

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

Closer to the Sun

Wiltshire Society Page	2
Swindon Stargazers	3
Beckington AS and Herschel Society	4
NASA Space Place Dance of the Planets	5
Viewing Logs emails	5-9
Space News Landing sites chosen for 2020 Mars rover Exoplanets need land and water Big hole for ELT Kepler is shut down Parker Solar Probe Hubble revived after cold boot. Comet 46P should be best of (poor) year Dawn runs out of fuel Dramatic Soyuz failure on launch, fault found and cosmonauts safe	10-17
What's Up November 2018	18-22
Constellation of the Month Pegasus	23-24
Space Station Timings	25
IMAGES, VIEWING SESSIONS and OUTREACH	26

Firstly thank yous are in order for Sam Franklin and Martin Page for eventually getting together for the hand over of the Website: www.wasnet.org.uk.

It is now under construction to include what we need to advance through into the next decade with a regular attendee at its helm. It will take a while to sort so please be patient.

Tonight's speaker is Peter Williamson who is now turning his astronomy towards the Sun, and he will be giving us an insight of our nearest star. But he is well aware we have a lot of unresolved questions about the Sun, and its mechanics and we are basing a lot of our studies on a very small period of our star's history, a few decades of observations (apart from Sunspot recording which goes back a few centuries) out of 5 BILLION years.

We have to look at the birth and death of stars elsewhere in our galaxy to give us either end of our Sun's story.

News last week of the Parker Solar Probe is now the closest object to the Sun that we've ever sent into space. On Oct. 29, 2018, at about 1:04 p.m. EDT, NASA's probe broke the old record for the close-to-Sun distance of 42.73 million km (26.55 million miles). That record was held by the German-American Helios 2 spacecraft in 1976. which was launched on August 12th, 2018, on a projected 6+ year mis-

sion. The mission is designed to answer 60 year old questions regarding our Sun:

How do energy and heat move through the Corona?

How do the structure and dynamics of the magnetic fields accelerate the solar winds?

What mechanisms accelerate and transport energetic particles?

In order to answer these questions, the probe has to get closer to the Sun than any object before it. It will move directly through the Sun's outer corona, and come as close as 6.9 million kilometers (4.3 million miles).

So we have a few more years before we can get answers to many questions, and undoubtedly, as many new questions will need asking after we get results from the Parker Probe.

This is one of the exciting things about astronomy as a science. It is developing and creating as many questions for the next generations as there have been answers found. And like all science, it is prepared to change theories as data and evidence change.

Clear Skies Andy

I could not make the session at Bratton Camp as I was in Menorca, so here is the startrail I made there.

This startrail is looking North East and includes Capella, The Pleiades (bottom right hand corner), Perseus and Cassiopeia. The sign in the picture says "Vista Panoramica" which is very appropriate.

Canon G16 in Startrail Mode, 120x30 sec, F1.8, ISO 400, 28mm.

John Dartnell

Thankyou John for showing me the wonderful startrail capabilities with-in the G range of compact cameras—Andy



Wiltshire Society Page

Wiltshire Astronomical Society

Web site: www.wasnet.org.uk

Meetings 2018/2019 Season.

NEW VENUE the Pavilion, Rusty Lane, Seend

Meet 7.30 for 8.00pm start

Date	Speaker	Title
6 Nov	Pete Williamson:	The Sun & How it Works.
4 Dec	Dr Elizabeth Pearson:	A very brief History of Rovers & Landers.
2019		
15 Jan		Open Forum/Beginners Meet.
5 Feb	Prof. David Southwood:	Mars: Delirium, Delight & Disasters, some personal stories.
5 Mar	Martin Griffiths:	'Universal Death' or How the Universe is trying to kill us.
2 Apr	Chris Starr:	A Most beautiful Moon – A History of Lunar Exploration.
7 May	Mark Radice:	Observing the Solar System.
4 Jun	Jon Gale:	Observing the Herschel 400.

Pete Williamson embarked on his astronomical journey in 1967 when I started Hagley RC Secondary School and noticed an observatory in a garden near the school playing fields in the village of Churchill Worcestershire.



After several attempts of knocking on the door of the owner and being told to go away I was eventually allowed in to take a look. The observatory was owned by Mr Brian Manning a noted discoverer of asteroids...

In 2012 things changed as far as music was concerned enabling me to concentrate on astronomy in earnest again. I

went back to University (home study) and obtained full astronomical certification with UCLAN & Planetary Geology with John Moors University. I purchased many new pieces of equipment and found a new calling which is Solar Astronomy. Not being one to sit on the sidelines I looked for work within the world of astronomy and before long was presenting [BBC Radio Shropshire Eye On the Sky](#), a regular sky guide with features for the beginner plus any other astronomical events the BBC require. I have had many solar & Deep Sky images to date published worldwide and in some odd places such as a lifestyle magazine in Dubai.

He now does solar imaging, Deep Sky Imaging with robotic Telescope workshops for organisations or the individual and not just in the UK, I also have many images published in the major Astronomical Journals and books around the globe plus I write articles for publications when asked to do so.

In 2015 I created and built an internet based radio station entitled [Astro Radio](#) and now have many people working as volunteers within the organisation with sponsorship via [Astronomy Now Magazine](#), [Astro Farm France](#) & [iTelescopes Australia](#).

[Solarsphere Astronomical & Music Festival](#) is another one of my projects along with my Daughter Sarah in which we try to bring the world of astronomy and music together and in doing so introduce the world of astronomy to a new audience whilst enthusing the young to take up science.

(From the Pete Williamson web site)

Membership Meeting nights £1.00 for members £3 for visitors

Wiltshire AS Contacts

Keith Bruton Chair, keisana@tiscali.co.uk

Vice chair: Andy Burns and newsletter editor.

Email anglesburns@hotmail.com

Bob Johnston (Treasurer) Debbie Croker (vice Treasurer)

Philip Proven (Hall coordinator) Dave Buckle (Teas)

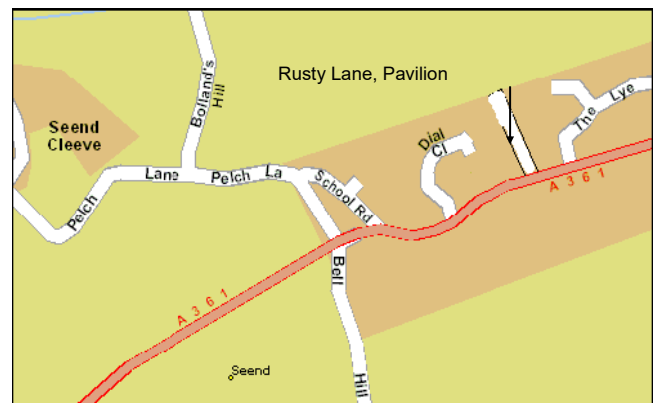
Peter Chappell (Speaker secretary)

Nick Howes (Technical Guru)

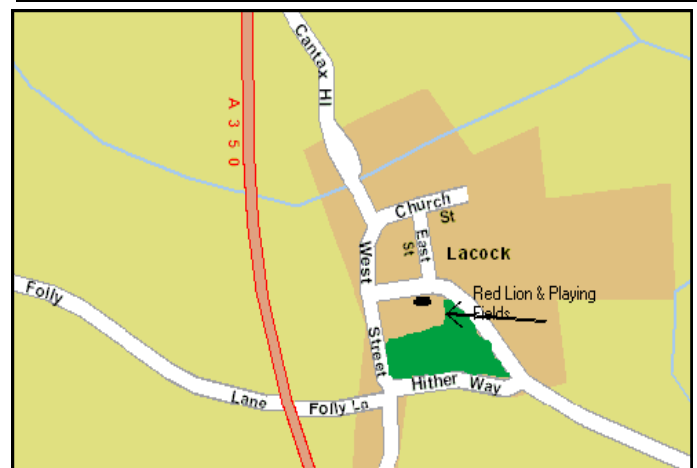
Observing Sessions coordinators: Jon Gale, Tony Vale

Web coordinmator: Sam Franklin

Contact via the web site details.



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!

PLEASE see our proposed changes to the observing sessions, contacting and other details. Back Page

Note this year we have moved away from the '4th Friday of the month' routine to get away from nights when the Moon is too bright to view other objects, so may be 1st Friday of month...



Swindon Stargazers

The club meets once a month at Liddington Hall, Church Road, Liddington, Swindon, SN4 0HB at 7.30pm. See programme below.

Stargazing Season

We have quite a few observers at Swindon Stargazers so we are very much looking forward to the winter season.

Ad-hoc viewing sessions

Regular stargazing evenings are being organised near Swindon. To join these events please visit our website for further information.

Lately we have been stargazing at Blakehill Farm Nature Reserve near Cricklade, a very good spot with no distractions from car headlights.

We often 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.htm>

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 at Liddington Village Hall, Church Road, Liddington, SN4 0HB – 7.30pm 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.htm>

Meeting Dates for 2018

Friday 16 November 2018

Programme change: Dr Robin Clegg - Exoplanets and the Search for Life

Friday 14 December 2018

Programme: Christmas Social

Meeting Dates for 2019

Friday 18 January 2019

Programme: Ray Doran, Reaction Engines: SABRE: Unlocking the future of Hypersonic Flight and Space Access

Friday 15 February 2019

Programme: Graham Bryant: Astronomical Events that have effected Human History

Friday 15 March 2019

Programme: AGM plus Viv Williams: Astro Imaging - the Basics

Friday 12 April 2019

Programme: Dr. Sarah Bosman: Dark Matter the most distant Objects

Friday 17 May 2019

Programme: Mark Woodland FRAS: Exoplanets and the Charterhouse Exoplanet Project

Friday 21 June 2019

Programme: TBA

Website:

<http://www.swindonstargazers.com>

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.com

Address: 17, Euclid Street,

Swindon, SN1 2JW

BECKINGTON ASTRONOMICAL SOCIETY

Society Details & Speakers programme can be found on our Website www.beckingtonas.org

General enquiries about the Society can be emailed to chairman@beckingtonas.org.

Our Committee for 2016/2017 is

Chairman: Steve Hill (email chairman@beckingtonas.org)

Treasurer: John Ball

Secretary: Sandy Whitton

Ordinary Member: Mike Witt

People can find out more about us at www.beckingtonas.org

Meetings take place in Beckington Baptist Church Hall in Beckington Village near Frome.

See the location page for details of how to find us on our website.....

Post Code for Sat Nav is BA11 6TB.

Our start time is 7.30pm.

16th November	<i>Around the Universe in 40 minutes</i>	Grant Privett
7th December	Social Evening + bring and tell	
18th January	<i>The Mathematical Universe</i>	Steve Hill
15th February	<i>Journey to the Edge of the Solar System</i>	Chris Starr
15th March	<i>How Old Is It?</i>	Stephen Tonkin
26th April	<i>Observing and Sketching the Deep Sky</i>	Mark Radice
17th May	<i>The Herschel 400</i>	Jonathan Gale
21st June	Annual General Meeting <i>Member Talks</i>	

Herschel Society

Next lecture at Bath University

[Wednesday 21st November – Caroline Herschel Prize Lecture. Bath University.](#)



November's Dance of the Planets

By Jane Houston Jones and David Prosper

November's crisp autumn skies bring great views of our planetary neighbors. The Moon pairs up with Saturn and Mars in the evenings, and mornings feature eye-catching arrangements with dazzling Venus. Stargazers wanting a challenge can observe a notable opposition by asteroid 3 Juno on the 17th and watch for a few bright Leonid meteors.

Red **Mars** gleams high in the southern sky after sunset. **Saturn** sits westward in the constellation Sagittarius. A young crescent Moon passes near Saturn on the 10th and 11th. On the 15th a first quarter Moon skims by Mars, coming within 1 degree of the planet. The red planet receives a new visitor on November 26th, when NASA's InSight mission lands and begins its investigation of the planet's interior. News briefings and commentary will be streamed live at: bit.ly/landsafe

Two bright planets hang low over the western horizon after sunset as November begins: **Jupiter** and **Mercury**. They may be hard to see, but binoculars and an unobstructed western horizon will help determined observers spot them right after sunset. Both disappear into the Sun's glare by mid-month.

Early risers are treated to brilliant **Venus** sparkling in the eastern sky before dawn, easily outshining everything except the Sun and Moon. On November 6th, find a location with clear view of the eastern horizon to spot Venus next to a thin crescent Moon, making a triangle with the bright star Spica. The following mornings watch Venus move up towards Spica, coming within two degrees of the star by the second full week of November. Venus will be up three hours before sunrise by month's end – a huge change in just weeks! Telescopic observers are treated to a large, 61" wide, yet razor-thin crescent at November's beginning, shrinking to 41" across by the end of the month as its crescent waxes.

Observers looking for a challenge can hunt asteroid **3 Juno**, so named because it was the third asteroid discovered. Juno travels through the constellation Eridanus and rises in the east after sunset. On November 17th, Juno is at opposition and shines at magnitude 7.4, its brightest showing since 1983! Look for Juno near the 4.7 magnitude double star 32 Eridani in the nights leading up to opposition. It is bright enough to spot

through binoculars, but still appears as a star-like point of light. If you aren't sure if you have identified Juno, try sketching or photographing its star field, then return to the same area over the next several days to spot its movement.

The **Leonids** are expected to peak on the night of the 17th through the morning of the 18th. This meteor shower has brought "meteor storms" as recently as 2002, but a storm is not expected this year. All but the brightest meteors will be drowned out by a waxing gibbous Moon. Stay warm and enjoy this month's dance of the planets!

You can catch up on all of NASA's current and future missions at nasa.gov

With articles, activities and games **NASA Space Place** encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!



Caption: This finder chart shows the path of the asteroid 3 Juno as it glides past 32 Eridani in November 2018. The asteroid's position is highlighted for selected dates, including its opposition on the 17th. Image created in Stellarium for NASA Night Sky Network.

MEMBERS VIEWING LOGS and IMAGES

11/10/2018

I could not make the session at Bratton Camp as I was in Menorca, so here is the startrail I made there.

This startrail is looking North East and includes Capella, The Pleiades (bottom right hand corner), Perseus and Cassiopeia. The sign in the picture says "Vista Panoramica" which is very appropriate.

Canon G16 in Startrail Mode, 120x30 sec, F1.8, ISO 400, 28mm.



The second image is the night scene when I finished the startrail.



Canon G16, 15 sec, ISO 800, 28mm.

24/10/2018

Hunter's Full Moon Rise

Full Moon 16:45 UT then rising at 17:23 UT at my location according to dateandtime.com, so very close to a full Moon as it came above the horizon.

Low cloud and dust particles have introduced distortion and some interesting colour effects.

Moon images - Canon SX50 HS, F6.5, 1/125, ISO 6400



Hunter's Full Moon after the Moon had cleared the clouds.

Canon SX50HS, 1800mm (50x Optical and 25 x Digital)

F8.0, 1/250 sec, ISO 80

Clear Skies,

John Dartnell

Peter Chappell's Observing Logs

Viewing Log for 29th of October

Had a free evening and the sky was clear, this equals a viewing session for me I knew the Moon would be putting in an appearance later in the evening so the session would not be too long due to Moonlight washing the sky out?

I arrived at my usual viewing site of Uffcott and had my Meade LX90 GOTO telescope set up and ready by 19:58, again I would be using my Pentax 14 mm eye piece giving me a magnification of about 143. The temperature was around 2 ° so the air was crisp but with very little wind it should not be too cold? I noticed the Milky Way directly overhead going towards the western horizon, suggest the skies were pretty clear?

Before I went off to my first target I could see the Hyades star cluster already above the eastern horizon, winter was well on its way! Thought I would start on the planets and Mars was my first target, Mars was not in the field of view yet I had set up the scope pretty well I had thought? After some adjustments it came into view, as usual I could not make out any detail on this planet. As for Uranus and Neptune, these were just dots in the sky! Again I had to do some adjustments to find them as neither where in the eye piece. That was the last of Solar System objects until the Moon came up. I could make out the Square of Pegasus so my first target was M 15; this was a nice bright Globular Cluster (G C) to look at. I had a look at my star atlas (yes even with GOTO equipment I do sometimes look at a star atlas!) I noticed the Saturn Nebula was nearby, this Planetary Nebula (P N) looked like an out of focus star with a bar thru it, hence the name, it also goes by the name NGC 7009 or Caldwell (C) 15. Another Caldwell object in the same area is C 63 better known as the Helix Nebula, could not make out anything apart from it being grey to view! The lowest magnitude one star (1.1) to be seen from the UK shores is Fomalhaut; this white star shines brightly in the southern skies. Last year one object that had been giving me trouble to view was C 27 the Crescent Nebula in Cygnus. Again it was still giving me trouble, I tired with an UHC-E and Deep Sky filter, and neither gave much improvement? I knew I was in the correct area as I would go to

M 27, the Dumbbell Nebula and this object was nearly in the middle of my field of view! Guess it is there BUT I cannot pick it out, maybe a bigger aperture would help me out, need a friend for that one? An object that rarely gets any attention from me is M 71 in Sagitta; this G C was faint to view? Slightly brighter than M 71 was M 56 in Lyra, again another G C. M 57, the Ring Nebula also in Lyra was beautiful to look at. Across the border and into Cygnus to look at M 29, this rectangle of six stars forms the main part of this Open Cluster (O C). M 39 which is below the tail of the Swan is a fairly loose O C. As I was in O C mood, time to look at Auriga and M 38 looks like it had propeller blades in it, M 37 is the denser of the three and finally M 36 a fairly loose O C. While I was viewing these three objects the Moon had finally come above the horizon but was still behind the hedge I had set my telescope up so I had at least another 30 minutes before a shadow would come across my area? Off to Cassiopeia and the usual two of M 52 and M 103, M 52 was compact to look at and M 103 I could make out an arrow head of stars, both of these are O C's. Also in Cassy is NGC 457 better known as the Owl Nebula, this look good to view, another good object to view is the Double Cluster, an object I had not look at in over a year? The Little Dumbbell, M 76 was compact to look at and fairly dim, why this was, the Moon had now cleared the hedge and was making shadows in my area! Final object before the Moon was Albireo, probably the best double star system in the whole sky? Slewed to the Moon and again like Mars was not in the field of view, strange? So I went back to Mars and manually adjusted the telescope to centre Mars, this meant all deep sky objects would no longer be in the field of view if I wanted to go to them? I found Neptune and Uranus and the Moon was now in view, strange might need help on that one? Even using a Moon filter it was still bright to look at, the 70.1 % lit waning Moon or 20.74 days old had some interesting objects on the terminator.

With the Moon raising higher in the sky I decided to call it a day at 21:48, in just under two hours I had about 10 cars go past me which was a lot, normally I might see six at best, even got three on the trot! Temperature had not changed since I had got there and there was hardly any frost/dew on the equipment but I would still have to dry anything off I had used that night at home, very important thing to do with used equipment.

Clear skies.

Peter Chappell

Viewing Log for 2nd of November

This was my first viewing session at Lacock for at least six months, so I was looking forward to it! During the day it had been brilliant sunshine, so I hoped it would carry into the evening, how wrong I would be?

I had the car packed up and set off around 19:30, I noticed cloud in front of me while driving down the M 4 towards junction 17, not another clouded out session crossed my mind. Anyway when I finally got to Lacock several people were already set up and viewing, so as I had come this distance I got my telescope out and was ready to view at 20:13. As usual I would be using my Meade LX90 with 14 mm Pentax eye piece. The skies were not great at all; the cloud bank I had seen on the M 4 was nearly overhead by now, so the 'Summer Triangle' constellations would not be viewed at all? There was still a small gap near the cross of Cygnus, so I got a quick view of M 29. While viewing this Open Cluster (O C), I noticed the stars were not as bright as usual, high thin cloud was around? Off to M 57, the Ring Nebula in Lyra, again I could just about make out this object. By now Mars had reappeared from behind some cloud, so I slewed off to this planet. Just like my previous session at Uffcott (see other viewing log in current magazine) Mars was not in the eye piece yet all the deep sky objects were? I had wondered if I needed to update my software for the Meade, need

to speak to other people with GOTO's to seek their advice? Anyway after doing a slight adjust Mars came to the eye piece, just like others sessions I could not make out any markings on the planet, probably too low in sky for any serious viewing? Time to go in the other direction and look at M 32, this Globular Cluster (G C) was good to look at, same for its near neighbour and M 31 the Great Andromeda Galaxy, as for the third member of this group and M 110, could just about make out this G C? Finding targets was now getting harder due to the cloud, could make out Cassiopeia so I went to M 52 and M 103. Both of these O C's were dim to look at.

By now the cloud had rolled across the whole sky, we gave it another 20 odd minutes but it was not getting any better so it was time to pack up (21:10) and go off for a committee meeting with Jon Gale at the McDonalds in Chippenham J.

We had a reasonable turn out of people at this session; I think we had around eight people including an American voice I could hear, maybe a new member?

Hopefully we have some better sessions at Lacock later in the year?

Peter Chappell

REPORT FROM GRIFFON EDUCATIONAL OBSERVATORY

I went out to Spain on the 12th October for some ME astronomy time on the equipment installed out here all ready to use, from Dobsonian Reflectors (12" and 10" available) plus pier mounts in the dome swapping between a 10" Maksutov Intes Delux 1/20 wave scope for planetary and lunar work, and an incredible 6" iStar flourite triplet scope.both of which can be used visually or mounted with cameras.

Out side is a pier with an EQ6 mount and several scopes are available to fit on this mount (and there are more mounts in the store room Losmandy Gemini 11, EQ6 and HEQ5 mounts), but I used the 102mm Televue for wider field work, though there is a 6" Astrgraph available too. Solar scopes can also be set up, a 60mm Solarscope, 40mm Coronado and a small CAK scope, also spectroscopes available on site with DMK cameras and 2 digital DSLRs (now 3 as I left one I took out with me). There is also a SkyWatcher Travel Adventurer mount for camera only work.

The computers now need some upgrades but all in all it is a great just go there and absorb the skies, mid October, Tshirt and shorts weather 5 clear nights out of 6 were available and two of these very steady seeing and transparency.

Tony Vale and Kath Griffiths were out there with Gwen (much to her delight to smell a familiar person out there).

We were very lucky to catch the neighbours in a tree chopping and vine clearing mode. They cut back the Lalandi and the skies opened up gloriously for us.

No snakes or scorpions about but plenty of



geckos and peafowl to keep us company with the occasional cat!

Using the Maksutov camera for planetary viewing we were able to see the features on Mars, and the Cassini division and many Saturnian moons, with the Moon within 15 degrees!

Imaging through the week with various rigs and my Nikon D810A I was able to build up a library of deep sky objects to large to include here.

Merged three images in PTgui to show the 6 degree area of the veil nebula regions.



By night time the stars were clear enough for wide angle star trail using Canon G7X compact camera, despite a quarter



Moon shining brightly enough to light the dome building.



Even the heart nebula was easy to resolve out from the wider 102mm Televue images.

The last session on the night before I flew home I was joined by a large preying mantis on the scope mount. Took some getting rid of, but he did fly away eventually.

A pyjama log from October 9th morning.

Pyjama log 9th Oct 18

Nearly a splendid morning for a pyjama log... I think any clear skies after even a short spell of bad weather is worth getting out to view the stars, especially with what ever binoculars fall to hand. Today some 11x60 Helios (but suspect they may be slightly cut off to smaller through the prisms but they are good hand holding binoculars when up at silly o'clock to take some pills).

Canon Compact G7 Camera is set up for star trails after a longer shot to pick up Orion, which can just be seen looking between houses to cut off some street lights I have at the front road. Damn being on an 'essential road' round the corner from a fire station.

The view to the north, west and north east has quite a bit of cloud in it as I check for viewing, so front view through the bamboo specially planted to cover a street light is the best I can use. Ooooooh, that bamboo gets everywhere!

To the bino viewing. Auriga is resplendent, with Capella and the kids (goats) looking good as I work down to the 'Silver fish' or 'Scimitar' asterism that points like a crooked finger (and I do know what that is like) towards M38, the celtic cross like stricter of the cluster can be picked out in

these binoculars. Could that finger of stars be a sign from god as Micheangelo painted? Either side of the tip of the finger are some very interesting hydrogen cloud regions, one the current position of a rogue star flung out from its companion in a sling shot that has projected it through interstellar space. IC 405 The flaming star nebula. Not visible through binoculars but worth imaging through a modest refractor.

Down through M36, bright but sparse before looking at the richer clusters of M37 (a beauty) and M35, a favourite open clusters looking like a football at the feet of Gemini, the twins. The star Propus looks like a boot on the end of a leg. (Those pills must be kicking in my head).

Trawling through Monoceros the Unicorn (why did they miss the sailing time for Noah's Ark), and though some great small refractor and camera targets exist here such as Rosette nebula and the Christmas tree absorption nebula, the binoculars only pick up their associated open star clusters ngc 2244 and ngc 2264. On to Sirius, just between the trees, and M41 cluster is visible.

Up through Orion, and M42 and 43 the Orion nebula are very clear, with lots of the nebular visible in the binoculars. Struve 6 very open cluster visible on the hop to the belt of Orion, and a suggestion of M78 in the binoculars, but not ngc 2024 the Flame nebula, to difuse for these handheld binoculars.

With cloud flirting with Triangulum the first galaxy was gone M33, and so to had Andromeda. But it left the binocular jewels of Taurus to see, the Hyades around, but not associated with Aldebaran, and M45 the Pleiades. Naked eye (Ooops again, getting chilly, less for the bamboo to thwack) we see 6 or 7 stars, but through the binoculars over a hundred hit you, filling the observing field of these binoculars.

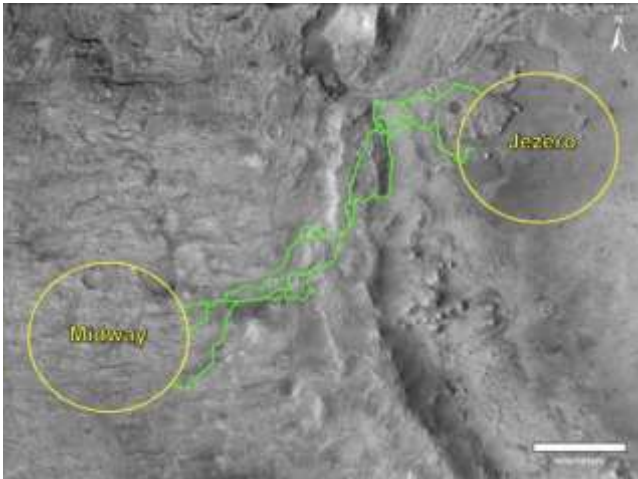
Turn of the star-trail camera hoping it didn't see too much In for coffee.

SPACE NEWS FOR NOVEMBER

Our Facebook page carries a lot of these news items throughout the month.

Space and Astronomy news Nov 18

Planetary Scientists Have Chosen a Few Landing Sites for the Mars 2020 Rover



In the summer of 2020, NASA's *Mars 2020* rover will launch from Cape Canaveral and commence its journey towards the Red Planet. Once it arrives on the Martian surface, the rover will begin building on the foundation established by the *Opportunity* and *Curiosity* rovers. This will include collecting samples of Martian soil to learn more about the planet's past and determine if life ever existed there (and still does).

Up until now, though, NASA has been uncertain as to where the rover will be landing. For the past few years, the choice has been narrowed down to three approved sites, with a fourth added earlier this year for good measure. And after three days of intense debate at the recent fourth Landing Site Workshop, scientists from NASA's Mars Exploration Program held a non-binding vote that has brought them closer to selecting a landing site.

Exoplanets Will Need Both Continents and Oceans to Form Complex Life



When it comes to the search for extra-terrestrial life, scientists have a tendency to be a bit geocentric – i.e. they look for planets that resemble our own. This is understandable, seeing as how Earth is the only planet that we know of that supports life. As result, those

searching for extra-terrestrial life have been looking for planets that are terrestrial (rocky) in nature, orbit within their stars habitable zones, and have enough water on their surfaces.

In the course of discovering several thousand exoplanets, scientists have found that many may in fact be “water worlds” (planets where up to 50% of their mass is water). This naturally raises some questions, like how much water is too much, and could too much land be a problem as well? To address these, a pair of researchers from the Harvard Smithsonian Center for Astrophysics (CfA) conducted a study to determine how the ratio between water and land masses can contribute to life.

An Extremely Large Hole has Been Dug for the Extremely Large Telescope



All over the world, some truly groundbreaking telescopes are being built that will usher in a new age of astronomy. Sites include the mountain of Mauna Kea in Hawaii, Australia, South Africa, southwestern China, and the Atacama Desert – a remote plateau in the Chilean Andes. In this extremely dry environment, multiple arrays are being built that will allow astronomers to see farther into the cosmos and with greater resolution.

One of these is the European Southern Observatory's (ESO) *Extremely Large Telescope* (ELT), a next-generation array that will feature a complex primary mirror measuring 39 meters (128 feet) in diameter. At this very moment, construction is underway atop the Andean mountain of Cerro Armazones, where construction teams are busy pouring the foundations for the largest telescope ever built.

It's Over For Kepler. The Most Successful Planet Hunter Ever Built is Finally out of Fuel and Has Just

Been Shut Down.

It's been quite a tumultuous time for space telescopes lately! Less than a month ago, the *Hubble Space Telescope* went into safe mode after experiencing a mechanical failure with one of its gyroscopes (which has since been remedied). Shortly thereafter, the *Chandra X-ray telescope* went into safe mode as well, and for similar reasons. After three days, it's operations team managed to get it back in working order as well.

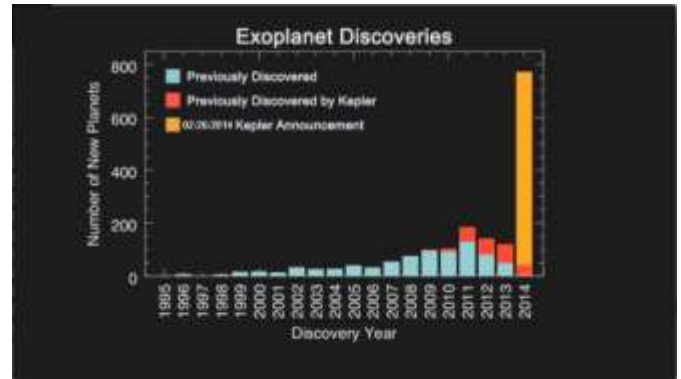
And now, after nine years of service, NASA has officially announced that the *Kepler Space Telescope* will be retiring. With no fuel remaining to conduct its science observations, NASA has decided to leave the telescope in its current safe orbit (well away from Earth). Far from being a sad occasion, Kepler's retirement is an opportunity to reflect upon the immense accomplishments of this telescope and how it revolutionized the study of exoplanets.

With its launch in March 6th, 2009, *Kepler* began an ambitious mission: to survey our region of the Milky Way in search of Earth-size planets that orbited within (or near to) their stars respective habitable zones and determine how many of the hundreds of billions of stars in our galaxy might have such planets. In its time, it has been responsible for the discovery of 2,600 confirmed planets, and almost 4000 candidates.

"As NASA's first planet-hunting mission, Kepler has wildly exceeded all our expectations and paved the way for our exploration and search for life in the solar system and beyond. Not only did it show us how many planets could be out there, it sparked an entirely new and robust field of research that has taken the science community by storm. Its discoveries have shed a new light on our place in the universe, and illuminated the tantalizing mysteries and possibilities among the stars."

In order to detect distant exoplanets, *Kepler* relied on what is known as the Transit Method (aka. Transit Photometry). This method consists of measuring the light curves of distant stars for periodic dips in brightness, which are an indication that exoplanets are passing in front of them (i.e. transiting) relative to the observer. Using this method, astronomers are able to place constraints on a planet's size, orbital period and mass, which helps them to determine if the planet is rocky and potentially-habitable.

Since transits are very brief, *Kepler* monitored thousands of stars simultaneously within specific fields and avoided the obscuring light from the Sun. Hence why *Kepler* was focused on the Cygnus and Lyra constellation, which have the largest possible number of stars while also not being within the ecliptic plane (the path of the Sun).



This graph shows exoplanet discoveries between 1995 and 2014, when Kepler boosted our knowledge considerably. Image: NASA/Kepler

What made *Kepler* so effective in its mission was the way it combined cutting-edge techniques for measuring a star's brightness with the largest outer space digital camera at that time. With its instrument aimed at one field of stars after another, *Kepler* conducted the first survey of planets in our galaxy and became NASA's first mission to search for potentially habitable exoplanets.

Leslie Livesay, the director for astronomy and physics at NASA's Jet Propulsion Laboratory, also served as *Kepler's* project manager during mission development. As she summarized:

"The Kepler mission was based on a very innovative design. It was an extremely clever approach to doing this kind of science. There were definitely challenges, but Kepler had an extremely talented team of scientists and engineers who overcame them."

Thanks to the almost 3000 planets *Kepler* has confirmed, astronomers have learned a great deal about the diversity of planets that exist within our galaxy. Of all the exoplanets that have been detected and confirmed so far, the majority have fallen into one of three categories: gas giants, hot-super-Earths in short period orbits, and ice giants.



The *Kepler* space telescope is done with its work collecting astounding science data showing there are more planets than stars in our galaxy. Here's a round-up of what *Kepler* has achieved. Credit: NASA/Ames/Wendy Stenzel

However, based on the most recent analysis of *Kepler's* discoveries, astronomers have concluded that 20 to 50% of stars visible in the night sky are likely to have

planets that are similar in size and composition (i.e. rocky) to Earth. These planets would also be located within their parent stars habitable zones, meaning that they would be warm enough to support liquid water on their surfaces.

Another thing that *Kepler* opened our eyes to is how divergent other systems can be from our own. For instance, the most common type of planet it observed (those that are between the size of Earth and Neptune) doesn't even exist in our Solar System. In addition, *Kepler* found planetary systems that were so packed with planets orbiting close to their stars that it made the Solar System look sparsely populated by comparison.

Said William Borucki, the *Kepler* mission's founding principal investigator from NASA's Ames Research Center (now retired):

"When we started conceiving this mission 35 years ago, we didn't know of a single planet outside our solar system. Now that we know planets are everywhere, Kepler has set us on a new course that's full of promise for future generations to explore our galaxy."

Because of its success rate, the astronomical community received a bit of a fright when mechanical failures occurred four years into its mission (after *Kepler* had met its primary mission objectives). This consisted of one of *Kepler's* gyroscope-like reaction wheels (which are used to precisely point the telescope) failing in July 2012, followed by a second wheel failing in May of 2013.

After months of analysis, the mission team abandoned restoring the telescope to full working order and devised a secondary mission – known as *K2*. For this mission, the team switched the spacecraft's field of view roughly every three months, which doubled the life of the telescope and increased the number of *Kepler's* surveyed stars to more than 500,000.

The observation of so many stars was also a major contribution, allowing astronomers to better understand stellar behaviors and properties – which are essential to studying the planets that orbit them. The data it collected is also allowing astronomers to learn more about the history of our Milky Way and stellar evolution, which is yielding insight into the history and evolution of our Universe.

The extended missions also set a precedent for data-sharing, where new observations were immediately made available to the public. This allowed for a very rapid discovery process and has set a new standard which future missions hope to follow. Despite the fact that the *Kepler* mission is now at an end, scientists anticipate that they will be studying the volumes of data it obtained for at least a decade.

"We know the spacecraft's retirement isn't the end of *Kepler's* discoveries," said Jessie Dotson, *Kepler's* project scientist at NASA's Ames Research Center. "I'm excited about the diverse discoveries that are yet to come from our data and how future missions will build upon *Kepler's* results."

Even though the mission has contributed to almost 3000 scientific papers already, the *Kepler* team published a white paper that offers suggestions about where important scientific discoveries could still be made using the mission data. They also included a list of 21 important data analysis projects which can be executed using data that is already available in the *Kepler* archives today.

The data obtained as part of *Kepler's* last campaign (Campaign 19), will also complement data from NASA's *Transiting Exoplanet Survey Satellite* (TESS), which launched back in April. TESS and the *James Webb Space Telescope* (JWST) – which is scheduled to launch in 2021 – will pick up where *Kepler* left off, surveying nearby star systems in the hopes of finding habitable planets and answering the fundamental question: are we alone in the Universe?

Here's to you *Kepler!* You did great and were gone too soon. May those who follow in your footsteps live up to the standard you set!

Further Reading: NASA

Parker Solar Probe Became the Closest Thing We've Ever Sent to the Sun. And it's Just Getting Started.

NASA's Parker Solar Probe is now the closest object to the Sun that we've ever sent into space. On Oct. 29, 2018, at about 1:04 p.m. EDT, NASA's probe broke the old record for the close-to-Sun distance of 42.73 million km (26.55 million miles). That record was held by the German-American Helios 2 spacecraft in 1976. And the probe will keep getting closer to the Sun.

The Parker Solar Probe was launched on August 12th, 2018, on a projected 6+ year mission. The mission is designed to answer 60 year old questions regarding our Sun:

How do energy and heat move through the Corona?

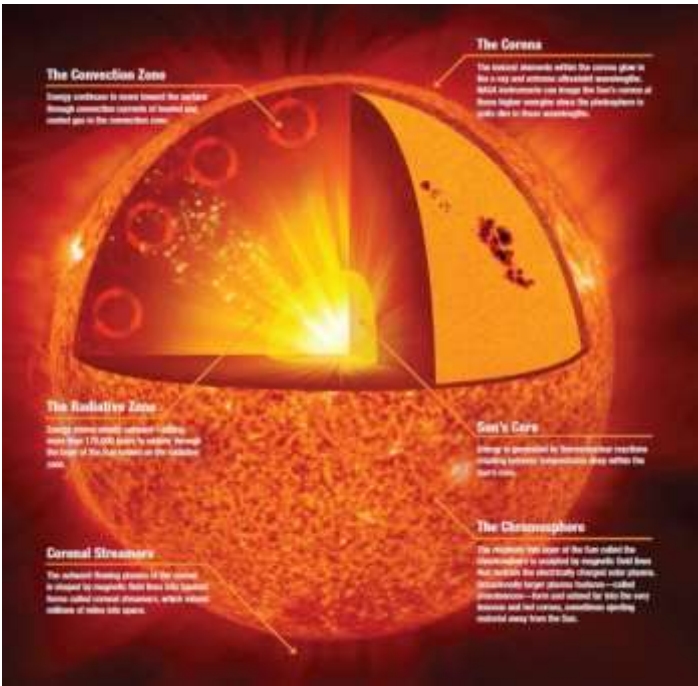
How do the structure and dynamics of the magnetic fields accelerate the solar winds?

What mechanisms accelerate and transport energetic particles?

In order to answer these questions, the probe has to get closer to the Sun than any object before it. It will move directly through the Sun's outer corona, and come as close as 6.9 million kilometers (4.3 million miles).

"It's been just 78 days since Parker Solar Probe launched, and we've now come closer to our star than any other spacecraft in history," said Project Manager Andy Driesman, from the Johns Hopkins Applied Physics Laboratory in Laurel, Maryland. "It's a proud moment for the team, though we remain focused on our first solar encounter, which begins on Oct. 31."

Jonathan McDowell, of the Harvard-Smithsonian Center for Astrophysics, recognized that the moment was tweet-worthy.



The anatomy of the Sun. Image Credit: NASA/Jenny Mottar

This is a perilous journey for the spacecraft. It will be exposed to the blistering heat of the Sun at that distance, a spacecraft-melting temperature of 1,377 degrees Celsius (2,500 degrees F.) To withstand that intense energy, the Parker Solar Probe is protected by a carbon-composite shield 11.43 cm (4.5 inch) thick.

The spacecraft won't spend all of its time in that intense heat. The probe will conduct 24 close approaches to the Sun during its mission.



A plot of the Parker Solar Probe's location on Oct. 31, 2018 as it began its first solar encounter. Image Credit: NASA/ Johns Hopkins APL

The Parker Solar Probe is also the Fastest

The probe is not only the closest object to the Sun that we've ever sent into space. It's also really fast. In fact it's the fastest object ever sent into space, reaching a speed of 246,961 kph (153,454 mph) relative to the Sun. This dwarfs the speed of the plodding Voyager 1 spacecraft, for example, which is travelling at only 62,856 kph.

Of course, the conditions so close to the Sun are so intense, that the Parker won't hang out there for long. The radiation environment that close to a star is deadly, and

Parker has to limit its exposure to protect itself and its instruments.

It will conduct 24 looping elliptical orbits, including 7 flybys of Venus to decelerate. In each of these 24 orbits, it will approach the Sun closely, conduct its science, then loop away safely. There will be communication blackouts while it's close to the Sun, and behind the Sun as seen from Earth. It's first close encounter with the Sun will be on November 6th, when it reaches perihelion for the first time. We won't know the science results from that encounter until December.

The Parker Solar Probe is part of NASA's Living With A Star program. The aim of that program is to study the Earth-Sun relationship and how it affects life on Earth. The Sun is the only star we have access to, so studying how it interacts with Earth should tell us something about how life evolved here, and how life might evolve around other stars.

h1>Sources:

NASA's Parker Solar Probe Blog: "Parker Solar Probe Starts First Solar Encounter"

NASA Press Release: "Parker Solar Probe Breaks Record, Becomes Closest Spacecraft to Sun"

NASA Press Release: "Parker Solar Probe Looks Back at Home"

NASA JHUAPL Website: Parker Solar Probe

Yes! Hubble is Back in Operation



Since it was first launched into space in 1990, the *Hubble Space Telescope* has become something of a household name. Over the course of its almost thirty years of service, Hubble has established a reputation as one of NASA's Great Observatories, giving astronomers the ability to look farther into the cosmic field than ever before and learn new and fascinating things about our Universe.

It was therefore a bit of a scare then when NASA announced earlier this month that one of *Hubble's* gyroscopes (gyros) had failed, causing it to go into safe mode. But on Oct. 26th, after a considerable effort on behalf of the operations team, NASA announced that the venerable Hubble had been restored to working order. As we speak, it is collecting science data and carrying on in the tradition it helped establish.

Comet 46P Wirtanen Rounds Out 2018

One. More. Comet. Though the next great 'Comet of the Century' has yet to make its appearance in 2018, we've had a steady stream of binocular comets this

year, including Comets C/2017 S3 PanSTARRS, 38P Stephan-Oterma, and 21P Giacobini-Zinner.

Now, the calendar year may have saved the best for last, as periodic Comet 46P Wirtanen takes center stage.

U.S. astronomer Carl Wirtanen first spied the 46th periodic comet in the catalog on the night of January 17th, 1948 while carrying out a stellar proper motion survey from the Lick Observatory. Wirtanen went on to discover four more comets

DAWN Spacecraft Runs Out of Fuel

NASA's Dawn spacecraft ran out of fuel Wednesday and stopped transmitting to Earth, ending an 11-year mission that explored the two largest objects in the asteroid belt and set several records in the annals of space history.

Dawn failed to contact controllers at NASA's Jet Propulsion Laboratory in California during an overnight communications opportunity late Wednesday into early Thursday, and officials declared the mission over after evidence indicated the spacecraft ran out of hydrazine fuel.

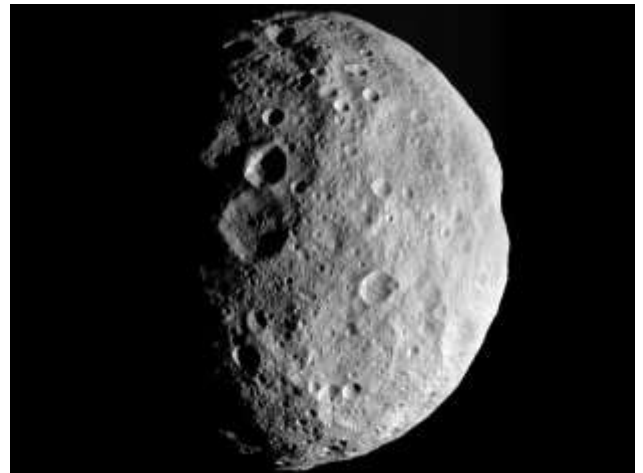
The fuel depletion was long anticipated, and engineers expected Dawn to run out of hydrazine some time in September or October. Dawn apparently emptied its hydrazine tank some time Wednesday, rendering the spacecraft in orbit around the dwarf planet Ceres unable to keep its antenna pointed at Earth, or its solar arrays trained on the sun to generate electricity.

"Everybody rightly recognizes that it's bittersweet, but I actually find it a lot sweeter than bitter," said Marc Rayman, Dawn's chief engineer at JPL, in an interview Thursday with Spaceflight Now. "This is the successful conclusion to a successful mission. To me, this is the best possible way for a mission to end because it was productive to the very end, and we squeezed as much as possible, even in principle, from the spacecraft, so I couldn't be happier."

"Today, we celebrate the end of our Dawn mission — its incredible technical achievements, the vital science it gave us, and the entire team who enabled the spacecraft to make these discoveries," said Thomas Zurbuchen, associate administrator of NASA's science mission directorate in Washington, in a statement Thursday. "The astounding images and data that Dawn collected from Vesta and Ceres are critical to understanding the history and evolution of our solar system."

Launched from Cape Canaveral aboard a United Launch Alliance Delta 2 rocket on Sept. 27, 2007, the Dawn spacecraft traveled 4.3 billion miles (6.9 billion kilometers) through the inner solar system over the last 11 years, flying by Mars for a gravity assist maneuver in 2009 before reaching asteroid Vesta, the second-biggest object in the asteroid belt, in 2011.

The spacecraft was built by Northrop Grumman Innovation Systems, formerly known as Orbital ATK, and carried three instruments — a framing camera, and visible and infrared spectrometer, and a gamma ray and neutron detector — to investigate the geology, mineral make-up and water content of Vesta and Ceres.



This image is from the last sequence of images NASA's Dawn spacecraft obtained of the giant asteroid Vesta, looking down at Vesta's north pole as it was departing in August 2012. Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

Dawn orbited Vesta more than year, using its ion engines to spiral close to the giant asteroid, then to back away and escape Vesta's gravity field for the journey to Ceres.

Dawn's time at Vesta yielded several big surprises, chiefly with the discovery of evidence that liquid water may have once flowed on the asteroid, Raymond said.

Scientists already have some samples from Vesta in laboratories on Earth.

Before Dawn's mission, researchers suspected a special class of rock samples called Howardite–Eucrite–Diogenite, or HED, meteorites that fell to Earth from space were chunks knocked off Vesta by an ancient interplanetary collision.

Dawn confirmed that hypothesis, and found Vesta likely once had global tectonic activity, something scientists did not expect on such a small world. Vesta measures around 359 miles (578 kilometers) in diameter along its longest axis.

The Dawn spacecraft's German-built camera suite found pits in the bottom of several relatively fresh craters on Vesta, suggesting volumes of gas — perhaps water vapor — were released by violent impacts with other asteroids.

Dawn's voyage from Vesta to Ceres took nearly three years, relying on the probe's plasma propulsion system to reshape its trajectory through the asteroid belt to intercept its next target.

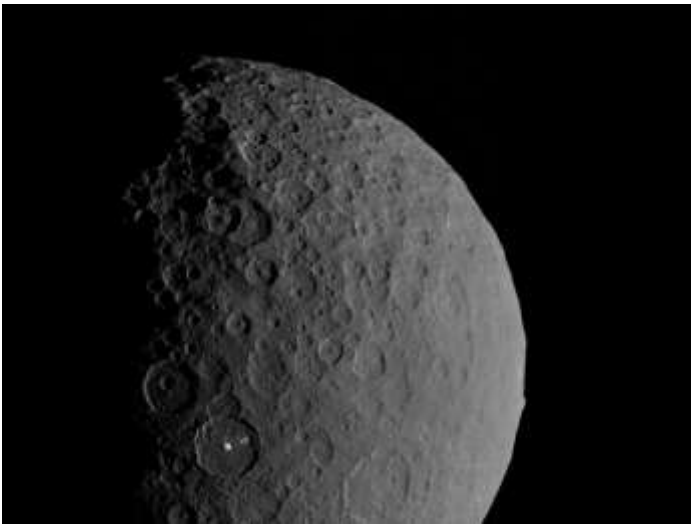
The maneuvers put Dawn on course to be captured by Ceres's gravity field in March 2015.

Before Dawn's arrival, the best imagery of Ceres from the Hubble Space Telescope gave scientists a glimpse of the mysterious mini-planet's appearance. Scientists knew its size and shape, and they believed Ceres might contain a sub-glacial ocean.

Ceres astonished Dawn's team almost as soon as the spacecraft moved within visual range.

"The big surprise during the early approach phase was that there is an area of high reflectivity near Occator (Crater)," said Andreas Nathues, lead investigator for

the framing camera team at the Max Planck Institute for Solar System Research in Göttingen, Germany, in a press conference last year. “It was so bright in the first images that we saturated all the chips (in the camera) because we didn’t expect such a bright feature on a dark surface.”



Occator Crater, with its bright spots, and Ahuna Mons appear together in this view obtained by NASA’s Dawn spacecraft on Feb. 11, 2017. Ahuna Mons is on the limb at right, is a mountain 2.5 miles (4 kilometers) tall. Image credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

The bright spots in Occator Crater immediately triggered speculation that they might be icy patches, or perhaps an erupting volcano spewing water into space. Scientists initially favored the ice explanation, but a closer examination by Dawn’s science instruments revealed them to be deposits of sodium carbonate, a type of salt.

Scientists believe the bright salt deposits got to the surface when an ancient impactor struck Ceres, releasing melted rock and water in a complex hydrothermal or cryovolcanic system. Dawn also discovered Ahuna Mons, a three-mile-high (5-kilometer) peak that Dawn’s team believes is a dormant volcano that spewed watery material into the sky instead of rocky magma.

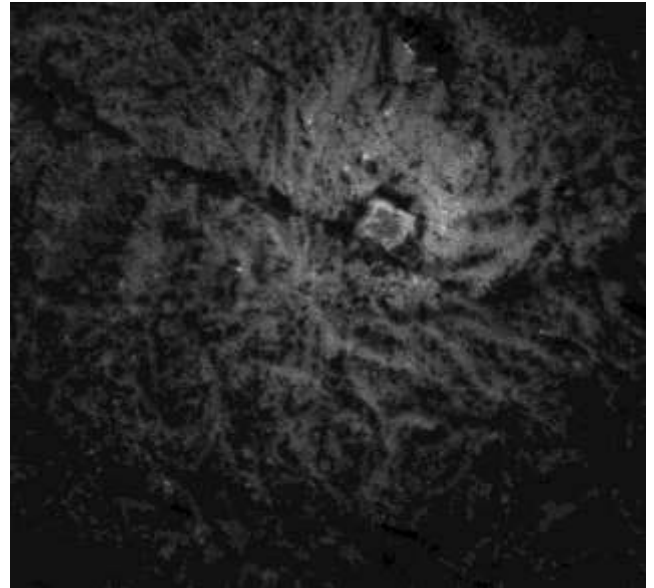
Dawn’s exploration of Ceres helped shape scientists’ conclusion that dwarf planets could have once harbored oceans, and contained the ingredients necessary to give rise to life.

Ceres spans around 590 miles (950 kilometers) in diameter, about one-thirteenth the size of Earth. It’s bigger than Saturn’s moon Enceladus, which hides a global ocean under its icy shell warmed by the constant tug of Saturn’s gravity on the moon’s interior, a phenomenon known as tidal heating.

“There is an affinity between some of the icy moons and Ceres, and certainly they do bear resemblances,” said Carol Raymond, Dawn’s principal investigator at JPL, in an interview with Spaceflight Now last year. “But since Ceres now lives in such a warm environment relative to those objects, it looks very different. Its ocean froze out. It doesn’t have any tidal heat. So it’s ocean is frozen, and its surface is baking relative to the icy moons. The way it formed, what it formed of, appears to be similar, but the evolutionary paths are quite different.”

Dawn’s prime mission ended in 2016, and NASA approved an extension to continue the probe’s exploration of Ceres,

the biggest world between the orbits of Mars and Jupiter. Senior agency officials did not approve a proposal to fire Dawn’s trusty ion engines and escape Ceres to head for a flyby of an asteroid, concluding there was more science to be gained at Ceres than at another target.



This image was obtained by NASA’s Dawn spacecraft on July 6, 2018 from an altitude of about 36 miles (58 kilometers). It shows an exotic landscape within Vinalia Faculae, a grouping of bright spots inside Occator crater on Ceres. The scene is about 3.4 miles (5.5 kilometers) across. Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

Dawn almost never made it to the launch pad.

Cost overruns and difficulties with Dawn’s electric propulsion system prompted NASA to cancel the mission in March 2006. The space agency reinstated the mission less than a month later after an appeal from managers at JPL.

“There were a couple of dramatic points,” Raymond said last year. “The first was right before launch when we learned that we were launching with defective reaction wheels, and there was nothing we could do about it. We went into a mode where we were trying to preserve wheel lifetime.”

Three of the spacecraft’s four reaction wheels failed during the mission, forcing engineers to devise a new way to control the probe’s pointing with a combination of momentum wheels and hydrazine-fueled thrusters. The spinning gyro-like wheels are designed to change their spin rate to pivot the spacecraft.

With the failure of a third reaction wheel last year, Dawn started consuming more hydrazine fuel for pointing control. The probe launched with around 100 pounds (45 kilograms) of hydrazine to feed its thrusters.

Dawn’s enduring legacy

Rayman said Dawn’s mission of exploration will leave an enduring scientific and engineering legacy.

“In science, it’s the unveiling of two of the last uncharted worlds in the inner solar system,” Rayman said. “Vesta and Ceres are the two largest bodies between

Mars and Jupiter, and prior to the Dawn mission, Ceres was the largest object between the sun and Pluto that a spacecraft had not yet visited.

“The main asteroid belt has truly millions of objects in it, and yet 45 percent of that total mass is contained in Vesta and Ceres, which Dawn singlehandedly explored,” Rayman said. “I think that’s pretty impressive, and it showed us that Vesta is not just an asteroid like the others. A lot of people call it a big rock or something like that. Geologically, it’s more closely related to the terrestrial planets, one of which right underneath our feet. It’s got a dense iron-nickel core surrounded by a mantle, surrounded by a crust, and it’s more akin to the terrestrial planets than it is to the rocks we think of as asteroids.”

Dawn carried three ion engines to push the spacecraft around the solar system, setting a record for the longest run time on a plasma propulsion system in space.

Using a combination of xenon fuel and electrical power to generate low levels of thrust, ion engines are not as powerful as conventional thrusters, but they produce more of an impulse over time, providing a leap in fuel efficiency for space missions.

Dawn’s ion propulsion system took four days to accelerate the spacecraft by 60 mph (96 kilometers per hour), but the probe thrust with its ion engines for 5.9 years of cumulative operation, changing the craft’s velocity by 25,700 mph (41,400 kilometers) over the course of its mission.

That capability enabled Dawn to become the first spacecraft to orbit two solar system destinations outside of the Earth and the moon.



NASA’s Dawn spacecraft is attached to the upper stage of its Delta 2 booster before launching from Cape Canaveral in September 2007. Credit: NASA

“To me, Dawn was the first interplanetary spaceship,” Rayman said. “The capability to travel to a distant alien world, go into orbit around it, and then maneuver extensively in orbit, then break out of orbit, travel through the solar system — it was two-and-a-half years and 900 million miles to get from Vesta to Ceres — go into orbit around another alien world and explore it, I think that is really extraordinary. Indeed, it is truly unique in the more than 61 years of space exploration, and I think this bodes well for our species as we continue to reach out into the cosmos.”

“In many ways, Dawn’s legacy is just beginning,” Raymond said Thursday in a statement. “Dawn’s data sets will be deeply mined by scientists working on how planets grow and differentiate, and when and where life could have formed in our solar system. Ceres and Vesta are important to the study of distant planetary systems, too, as they provide a glimpse of the conditions that may exist around young stars.”

Rayman said Dawn’s ground team first noticed signs Wednesday that the spacecraft, located more than 300 million miles from Earth, could be out of fuel. NASA’s Deep Space Network, which comprises antennas in California, Spain and Australia, was tracking Dawn’s radio signal to measure its Doppler shift, collecting data for scientists to precisely map Ceres’s gravity field, information that could help determine variations in the dwarf planet’s internal structure.

“We actually lost the signal late in the track, so we continued to look during that track and didn’t see it, but that was not enough to make a definitive determination that the mission was over,” Rayman said.

Dawn was not transmitting any telemetry during the Doppler track — just a blank radio signal — so controllers could not be sure of the spacecraft’s status. They waited for another communications pass late Wednesday, when engineers heard only silence.

“We didn’t see the spacecraft at all,” Rayman said. “To me, that was enough to confirm that the mission has ended because we had known for so long that we were on the verge of running out of hydrazine.”

Without hydrazine to fuel its control jets, Dawn was unable to correct its orientation, which requires regular maintenance to counteract natural forces tugging at the spacecraft, such as Ceres’s gravity and solar pressure.

Engineers expected these forces to gradually pull Dawn’s solar arrays, which span 65 feet (20 meters) tip-to-tip, off their lock on the sun, leaving the spacecraft unable to recharge its batteries. Under such circumstances, on-board software was programmed to automatically switch off Dawn’s radio transmitter to conserve power until the batteries could be charged again.

“It’s smart enough to turn that radio off, save power, save battery, until it has its solar arrays on the sun, but it will never achieve that condition, so it turned the radio off, and it will not turn it back on,” Rayman said.

Dawn is the second mission NASA has declared complete this week.

NASA announced Wednesday that the Kepler space telescope has run out of fuel, ending its search for planets around other stars. Engineers plan to uplink the final commands to switch off Kepler's radio as soon as next week.

NASA selected the Dawn and Kepler missions on Dec. 21, 2001, after a competition among other mission proposals to win federal funding under the space agency's Discovery program, a series of relatively low-cost, science-focused robotic space missions.

Kepler launched in March 2009, and also suffered reaction wheel trouble during its mission.

"They were selected the same day," Rayman said. "Of course, they launched far apart. Kepler launched in 2009, and Dawn launched in 2007. So the same start and the same ending, but very different lives in between, but it is an interesting coincidence."

Dawn will remain in its current orbit around Ceres for the foreseeable future. The spacecraft maneuvered into an egg-shaped orbit earlier this year that takes Dawn around Ceres once every 27 hours, passing as close as 22 miles (35 kilometers) above its surface on each orbit, closer to Ceres than Dawn ever flew before.

"We have a planetary protection requirement that Dawn not contact Ceres for at least 20 years," Rayman said. "The reason for that is because Ceres has a substantial amount of water. Most of it's frozen, but some of it could still be liquid. It has organic materials that Dawn has detected. It has a rich inventory of other chemicals as well ... So it has many of the ingredients that are important, or that are interesting, for the study of the chemistry that leads to the development of life."

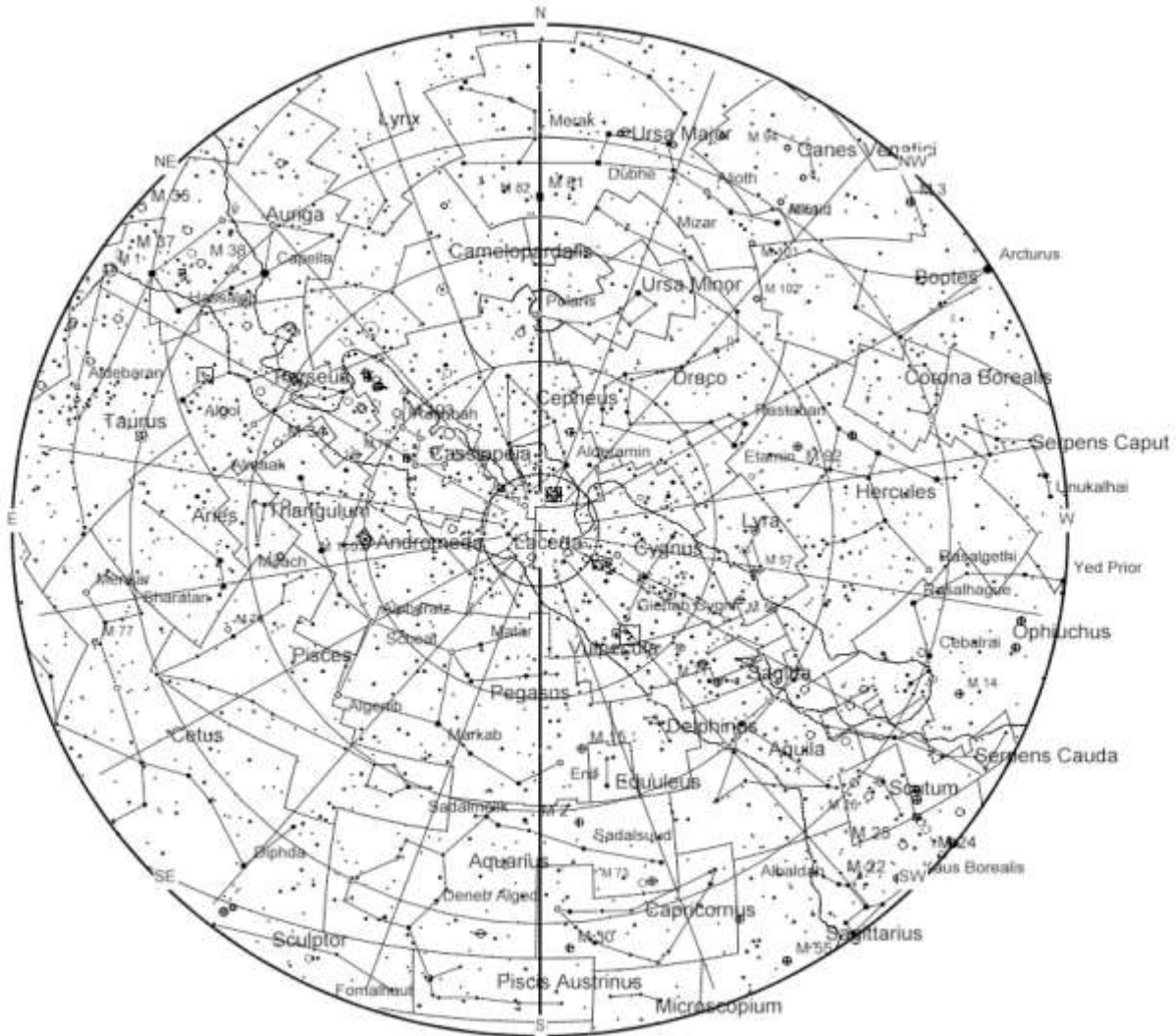
NASA does not want to contaminate Ceres with debris from Dawn, ensuring that the icy world in the asteroid belt remains pristine for future missions to study.

"(Our) analysis shows quite clearly that there's no chance of impact in 20 years, and even in 50 years, there's less than a 1 percent chance that the spacecraft will hit the ground. So it's going to be there in orbit for a very long time," Rayman said.

Russians trace Soyuz launch abort to faulty sensor

November 1, 2018

Russian investigators have traced the cause of a dramatic Oct. 11 Soyuz launch abort to a "deformed" sensor in a system that controlled the separation of a strap-on first-stage booster from the rocket's central core stage, triggering a dramatic emergency escape for the Russian mission commander and his NASA co-pilot, senior managers said Thursday



November 5, 6 - Taurids Meteor Shower. The Taurids is a long-running minor meteor shower producing only about 5-10 meteors per hour. It is unusual in that it consists of two separate streams. The first is produced by dust grains left behind by Asteroid 2004 TG10. The second stream is produced by debris left behind by Comet 2P Encke. The shower runs annually from September 7 to December 10. It peaks this year on the the night of November 5. The thin crescent moon will set early in the evening leaving dark skies for viewing. Best viewing will be just after midnight from a dark location far away from city lights. Meteors will radiate from the constellation Taurus, but can appear anywhere in the sky.

November 6 - Mercury at Greatest Eastern Elongation. The planet Mercury reaches greatest eastern elongation of 23.3 degrees from the Sun. This is the best time to view Mercury since it will be at its highest point above the horizon in the evening sky. Look for the planet low in the western sky just after sunset.

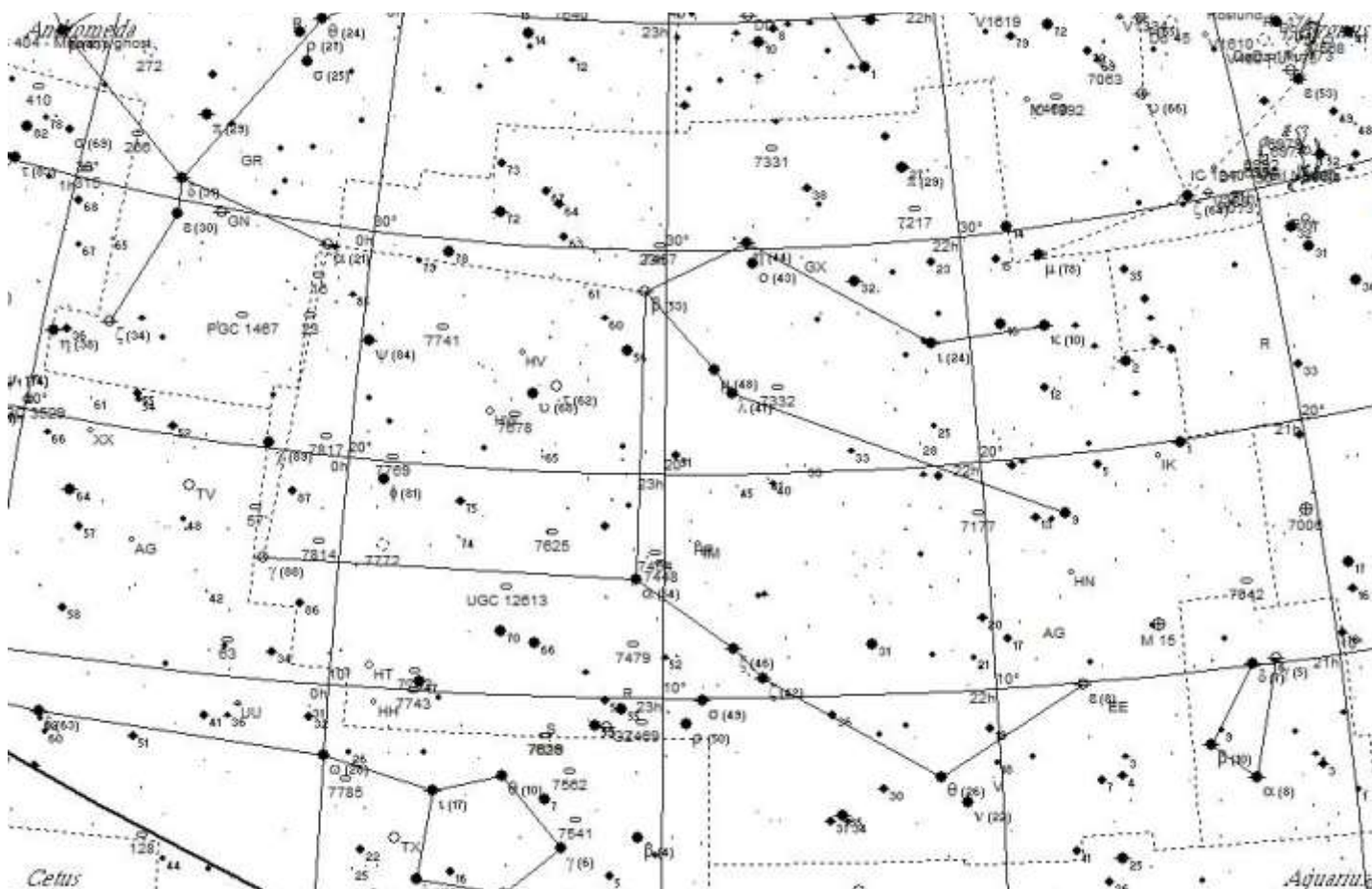
November 7 - New Moon. The Moon will located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 16:02 UTC. This is the best time of the month to observe faint objects such as galaxies and star clusters because there is no moonlight to interfere.

November 17, 18 - Leonids Meteor Shower. The Leonids is an average shower, producing up to 15 meteors per hour at its peak. This shower is unique in that it has a cyclonic peak about every 33 years where hundreds of meteors per hour can be seen. That last of these occurred in 2001. The Leonids is produced by dust grains left behind by comet Tempel-Tuttle, which was discovered in 1865. The shower runs annually from November 6-30. It peaks this year on the night of the 17th and morning of the 18th. The waxing gibbous moon will set shortly after midnight leaving fairly dark skies for what could be a good early morning show. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Leo, but can appear anywhere in the sky.

November 23 - Full Moon. The Moon will be located on the opposite side of the Earth as the Sun and its face will be will be fully illuminated. This phase occurs at 05:40 UTC. This full moon was known by early Native American tribes as the Full Beaver Moon because this was the time of year to set the beaver traps before the swamps and rivers froze. It has also been known as the Frosty Moon and the Hunter's Moon.

Lets hope for clear skies! Andy

CONSTELLATIONS OF THE MONTH: Pegasus



Positioned north of the ecliptic plane, the constellation of Pegasus was one of the original 48 constellations listed by Ptolemy, and endures as one of the 88 modern constellations adopted by the IAU. It covers 1121 square degrees of sky and ranks 11th in size. Pegasus contains between 9 and 17 main stars in its asterism (depending on how you depict it) and has 88 Bayer Flamsteed designated stars within its confines. Pegasus is bordered by the constellations of Andromeda, Lacerta, Cygnus, Vulpecula, Delphinus, Equuleus, Aquarius and Pisces. It is visible to observers located at latitudes between +90° and -60° and is best seen at culmination during the month of October.

There is one annual meteor shower associated with the constellation of Pegasus which peaks on or about November 12 of each year – the Pegasids. The radiant – or point of origin – for the meteor shower is near the asterism of the “Great Square”. Activity begins around October 10 and lasts to late November. The average fall rate at maximum during the peak is 10 per hour. This particular meteor used to be spectacular, but Jupiter has perturbed the meteor stream over the years and lessened the activity.

In mythology, Pegasus represents the Winged Horse, and child of Medusa who was slain by the hero Perseus. According to Greek mythology, Pegasus was delivered to Mount Helicon by Bellerophon, where the magnificent horse kicked the source of poetic inspiration – the Spring of Hippocrene – into flowing. When Bellerophon defeated Chimaera, he became so proud he ordered Pegasus to fly him to Mount Olympus. This action angered Zeus, who ordered an insect to sting Pegasus, resulting in Bellerophon’s fatal fall to Earth. Zeus then went on to recognize Pegasus in the stars as the “Thundering Horse of

Jove” – carrier of his lightning bolts.

Let’s begin our binocular tour of Pegasus with its brightest star – Alpha – the “a” symbol on our map. Alpha Pegasi’s proper name is Markab and it marks the southwestern corner of the asterism of the Great Square. Located 140 light years from Earth, Markab is a hot class B (B9) dwarf star which shines about 205 times brighter than our own Sun and is about three times larger. This fast rotator completes a full turn on its axis in just about 36 hours! Right now, Markab sits on the edge of the main sequence, about to die and become a much cooler orange giant star. It’s about as “normal” as a star can be!

Now, turn your binoculars towards Beta – the “B” symbol. Named Scheat, you’ll find this particular star located in the northwestern corner of the Great Square and about 200 light years from our solar system. Scheat is unusual among bright stars in having a relatively cool surface temperature of 3700 degrees Kelvin, compared to stars such as our Sun. Scheat is a red giant star some 95 times larger than Sol and has a total stellar luminosity of 1500 times solar. It is also an irregular variable star, its brightness changing from magnitude 2.31 to 2.74.

You’ll need a telescope to reveal the mysteries surrounding Eta Pegasi – the “n” symbol on our map. Named Matar and located about 215 light years away, this spectral class G2II-III star has a close binary star companion of class F0V. There are also 2 class G stars further away that may or may not be physically related to the main pair. According to Jim Kaler, “Matar is double star and may well be quadruple, consisting of a very unequal pair of pairs, an unbalanced double-double. The brighter of the bright pair is on its way to becoming

a much larger giant, and will eventually expand to a radius of a quarter the distance that now separates the two stars, streams of matter running from the brighter to the dimmer creating quite a sight from the smaller pair. Eventually the bright star of the brighter pair will fade to become a white dwarf, this double perhaps looking something like Sirius does today.”

Next up? Epsilon Pegasi – the backwards “3” symbol on our map. Located 670 light years away, Enif is a cool star for more than one reason! To begin with, Enif is orange class K (K2) supergiant star whose stellar temperature only averages about 4460 degrees Kelvin. Even in binoculars you’ll notice the reddish hue. It’s big, too... About 150 times the size of our Sun and if located in our solar system would fill out the space about halfway to the orbit of Venus. This supergiant star’s fate awaits it as a supernova, but there is always a possibility it could become a heavy, rare neon-oxygen white dwarf whose size would be no larger than the Earth. What makes Enif so cool is that it is very unpredictable. According to records, in 1972 Enif had a flare event which caused it to brighten 5 times more than its normal stellar magnitude!

Keep your binoculars handy, because following the trajectory from Theta to Epsilon just another third of the way will bring you to awesome globular cluster – Messier 15 (RA 21:29:58.3 Dec +12:10:01). Located almost equidistantly from both the galactic center and from us, this superior globular cluster was first discovered by Jean-Dominique Maraldi on September 7, 1746 and later listed by Charles Messier on his famous Messier Catalog list of “objects which are not comets”. It ranks third in variable star population and M15 is perhaps the oldest and most dense of all globulars located in the Milky Way Galaxy. Its compact central core may be the result of mutual gravitational interaction, or it could contain a dense, supermassive object – a black hole. One thing we do know that M15 contains is a planetary nebula known as Pease 1 – only four known planetary nebulae in Milky Way globular clusters! Another curiosity is M15 also contains 9 pulsars, the remnants of ancient supernova explosions leftover from its youthful beginnings. While you can easily see M15 with binoculars, even a small telescope can begin resolution on this great deep sky object!

For telescopes, have a look at spiral galaxy NGC 7217 (RA 22:07.9 Dec +31:22). This magnitude 10 jewel displays a bright nucleus and hazy frontier over its generous 3.7 arc minute size. Taken photographically this particular galaxy exhibits very tight spiral galaxy structure and is sometimes considered an “unbarred” spiral galaxy with a dark ring of obscuring material around the nucleus.

Try your hand at spiral galaxy NGC 7814 (RA 0:03.3 Dec +16:09), too. At magnitude 10 and a huge 6.3 arc minutes in diameter, this particular galaxy is easily seen in small telescopes and larger binoculars. Often referred to as Caldwell 43, it’s located about 40 million light years from Earth and gives a great edge-on presentation! It is sometimes referred to as the a miniature version of Messier 104, or “the Little

Sombrero”.

Now, it’s time for NGC 7331 (RA 22:37.1 Dec +34:25). Easily spotted in big binoculars and small telescopes under dark skies, it was first discovered by Sir William Herschel. This beautiful, 10th magnitude, tilted spiral galaxy is very much how our own Milky Way would appear if we could travel 50 million light-years away and look back. Very similar in structure to both our own Milky Way and the Great Andromeda Galaxy, this particular galaxy gains more and more interest as scope size increases – yet it can be spotted with larger binoculars. At around 8” in aperture, a bright core appears and the beginnings of wispy arms. In the 10” to 12” range, spiral patterns begin to emerge and with good seeing conditions, you can see “patchiness” in structure as nebulous areas are revealed, and the western half is deeply outlined with a dark dustlane. But hang on... Because the best is yet to come!

Return to NGC 7331 with a big telescope. What we are about to look at is truly a challenge and requires dark skies, optimal position and excellent conditions. Now breathe the scope about one half a degree south-southwest and behold one of the most famous galaxy clusters in the night. In 1877, French astronomer Edouard Stephan was using the first telescope designed with a coated mirror when he discovered something a bit more with NGC 7331. He found a group of nearby galaxies! This faint gathering of five is now known as “Stephan’s Quintet” and its members are no further apart than the diameter of our own Milky Way galaxy.

Visually in a large scope, these members are all rather faint, but their proximity is what makes them such a curiosity. The Quintet is made up of five galaxies numbered NGC 7317, 7318, 7318A, 7318B, 7319 and the largest is 7320. Even with a 12.5” telescope, this author has never seen them as much more than tiny, barely-there objects that look like ghosts of rice grains on a dinner plate. So why bother? Because I’ve seen them with large aperture... What our backyard equipment can never reveal is what else exists within this area – more than 100 star clusters and several dwarf galaxies. Some 100 million years ago, the galaxies collided and left long streamers of their materials which created star forming regions of their own, and this tidal pull keeps them connected. The stars within the galaxies themselves are nearly a billion years old, but between them lie much younger ones. Although we cannot see them, you can make out the soft sheen of the galactic nuclei of our interacting group. Enjoy their faint mystery!

There are many more faint galaxies and deep sky objects in Pegasus to be enjoyed, so grab a good star map and fly with the “Winged Horse”!

ISS PASSES For September 2018

From Heavens Above website maintained by Chris Peat

Date	Brightness (mag)	Start Time	Highest point		End Time	Alt.	Az.	Time	Alt.	Az.
			Alt.	Az.						
06 Nov	-4.0	05:12:58	70°	WNW	05:13:18	84°	N	05:16:36	10°	E
07 Nov	-1.5	04:23:04	25°	E	04:23:04	25°	E	04:24:34	10°	E
07 Nov	-3.8	05:55:45	21°	W	05:57:47	74°	SSW	06:01:03	10°	ESE
08 Nov	-3.9	05:05:51	84°	ESE	05:05:51	84°	ESE	05:09:03	10°	E
09 Nov	-1.0	04:15:57	19°	E	04:15:57	19°	E	04:17:00	10°	E
09 Nov	-3.4	05:48:38	26°	W	05:50:08	49°	SSW	05:53:19	10°	SE
10 Nov	-3.1	04:58:46	51°	SE	04:58:46	51°	SE	05:01:24	10°	ESE
10 Nov	-2.0	06:31:44	10°	W	06:34:14	20°	SW	06:36:44	10°	SSE
11 Nov	-0.6	04:08:55	13°	ESE	04:08:55	13°	ESE	04:09:22	10°	ESE
11 Nov	-2.7	05:41:36	27°	WSW	05:42:20	30°	SSW	05:45:15	10°	SSE
12 Nov	-2.0	04:51:48	26°	SSE	04:51:48	26°	SSE	04:53:30	10°	SE
12 Nov	-1.4	06:25:15	10°	WSW	06:26:14	11°	SW	06:27:12	10°	SSW
13 Nov	-1.8	05:34:44	17°	SSW	05:34:44	17°	SSW	05:36:38	10°	S
14 Nov	-0.9	04:45:03	11°	SSE	04:45:03	11°	SSE	04:45:16	10°	SSE
26 Nov	-1.4	17:23:42	10°	SSE	17:24:57	12°	SE	17:26:01	10°	ESE
26 Nov	-1.2	18:57:41	10°	SW	18:58:41	18°	SW	18:58:41	18°	SW
27 Nov	-2.7	18:05:43	10°	SW	18:08:36	31°	SSE	18:08:36	31°	SSE
28 Nov	-2.1	17:14:00	10°	SSW	17:16:32	21°	SE	17:18:28	13°	ESE
28 Nov	-1.9	18:49:23	10°	WSW	18:51:08	28°	WSW	18:51:08	28°	WSW
29 Nov	-3.5	17:57:12	10°	SW	18:00:24	51°	SSE	18:00:56	45°	ESE
29 Nov	-0.2	19:33:31	10°	W	19:33:35	10°	W	19:33:35	10°	W
30 Nov	-2.8	17:05:09	10°	SW	17:08:10	36°	SSE	17:10:42	13°	E
30 Nov	-2.4	18:41:13	10°	W	18:43:21	38°	W	18:43:21	38°	W
01 Dec	-3.8	17:48:54	10°	WSW	17:52:10	75°	SSE	17:53:06	43°	E
01 Dec	-0.4	19:25:22	10°	W	19:25:44	13°	W	19:25:44	13°	W
02 Dec	-3.4	16:56:38	10°	WSW	16:59:52	57°	SSE	17:02:49	12°	E
02 Dec	-2.8	18:33:01	10°	W	18:35:27	47°	W	18:35:27	47°	W
03 Dec	-3.9	17:40:39	10°	W	17:43:56	88°	N	17:45:10	35°	E
03 Dec	-0.7	19:17:09	10°	W	19:17:49	15°	W	19:17:49	15°	W
04 Dec	-3.8	16:48:17	10°	WSW	16:51:35	80°	SSE	16:54:50	10°	E
04 Dec	-3.3	18:24:47	10°	W	18:27:32	60°	W	18:27:32	60°	W
05 Dec	-3.9	17:32:24	10°	W	17:35:41	85°	N	17:37:16	28°	E
05 Dec	-0.9	19:08:54	10°	W	19:09:55	18°	W	19:09:55	18°	W
26 Nov	-1.4	17:23:42	10°	SSE	17:24:57	12°	SE	17:26:01	10°	ESE
26 Nov	-1.2	18:57:41	10°	SW	18:58:41	18°	SW	18:58:41	18°	SW
27 Nov	-2.7	18:05:43	10°	SW	18:08:36	31°	SSE	18:08:36	31°	SSE
28 Nov	-2.1	17:14:00	10°	SSW	17:16:32	21°	SE	17:18:28	13°	ESE
28 Nov	-1.9	18:49:23	10°	WSW	18:51:08	28°	WSW	18:51:08	28°	WSW
29 Nov	-3.5	17:57:12	10°	SW	18:00:24	51°	SSE	18:00:56	45°	ESE
29 Nov	-0.2	19:33:31	10°	W	19:33:35	10°	W	19:33:35	10°	W
30 Nov	-2.8	17:05:09	10°	SW	17:08:10	36°	SSE	17:10:42	13°	E
30 Nov	-2.4	18:41:13	10°	W	18:43:21	38°	W	18:43:21	38°	W
01 Dec	-3.8	17:48:54	10°	WSW	17:52:10	75°	SSE	17:53:06	43°	E
01 Dec	-0.4	19:25:22	10°	W	19:25:44	13°	W	19:25:44	13°	W
02 Dec	-3.4	16:56:38	10°	WSW	16:59:52	57°	SSE	17:02:49	12°	E
02 Dec	-2.8	18:33:01	10°	W	18:35:27	47°	W	18:35:27	47°	W
03 Dec	-3.9	17:40:39	10°	W	17:43:56	88°	N	17:45:10	35°	E

END IMAGES, OBSERVING AND OUTREACH

The Moon 26th October, 2 days after full.

24 zones of the Moon imaged through 9.25" Celestron telescope, plus 2x Barlow.

Imaging source 52AU DMK webcam, around 600 frames in each zone stacked in registax.

Andy Burns



Wiltshire Astronomical Society	Observing Sessions 2018 – 2019	
Date	Moon Phase (%)	Moonrise
2018		
30 th November	Waning Crescent (39%)	After midnight
28 th December (6.30pm start)	Last Quarter (54%)	11.35 pm
2019		
21 st January	Total Lunar Eclipse	Starts 03:30 am
25 th January	Waning Gibbous (70%)	10.36 pm
22 nd February	Waning Gibbous (84%)	9.31 pm
29 th March	Waning Crescent (32%)	After midnight
26 th April	Waning Gibbous (58%)	After midnight
24 th May	Waning gibbous (75%)	After midnight

OUTREACH

Friday 9th November. Great Wishford School, nr Wilton. Afternoon and possible evening.

Tuesday 13th November Minety CofE Primary School. Afternoon and possible evening, weather permitting.

January tba Kings Lodge School, Chippenham