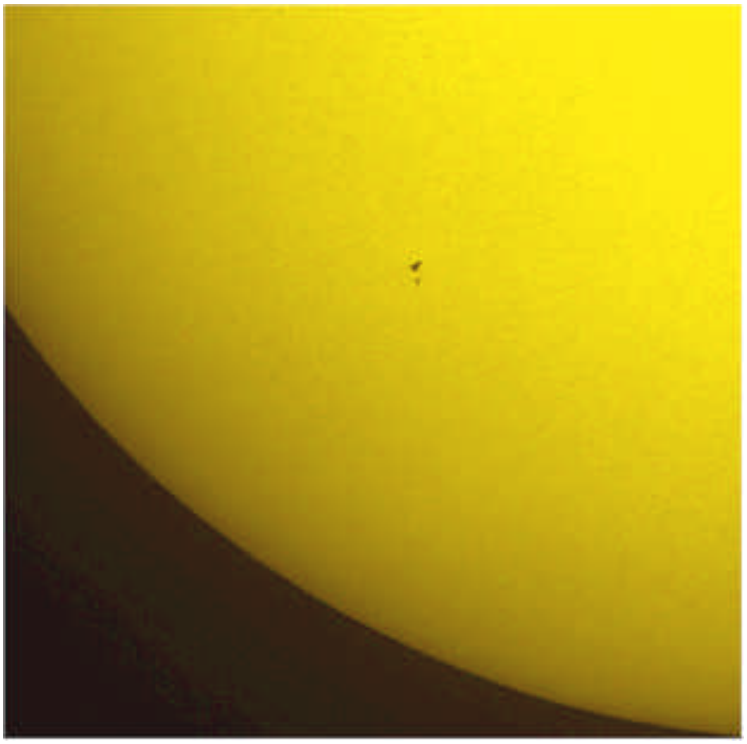
TRANSIT

The Newsletter of

Cleveland & Darlington Astronomical Society

05 June 2009



Solar Transit of Atlantis and the Hubble Space Telescope

Front Page Image – The only image ever taken of a transit of a space shuttle (Atlantis) and the Hubble Space Telescope (HST) in front of the Sun (the two black marks at image center) during the last repair mission of Hubble, obtained from Florida at 100 km south of the Kennedy Space Center on May 13th 2009 12:17 local time, several minutes before grapple of Hubble by Atlantis.

Takahashi TOA-130 refractor (diameter 130mm, final focal 2200mm), Baader solar prism and Canon 5D mark II. Exposure of 1/8000s at 100 ISO, extracted from a series of 16 images (4 images/s) started 2s before the predicted time.

Visit our new CaDAS website : http://www.cadas-astro.org.uk.org.uk

Next meeting : 12 June 2009 , CaDAS Annual Presidential Presentation – "Meteors and Meteor Astronomy" by Jack Youdale F.R.A.S.

Please note the venue for the next meeting :-

7.15pm for a 7.30 pm start, Thorpe Thewles Parish Hall

Last meeting : 08 May **-** Professor Tom Hartquist "Shocks in Astronomy"

The subject of the lecture was "Shocks". On the drive over from Darlington Station, Professor Hartquist asked for my opinion on what level to pitch the talk. I said there would be a wide range of ability in the audience, so don't take any prisoners; make 'em work, hit 'em hard. And so he did! When someone engaged in a subject on the very forward battle-lines of astronomy research gives a talk to a general audience, it must be almost impossible to hit the "right" level. Does one trivialise the subject and miss the real point, or just tell it as it is? Tom Hartquist, who described himself as a theorist, chose the second option and I respect him for that.

The sort of shocks he was talking about are those generated when projectiles, in this case material shed from supernovae, are going faster than the speed of sound in their surroundings. The analogy with shock waves made by aircraft exceeding the speed of sound was the introduction to the idea. This was extended to take in shocks and rebounding, oscillating shocks around supernovae and their effects. Even a quick look at the results was difficult to follow. However, Tom made the point clear that the principle is that any theory must explain the observations and smooth, tidy explanations are not an option.

He drew attention to the curious and unexpected finding that the stregth of molecular bonds, the interstellar magnetic pressure and other physical constants of the interstellar material are all about the same value - one electron volt per cubic centimetre. "Remember that; take the idea away with you" he enjoined.

The second part of the talk concerned cosmic rays , their speeds and origins.

Once again, shocks are the explanation for why these particles from supernovae are accelerated to near the speed of light. The particles are accelerated as they bounce between the two parallel shocks. (It was in our travelling conversation that Tom gave the comparison that the energy in a proton cosmic ray is more than that in a golf ball hit by Tiger Woods).

The third part of the talk asked the question "Why do some galaxies contain mostly stars that are the mass of the Sun (lifetime 10 billion years) and others contain a major proportion of stars with 10 solar masses or greater (lifetime 10 million years)? The example chosen for the second type was the Starbhurst Galaxy, M82. It all comes down to how Shocks work - do they disperse the "clumps" leading to stars, or do they promote star formation? The jury is trying to come to a view .

Letters to the Editor

From **Neil Haggath**

I've just had to say farewell to an old and trusted friend – my beloved and faithful Mazda MX3, which has been given an MOT death sentence! To say that she has served me well is a huge understatement; I've owned her for twelve years, almost to the day, and she has clocked up an incredible 184371 miles – and never broken down once!

This is an indication of how engine technology has improved; a couple of decades ago, such mileages were unheard of! I remember the days when odometers had only five digits, because cars were simply not expected to survive as long as 100000 miles. The rare ones which did were said to have "gone around the clock", as after 99999, the odometer wrapped around and returned to zero.

Now, as the Mazda's final tally is appropriately astronomical, I can't resist making a few astronomical comparisons. Most of you – at least, the older ones who are used to thinking in miles instead of kilometres – will have instantly realised that she has travelled just over three quarters of the way to the Moon – 77% of the way, in fact. It's also equivalent to 7.36 times around the Earth, or – I love this one – just 2014 miles short of one light second!

Dear old Sir Patrick is fond of illustrating astronomical distances by saying, for example, "to drive to the Moon at 70 miles per hour would take nearly five months". In similar vein, I estimate that the total amount of my life which I've spent behind the wheel of this one car is a little more than half an orbit of the Sun.

From **John Crowther**

- **Emptier and emptier.**

An empty room is full of air and according to Professor Tom Harquist, our speaker in May, there are degrees of emptiness in space between the galaxies.

So what about Black Holes? Are they emptier than the almost nothingness of emptier space? Are they holes in space into which nature – "as it abhors a vacuum" - tries to completely fill with stellar material?

The Professor in his lecture almost persuaded me that an all pervading "ether" of the nineteenth century physics was making a comeback.

The analogy of Flatland helps as we struggle to picture just one extra dimension, never mind the sixteen or so which may exist in the Universe. Its cheating of course, for if we imagine a universe of two dimensions knowing that we exist in a three dimensional one then a four dimensional one is easier to accept.

On a perfectly flat and motionless sheet of water a cutout figure with no thickness rests. When the bath plug disappears not having any sense of downward motion the figure just rotates. Yet the vortex , the black hole of his 2D universe has him in its grip.

In Flatland, if a solid such as sphere comes into contact a curved line approaches. It gradually grows into a circle and then shrinks to become a line curving in the opposite direction before it disappears.

Back in three dimensions we may see a total eclipse of the Sun as it happen s, or on the two dimensional curved screen of the Planetarium. In the Planetarium we get the sphere in Flatland effect as the Moon intersects the Sun.

To end, see how a pre-Copernian idea is used in the following poem and its accompanying letter :-

Todays verse comes from Robert Louis Stevenson's marvelous "A Child's Garden of Verses.

"The Sun Travels"

The sun is not a-bed when I,
At nights upon my pillow lie;
Still round the Earth his way he takes,
And morning after morning makes.
We round the sunny garden play,
Each little Indian sleepy-head
Is being kissed and put to bed.
And when at eve I rise from tea,
Day dawns beyond the Atlantic Sea,
And all the children in the west,
Are getting up and being dressed

Skylights – June 2009

from Rob Peeling

The Sun

The continuing absence of sunspots, so long after the solar minimum is the big story in solar physics at the moment. Dust off your projecting box or check that your solar filters are still safe to use to be ready to catch the next sunspots when they appear – surely the Sun cannot stay clear for much longer.

If you haven't got the right gear or don't know how to look at the Sun safely then please just don't. There will be a public solar observing session at the planetarium in August where you can learn how to safely view the Sun. Will the sunspots condescend to join us?

The Moon

7 June	15 June	22 June	29 June
Full Moon	Last Quarter	New Moon	First Quarter

Planets

Saturn

Saturn will be setting, as it gets dark. It will still be possible to see it well and continue to enjoy the ever-changing positions of the moons.

Jupiter

Jupiter remains an object for night owls. Around the 15th June it rises at about 23:00. Jupiter will be fairly close to Neptune which brings the interesting possibility of seeing both in the same telescope field. They will be even closer in July and better placed in the sky.

Deep Sky

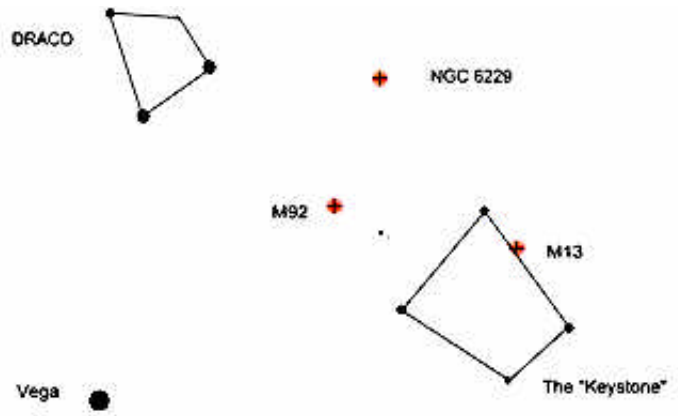
Orphiuchus

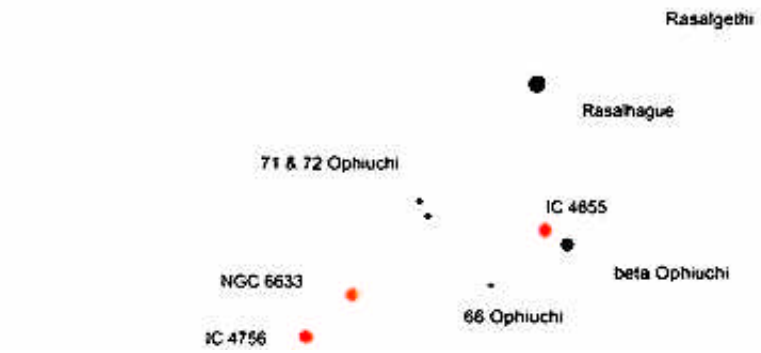
The constellation of Ophiuchus is well placed to the south at 23:00 in the middle of June. The star Rasalhague, or alpha Orphiuchi is bright and prominent and so easily found below and to the west of Vega in the sky. Use Rasalhague as a guide to three bright open clusters that I always seek out in Ophiuchus. The first is so large and bright that it is a very easy binocular object. This is IC 4665. IC stands for Index Catalogue and was Dreyer's extension to his original NGC

catalogue. IC 4665 can be found be sweeping down to the horizon from Rasalhague to the next bright star which is beta Ophiuchi. As seen with binoculars, the cluster is a little above and to the left of beta.

The other two clusters are similarly bright and lie to the east of IC 4665. They can be seen with binoculars but are probably best seen with a telescope at low power. Look up and to the east of beta Ophiuchi for the wide, bright, pair of 71 & 72 Ophiuchi which lie one over the other. Now scan down and further east amongst brightish stars. The nearest cluster to 71 & 72 is NGC 6633 and a little further on is IC 4756 (this cluster is actually in Serpens Cauda).

If you fancy a little challenge then how about tracking down Barnard's Star. It is near to 66 Ophiuchi which is close by and east of beta Ophiuchi. This red dwarf is neither bright nor impressive. However it is the second nearest stellar system to our Sun and shows the greatest proper motion of all stars. It moves across the sky so fast that you will need a star chart showing its exact position for this year. Otherwise you won't be able to tell which one of the several faint stars in the field of view is actually Barnard's Star.





Hercules

Go back to Rasalhague and look for a nearby brightish star to the west of it. This is alpha Herculis or Rasalgethi and is an excellent colour contrasting double. Moderate power is enough to split it and see the orange primary and the much dimmer greenish or bluish (depending on how your eyes work) secondary. The orange star is a red supergiant with a stellar diameter greater than the diameter of the orbit of Mars.

Almost overhead, you will find the famous "Keystone" asterism which represents the body of Hercules. Most of you will already know how to find the fantastic globular cluster M13, halfway up the western side of the asterism. This is easily the best globular cluster visible from Teesside. Less well known is the faint galaxy NGC 6207 nearby. You will need a dark night to find this galaxy.

There is a second prominent globular in Hercules, M92. Take the midpoint of northern edge of the Keystone and look further north (towards the head of Draco) for a moderately bright, wide pair of stars. Use these as pointers to guide you a bit further north. M92 should be picked up as fuzzy blob in your finder or binoculars.

There is a third globular in Hercules, NGC 6229. It is not bright and also tricky to find. Have a go.

Observing Report for May 2009

Looking back over my records for April and early May, I find that just two classes of objects dominate them.

Just about every observing session I've recorded, I've taken a look at Saturn and recorded just where I can see or suspect I've seen moons. I never look at planetarium programs or charts before observing. That way I can say that I haven't "cheated" when I check from my notes against the software (I use Sky Map Pro) to identify which moons I saw. If you already know something is in a particular place it isn't difficult to persuade yourself that you "saw" it. With these house rules in place, my claim is to have positively seen seven different moons since March 12th If anyone else has seen this lot and caught Mimas as well which is the only other likely one to be seen then I take my hat off to you.

The other class of objects that I have been concentrating on is galaxies. I have had some really good nights looking for them in Coma Berenices, Virgo, Leo, Canes Venatici and Ursa Major. My tally is 89 *different* galaxies since 12th March of which 34 I observed for the first time. Ok, I'll admit I haven't made sketches of more than handful or made very detailed notes on many, but I enjoyed myself and when it comes down to it isn't that the whole point?

Saturn's Moons Seen
Dione
Enceladus
Hyperion
Iapetus
Rhea
Tethys
Titan

A recent highlight was finding the galaxy cluster Hickson Compact Group 68 which is centered on NGC 5353. I saw 3 galaxies in close proximity through light pollution from my back garden. I look forward to an opportunity to look again with dark sky on the moors. At least 5 galaxies should show up.

One other delight was clearly seeing rills on the moon for the first time using the twins' refractor during the Moonwatch public observing for IYA at the planetarium. I also satisfied another personal lunar wish when I saw the Straight Wall for the first time.

Transit quiz questions for the June 2009 issue

from Rod Cuff

Where in the Universe? A pictorial challenge. Of what, where and when was this image taken

Q 1. What's the final item in each of these series?
(a) Potsdam 1899, Meudon 1891, Lick 1888, Yerkes 1897, ...?.
(b) Centaurus, Draco, Hercules, Ursa Major, Virgo, ...?.
(c) Europa, the Moon, Io, Callisto, Titan, ...?.

Q 2. What do the members of each set have in common?
(a) Algol, Mira, Rasalgethi, Mintaka, Proxima Centauri
(b) M13, M3, 47 Tucanae, Omega Centauri
(c) Alpha Centauri, Polaris, the Trapezium, Mizar, Castor

Q 3. Who in the world of British astronomy are these people?

(a) Andy Fabian (b) Roger Pickard (c) Helen Walker (d) Jack Youdale
(e) Robert Kennicutt (f) Lord Rees (g) John C. Brown

Q 4. What do these strange words signify?
(a) gegenschein (b) saros (c) Brocken Spectre (d) Lunokhod

Q 5. What do these abbreviations stand for in the astronomical world, and what do they refer to?
(a) LMC (b) ZHR (c) RA (d) ESA (e) IAU

Q 6. Astronomers use certain words or terms, sometimes for historical reasons, in ways that that are different from their day-to-day meanings outside astronomy. What do these mean to astronomers?
(a) metal (b) early galaxy (c) late-type star (d) coma (two meanings!)

A Genocidal Orbit? -The Solar System's Journey Through the Milky Way

Posted by Luke McKinney.

Is there a genocidal countdown built into the motion of our solar system? Recent work at Cardiff University suggests that our system's orbit through the Milky Way encounters regular speedbumps - and by "speedbumps" we mean "potentially extinction-causing asteroids".

Professor William Napier and Dr Janaki Wickramasinghe have completed computer simulations of the motion of the Sun in our outer spiral-arm location in the Milky Way (image left of spiral arms).

These models reveal a regular oscillation through the central galactic plane, where the surrounding dust clouds are the densest. The solar system is a non-trivial object, so its gravitational effects set off a far-reaching planetoid-pinball machine which often ends with comets hurled into the intruding system.

The sun is about 26,000 light-years from the center of the Milky Way Galaxy, which is about 80,000 to 120,000 light-years across (and less than 7,000 light-years thick). We are located on on one of its spiral arms, out towards the edge. It takes the sun -and our solar system- roughly 200-250 million years to orbit once around the Milky Way. In this orbit, we are traveling at a velocity of about 155 miles/sec (250 km/sec).

Many of the ricocheted rocks collide with planets on their way through our system, including Earth. Impact craters recorded worldwide show correlations

with the ~37 million year-cycle of these journeys through the galactic plane - including the vast impact craters thought to have put an end to the dinosaurs two cycles ago.

Almost exactly two cycles ago, in fact. The figures show that we're very close to another danger zone, when the odds of asteroid impact on Earth go up by a factor of ten. Ten times a tiny chance might not seem like much, but when "Risk of Extinction" is on the table that single order of magnitude can look much more imposing.

But you have to remember that ten times a very small number is still a very small number - and Earth has been struck by thousands of asteroids without any exciting extinction events. A rock doesn't just have to hit us, it has to be large enough to survive the truly fearsome forces that cause most to burn up on re-entry.

Professors Medvedev and Melott of the University of Kansas have a different theory based on the same regular motion. As the Sun ventures out "above" the galactic plane, it becomes increasingly exposed to the cosmic ray generating shock front that the Milky Way creates as it ploughs through space.

As we get closer to this point of maximum exposure, leaving the shielding of the thick galactic disk behind, the Kansas researchers hold that the increasing radiation destroys many higher species, forcing another evolutionary epoch. This theory also matches in time with the dinosaur extinction - and it's nice to see theories for that from Kansas not based on "an angry bearded man in the sky did it".

SPACE STATION FLARES

from Spaceweather.com

Lately, a growing number of observers are reporting intense "flares" coming from the International Space Station (ISS). During some nighttime flybys, the luminosity of the space station surges 10-fold or more. Some people have witnessed flares of magnitude -8 or twenty-five times brighter than Venus.

A movie featured on today's edition of http://spaceweather.com shows what is happening: sunlight glints from the station's recently expanded solar arrays in a shadow-casting flash. Currently, the flares are unpredictable. You watch a flyby not knowing if one will happen or how bright it might be. That's what makes the hunt for "ISS flares" so much fun.

FIRST NLCs of 2009:

Spaceweather.com

The first noctilucent clouds (NLCs) of 2009 have been sighted over northern Europe. Last night, May 29th, photographers recorded wispy electric-blue tendrils spreading across the twilight skies of Denmark, Northern Ireland and Scotland. This follows a similar display over Russia on May 27th. These sightings signal the beginning of the 2009 NLC season, which is expected to last until late July. Early-season NLCs are usually feeble, but these were fairly bright and vibrant, suggesting that even better displays are in the offing. Check today's edition of http://spaceweather.com for photos.

Noctilucent clouds are an unsolved puzzle. They float 83 km above Earth's surface at the edge of space itself. People first noticed NLCs in the late 19th century. In those days you had to travel to high northern latitudes to see them. In recent years, however, the clouds have been sighted in the United States as far south as Oregon, Washington and even Colorado. Climate change, space dust, and rocket launches have all been cited as possible explanations for the phenomenon. Interestingly, low solar activity seems to promote the clouds, so the ongoing deep solar minimum could set the stage for a good season in 2009.

The best time to look for NLCs is just after sunset or just before sunrise when the sun is between 6 and 16 degrees below the horizon. That's when the geometry is just right for sunlight to illuminate the tiny ice crystals that make up the clouds. Observing tips and sample photos may be found in the 2008 Noctilucent Cloud Gallery:

http://spaceweather.com/nlcs/gallery2008_page10.htm

Did Several Moons Once Orbit Earth? A Galaxy Insight

posted by Josh Hill.

The history of planet Earth is a fascinating story, involving catastrophic collisions with other small planets and a veritable plethora of asteroid impacts. The prevailing theory about the formation of the moon is called the giant impact hypothesis: the theory goes that a Mars-sized object, known as Theia, crashed in to the young Earth. What was left was Earth, and its moon.

A new computer model suggests, however, that the Moon may not have been the only reminder of that big collision. Jack J. Lissauera of the Space Science and Astrobiology Division, NASA Ames Research Center, and John E. Chambers of the Department of Terrestrial Magnetism, Carnegie Institution of Washington,

have suggested that moonlets called Trojans may have been left behind in the collision.

"The giant impact that likely led to the formation of the Moon launched a lot of material into Earth orbit, and some could well have been caught in the Langrangian points," -points in space where the gravity between two objects cancels the other out, said says study team member Lissauer. Their theory places small moonlets, or Trojans, in Earth's orbit, for up to 100 million years.

Over time, gravitational tugs from other planets would have eventually altered Earth's orbit, even if it was only slightly. Thus, the Langrangian points would have altered, leaving the Trojans once again susceptible to gravity. From there, they could be anywhere by now, or destroyed entirely.

"The perturbations from the other planets are very, very tiny," said Lissauer. But they change the shape of Earth's orbit, which subsequently changes the effect that the Sun's gravity has on the moons, that "...is what ultimately destabilizes the Trojans."

A separate yet similar model created by Matija Cuk, an astrophysicist at the University of British Columbia in Canada has suggested that smaller, asteroid sized objects, only a few tens of kilometers in width, could have lasted longest in those stationary positions. She believes that they could have lasted a lot longer too, up to a billion years or more.

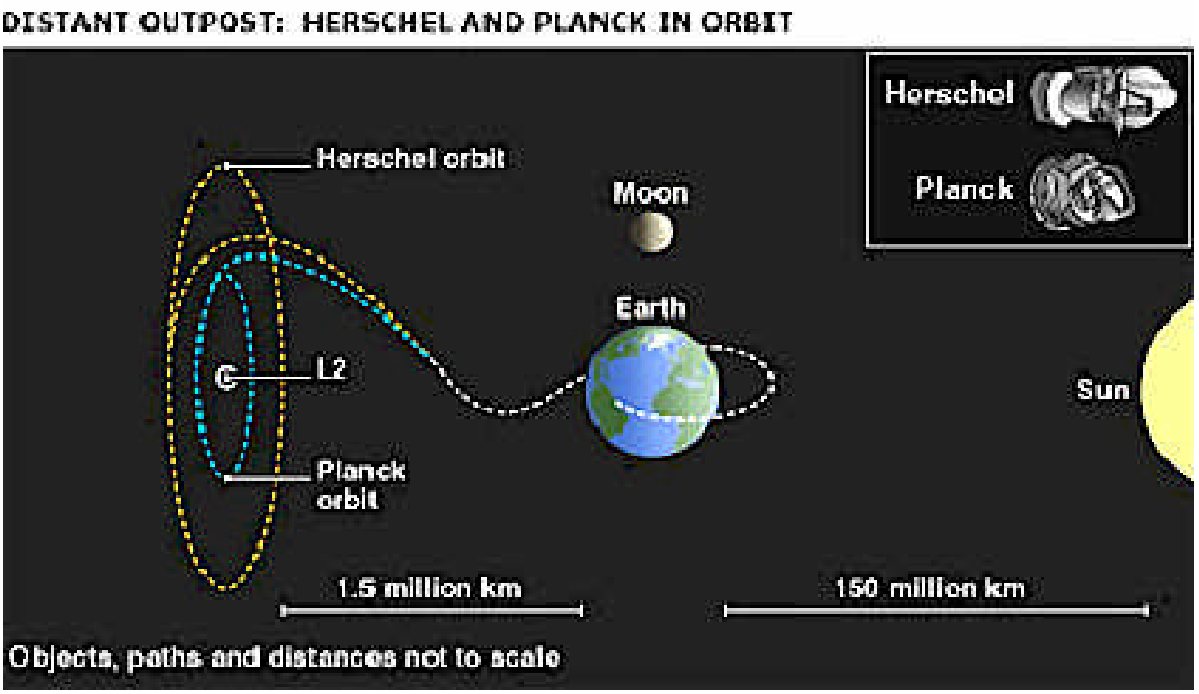
However she noted that "they would have looked more like Jupiter or Venus in the sky than a satellite. They would have resembled very bright stars."

Herschel and Planck Heading for Lagrange

from ESA

ESA's Herschel and Planck space telescopes were launched on an Ariane 5 rocket on May 14th from Kourou in French Guiana. Both telescopes will orbit a point in space known as Lagrange 2 or L2, about 1.5 million kilometers further from the Sun than the Earth.

L2 is one of several Lagrangian points where the Earth's and Sun's gravitational fields combine to produce a point which travels around the Sun at the same rate as the Earth. Thus anything positioned at or orbiting around L2 will stay in the same relative position to the Earth, making communication much simpler.



Herschel is the largest space telescope to be launched so far and has a primary mirror diameter of 3.5m, similar in size to the UK's Infra-red Telescope (UKIRT) on Hawaii. It is also an infra-red telescope and will look into the heart of dust clouds where star formation is taking place. It will study the formation and evolution of elliptical galaxies and the central bulges in other galaxies. Like any new instrument it will also reveal unexpected results that will be followed up in more detail.

Planck is a millimetre/sub-millimetre telescope with a primary mirror of 1.5m and is designed to map the cosmic microwave background. It rotates around its main axis once every minute scanning a circular strip of sky at right-angles to the axis. As it orbits the Sun with the Earth the scanned strip will progress through the whole sky.

Planck and Herschel will both orbit L2 and will join the WMAP satellite that is already there. Gaia and the James Webb Space Telescope will also join them in due course.

Cardiff University has been heavily involved in both projects and has set up web sites with a lot more information. You can find these at herschel.cf.ac.uk and planck.cf.ac.uk

The Sun's Demise

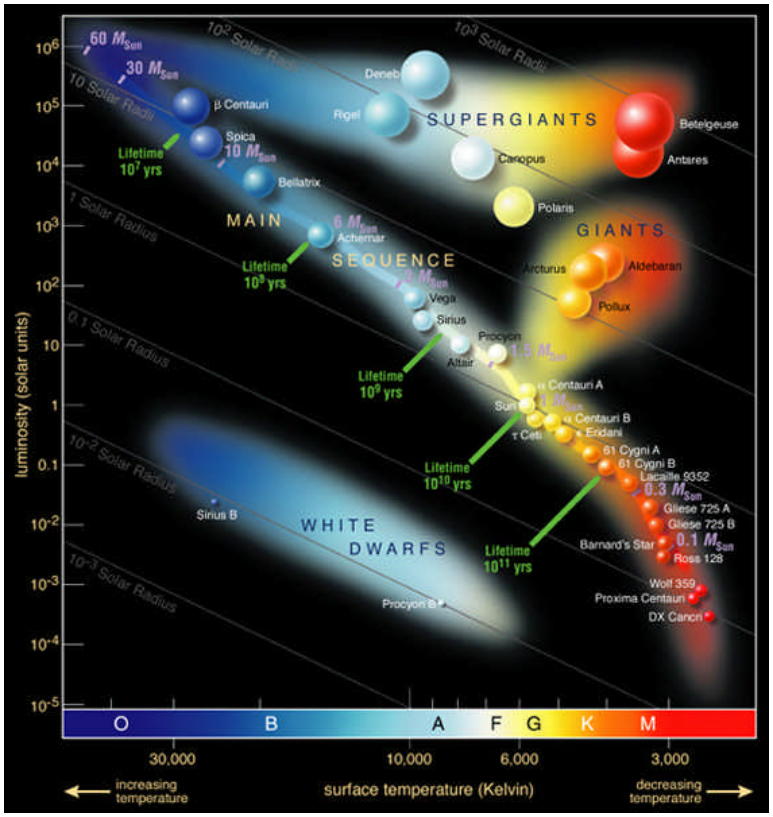
from Today's One-Minute Astronomer...

After forming out of a cloud of gas and dust, a mid-sized star like our Sun sits nicely on the main sequence and burns hydrogen in its core for some 5 billion years. Then, the end begins. Here's what happens ...

The Basics

? Stars on the main sequence fuse hydrogen into helium in their cores, releasing heat and light for tens of millions to billions of years. Massive stars burn fast, hot, and blue; less massive stars burn slower, cooler, and white or yellow or red. Eventually, all but the smallest stars run out of hydrogen, and that's when they start burning heavier elements in the core and quickly evolve off the main sequence.

? After 5-10 billion years, when a mid-sized star like our Sun runs low on hydrogen, nuclear fusion in the core slows. With less light to push back against gravity, the star contracts and heats the helium-rich core, re-igniting a thin shell of hydrogen, which pushes out the star's atmosphere.



? The star cools and swells by 50-100 times, becoming a red giant. It moves to the right and upwards on the HR diagram. Planets closest to the star may get swallowed up. This fate awaits Mercury and Venus. Earth may be spared, but the Sun will expand to fill much of our sky.

? In some cases, depending on the star's mass, the helium core will be squeezed enough to suddenly ignite it in what's called the "helium" flash. This expels as much energy as 100,000,000 Suns. But this happens only briefly, and the released energy does not disturb the outer layers of the star.

A Deeper Look

? After helium starts burning, the hydrogen shell around the core expands and cools, which means the outer layers of the star contract again. The star shrinks and moves to the left and downwards on the HR diagram, but it does not return to the main sequence.

? Helium burning is notoriously unstable, so the star begins to pulsate irregularly. Mira is an example of a star in this late phase of life. The outer layers are expelled as a planetary nebula. Once the helium is finished burning, the core becomes rich in carbon and oxygen. The core collapses again, but this time it doesn't get hot enough to continue burning. What's left of the core become a white dwarf, which we'll cover in the next issue.

? The sun has 5 billion years of hydrogen fuel left to burn before it enters the red giant stage. But here's the kicker... as the hydrogen burns, the Sun slowly contracts and becomes too hot to comfortably sustain life on Earth. This will happen not in 5 billion years, but just 500 million years. So plan accordingly.

Good To Know

A word about classification. On the main sequence, in the prime of life, a star has a luminosity class of "V" (five). So the sun is a G2V star, and Sirius is a B3V star. When mid-sized stars become red giants, they have luminosity class III (three) or IV (four). Aldebaran in the constellation Taurus, for example, is a K5III star, which means it's become a red giant.

Personal View

A little knowledge of star types will help you better understand what you see in the sky. For example, go out on this fine spring night and find Arcturus in the constellation Bootes. It's a red giant star, type K2III, and it's at this very moment burning a shell of hydrogen near its core; our Sun will look very much like this in some 6 -7 billion years. Now you know why.

Transit Quiz Answers for the May 2009 issue

From Rod Cuff

Where in the Universe? A pictorial challenge. of what, where and when was this image taken

A. This is an image from the Mars Pathfinder rover, Sojouner. The rock was named “Yogi” and is a meter-size rock located about 5 meters northwest of the Mars Pathfinder lander and was the second rock visited by the Sojourner Rover’s alpha proton X-ray spectrometer (APXS) instrument.

Q 1. Who discovered these?:
(a) Uranus
(b) Neptune
(c) Pluto
(d) M100
(e) Comet C/2006 P1

A 1. (a) William Herschel at Bath, on 1781 March 13. As an encore, he also discovered two of its moons, Titania and Oberon. The latest count of moons seems to be 27 – see www.nineplanets.org/uranus.html
(b) Johann Gottfried Galle at Berlin, on 1846 September 23, from calculations made by Urbain Le Verrier. At least, so says www.solarviews.com/eng/neptune.htm. You'll find a different, anglocentric, view at www.cornwall-calling.co.uk/famous-cornish-people/adams.htm.
(c) Clyde Tombaugh at Flagstaff, Arizona, on 1930 February 18. There's more on the history of this at http://library.thinkquest.org/J0112188/the_discovery_of_pluto.htm.
(d) Stand in the corner if you said 'Charles Messier'! His friend Pierre Méchain discovered this 'grand design' spiral galaxy on 1781 March 15, and at other times several other objects that figure in the famous catalogue. There's a lot on it at www.maa.clell.de/Messier/E/m100.html.
(e) This is the spectacular comet from early 2007: Comet McNaught. So the discover was Robert McNaught at Siding Springs, Australia – see http://cometography.com/lcomets/2006p1.html for more and for an iconic

photo from the Southern Hemisphere.

Q 2. What's the brightest star in the northern celestial hemisphere? What are the three stars brighter than that in the southern celestial hemisphere?

A 2. Arcturus, or alpha Boötis (apparent magnitude –0.05) – did you know its light was used to open the 1933 World's Fair in Chicago (http://starryskies.com/Artshtml/dln/5-96/arcturus.html)? The southerly beacons in order of brightness are Alpha Centauri (–0.27), Canopus (–0.72) and Sirius (–1.42). There's much more at www.space.com/scienceastronomy/brightest_stars_030715-1.html.

Q 3. What are these?
(a) a red giant
(b) a red dwarf
(c) the Red Planet
(d) redshift

A 3. (a) A star of mass roughly 0.5–10 times that of the Sun and that has run out of hydrogen fuel in its core and is now burning it in a shell outside the core. It swells to a huge size in the process (http://imagine.gsfc.nasa.gov/docs/ask_astro/answers/971016.html).
(b) A main-sequence star of mass 0.5–0.08 times that of the Sun. Most of its light is from the red end of the spectrum. Red dwarfs make up at least 80% of the stars in our galaxy. Read about star types at www.enchantedlearning.com/subjects/astronomy/stars/startypes.shtml.
(c) Mars. There's good coverage at www.spacetoday.org/SolSys/Mars/Mars.html – or, for something different, www.imdb.com/title/tt0199753.
(d) The shift of features in the spectrum of objects receding from us – the wavelengths of light we receive are longer than those the object emitted. This is partly due to the Doppler effect and (for objects sufficiently far away) partly due to the fact that the Universe is expanding. It's a fascinating business – see http://universeadventure.org/big_bang/expand-redshift.htm for a good explanation.

Q 4. What constellation is each set of objects in?
(a) the Pointers to the Southern Cross, Rigel Kent and our galaxy's biggest globular cluster
(b) the Rosette Nebula, Hubble's variable nebula and the Cone Nebula
(c) Algol, the Little Dumbbell Nebula and the California Nebula
(d) the Lagoon Nebula, the Trifid Nebula and the centre of our galaxy

A 4. (a) Centaurus. The pointers are Alpha and Beta Centauri, and Rigel Kent is an old and still-used alternative name for Alpha. The cluster is the fabulous Omega Centauri (NGC 5139) – there are a picture and links at

http://apod.nasa.gov/apod/ap090301.html.

(b) Monoceros. Astronomy Pictures of the Day for those nebulae are at http://apod.nasa.gov/apod/ap010214.html, http://antwrp.gsfc.nasa.gov/apod/ap991020.html and http://antwrp.gsfc.nasa.gov/apod/ap070412.html.

(c) Perseus. Algol (Beta Persei) is a famous, very regular binary star (www.astro.illinois.edu/~jkaler/sow/algol.html); the little Dumbbell is Messier 76 (www.maa.clell.de/Messier/E/m076.html); and the California Nebula is covered at www.skyfactory.org/ngc1499/ngc1499.htm, a good site for browsing.

(d) Sagittarius. The Lagoon Nebula is Messier 8 (www.nightskyinfo.com/archive/lagoon_nebula); the Trifid Nebula is Messier 20 (Hubble-originated results on star formation within it are very accessibly covered at http://eagle.la.asu.edu/hester/trifid.html); the centre of our galaxy is an object known as Sagittarius A*, now known to be a supermassive black hole (http://tinyurl.com/r6777q).

Q 5. On which solar system bodies would you find the following?

(a) Caloris Planitia
(b) Ishtar Terra
(c) D'Alembert Montes
(d) Elysium Fossae

A 5. (a) Mercury – it's a huge impact crater 1550 km wide (despite the size given at http://tinyurl.com/omxvq9!).

(b) Venus – it's a highland plateau about as big as the USA. See www.windows.ucar.edu/tour/link=/venus/interior/Ishtar_Terra.html.

(c) The Moon – it's the "historic name for suspected mountain range near the moon's western limb, in reality the northern part of Orientale Basin seen in profile on the limb."
(From http://the-moon.wikispaces.com/Montes+D%27Alembert.)

(d) Mars – it's a linear trough about 1175 km long (http://photojournal.jpl.nasa.gov/catalog/PIA04001).

Q 6. There are a lot of big telescopes in existence or planned. Can you expand these acronyms, and place the telescopes?

(a) ELT
(b) JWST
(c) SALT
(d) SOAR
(e) VLA

A 6. (a) (European) Extremely Large Telescope. (b) James Webb Space Telescope. (c) South African Large Telescope. (d) SOuthern Astrophysical Research (Telescope). (e) Very Large Array.

Only SALT (optical) and VLA (radio) are up and running as functioning instruments. The others are in various phases of planning or construction. VLA welcomes you at www.vla.nrao.edu, while the others and many more large telescopes are linked from http://astro.nineplanets.org/bigeyes.html

SOLAR ACTIVITY

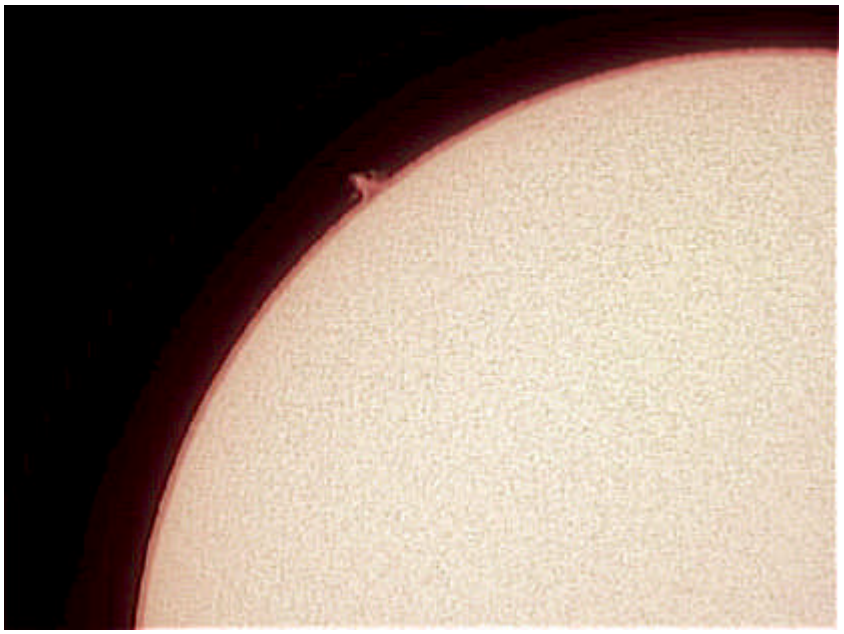
From Keith Johnson

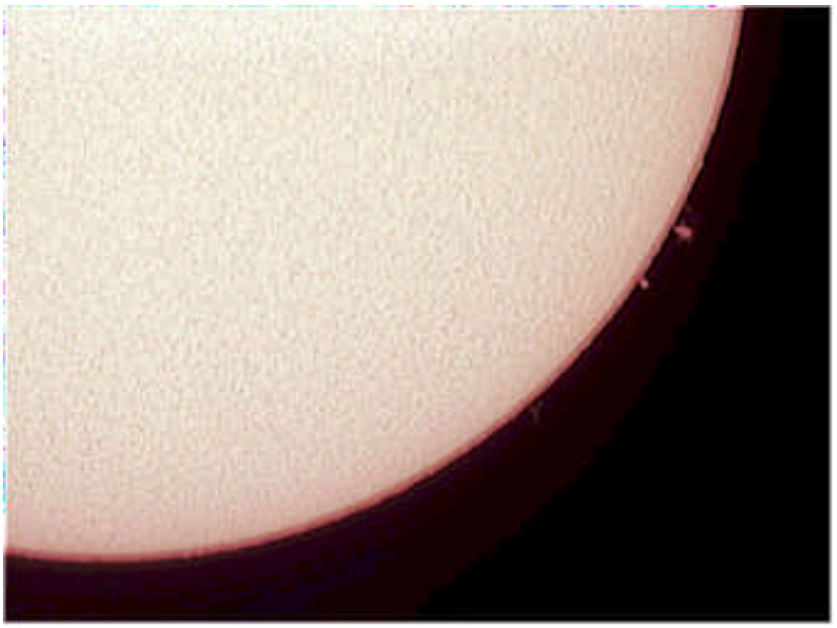
Hi Lad's

After I had recieved a telephone call from our dear friend Jurgen Schmoll informing me that there was some solar activity I decided to have a play with his 60mm Coronado filter on the 80mm ED and - together with the Toucam Pro. 2 several AVI's were taken, trying to focus and adjust the camera settings in the conservatory was proving very difficult due to the heat and brightness in the conservatory so I used the "remote desktop" feature in XP and with the help of my laptop in the livingroom which incidentally is connected to the HD TV.I was able not only to set up the camera settings but also control the EQ6 Pro. mount via Skymap Pro.

The following images are the result of 20 second AVI's that were processed in Registax 3 : Aligned and stacked with a very slight wavelet applied :

Best Regards,
Keith





Clockwise and Counterclockwise

By John Crowther

When we went to Canterbury to see our latest grandson, I slept for the first time in the attic, as we moved around due to Henry's arrival !

It was dark and quiet up there and I was surrounded by unusual books and other objects which curators collect.. The cool summer night's breeze came through the slightly open window (skylight) and the moon and stars were visible. When I awoke the following morning and checked the time I was baffled … for the clock was a counter-clockwise timekeeper with the number one on the left going round to the number eleven on the right.

Looking at the hands you thought you were either late or early, however seen in a mirror the clock was correct. It is a wonder that Lewis Carrol did not have one in "Alice through the Looking Glass".

The clock had the words "SEILF EMIT" on it. No its not Latin it is "TIME FLIES" written backwards.

Just as left-handedness used to be associated with bad fortune and the sinister side and the(no longer, we hope, with President Obama being a lefty), so moving clockwise in the northern hemisphere seems to be the accepted fortunate way to move, even the stars in the night sky appear to move in a clockwise direction with the rotation of the Earth.

This fact was known by the early civilisations and the Babylonians divided the circle into 360 ^{o,} not a bad estimate of the days in the year. In Roman Catholic and Anglican churches processions move clockwise. The exception to this rule is sometimes observed in Lent, when they move counter-clockwise chanting The Litany. The Stations of the Cross is a Lenten service when the congregation moves counter-clockwise to emphasise a different and serious season.

It may even be argued that one of the factors which played a part in the killing of Captain James Cook was that a too early return visit to the island of Hawaii and that his approach was from the wrong direction.
For the first approach of the "Resolution" and its companion ship "Discovery" was clockwise, and by a fortunate coincidence the ships arrived at a time of year sacred to the Hawaiins. The following paragraph is taken from Richard Hough's book "The Murder of Captain James Hook"

" … What he did not know, and never did learn, was that he had been acknowledged as the incarnation of the god Orono. His arrival was the greatest event in Hawaii's history. Orono Makua was the Hawaiin god of the season of abundance and relaxation, who was said to process clockwise about the island to be greeted by white banners and elaborate ceremonies of obeisance. Cook had arrived at the appointed time and by reason of his decision to sail slowly offshore for better trading, had indeed progressed slowly and clockwise around the island, his standard at his masthead a divine acknowledgement of the white banners ashore. And properly, and according to tradition, he had come to rest at Kealakekua, 'the path of the Gods', in his miracle giant canoe opposite the heiau in the middle of god's season, in time for the ceromonies of worship annually accorded to him for the abundance of riches he caused the soil to grant them …"

Cook was seen as an incarnation of the god Orono and so the islanders were extremely hospitable. They gave so much livestock to stock the ships and wood to repair the storm damage as to cause possible future shortages for themselves. So for the first time in three voyages amongst the Pacific Islands a chief was anxious for the ships to depart.

Unfortunately a faulty foremast on the "Resolution" had been overlooked and in the storm less than a week after departure it split. So the ships were forced to return to Kealakekua Bay retracing their recent departure in an anti-clockwise direction. This time there were no welcomings, and due to faults on both sides, relationships rapidly got worse, until things came to a tragic end when Captain Cook was attacked and killed.

It was a case of coming back in the wrong direction at the wrong time !!

[Fedastro] Herschel outreach website

Dear All,

I've been asked to pass onto you details about the new Herschel outreach website - it has a bunch of resources that societies might find us eful..

"The websites are at:

http://herschel.cf.ac.uk
http://planck.cf.ac.uk

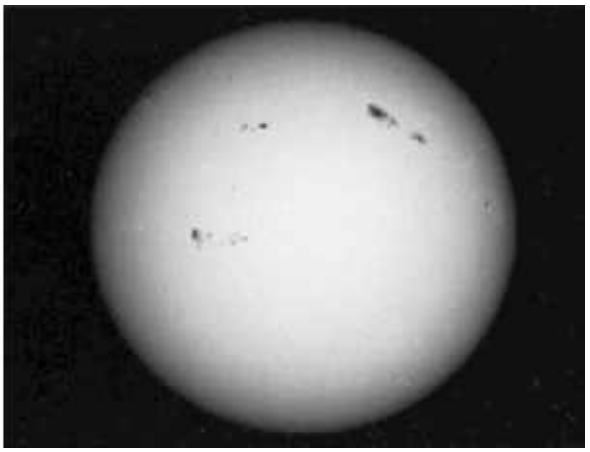
and contain images for anyone to use as well as descriptions on the instruments and science they will do. We also have a few videos (ESA+our own) on there for people to watch. There will also be updates on technical info after launch and will include popular science articles written by mission scientists.

best wishes,

sam

The Spotted Sun

from Herb Koller



Some of the first telescopic observations of dark regions on the Sun were made in late 1610 and early 1611 by Thomas Harriot, David Fabricius and Christoph Scheiner as well as Galileo.

In January of 1612 Scheiner, a Jesuit mathematician, had published an account of these “spots” on the Sun. Since he could not conceive the Sun to be anything but perfect, Scheiner thought these spots were actually satellites in orbit around the Sun.

These early observations were probably made in the early morning or late evening when the Sun was close to the horizon. Although it was then relatively safe to observe the Sun with such tiny telescopes, not much detail could have been seen.

Galileo began to seriously study sunspots in April of 1612. At this time, a pupil of Galileo, used the telescope to project an image of the Sun. This allowed Galileo to safely observe the Sun when it was high in the sky giving better images.

He saw that sunspots were irregular in shape and appeared to move in unison across the visible surface of the Sun. Rather than being in orbit around the Sun, Galileo reasoned that the sunspots were on the surface of the Sun and their motion was due to the rotation of the Sun itself.

Whether Galileo was the first to observe sunspots is not entirely clear but he was probably among the first to deduce they were part of the Sun. Even Scheiner eventually conceded that Galileo was correct and used sunspots to measure the rotation period of the Sun.

NOTE: Do NOT attempt to observe the Sun at ANY time through any optical device that is not specifically designed for that purpose!!

Articles : Please send contributions for the newsletter to The Editor, Bob Mullen, 18 Chandlers Ridge, Nunthorpe, Middlesbrough, TS7 0JL, 01642 324939 (b2mullen@hotmail.com) Copy deadline date is the 25th of each month).

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