) at the Pavillion Hall in Seend, near Devizes. Come along, and hopefully you'll see a unique talk, no powerpoint, just ... well....you'll see!

'The Square Kilometre Array to me, from working on it, is the Apollo of this generation... in scale, ambition, size and the fact that the technology simply does not exist right now to make it happen... we'll need to wait and hope Moores law et al catch up.'…

Swindon Stargazers

Swindon's own astronomy group

The club meets once a month at Liddington Hall, Church Road, Liddington, Swindon, SN4 0HB at 7pm

Ad-hoc viewing sessions near Uffcott and National Astronomy Week

Once again, we are looking forward to a new winter season of stargazing, with plenty to see in the night sky. Regular stargazing evenings will be organised near Swindon. To join these events please visit our website for further information.

We meet regularly at a lay-by just outside the village of Uffcott, near Wroughton. Directions are also shown on the website link below.

When we use East Kennett, we meet at the public car park just below The Red Lion pub at Avebury; we usually hang on for 10 minutes and then move on to our viewing spot at East Kennett. Information about our evenings and viewing spots can be found here:

http://www.swindonstargazers.com/noticeboard/noticeboard06.ht

If you think you might be interested email the organiser Robin Wilkey (see website). With this you will then be emailed regarding the event, whether it is going ahead or whether it will be cancelled because of cloud etc.

We are a small keen group and I would ask you to note that you DO NOT have to own a telescope to take part, just turn up and have a great evening looking through other people's scopes. We are out there to share an interest and the hobby. There's nothing better than practical astronomy in the great cold British winter! And hot drinks are often available, you can also bring your own.

Enjoy astronomy at it's best!

Members of the Wiltshire Astronomical Society always welcome!

Meetings for 2014
At Liddington Village Hall, Church Road, Liddington, SN4 0HB – 7pm onwards

The hall has easy access from Junction 15 of the M4, a map and directions can be found on our website at: http://www.swindonstargazers.com/clubdiary/directions01.ht

Friday 17 Oct 2014

Programme: Lillian Hobbs: "Wish You Were Here for Astronomers"

Friday 21 Nov 2014

Programme: Bruce MacDonald: George Alcock – the back garden astronomer

Friday 19 Dec 2014

Programme: Christmas Social and Astro Bring & Buy Sale

Dates for 2015

Friday 16 Jan 2015

Programme: Ian Morison – The Story of Jodrell Bank

Friday 20 Feb 2015

Simon Barnes - The Moon Landings - A Retrospective

Friday 20 March 2015

AGM plus Jon Gale: Patterns in the Night Sky – Exploring and Observing Asterisms

Friday 17 April 2015

Owen Brazell: Dark Nebula

Friday 15 May 2015

Prof. Malcolm MacCallum - Cosmology

Friday 19 June 2015

Ian Coster – Double Stars: Jewels of the Night Sky

Friday 18 Sept 2015

Telescope Evening & Astro Bring & Buy Sale

Friday 16 Oct 2015

Paul Roche: X-Ray Binaries

Friday 20 Nov 2015

Programme: TBA

Friday 18 Dec 2015

Christmas Social plus a presentation

Website:
http://www.swindonstargazers.co
Chairman: Peter Struve

Tel No: 01793 481547
Email: peter.struve@sky.com
Address: 3 Monkton Close, Park South, Swindon, SN3 2EU

Secretary: Dr Bob Gatten (PhD)
Tel Number: 07913 335475

Email: bob.gatten@ntlworld.co.uk
Address: 17, Euclid Street, Swindon, SN1 2JW

BECKINGTON ASTRONOMICAL SOCIETY

We also have a new website www.beckingtonas.org where details of our programme and other useful information can be found. General enquiries about the society can be emailed to chairman@beckingtonas.org

So our committee is now:

Steve Hill, Chairman/Imaging 01761 435663
John Ball, Vice Chairman 01373 830419
Alan Aked, Treasurer 01373 830232
Rosie Wilks, Secretary 01225445814
Mike Witt, Membership 01373 303784
John Dolton, Telescope Hardware 01225335832

Meetings take place in Beckington Baptist Church Hall (see the location page for details of how to get to us) and start at 7:30pm.

Programme 2013/2014

17th October Martin Griffiths, "Planetary Nebulae"

21st November Dick Cardy, "A Nobleman and his House Dog"

5th December Members Social Evening

16th January Jonathan Gale, "Asterisms"

20th February Nick Howes, "The Greatest Scope on Earth"

20th March Simon Barnes, "The Spark of Gum-drop"

17th April Steve Hill, "Science of the Solar System"

15th May James Fradgley, "Variable Stars: What makes them tick?"

19th June AGM + Member Talks

The programme and details of how to contact the society are at www.beckingtonas.org

SPOG OBSERVING SITES

Any ground rules for a session?

Common sense applies in the group; red light is essential to preserve night vision; we park cars so you can leave when you wish and not disturb others with your headlights.

Contact Details

Our Website

www.spogastro.co.uk

Our Email

spogastro@googlemail.com

Twitter

http://twitter.com/SPOGAstro

Facebook

http://www.facebook.com/group.php?gid=119305144780224

SALISBURY PLAIN OBSERVING GROUP

September to December 2014

- We will alert session updates via email and via our Twitter feed at http://twitter.com/SPOGAstro
- Don't forget that MAD Viewers meets at Whitesheet Hill nr Stourhead on the 1st Wednesday from September until March/April —visit www.madviewers.org for details.

For the last year or so, we have not scheduled regular meetings. We're going to reinstate these and meet up whether cloudy or not to chat over all things astronomical and hopefully observe if the clouds part.

October

Saturday 25th

At 5pm is an occultation of Saturn by the Moon. Suggest meeting at Pewsey Downs site at 16:30 as we can go up on the downs or on Golden Ball Hill. For those that want to stay on, we can then adjourn to The Barge Inn, then return to the site for the evening session

November

Monday 17th /Tuesday 18th

Leonid meteor shower, maybe meet at Lacock with WAS.

Saturday 22nd

New Moon meeting at Tilshead. Meet at Rose and Crown, Tilshead at 8pm.

December

Saturday 13th

Geminids meteor shower and last quarter Moon. Meet at Casterley Camp at 8pm. If weather poor, then meet at Ship Inn, Upavon.

Saturday 20th

New Moon. If anyone wants to meet up we'll plan a venue nearer the time. Pubs may be busy!

Where do you meet?

We meet at a variety of sites, including Pewsey Downs, Everleigh, Bratton Camp, Redhorn Hill and Whitesheet Hill. The sites are cold in winter so you will need warm clothing and a flask. We are always looking for good sites around the edge of the Plain.

Do I join?

No. We are not a club. We meet informally, so aside from contacting our friends to give a yes or no to meeting up, that's it.

I am a beginner—am I welcome?

Of course you are — whether you have a telescope, binoculars or just your eyes, there will be someone to observe with. We have a variety of equipment and are always happy for newcomers to look through.

So I just turn up?

Essentially yes, but please drop us an email as parking can be an issue at some of the meeting areas or at the pubs.

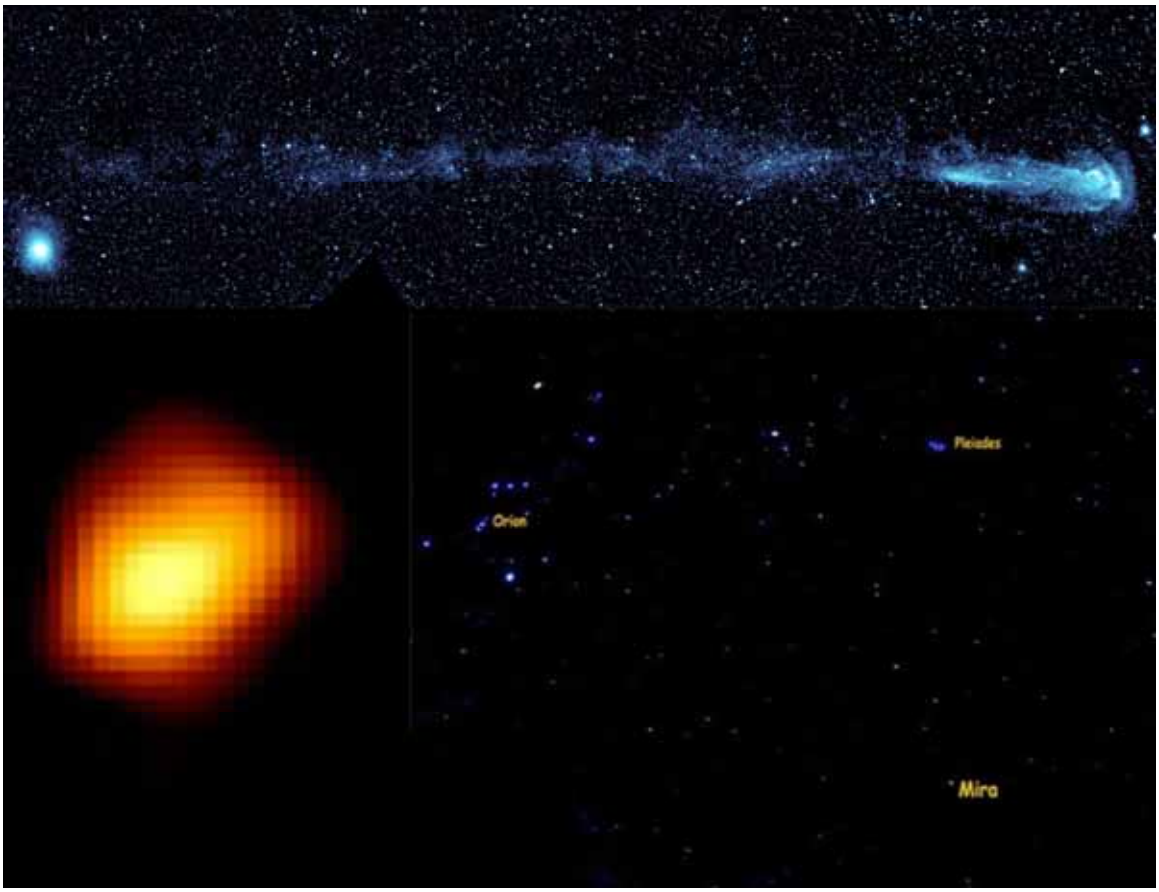
I am more experienced—what's in it for me?

If you have observing experience we prepare a monthly observing list chosen in rotation by the group. We pick some easy objects, some moderate and some tough ones. If you are experienced, why not share what you know?

Twinkle, twinkle, variable star

By Dr. Ethan Siegel

As bright and steady as they appear, the stars in our sky won't shine forever. The steady brilliance of these sources of light is powered by a tumultuous interior, where nuclear processes fuse light elements and isotopes into heavier ones. Because the heavier nuclei up to iron (Fe), have a greater binding energies-per-nucleon, each reaction results in a slight reduction of the star's mass, converting it into energy via Einstein's famous equation relating changes in mass and energy output, $E = mc^2$. Over timescales of tens of thousands of years, that energy migrates to the star's photosphere, where it's emitted out into the universe as starlight.



There's only a finite amount of fuel in there, and when stars run out, the interior contracts and heats up, often enabling heavier elements to burn at even higher temperatures, and causing sun-like stars to grow into red giants. Even though the cores of both hydrogen-burning and helium-burning stars have consistent, steady energy outputs, our sun's overall brightness varies by just ~0.1%, while red giants can have their brightness's vary by factors of thousands or more over the course of a single year! In fact, the first periodic or pulsating variable star ever discovered—Mira (omicron Ceti)—behaves exactly in this way.

There are many types of variable stars, including Cepheids, RR Lyrae, cataclysmic variables and more, but it's the Mira-type variables that give us a glimpse into our Sun's likely future. In general, the cores of stars burn through their fuel in a very consistent fashion, but in the case of pulsating variable stars the outer layers of stellar atmospheres vary. Initially heating up and expanding, they overshoot equilibrium, reach a maximum size, cool, then often forming neutral molecules that behave as light-blocking dust, with the dust then falling back to the star, ionizing and starting the whole process over again. This temporarily neutral dust absorbs the visible light from the star and re-emits it, but as infrared radiation, which is invisible to our eyes. In the case of Mira (and many red giants), it's Titanium Monoxide (TiO) that causes it to dim so severely, from a maximum magnitude of +2 or +3 (clearly visible to the naked eye) to a minimum of +9 or +10, requiring a telescope (and an experienced observer) to find!

Visible in the constellation of Cetus during the fall-and-winter from the Northern Hemisphere, Mira is presently at magnitude +7 and headed towards its minimum, but will reach its maximum brightness again in May of next year and every 332 days thereafter. Shockingly, Mira contains a huge, 13 light-year-long tail -- visible only in the UV -- that it leaves as it rockets through the interstellar medium at 130 km/sec! Look for it in your skies all winter long, and contribute your results to the AAVSO (American Association of Variable Star Observers) International Database to help study its long-term behavior!

Check out some cool images and simulated animations of Mira here: http://www.nasa.gov/mission_pages/galex/20070815/v.html

Images credit: NASA's Galaxy Evolution Explorer (GALEX) spacecraft, of Mira and its tail in UV light (top); Margarita Karovska (Harvard-Smithsonian CfA) / NASA's Hubble Space Telescope image of Mira, with the distortions revealing the presence of a binary companion (lower left); public domain image of Orion, the Pleiades and Mira (near maximum brightness) by Brocken Inaglory of Wikimedia Commons under CC-BY-SA-3.0 (lower right).

NICK'S COMET and ASTEROID TEAM

Follow-up of splitting event in Comet C/2011 J2

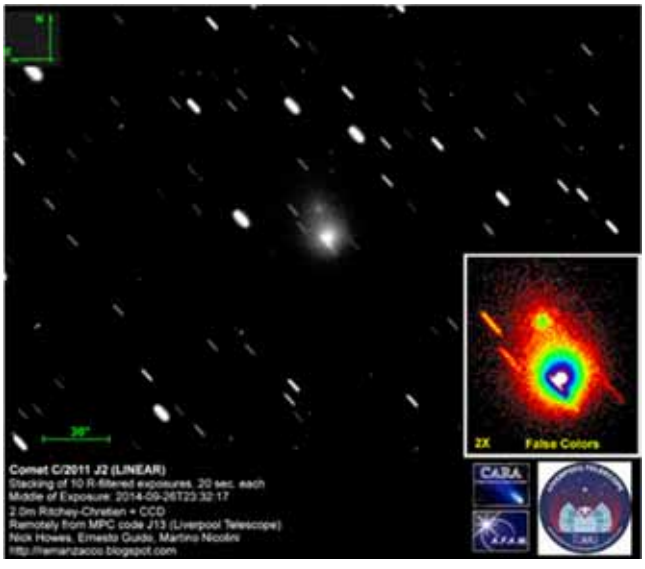
CBET 3979, issued on 2014 September 19, announced that observations of comet **C/2011 J2 (LINEAR)** (by F. Manzini, V. Oldani, A. Dan and R. Behrend) on Aug. 27.95, 28.85, and 30.91 UT led to the detection of a second, fainter, nuclear condensation (from now on Component B) located 0".8 east and 7".5 north of the main, brighter nuclear condensation (component A).

For more info about comet C/2011 J2 please see our

Whilst working on a long term morphology study on comet C/2012 K1 with N. Samarasinha and B. Mueller using the 2-meter **Liverpool Telescope**, we were alerted of the fragmentation event in comet C/2011 J2 and so diverted the telescope to this comet for a few days.

Our follow-up images were taken on 2014, Sept 26.9 through a 2.0-m f/10.0 Ritchey-Chretien + CCD (La Palma-Liverpool Telescope). Stacking of 10 SDSS-R filtered exposures, 20-sec each, shows component B at 14" away in PA 17 from component A. Magnitude of component B is about R = 19.5

Below you can see our follow-up image that clearly shows comet C/2011 J2 (LINEAR) and its seconday B component



For some examples of past comet fragmentation events please check the following links:

http://remanzacco.blogspot.it/2012/10/splitting-event-in-comet.html

http://remanzacco.blogspot.it/2012/11/follow-up-of-splitting-event-in-comet.html

http://remanzacco.blogspot.it/2011/08/update-about-213pvan-ness-fragmentation.html

http://comete.uai.it/2005k2/C2005K2_050617.jpg

UPDATE - October 05, 2014

In the video below we show a first attempt to measure component B drifting movement from the nucleus of comet C/2011 J2 on 2014, through a 2.0-m f/10.0 Ritchey-Chretien + CCD (La Palma-Liverpool Telescope). Blinking the frames of Sept. 26.9 and Oct 02.9, there is evidence of fragment B moving off from the main comet component while profile graphs show that fragment is fading and less condensed. On Sept 26.9 the distance is of 14.4 arcsec. whilst on Oct. 2.9 the distance from the nucleus is of 15.6 arcsec.

by Ernesto Guido, Nick Howes & Martino Nicolini

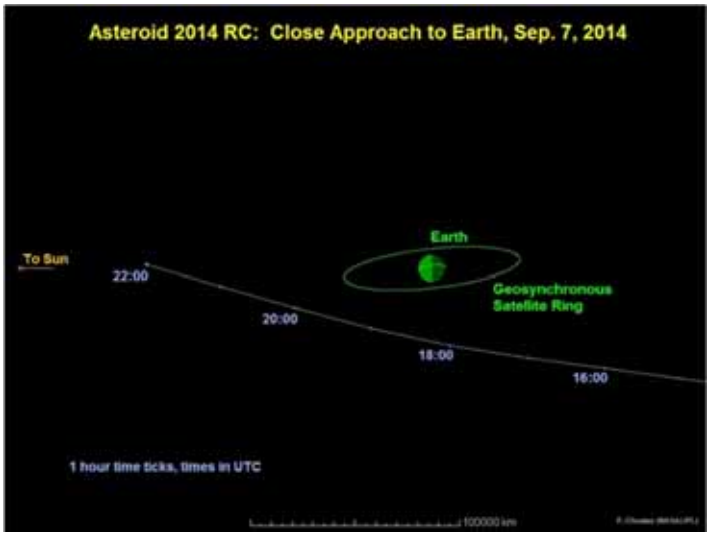
Close Approach of Asteroid 2014 RC

The asteroid **2014 RC** was discovered (at ~ magnitude +20.0) on 2014, September 01.2 by ***Catalina Sky Survey*** (MPC code 703) with a 0.68-m Schmidt + CCD (and independently detected the next night by the Pan-STARRS survey).

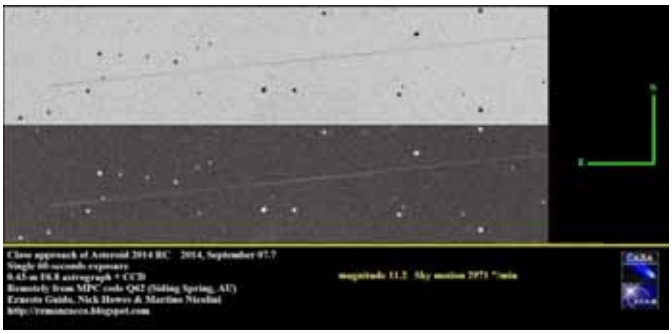
2014 RC has an estimated size of 12 m - 26 m (based on the object's absolute magnitude H=26.8) and it will have a close approach with Earth at about 0.1 LD (Lunar Distances = ~384,000 kilometers) or 0.0003 AU (1 AU = ~150 million kilometers) at 1801 UT on 2014, September 07. This asteroid will reach the peak magnitude about +11.5 on Sep 7 between 17UT and 18UT.

We performed some follow-up measurements of this object on 2014, September 05.3, remotely from the U69 iTelescope network (Auberry California, USA) through a 0.61-m f/6.5 astrograph + CCD). Below you can see our image taken with the asteroid at about magnitude +17.4 and moving at ~ 1.71 "/min. At the moment of its close approach on Sep 7, around 18UT, 2014 RC will move at ~ 3300 "/min. North is up, East is to the left.

The graphic below depicts the passage of asteroid 2014 RC past Earth on September 7, 2014. At time of closest approach, the space rock will be about one-tenth the distance from Earth to the moon. Times indicated on the graphic are Universal Time.



UPDATE - September 07, 2014
Image of asteroid 2014 RC on Sep 07 at 17:30UT, about 30 minutes before its close approach. The asteroid was at magnitude +11.2 and moving at 2971 "/min (the asteroid is trailed in the image due to its fast speed). North is up, East is to the left.



by Ernesto Guido, Nick Howes & Martino Nicolini

IMAGES FROM REMOTE TELESCOPE RIG AT SIDING SPRINGS

TAKEN BY NICK HOWES

M2

M30

M55

IC2118

THE SQUARE KILOMETRE ARRAY

From Wikipedia, the free encyclopedia

The **Square Kilometre Array** (**SKA**) is a radio telescope in development in Australia and South Africa which will have a total collecting area of approximately one square kilometre. It will operate over a wide range of frequencies and its size will make it 50 times more sensitive than any other radio instrument. It will require very high performance central computing engines and long-haul links with a capacity greater than the current global Internet traffic. It will be able to survey the sky more than ten thousand times faster than ever before.

With receiving stations extending out to distance of at least 3,000 kilometres (1,900 mi) from a concentrated central core, it will exploit radio astronomy's ability to provide the highest resolution images in all astronomy. The SKA will be built in the southern hemisphere, in Sub-Saharan states with cores in South Africa and Australia, where the view of the Milky Way Galaxy is best and radio interference least.

With a budget of about €1.5 billion, construction of the SKA is scheduled to begin in 2018 for initial observations by 2020 and full operation by 2025. The headquarters of the project are in Manchester, in the UK.

Organisation

The SKA is a global project with ten member countries which aims to provide answers to fundamental questions about the origin and evolution of the Universe.
In April 2011, Jodrell Bank Observatory of the University of Manchester, in Cheshire, England was announced as the location of the headquarters office for the project

In November 2011, the SKA Organisation was formed and the project moved from a collaboration to an independent, not for profit, company. As of December 2012 [update], the members of the SKA Organisation are:
Australia: Department of Innovation, Industry, Science and Research
Canada: National Research Council

China: National Astronomical Observatories of the Chinese Academy of Sciences

Germany: Federal Ministry of Education and Research (withdrew in 2014)

Italy: National Institute for Astrophysics

New Zealand: Ministry of Economic Development

South Africa: National Research Foundation

Sweden: Onsala Space Observatory

The Netherlands: Netherlands Organisation for Scientific Research

United Kingdom: Science and Technology Facilities Council

India's National Centre for Radio Astrophysics is an associate member of SKA. Germany is a member, but on 5 June 2014 the federal science ministry indicated its intention to leave the SKA project at the end of June 2015.

Description

Countries which have participated in the preparatory phase of SKA

The SKA will combine the signals received from thousands of small antennas spread over a distance of more than 3000 km to simulate a single giant radio telescope capable of extremely high sensitivity and angular resolution. The SKA will also have a very large field-of-view (FOV) with a goal at frequencies below 1 GHz of 200 square degrees and of more than 1 square degree (about 5 full Moons) at higher frequencies. One innovative development is the use of Focal Plane Arrays using phased-array technology to provide multiple FOVs. This will greatly increase the survey speed of the SKA and enable multiple users to observe different pieces of the sky simultaneously. The combination of a very large FOV with high sensitivity means that the SKA will transform the exploration of the Universe.

The SKA will provide continuous frequency coverage from 50 MHz to 14 GHz in the first two phases of its construction. A third phase will then extend the frequency range up to 30 GHz.

- Phase 1: Providing ~10% of the total collecting area at low and mid frequencies by 2020.

Phase 2: Completion of the full array at low and mid frequencies by 2025.

The frequency range from 50 MHz to 14 GHz, spanning more than two decades, cannot be realised using one design of antenna and so the SKA will comprise arrays of three types of antenna elements that will make up the SKA-low, SKA-mid and dish arrays:

Artist's impression of a Low-Band SKA Sparse Aperture Array Station

Artist's impression of a SKA Dense Aperture Array Station

SKA-low array – a phased array of simple dipole antennas to cover the frequency range from 50 to 350 MHz. These will be grouped in 100 m diameter stations each containing about 90 elements.

SKA-mid array – an array several thousand dish antennas to cover the frequency range 350 MHz to 14 GHz. It is expected that the antenna design will follow that of the Allen Telescope Array using an offset Gregorian design having a height of 15 metres and a width of 12 metres.

SKA-survey array - a compact array of parabolic dishes of 12–15 meters diameter each for the medium-frequency range, each equipped with a multi-beam, phased array feed with a huge field of view and several receiving systems covering about 350 MHz – 4 GHz. This allows the dishes to observe over a far wider field of view than that achieved with a single element feed. Prototypes of such multiple element feeds are now under development for the pathfinder arrays described below.

The area covered by the SKA – extending out to ~3000 km – will comprise three regions:

1. A central region containing about 5 km diameter cores of SKA-mid antennas (South Africa) and of SKA-survey antennas and SKA-low dipoles (Western Australia). These central regions will contain approximately half of the total collecting area of the three SKA arrays.
2. A mid region extending out to 180 km. This will contain dishes and pairs of SKA-mid and SKA-low stations. In each case they will be randomly placed within the area with the density of dishes and stations falling off towards the outer part of the region.

An outer region from 180 km to 3000 km. This will comprise five spiral arms along which dishes of SKA-mid, grouped into stations of 20 dishes, will be located. The separation of the stations increases towards the outer ends of the spiral arms.

Key projects

Schematic of the SKA Central Region

The capabilities of the SKA will be designed to address a wide range of questions in astrophysics, fundamental physics, cosmology and particle astrophysics as well as extending the range of the observable universe.

A number of key science projects have been selected to be undertaken by the SKA and are listed below.

Extreme tests of general relativity

For almost one hundred years, Einstein's general theory of relativity has precisely predicted the outcome of every experiment made to test it. Most of these tests, including the most stringent ones, have been carried out using radio astronomical measurements. By using pulsars as cosmic gravitational wave detectors, or timing pulsars found orbiting black holes, astronomers will be able to examine the limits of general relativity such as the behaviour of space and time in regions of extremely curved space. The goal is to reveal whether Einstein was correct in his description of space, time and gravity, or whether alternatives to general relativity are needed to account for these phenomena.

Galaxies, cosmology, dark matter and dark energy

The sensitivity of the SKA in the 21-cm hydrogen line will map a billion galaxies out to the edge of the observable Universe. The large-scale structure of the cosmos revealed will give constraints to determine the processes resulting in galaxy formation and evolution. Imaging hydrogen through the Universe will provide a three-dimensional picture of the first ripples of structure which formed individual galaxies and clusters. This may also

allow the measurement of effects hypothetically caused by dark energy and causing the increasing rate of expansion of the universe.

Epoch of re-ionization
The SKA is intended to provide observational data from the so-called Dark Ages (between 300,000 years after the Big Bang when the radiation stops and the universe cools) and the time of First Light (a billion years later when young galaxies are seen to form for the first time). By observing the primordial distribution of gas, the SKA should be able to see how the Universe gradually lit up as its stars and galaxies formed and then evolved. This period between the Dark Ages and First Light is considered the first chapter in the cosmic story of creation and the distance to see this event is the reason for the Square Kilometre Array's design. To see back to First Light requires a telescope 100 times more powerful than the biggest radio telescopes currently in the world, taking up 1 million square metres of collecting area, or one square kilometre.

Cosmic magnetism
It is still not possible to answer basic questions about the origin and evolution of cosmic magnetic fields, but it is clear that they are an important component of interstellar and intergalactic space. By mapping the effects of magnetism on the radiation from very distant galaxies, the SKA will investigate the form of cosmic magnetism and the role it has played in the evolving Universe.
Transient radio phenomena caused by extraterrestrial life
The SKA will be capable of detecting extremely weak extraterrestrial signals if existing, and may even detect planets capable of supporting life. Astrobiologists will use the SKA to search for amino acids by identifying spectral lines at specific frequencies.

Locations
The headquarters of the SKA will be located at Manchester's Jodrell Bank Observatory, Cheshire, England.

An automatic wideband radio scanner system was used to survey the radio frequency noise levels at the various candidate sites in South Africa.
Suitable sites for the SKA telescope need to be in unpopulated areas with guaranteed very low levels of man-made radio interference. Four sites were initially proposed in South Africa, Australia, Argentina and China. After considerable site evaluation surveys, Argentina and China were dropped and the other two sites were shortlisted (with New Zealand joining the Australian bid, and 8 other African countries joining the South African bid):
Australia and New Zealand: The core site is located at the Murchison Radio-astronomy Observatory (MRO) at Mileura Station near Boolardy in Western Australia 315 km north-east of Geraldton on a flat desert-like plain at an elevation of about 460 metres. The most distant stations will be located in New Zealand.

South Africa: The core site is located at 30°43′16.068″S 21°24′40.06″E / 30.72113000°S 21.4111278°E / -30.72113000; 21.4111278 at an elevation of about 1000 metres in the Karoo area of the arid Northern Cape Province, about 75 km north-west of Carnarvon, with distant stations in Botswana, Ghana, Kenya, Madagascar, Mauritius, Mozambique, Namibia and Zambia.

On 10 March 2012 it was reported that the SKA Site Advisory Committee had made a confidential report in February that the South African bid was stronger. The final decision on the site to be made by the project's board of directors was expected on 4 April 2012. However a scientific working group was set up to explore possible implementation options of the two candidate host regions, and its report was expected in mid May 2012.
On 25 May 2012 it was announced that the SKA will be split over the South African and African sites and the Australia and New Zealand sites. While New Zealand remains a member of the SKA Organisation, as of 2014[it appears that no SKA infrastructure is likely to be sited in New Zealand.

SPACE NEWS

ESA reveals target site for risky comet landing

BY STEPHEN CLARK
SPACEFLIGHT NOW
Posted: September 15, 2014

European scientists have selected an aim point for the landing of Philae, a small probe riding piggyback on the Rosetta spacecraft set for the first-ever descent to a comet's nucleus in November.

Philae's primary landing site will target Site J, the center of which is indicated by the cross in this narrow-angle image from Rosetta's OSIRIS camera. Credit: ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA

The task will not be easy, but officials said Monday they chose the best possible location for the landing on comet 67P/Churyumov-Gerasimenko, an object covered with craggy terrain, rifts and cliffs, and jets of vapor and dust that will become more prominent as the comet dives closer to the sun over the next 11 months.

Scientists say combining data from Rosetta and the Philae lander will provide an unprecedented glimpse of a comet's behavior, yielding insights into the building blocks left over from the formation of the solar system 4.5 billion years ago.

Researchers believe comets may have seeded Earth with water and organic material, depositing the materials necessary for life.

Philae's landing location, known as Site J during lander team's deliberations, is on the small lobe of the comet, which is made up of two distinct segments connected by a narrow neck.

"There are flat areas, but there is also rough terrain," said Stephan Ulamec, head of the Philae lander team at DLR, the German Aerospace Center. "There are some cliffs. There are some boulders, so we have to work a little bit with statistics. It is not a perfectly flat area as we probably would have hoped for a safe landing site."

Landing is set for Nov. 11, following a descent of approximately seven hours once Philae is released from the Rosetta mothership, which arrived at the comet Aug. 6 and has moved within 30 kilometers, or about 18 miles, of 67P/Churyumov-Gerasimenko in the last few weeks.

The lander will be passive and on its own during the free fall to the comet, so engineers on Earth must put the Rosetta spacecraft in the correct position and orientation for separation of Philae.

"We need both Rosetta and Philae in synchronization," said Andrea Accomazzo, flight director for the Rosetta mission at the European Space Operations Center in Darmstadt, Germany. "We need very accurate navigation with Rosetta. This is the most challenging part."

Artist's concept of the Philae lander on the comet. Credit: ESA

The comet's tenuous gravity field makes it difficult to predict Rosetta's orbit around the nucleus, requiring rocket burns to adjust its path.

Thanks to the weak gravity, Ulamec said the 100-kilogram (220-pound) Philae lander will weigh just a gram on the comet. Its mission will last at least two days, but could stretch into early 2015 if the probe's battery can be recharged with solar energy.

Data from the lander will be routed though the Rosetta orbiter and back to Earth, so the mothership must be regularly in view of the landing site, including at the time of touchdown.

After deploying three landing legs fitted with shock absorbers, Philae will hit the comet at about a walking pace, fire a harpoon into the ground to prevent the lander from bouncing off, then screw into rock to firmly attach itself for at least two days of photo-taking, drilling, measurements and other science activities.

Speaking with reporters in a press conference in Paris on Monday, mission officials cautioned the endeavor was fraught with risk, mainly because comet 67P/Churyumov-Gerasimenko is covered in hazards, ranging from unstable, gravely pits to steep slopes and boulders.

"When we designed the lander 15 or 20 years ago, we had no idea of the target body," Ulamec said. "We had no idea of the size, no idea of the gravity, and no idea of the shape or the surface properties. We were even designing it for a different comet. This is completely different than missions that land on the moon or Mars, where you have all this data so you know what you're dealing with."

Armed only with imagery and data collected in the last few months -- once Rosetta was close enough to study the comet in detail -- scientists met last weekend in Toulouse, France, to go over five candidate landing sites.

The decision in favor of Site J as the primary landing site was unanimous, according to a European Space Agency press release. Officials chose a backup site, known as Site C, on the larger lobe of the comet.

Officials brief the media on Philae's landing site. Credit: ESA/S. Corvaja

Fred Jansen, Rosetta's mission manager at ESA, said officials predicted a 70 to 75 percent probability of a successful landing by Philae before the mission's launch in 2004. But that number assumed the comet was a rounded body, not the oddly-shaped world found by Rosetta.

Comet 67P/Churyumov-Gerasimenko's bizarre shape, likened by some to a rubber duck, adds more uncertainty in a smooth landing, officials said. Rosetta returned the first detailed images of the comet in July.

"In the beginning, it was so scary to see this comet as it was," said Jean-Pierre Bibring, a lead scientist on the Philae lander. "It was really unexpected and unpredicted. No one felt we would face such a comet. When we saw it rotating, the first view was we won't be able to reach any place there."

But a closer look revealed more possibilities.

"As soon as we got closer ... suddenly it happened that we might have reachable areas," Bibring said.

There are still many unknowns going into the landing. Ground controllers plan to move Rosetta even closer to the comet through October to get a better look at the landing site.

"For instance, one very important parameter is the surface strength," Ulamec said. "This is still not known. The comet looks more dusty, [and] this is an indication for a rather soft material, but we do not really know. When we designed the lander, our major fear was rebouncing on solid ice. This was one of our major concerns because of our ignorance of what a cometary surface might look like."

It turns out Rosetta has found no evidence of widespread ice on the comet's nucleus.

Even without a successful landing by Philae, Rosetta will continue escorting the comet through the end of 2015, observing its evolution as it passes nearest to the sun next August.

The Rosetta orbiter is the centerpiece of the $1.7 billion mission, supplying most of the data scientists are eager to analyze.

But Philae will provide ground truth for Rosetta's observations.

"We will get to a centimeter resolution, and this will enable us to get closer to the clues of the origin and what were the buidling blocks 4.5 billion years ago," said Holger Sierks, chief scientist for Rosetta's science camera. "It's really a quantum step. It's an historic mission in that sense already now."

On October 19, 2014, Comet Siding Spring will pass by Mars only 132,000 km away--which would be like a comet passing about 1/3 of the distance between Earth and the Moon.

The nucleus of the comet won't hit Mars, but there could be a different kind of collision.

"We hope to witness two atmospheres colliding," explains David Brain of the University of Colorado's Laboratory for Atmospheric and Space Physics (LASP). "This is a once in a lifetime event!"

A new ScienceCast video examines what might happen if the atmosphere of Comet Siding Spring hits the atmosphere of Mars. Play it

Everyone knows that planets have atmospheres. Lesser known is that comets do, too. The atmosphere of a comet, called its "coma," is made of gas and dust that spew out of the sun-warmed nucleus. The atmosphere of a typical comet is wider than Jupiter.

"It is possible," says Brain, "that the atmosphere of the comet will interact with the atmosphere of Mars. This could lead to some remarkable effects—including Martian auroras."

The timing could scarcely be better. Just last year, NASA launched a spacecraft named MAVEN to study the upper atmosphere of Mars, and it will be arriving in Sept. 2014 barely a month before the comet.

MAVEN is on a mission to solve a longstanding mystery: What happened to the atmosphere of Mars? Billions of years ago, Mars had a substantial atmosphere that blanketed the planet, keeping Mars warm and sustaining liquid water on its surface. Today, only a wispy shroud of CO2 remains, and the planet below is colder and dryer than any desert on Earth. Theories for this planetary catastrophe center on erosion of the atmosphere by solar wind.

"The goal of the MAVEN mission is to understand how external stimuli affect the atmosphere of Mars," says Bruce Jakosky of LASP, MAVEN's principal investigator. "Of course, when we planned the mission, we were thinking about the sun and the solar wind. But Comet Siding Spring represents an opportunity to observe a natural experiment, in which a perturbation is applied and we can see the response."

Brain, who is a member of the MAVEN science team, thinks the comet could spark Martian auroras. Unlike

Earth, which has a global magnetic field that shields our entire planet, Mars has a patchwork of "magnetic umbrellas" that sprout out of the surface in hundreds of places all around the planet. If Martian auroras occur, they would appear in the canopies of these magnetic umbrellas.

"That is one thing that we will be looking for with both MAVEN and Hubble Space Telescope," says Brain. "Any auroras we see will not only be neat, but also very useful as a diagnostic tool for how the comet and the Martian atmosphere have interacted."

The atmosphere of the comet includes not only streamers of gas, but also dust and other debris blowing off the nucleus at 56 kilometers per second relative to Mars. At that velocity, even particles as small as half a millimeter across could damage spacecraft. NASA's fleet of Mars orbiters including MAVEN, Mars Odyssey and Mars Reconnaissance Orbiter will maneuver to put the body of Mars between themselves and the comet's debris during the dustiest part of the encounter.

"It's not yet clear whether *any* significant dust or gas will hit the Mars atmosphere," cautions Jakosky. "But if it does, it would have the greatest effects on the upper atmosphere."

Meteoroids disintegrating would deposit heat and temporarily alter the chemistry of upper air layers. The mixing of cometary and Martian gases could have further unpredictable effects. Although MAVEN, having just arrived at Mars, will still be in a commissioning phase, it will use its full suite of instruments to monitor the Martian atmosphere for changes.

"By observing both before and after, we hope to determine what effects the comet dust and gas have on Mars, if any," says Jakosky.

Whatever happens, MAVEN will have a ringside seat.

India's MOM Snaps Spectacular Portrait of New Home – the Red Planet

by Ken Kremer on September 30, 2014

ISRO's Mars Orbiter Mission captures spectacular portrait of the Red Planet and swirling dust storms with the on-board Mars Color Camera from an altitude of 74500 km on Sept. 28, 2014. Credit: ISRO

MOM is truly something special.

For her latest eye popping feat, India's Mars Orbiter Mission (MOM) has snapped the first global portrait of her new Home – the Red Planet.

MOM is India's first interplanetary voyager and took the stupendous new image on Sept. 28, barely four days after her historic arrival on Sept. 23/24 following the successful Mars Orbital Insertion (MOI) braking maneuver.

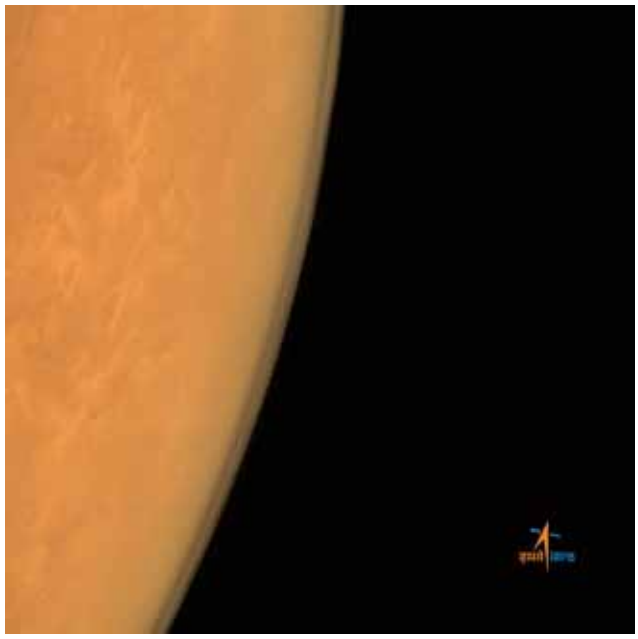
The MOM orbiter was designed and developed by the Indian Space Research Organization (ISRO), India's space agency, which released the image on Sept. 29.

Even more impressive is that MOM's Martian portrait shows a dramatic view of a swirling dust storm over a large patch of the planet's Northern Hemisphere. Luckily, NASA's Opportunity and Curiosity surface rovers are nowhere nearby.

"Something's brewing here!", ISRO tweeted.

The southern polar ice cap is also clearly visible.

It was taken by the probes on-board Mars Color Camera from a very high altitude of 74500 kilometers.



ISRO's Mars Orbiter Mission captures the limb of Mars with the Mars Color Camera from an altitude of 8449

km soon after achieving orbit on Sept. 23/24, 2014. . Credit: ISRO

When MOM met Mars, the thrusters placed the probe into a highly elliptical orbit whose nearest point to Mars (periapsis) is at 421.7 km and farthest point (apoapsis) at 76,993.6 km. The inclination of the orbit with respect to the equatorial plane of Mars is 150 degrees, as intended, ISRO reported.

So the Red Planet portrait was captured nearly at apoapsis.

This is the third MOM image released by ISRO so far, and my favorite.

MOM's goal is to study Mars atmosphere, surface environments, morphology, and mineralogy with a 15 kg (33 lb) suite of five indigenously built science instruments. It will also sniff for methane, a potential marker for biological activity.

The $73 million mission is expected to last at least six months.

MOM's success follows closely on the heels of NASA's MAVEN orbiter which also successfully achieved orbit barely two days earlier on Sept. 21 and could last 10 years or more.

With MOM's arrival, India became the newest member of an elite club of only four entities who have launched probes that successfully investigated Mars – following the Soviet Union, the United States and the European Space Agency (ESA).

Stay tuned here for Ken's continuing Earth and planetary science and human spaceflight news.

Ken Kremer

Robot Arm Will Install New Earth-Facing Cameras On The Space Station

by Elizabeth Howell on September 30, 2014

Canadarm2 is backdropped by Earth and the HTV-3 vehicle in this shot from the International Space Station. Credit: NASA

TORONTO, CANADA – Canada's robotic Canadarm2 will install the next two Urthecast cameras on the International Space Station, removing the need for astronauts to go outside to do the work themselves, the company announced today (Sept. 30).

Urthecast plans to place two Earth-facing cameras on the United States side of the station (on Node 3) to add to the two they already have on the Russian Zvezda module. Technical problems with the cameras forced the Russians to do an extra spacewalk to complete the work earlier this year.

PanSTARRS K1, the Comet that Keeps Going and Going and Going

by Bob King on September 29, 2014

Comet C/2012 K1 PanSTARRS photographed on September 26, 2014. Two tails are seen – a dust tail points off to the left and the gas or ion tail to the right. Copyright: Rolando Ligustri

Thank you K1 PanSTARRS for hanging in there! Some comets crumble and fade away. Others linger a few months and move on. But after looping across the night sky for more than a year, this one is nowhere near quitting. Matter of fact, the best is yet to come.

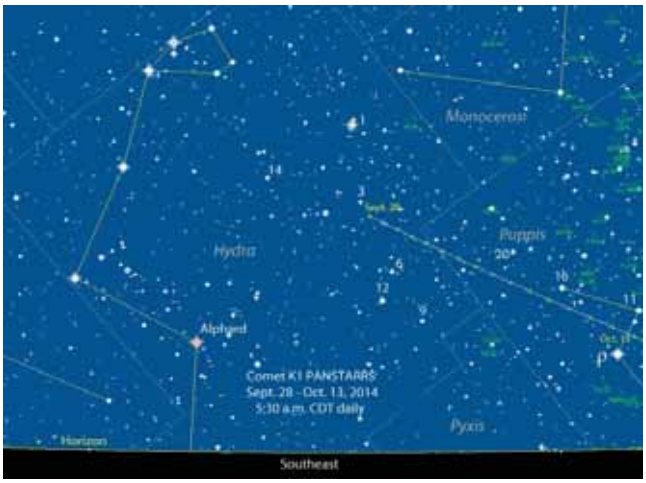
This new visitor from the Oort Cloud making its first passage through the inner solar system, C/2012 K1 was discovered in May 2012 by the **Pan-STARRS 1 survey telescope** atop Mt. Haleakala in Hawaii at magnitude 19.7. Faint! On its the inbound journey from the Oort Cloud, C/2012 K1 approached with an orbit estimated in the millions of years. Perturbed by its interactions with the planets, its new orbit has been reduced to a mere ~400,000 years. That makes the many observing opportunities PanSTARRS K1 has provided that much more appreciated. No one alive now will ever see the comet again once this performance is over.

Comet C/2012 K1 PanSTARRS' changing appearance over the past year. Credit upper left clockwise: Carl Hergenrother, Damian Peach, Chris Schur and Rolando Ligustri

Many amateur astronomers first picked up the comet's trail in the spring of 2013 when it had brightened to around magnitude 13.5. My observing notes from June 2, 2013, read:

"Very small, about 20 arc seconds in diameter. Pretty faint at ~13.5 and moderately condensed but not too difficult at 142x . Well placed in Hercules." Let's just say it was a faint, fuzzy blob.

K1 PanSTARRS slowly brightened in Serpens last fall until it was lost in evening twilight. Come January this year it returned to the morning sky a little closer to Earth and Sun and a magnitude brighter. As winter snow gave way to frogs and flowers, **the comet rocketed** across Corona Borealis, Bootes and Ursa Major. Its fat, well-condensed coma towed a pair of tails and grew bright enough to spot in binoculars at magnitude 8.5 in late May.



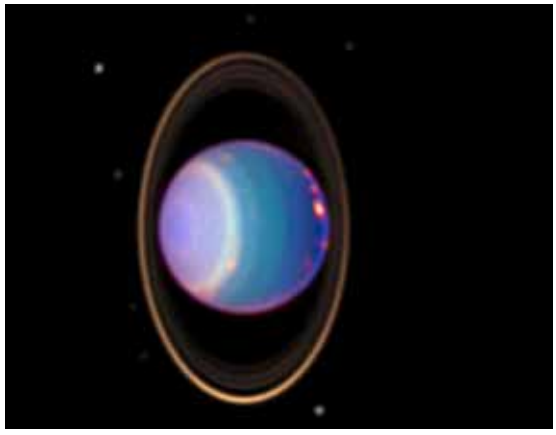
Skywatchers can find C/2012 K1 PanSTARRS in the morning sky in the Hydra and Puppis just before dawn when it's highest in the southeastern sky. The map shows its location daily with stars to magnitude 8.5. The numbers next to some stars are standard Flamsteed atlas catalog numbers. Click for a larger version. Source: Chris Marriott's SkyMap

By July, it hid away in the solar glare a second time only to come back swinging in September's pre-dawn sky. Now in the constellation Hydra and even closer to Earth, C/2012 K1 has further brightened to magnitude 7.5. Though low in the southeast at dawn, I was pleasantly surprised to see it several mornings ago. Through my 15-inch (37-cm) reflector at 64x I saw a fluffy, bright coma punctuated by a brighter, not-quite-stellar nucleus and a faint tail extending 1/4º to the northeast.

Mid-northern observers can watch the comet's antics through mid-October. From then on, K1 will only be accessible from the far southern U.S. and points south as it makes the rounds of Pictor, Dorado and Horologium. After all this time you might think the comet is ready to depart Earth's vicinity. Not even. C/2012 K1 will finally make its closest approach to our planet on Halloween (88.6 million miles – 143 million km) when it could easily shine at magnitude 6.5, making it very nearly a naked-eye comet.

PanSTARRS K1's not giving up anytime soon. Southern skywatchers will keep it in view through the spring of 2015 before it returns to the deep chill from whence it came. After delighting skywatchers for nearly two years, it'll be hard to let this one go.

Why did it take so long to discover Uranus?



Hubble telescope image of Uranus. Credit:NASA/JPL/STScI.

Right in Plain Sight

If you know where to look, and your eyes are strong enough, you might be able to see Uranus without a telescope or binoculars. It's not very bright and barely large enough, but it does sometimes appear in our night sky.

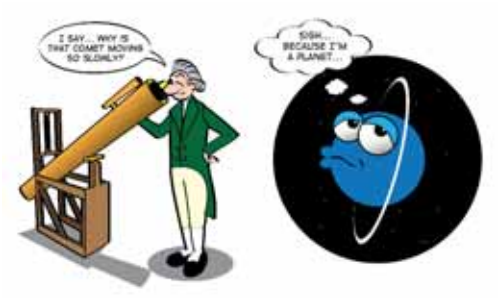
In spite of this, Uranus wasn't officially discovered until 1781. Ancient Babylonians knew about all of the planets from Mercury to Saturn long before that. Why did it take so long for people to find lonely Uranus?

What to Call It?

Actually, it wasn't a matter of finding it. It was a matter of knowing that it was a planet. The story of Uranus's discovery is full of people not realizing what they were seeing. People may have seen Uranus as early as 128 B.C. but, each time they saw it, they said it was a star.

In fact, the man who we credit with discovering the planet got it wrong too! Sure, he knew it wasn't a star,

but he didn't think it was a planet either. On March 13, 1781, William Herschel—an amateur astronomer—located an object in the night sky. After measuring it, he determined that this object moved too quickly to be a star. It had to be a comet, he thought.



A Great Debate

Sir William Herschel.

Herschel told other astronomers about the new "comet." They were confused. The problem was that a comet as bright as this object would have to be pretty close to the sun, but a comet that close to the sun would have to be moving through the sky much faster than this thing was moving. It also didn't have a coma or a tail like comets have.

These other astronomers began to study the object too. They figured out that its orbit was pretty close to circular—just like the orbit of a planet. That was enough for most of them to call it a planet. By 1783, Herschel also accepted that it must be a planet. After he tried to name it after King George III, the planet was named Uranus, after the Greek god of the sky.

VIEWING LOGS AND IMAGES FROM SEPTEMBER

Viewing Log for 4th of October

Had a free evening and the sky was clear, do I decided to go out and do some viewing, the Moon would be a bit of a problem as it was nearly 71 % lit and high in the sky, might have trouble finding some deep sky objects in my Herschel 400 Observing List?

Went out to my usual viewing site at Uffcott and was up and ready to start viewing at 8:22, I would be using my Meade LX90 with 14 mm Pentax eye piece, this would give me a magnification of just over 140. I was now up to Day 2 of August for viewing, first object was NGC 6445 a Planetary Nebula (P N) in Sagittarius, and I thought the objects in Sagittarius would be too low to view? Well for my first object it turned out to be good to view, even with the Moon blazing in the sky! The first of the many Globular Clusters (G C) on my list tonight was dim to view, NGC 6440 was hard to make out? The next G C in NGC 6638 was bright to view even though it was only 0.1 magnitudes brighter than NGC 6440 and lower in the sky! NGC 6642 was another G C, had to use adverted vision and movement with the telescope to confirm this object. NGC 6629 a P N was like a Spiral Galaxy for viewing, a faint fuzzy blob, this object was hard to make out! The next six objects (all in Sagittarius) were below a hedge line so it would be next summer or a trip out to Spain to view these objects? I decided to carry on with objects in this constellation in case any were still above the hedge, my luck held out as I could see NGC 6514, a dim G C. The next G C in NGC 6553 was more like a fuzzy blob to view. NGC 6514 is a Diffuse Nebula which is part of an Open Cluster (O C), these two items are better known as Messier 20, the Trifid Nebula. When Messier first located this object in June 1764 he could only make out the O C with no nebula, it took another 20 years and William Herschel to discover the true nebulosity here. The term Trifid Nebula came from John Herschel later on when he describe the trifold aspect of the nebula. All I could make out was the O C part of M 20! NGC 6568 was a loose and dim O C to view, the next O C in NGC 6583 was even dimmer to view, not many stars here! NGC 6645 was a good O C to view, being at only -15 in declination in is near the northern part of Sagittarius, I found NGC 6818 a P N easy to locate, similar to M 57 (the Ring Nebula in Lyra) but smaller in size, the Moon did not affect this object at all, it would be nice to view this object again but with the Moon well out of the way, it also has a name of 'Little Gem', I can understand why. Time to leave this constellation and head across the border and into Scutum to view NGC 6664 a loose but fairly bright O C. My final Herschel object for the evening was NGC 6712 a G C, this object was hard to view. Think all the G C's I had viewed tonight was difficult with the bright Moon around?

Time to look for Solar System objects and first was Uranus shining at mag 5.7 below the Square of Pegasus, even though Neptune was close to the Moon, I could

make out the blue of the planet fairly easy. Thought I would have a quick look at some Messier objects in M 29 & M 39 in Cygnus, both O C's and bright compared to the O C's viewed earlier on followed by M 27 and M 57, both P N's. M 27 was still easy to make out even with its close position to the Moon. Final object for the evening was the Moon, decided to put a filter on the eye piece so my eye would not be burnt too much. Had some great views of craters just coming into view of the Sun.

It was now 9:50 and time to pack up and go home for a cup of coffee. I could tell winter was on its way, not because I could see Pleiades (M 45) rising in the east but I had gloves and a hat on! First time in quite a few months for these objects to be aired.

Clear skies.

Peter Chappell

Observing Logs

25th September 2014

04:30-05:00 Pyjama Log

Cracking clear morning, just had to step out with some binoculars and vierw the skies in the uncomplicated way that binoculars can connect with the skies. Vixen 11x80 handheld.

Orion well up in the southwest, M41 and M42 with the theta Orionis stars clearly seen. Struve 6 and up to the belt stars Alnitac, Almilam and Mintaka crystal clear. Sirius just approaching the trees in the southeast but M41 just discernible with the local light pollution and river mist combining to my east and south.

Some interesting lines of stars in the shoulders of Orion but move on up to the Pleiades… best through good binoculars. Likewise the Hyades and Albaberan, Now is it dark enough for the Triangulum Galaxy M33? One of our local group and the most active of galaxies – but because it is face on it is often looked 'through' with telescopes. It was there in the binoculars.

Now Jupiter, and wow, I've caught one of those nights in the movements of the moons of the solar system giant where they line up in order, Calisto, Ganymede, Europa and Io all strung in a line moving in to the atmospheric belts visible on the planet. Io VERY tight in.

Then the Beehive M44 and M67 in Cancer, back up to gemini and M35, then climb back to M37 M36 and M38 open cluster season is coming!

Now round the house to look north and Cassiopeia high up and Andromeda so M31, M32 but M110 on the dim side for binoculars, but Owl cluster NGC472, M103, M52 and up to the garnet star in Cepheus. The double cluster in Perseus and M34, down to the west with Cygnus M39 and M29.

Back to the north east and Ursa Major is hanging with its 'tail' in the mist so M101 and M51 out. But Mizar splits into A and B components, higher up M81 and M82 easily caught.

A cracking morning – and not too cold…

1st October 2014

After the mist and cloud of the evening rolled back the stars of Orion blazed through the window and forced me to get out of bed and into the garden with the binoculars around 5:20 this morning. 11x80s.

Firstly to Jupiter, and only three moons visible, Calisto to the upper right then Europa and Ganymede to the lower left.

Then the messier trawl much like the previous log, M81 and M82 in Ursa Major, BUT a chance of M101 and M51 whirlpool as they are higher out of the town clagg this morning. There they are, only just, but again M101 is easier in big binoculars than medium telescopes as it is a face on spiral galaxy in our local group.

M33 is visible, then M31, M32. That was it for galaxies, so onto the clusters.

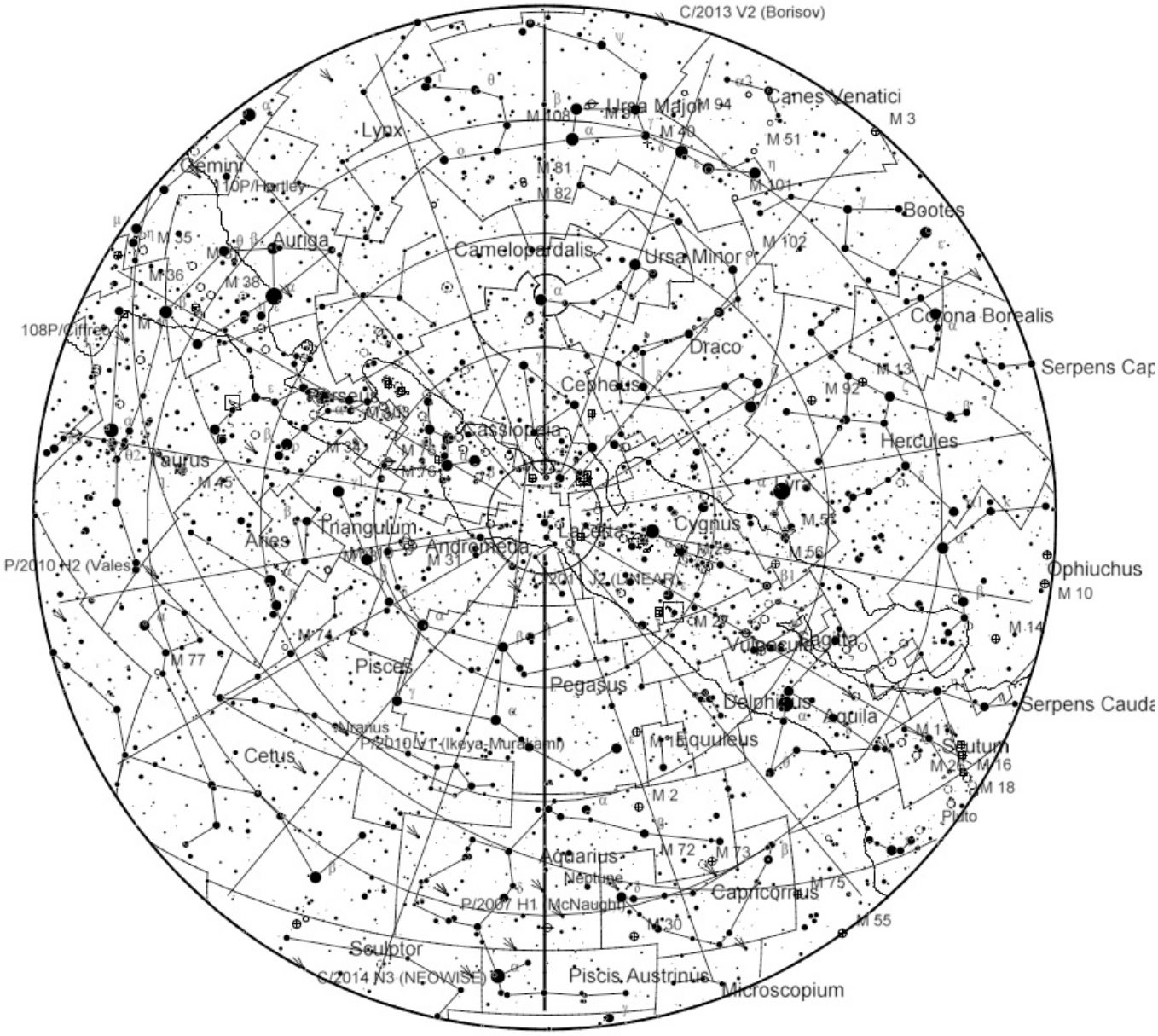
M45, M41, M35, M37, M36, M38, M44, plus ngc752 (Caldwell 28) and the double cluster ngc 869/884 or Caldwell14.

The predawn glow was creeping up the sky, and at this time the vast number of contrails were getting in the way as the trans atlantic flights come across and drop through the temperature zone where the contrails form.

Andy

The Moon taken in daylight in the 15th September. Opposite side of the moon lit as from the back page image. Andy Burns.

WHATS UP, OCTOBER 2014



•**October 7** - **Uranus at Opposition.** The blue-green planet will be at its closest approach to Earth and its face will be fully illuminated by the Sun. This is the best time to view Uranus. Due to its distance, it will only appear as a tiny blue-green dot in all but the most powerful telescopes.

•**October 8** - **Full Moon.** The Moon will be directly opposite the Earth from the Sun and will be fully illuminated as seen from Earth. This phase occurs at 10:51 UTC. This full moon was known by early Native American tribes as the Full Hunters Moon because at this time of year the leaves are falling and the game is fat and ready to hunt. This moon has also been known as the Travel Moon and the Blood Moon.

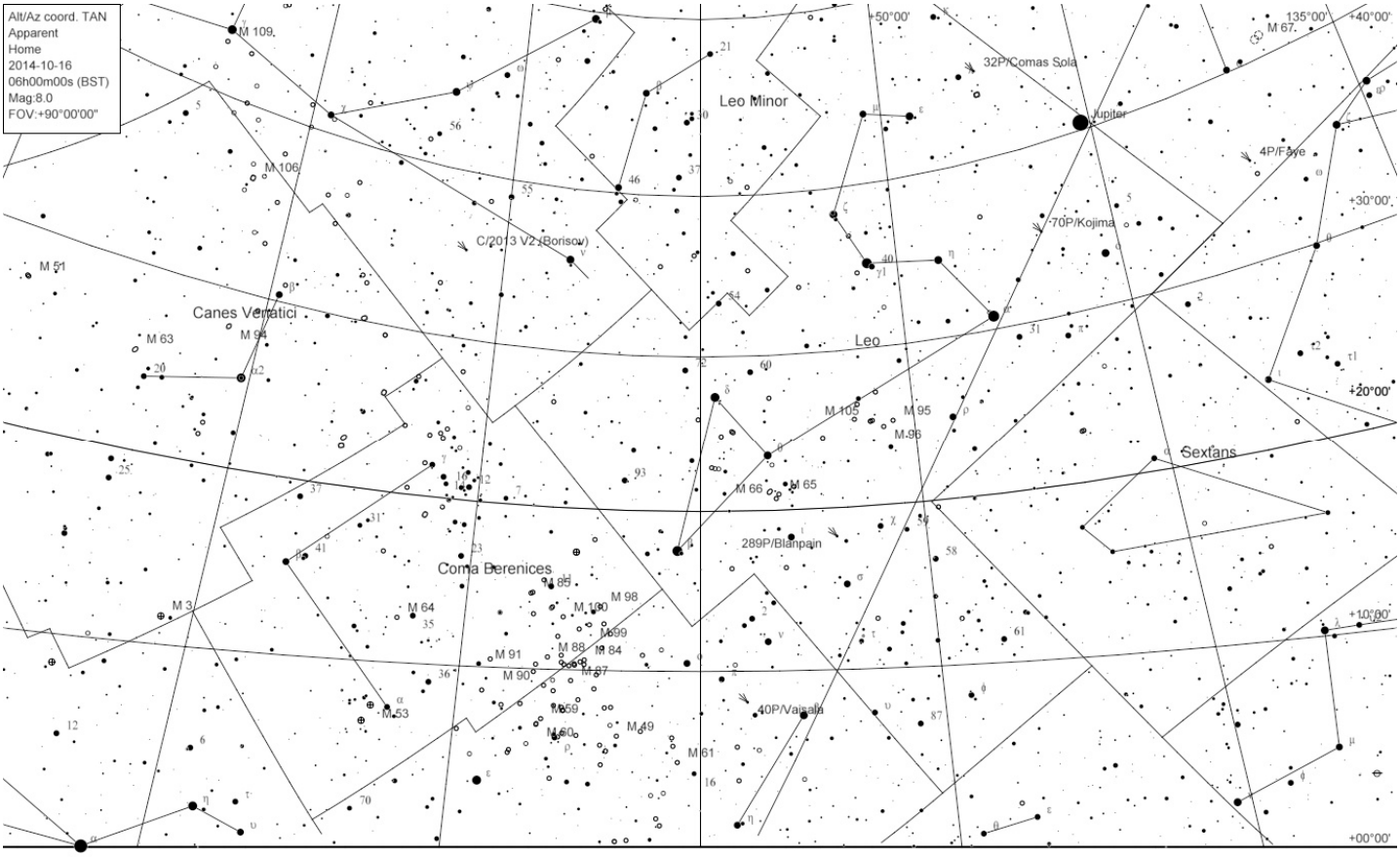
•**October 8, 9** - **Draconids Meteor Shower.** The Draconids is a minor meteor shower producing only about 10 meteors per hour. It is produced by dust grains left behind by comet 21P Giacobini-Zinner, which was first discovered in 1900. The shower runs annually from October 6-10 and peaks this year on the the night of the 8th and morning of the 9th. Unfortunately the glare from the full moon this year will block out all but the brightest meteors. If you are extremely patient, you may be able to catch a few good ones. Best viewing will be just after midnight from a dark location far away from city lights. Meteors will radiate from the constellation Draco, but can appear anywhere in the sky.

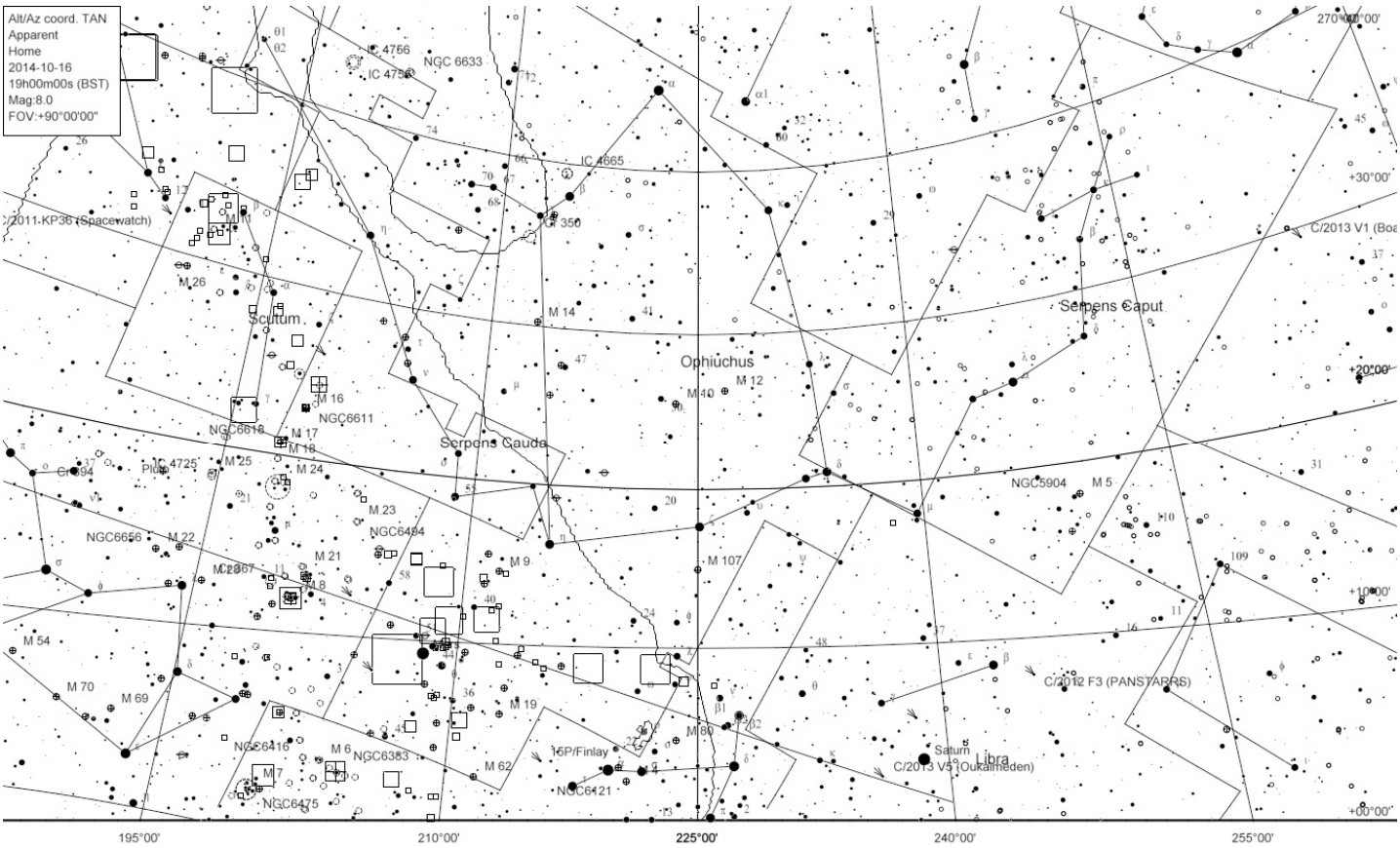
•**October 22, 23** - **Orionids Meteor Shower.** The Orionids is an average shower producing up to 20 meteors per hour at its peak. It is produced by dust grains left behind by comet Halley, which has been known and observed since ancient times. The shower runs annually from October 2 to November 7. It peaks this year on the night of October 21 and the morning of October 22. This will be an excellent year for the Orionids because there will be no moon to interfere with the show. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Orion, but can appear anywhere in the sky.

•**October 23** - **Partial Solar Eclipse.** A partial solar eclipse occurs when the Moon covers only a part of the Sun, sometimes resembling a bite taken out of a cookie. A partial solar eclipse can only be safely observed with a special solar filter or by looking at the Sun's reflection. The partial eclipse will be visible throughout most of North and Central America.

Clear skies...

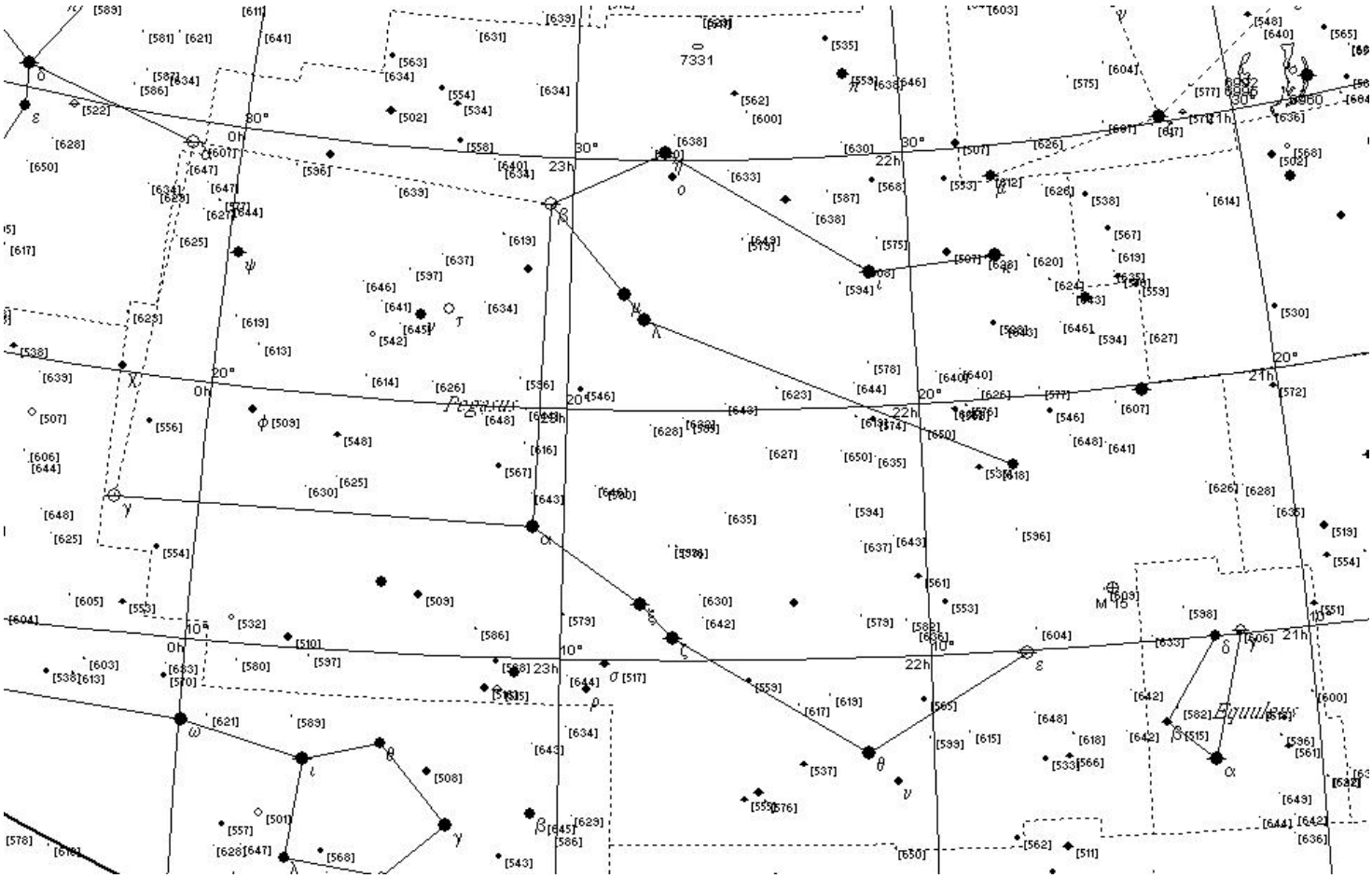
EASTERN MORNING SKIES AND EVENING WESTERNSKIES MID MONTH





Note the change of angle of the ecliptic...

CONSTELLATIONS OF THE MONTH: PEGASUS



Pegasus, the winged horse, flew out of the head of Medusa when Perseus slew her. It was fathered by Poseidon, some time earlier, and waited for the Gorgon's death to appear. (Medusa's story is told under the constellation "Cepheus".)

Athene gave Pegasus to Bellerophon (a grandson of Sisyphus), who used the winged creature in his fight against the Chimaera - a monstrous female with three heads.

Bellerophon shot arrows at the beast as he flew above her on Pegasus, then he stuck between her jaws a huge lump of lead. The monster's own breath melted the lead, which then flowed down her throat and burned her to death.

Now Bellerophon was sent off on another mission, which he accomplished with equal aplomb. Flushed with victory, he flew off for Olympus, home of the gods, as if he too were immortal. Zeus sent a gadfly, which stung Pegasus on the bum, and Bellerophon was kicked off the horse.

Pegasus went alone to Olympus, where he was used by Zeus to carry around his thunderbolts. As for Bellerophon, for his presumption of greatness, he wandered about the earth for the rest of his life, blind, lame, and shunned by man, until dying of old age.

Pegasus is a conspicuous constellation which includes the so-called "Great Square of Pegasus". However it must now share the northeast corner of the square with Andromeda: *delta Pegasus* was given to Andromeda, to provide the lady with a head!

The stars are generally second and third magnitude. There are several interesting binaries here, a curious flare star, and one outstanding deep sky object.

Double stars in Pegasus:

Kappa Pegasi is a very close binary, with an orbit of only 11.52 years: 4.8, 5.3; presently the companion is at PA 132 degrees and separation of only 0.2".

37 Pegasi is another close binary, with an orbit of 140 years: 5.8, 7.1; presently the companion is found at PA 118 degrees and separation of 0.8".

85 Pegasi is a well-known close binary with orbit of 26.27 years: 5.8, 8.9; currently the companion is at PA 149 degrees and separation of 0.8".

Variable stars in Pegasus:

Epsilon Pegasi is an irregular (Lb type) variable, and a flare star with a relatively cool shell. This supergiant can get as bright as 0.7 magnitude, and dimmer than 3.5. Generally it stays around 2.4.

Deep Sky Objects in Pegasus:

Pegasus has many galaxies and an outstanding globular cluster.

M15 (NGC 7078) is one of the finest globular clusters in the heavens, very bright and compact, at 35,000 to 40,000 light years away. It is found four degrees NW of epsilon Pegasi.

Globular cluster M15 is among the more conspicuous of these great stellar swarms. At a distance of about 33,600 light years, its diameter of 18.0 arc min corresponds to a linear extension of about 175 light years, and its total visual brightness of 6.2 magnitudes corresponds to an absolute magnitude of -9.17, or roughly 360,000 times that of our sun. Its brightest stars are about of apparent magnitude 12.6 or absolute magnitude -2.8 or a luminosity of 1,000 times that of our

Sun, and its horizontal branch giants are about of magnitude 15.6. Its overall spectral type has been determined as F3 or F4. The globular cluster is approaching us at 107 km/sec.

In amateur instruments, M30 appears somewhat smaller, perhaps about 7 arc minutes visually and 12.3 arc minutes photographically. On the other hand, the tidal radius of this globular cluster, beyond which member stars would escape because of the Milky Way galaxy's tidal forces is a bit larger: 21.5 arc minutes, corresponding to a distance of 210 light years from the cluster's center.

This globular cluster has the third rank in known variable star population, after M3 and Omega Centauri; a total of 112 variables have been identified. One of them is apparently a Cepheid of Type II (a W Virginis star).

M15 is perhaps the densest of all (globular) star clusters in our Milky Way galaxy. The Hubble Space Telescope has photographically resolved its superdense core. M15's core

has undergone a process of contraction called "core collapse", which is common in the dynamical evolution of globulars; of the 150 known globular cluster within our Milky Way Galaxy according to W.E. Harris' database, 21 have been found to contain a collapsed core (among them, besides M15, the Messier globulars M30 and M70), and there are 8 more candidates, among them M62. This central core is extremely small compared to the cluster, only about 0.14 arc minutes (8,4 arc seconds) in angular diameter, corresponding to a linear extent of roughly 1.4 light years. The half-mass radius is 1.06 arc min, or linearly about 10 light years - half the mass of this cluster is concentrated in the innermost sphere of that radius. It is still unclear if the central core of M15 is packed so dense simply because of the mutual gravitational interaction of the stars it is made of, or if it houses a dense, supermassive object, which would be resembling the supermassive objects in galactic nuclei. The one in M15 would among the nearest and better observable to us, being only little more remote than the Galactic Center and much less obscured by interstellar matter. Although the true nature of these objects remains obscure for the moment, many scientists believe they are strong candidates for "Black Holes".

M15 was discovered by Jean-Dominique Maraldi (Maraldi II, 1709-88) on September 7, 1746 while he was looking for De Chéseaux' comet; he described it as 'A nebulous star, fairly bright and composed of many stars'. Charles Messier, who cataloged it on June 3, 1764, and Johann Elert Bode couldn't make this out and described it as 'nebula without stars,' so that it remained to William Herschel in 1783 to resolve this fine star cluster.

M15 was the first globular cluster in which a planetary nebula, Pease 1 or K 648 ("K" for "Kuster"), could be identified (Pease 1928, on photographic plates taken at Mt. Wilson in 1927). Leos Ondra has provided more information on this planetary nebula. In 1976 Peterson has reported a possible second planetary nebula in this globular, situated near its center, which was however never confirmed since (thanks to Leos Ondra for pointing out this fact), so that Pease 1 remains one of only four known planetary nebulae in Milky Way globular clusters.

M15 can be found extremely easily: Find the 2nd mag star Epsilon Pegasi, and Theta Pegasi SE of it. Follow the line from Theta over Epsilon and find M15 3 1/2 deg W and 2 1/4 deg N of Epsilon. A 6th mag star is about 20' away to the East, another one of mag 7.5 about 5' to the NNE.

With its apparent visual brightness of magnitude 6.2, M15 is about at the limit of visibility for the naked eye under very good conditions. The slightest optical aid, opera glass or small binoculars, reveals it as a round nebulous object. It appears as a round mottled nebula in 4-inch telescopes, with at best the very brightest stars visible, but otherwise unresolved in a fine star field. In larger telescopes more and more stars become visible the outer parts are resolved, with a more irregular, non-circular outline. The compact core, however, stays unresolved even in large amateur telescopes, but the brightest stars can be glimpsed even there. Chains and streams of stars seem to radiate out of this core in all directions, but less concentrated toward the West.

NGC 7331 is a spiral galaxy resembling the Milky Way Galaxy; it's as if we were looking at outselves from fifty million light years away.

NGC 7479 is a barred spiral galaxy about three degrees due south of alpha Pegasi.

Stephan's Quintet is a noted cluster of galaxies half a degree SSW of NGC 7331. See how many of the five you can spot (three is average, four is good).

COMETS some definitions

A **comet** is an icy small Solar System body that, when passing close to the Sun, heats up and begins to outgas, displaying a visible atmosphere or coma, and sometimes also a tail. These phenomena are due to the effects of solar radiation and the solar wind upon the nucleus of the comet. Comet nuclei range from a few hundred metres to tens of kilometres across and are composed of loose collections of ice, dust, and small rocky particles. The coma and tail are much larger and, if sufficiently bright, may be seen from the Earth without the aid of a telescope. Comets have been observed and recorded since ancient times by many different cultures.

Comets have a wide range of orbital periods, ranging from several years to several millions of years. Short-period comets originate in the Kuiper belt or its associated scattered disc, which lie beyond the orbit of Neptune. Longer-period comets are thought to originate in the Oort cloud, a spherical cloud of icy bodies extending from outside the Kuiper Belt to halfway to the next nearest star. Long-period comets are directed towards the Sun from the Oort cloud by gravitational perturbations caused by passing stars and the galactic tide. Hyperbolic comets may pass once through the inner Solar System before being flung out to interstellar space along hyperbolic trajectories.

Comets are distinguished from asteroids by the presence of an extended, gravitationally unbound atmosphere surrounding their central nucleus. This atmosphere has parts termed the coma (the central atmosphere immediately surrounding the nucleus) and the tail (a typically linear section consisting of dust or gas blown out from the coma by the Sun's light pressure or outstreaming solar wind plasma).

As of August 2014 there are 5,186 known comets, a number which is steadily increasing. However, this represents only a tiny fraction of the total potential comet population, as the reservoir of comet-like bodies in the outer Solar System may number one trillion. Roughly one comet per year is visible to the naked eye, though many of these are faint and unspectacular. Particularly bright examples are called "Great Comets".

Orbital characteristics

Most comets are small Solar System bodies with elongated elliptical orbits that take them close to the Sun for a part of their orbit and then out into the further reaches of the Solar System for the remainder. Comets are often classified according to the length of their orbital periods: The longer the period the more elongated the ellipse.

Short period

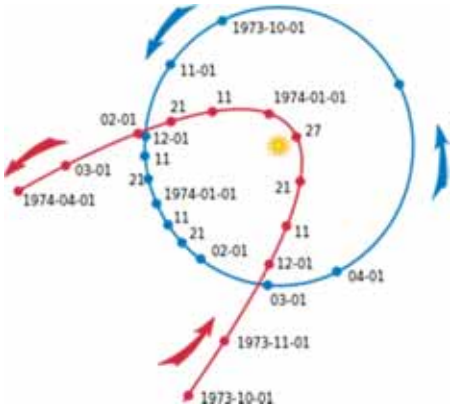
Periodic comets or short-period comets are generally defined as having orbital periods of less than 200 years. They usually orbit more-or-less in the ecliptic plane in the same direction as the planets. Their orbits typically take them out to the region of the outer planets (Jupiter and beyond) at aphelion; for example, the aphelion of Halley's Comet is a little beyond the orbit of Neptune. Comets whose aphelia are near a major planet's orbit are called its "family". Such families are thought to arise from the planet capturing formerly long-period comets into shorter orbits.

At the shorter extreme, Encke's Comet has an orbit that does not reach the orbit of Jupiter, and is known as an Encke-type comet. Short-period comets with orbital periods shorter than 20 years and low inclinations (up to 30 degrees) are called "Jupiter-family comets". Those like Halley, with orbital periods of between 20 and 200 years and inclinations extending from zero to more than 90 degrees, are called "Halley-type comets". As of 2014[update], only 74 Halley-type comets have been observed, compared with 492 identified Jupiter-family comets.

Recently discovered main-belt comets form a distinct class, orbiting in more circular orbits within the asteroid belt. Because their elliptical orbits frequently take them close to the giant planets, comets are subject to further gravitational perturbations. Short-period comets display a tendency for their aphelia to coincide with a gas giant's orbital radius, with the Jupiter family of comets being the largest. It is clear that comets coming in from the Oort cloud often have their orbits strongly influenced by the gravity of giant planets as a result of a close encounter. Jupiter is the source of the greatest perturbations, being more than twice as massive as all the other planets combined. These perturbations can deflect long-period comets into shorter orbital periods.

Based on their orbital characteristics, short-period comets are thought to originate from the centaurs and the Kuiper belt/scattered disc—a disk of objects in the trans-Neptunian region—whereas the source of long-period comets is thought to be the far more distant spherical Oort cloud (after the Dutch astronomer Jan Hendrik Oort who hypothesised its existence). Vast swarms of comet-like bodies are believed to orbit the Sun in these distant regions in roughly circular orbits. Occasionally the gravitational influence of the outer planets (in the case of Kuiper belt objects) or nearby stars (in the case of Oort cloud objects) may throw one of these bodies into an elliptical orbit that takes it inwards toward the Sun to form a visible comet. Unlike the return of periodic comets, whose orbits have been established by previous observations, the appearance of new comets by this mechanism is unpredictable.[77]

Long period



Orbits of the Kohoutek Comet (red) and the Earth (blue), illustrating the high eccentricity of its orbit and its rapid motion when close to the Sun.

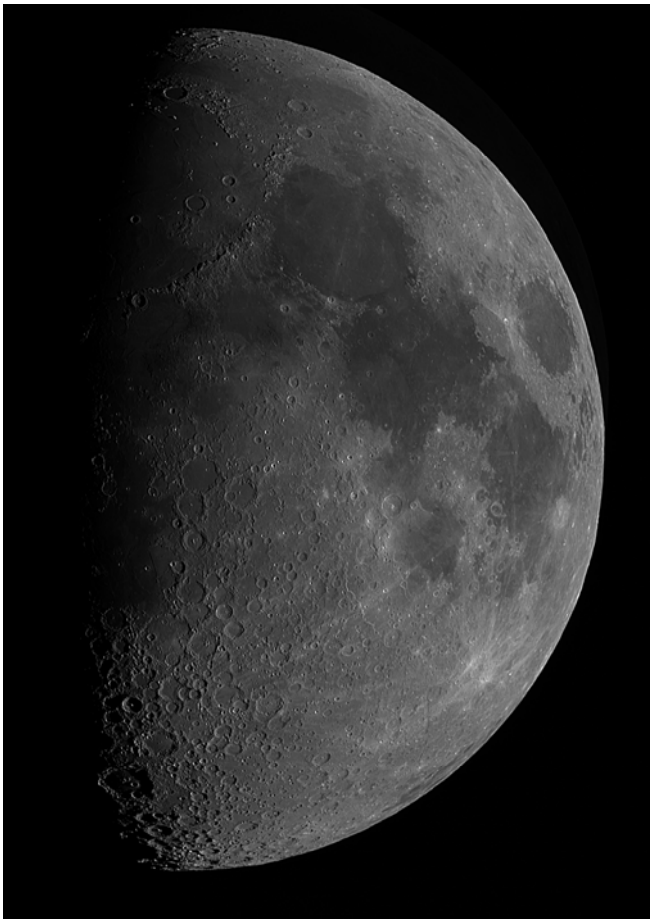
Long-period comets have highly eccentric orbits and periods ranging from 200 years to thousands of years.[79] An eccentricity greater than 1 when near perihelion does not necessarily mean that a comet will leave the Solar System.[80] For example, Comet McNaught had a heliocentric osculating eccentricity of 1.000019 near its perihelion passage epoch in January 2007 but is bound to the Sun with roughly a 92,600-year orbit because the eccentricity drops below 1 as it moves further from the Sun. The future orbit of a long-period comet is properly obtained when the osculating orbit is computed at an epoch after leaving the planetary region and is calculated with respect to the center of mass of the Solar System. By definition long-period comets remain gravitationally bound to the Sun; those comets that are ejected from the Solar System due to close passes by major planets are no longer properly considered as having "periods". The orbits of long-period comets take them far beyond the outer planets at aphelia, and the plane of their orbits need not lie near the ecliptic. Long-period comets such as Comet West and C/1999 F1 can have apoapsis distances of nearly 70,000 AU with orbital periods estimated around 6 million years.

ISS PASSES For September 2014

From Heavens Above website maintained by Chris Peat

Date	Brightness	Start	Highest point	End					
	(mag)	Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.
07 Oct	-0.4	20:58:54	10°	SW	20:59:03	11°	SW	20:59:03	11°	SW
08 Oct	-1.7	20:10:03	10°	SSW	20:12:08	22°	SSE	20:12:08	22°	SSE
09 Oct	-1.4	19:21:29	10°	S	19:23:36	16°	SE	19:25:03	13°	ESE
09 Oct	-1.2	20:56:31	10°	WSW	20:57:55	23°	SW	20:57:55	23°	SW
10 Oct	-2.8	20:07:19	10°	SW	20:10:29	42°	SSE	20:10:42	41°	SE
11 Oct	-2.2	19:18:14	10°	SSW	19:21:12	30°	SSE	19:23:22	15°	E
11 Oct	-1.6	20:54:18	10°	WSW	20:56:13	32°	WSW	20:56:13	32°	WSW
12 Oct	-3.3	20:04:54	10°	WSW	20:08:13	68°	SSE	20:08:47	54°	ESE
12 Oct	0.2	21:41:33	10°	W	21:41:37	10°	W	21:41:37	10°	W
13 Oct	-2.9	19:15:33	10°	SW	19:18:48	52°	SSE	19:21:16	16°	E
13 Oct	-1.6	20:52:04	10°	W	20:54:06	34°	W	20:54:06	34°	W
14 Oct	-3.4	20:02:34	10°	W	20:05:55	90°	S	20:06:32	57°	E
14 Oct	0.2	21:39:16	10°	W	21:39:21	11°	W	21:39:21	11°	W
15 Oct	-3.3	19:13:04	10°	WSW	19:16:24	79°	SSE	19:18:54	17°	E
15 Oct	-1.6	20:49:45	10°	W	20:51:43	33°	W	20:51:43	33°	W
16 Oct	-3.4	20:00:11	10°	W	20:03:32	85°	N	20:04:03	60°	E
17 Oct	-3.3	19:10:35	10°	W	19:13:56	86°	N	19:16:22	17°	E
17 Oct	-1.4	20:47:17	10°	W	20:49:11	31°	W	20:49:11	31°	W
18 Oct	-3.4	19:57:40	10°	W	20:01:00	83°	SSW	20:01:29	63°	ESE
19 Oct	-3.3	19:08:02	10°	W	19:11:22	88°	N	19:13:46	18°	E
19 Oct	-1.3	20:44:44	10°	W	20:46:35	27°	WSW	20:46:35	27°	WSW
20 Oct	-3.0	19:55:02	10°	W	19:58:19	57°	SSW	19:58:53	48°	SSE
21 Oct	-3.2	19:05:20	10°	W	19:08:39	74°	SSW	19:11:12	16°	ESE
21 Oct	-0.9	20:42:15	10°	W	20:44:01	21°	WSW	20:44:01	21°	WSW
22 Oct	-1.9	19:52:21	10°	W	19:55:24	34°	SSW	19:56:23	27°	S
23 Oct	-2.4	19:02:31	10°	W	19:05:44	47°	SSW	19:08:48	11°	SE
23 Oct	-0.4	20:40:20	10°	WSW	20:41:38	12°	SW	20:41:38	12°	SW
24 Oct	-0.8	19:49:50	10°	W	19:52:14	18°	SW	19:54:09	12°	S
25 Oct	-1.3	18:59:44	10°	W	19:02:35	27°	SSW	19:05:26	10°	SSE
27 Oct	-0.3	17:57:20	10°	WSW	17:59:11	14°	SW	18:01:02	10°	S
08 Nov	0.0	06:21:51	10°	SSE	06:23:09	12°	SE	06:24:27	10°	ESE
10 Nov	-0.8	06:16:14	10°	SSW	06:18:53	23°	SE	06:21:33	10°	E
11 Nov	-0.4	05:26:46	10°	S	05:28:47	15°	SE	05:30:49	10°	ESE
12 Nov	-2.0	06:11:32	10°	SW	06:14:38	40°	SSE	06:17:46	10°	E

PARTING SHOT



The Moon from 2nd October 2014, just around 8day phase, we can see beyond Sinus Medii, the approximate centre of the Moon as viewed from the Earth with the synchronous rotation keeping this face looking at us.

The left hand image is 2 regions videoed and joined together in PTGui. Registax can occasionally stumble on the large images from the DMK51au camera, and I find resaving the video through free Virtual Bub software can get rid of cloudy frames and anomalies.

Very useful when you then add magnification using a power mater and need 14 regions of 500 frame video stacks to make a high definition image as on the right.

Andy Burns TMB102 mounted on NEQ6 mount.

Had to rush these between houses for a 50 minute opportunity, and low clouds.

Wiltshire Astronomical Society Observing List & Sky Notes - September 2014

Deep Sky Objects			
Object Ref / Name	**Type & Mag**	**Constellation**	**Biography / Observing Notes**
Albireo	DS	Cygnus	A lovely double star at the head of Cygnus, Albireo is a lovely gold and blue double, resolvable in binoculars.
Coathanger (CR 399)	AST	Vulpecula	It looks like its description. Locate Albireo in binoculars, and move gently southwards, finding two stars (Anser - Alpha Vulpeculae, an optical binary) close together. Keep on this line and as the two stars leave the field of view, the Coathanger comes into view.
M13 / M92	GC 5.7 & 6.4	Hercules	Easy binocular objects, these globular clusters are a summer favourite of many. M13 has a diameter of around 140 light years and contains several hundred thousand stars. In binoculars, it resolves to a small fuzzy blob; apply a moderate aperture telescope and the stars resolve into chained links; spend a while following these around and tracing these, don't be afraid to apply some magnification. M92 lies outside the keystone between the arms of Hercules and is smaller but still resolvable in a telescope and visible in binoculars.
NGC 457	OC 6.4	Cassiopeia	Also known as the Owl or ET cluster, 457 is easily seen in binoculars, and resolvable in a small telescope. Locate the distinctive W of Cassiopeia, then find the 4th star Delta; NGC 457 lies at around the 5 o'clock position from the star
M71	GC 8.3	Sagitta	A globular (or maybe a loose open) cluster which lies 12,000 light years away and is 27 light years across. It sits approximately halfway down the shaft of Sagitta and should be detectable in binoculars.
Garnet Star (Mu Cephei)	VS 3.4 to 5.1	Cepheus	Known as the Garnet Star due to its striking red/orange colour, this red super giant had a diameter which would place it past the orbit of Jupiter if it were our Sun! It lies some 3,000 light years away.
M15	GC 6.3	Pegasus	M15 lies around 33,000 light years from Earth and is an easy one to spot in binoculars. Locate the square of Pegasus, then take a straight line through Baham and Enif, extending the line from Enif a little shorter than the distance between the two stars. You'll easily spot the globular in binoculars.
M56	GC 8.4	Lyra	Overlooked due to its numerical successor, M56 is another globular to challenge binocular skills, but easy in a telescope. Take a straight line from Albireo through to Sulafat (bottom left hand star of Lyra). About half way along, you'll spot what I see as an open chevron of stars (some see it as a 7). M56 lies at the lower end of the chevron, a little to the left of the bottom star.
NGC 7331	GX 10	Pegasus	NGC 7331 is one of the Herschel 400 objects and appears in the list of the RASC Finest NGC objects. You'll need a map for this one to make it easy; locate the square of Pegasus and the top right star, Scheat. From here locate Lambda and Eta Pegasi, drawing a line from Lambda to Eta. Extend the line about 2/3 the distance between the two stars, and 7331 lies to the right of the line. It is the brightest member of a group of galaxies, with several smaller dimer ones adjacent. An 8" scope is needed to resolve these

KEY	PN planetary nebula	EN emission nebula	BN bright nebula	DN dark nebula	RN reflection nebula	OC open cluster	GX galaxy	AST asterism	VS variable star	DS double star	SNR supernova remnant	GC Globular Cluster

Observing Evenings

For the new season in September, we'll be offering a different approach to the observing sessions. Historically, they have been the last Friday in the month, but now we're setting dates in advance up to May 2015 so we have these in place and in diaries for those who want to come along. This way we can plan ahead to take advantage of dark, new moon skies or to be bathed in moonlight! It is also a team effort; Tony Vale has kindly agreed to be a team member along with myself for arranging sessions and issuing "On" or "Off" notices.

Clouds in September meant no observing done so conditions in October will give the same observing targets as September.

Jonathan Gale

OUTREACH ACTIVITIES

October 13th Potterne WI and families, talk then viewing session

November 7th, Shoscombe school, Brownies and Girl Guides. 28th, Shoscombe School Pupils.

December 17th? Melksham centre.