Wadhurst Astronomical Society Newsletter November 2012

MEETINGS

OCTOBER MEETING

The meeting was introduced by Phil Berry who began by saying that since we have sadly lost Society member Michael Harte who had been the Wadhurst web-site's Web Master for many years, it had become necessary for us to have our own website. The site is now up and running, although it will need some work to bring it up to date. The web address is: www.wadhurstastro.co.uk

Phil also announced that one of our members, Alan Goddard who lives in Wadhurst had very kindly offered the use of his garden for the Society to arrange the occasional observing evenings using their own or the Society's telescopes. A board was on the table for members to enter their names to give some idea how many members would be interested in joining such a group for some practical astronomy.

Then the evening's speaker, Society member Bob Seaney was introduced. Bob has spoken on a variety of well researched subjects in the past such as astro-archaeology, the space art of Chesley Bonestal and the multi-universe. Tonight Bob is talking about Lick Observatory in California.

Lick Observatory
Bob Seaney

Bob began by looking at the location of the Lick Observatory at 4,250 feet on top of Mount Hamilton, part of a range of mountains in California to the east of San Francisco, not very far from San Jose and accessed by a very tortuous route. It had been built by James Lick during the time of the gold rush and when he had made his money. It had cost $700,000; a considerable amount of money around the late 1800s when it was constructed.

Then we were taken on a fascinating story of the observatory's history.

James Lick intended to construct an observatory housing the most powerful telescope yet made. He set up a trust in 1875 whose first decision was whether to use a refracting or reflecting telescope.

We looked at how lenses were ground at around that time. Lenses had developed from spectacle lenses and bigger lenses were made by the glass-blower blowing molten glass into a mould to create a blank of about the right size and shape. It was then ground and polished to make either a positive or negative lens.

The surfaces were spherical which resulted in spherical aberration, although this was reduced by using just the centre part of the lens. Another problem was caused by different wavelengths of light being refracted at different angles as it passed through the glass resulting in chromatic aberration because different colours of the spectrum came to focus at different points.

As an example of early telescopes, Huygens used lenses with a focal length of 98 feet with a focal ratio of f147! We saw drawings of examples of these long telescopes and Bob talked about the incredible difficulties there must have been in directing them and using such long tubes tended to result in sagging under their weight.

Newton made a telescope using a mirror that overcame the problem of chromatic aberration. The mirror was made out of a mixture of copper and tin (bronze) and then highly polished, although not very efficient at reflecting light. The surface also tarnished very quickly and needed frequently re-polishing.

Towards the end of the 18th century, lenses were improving. One big advance was the careful combination of lenses using glasses such as crown and flint glass with different refractive indexes, so reducing the chromatic aberration.

Many other uses for telescopes were being found such as their use at sea and for transit telescopes to establish accurate time, but as Bob said, lenses were becoming bigger and bigger and more difficult to produce.

In 1856 a method of silvering the surface of a glass mirror by depositing a thin layer of tin was discovered, improving the reflective efficiency dramatically although large glass mirrors brought their own problems. The glass had to be free of bubbles and once poured the large molten glass blanks have to be cooled over many months.

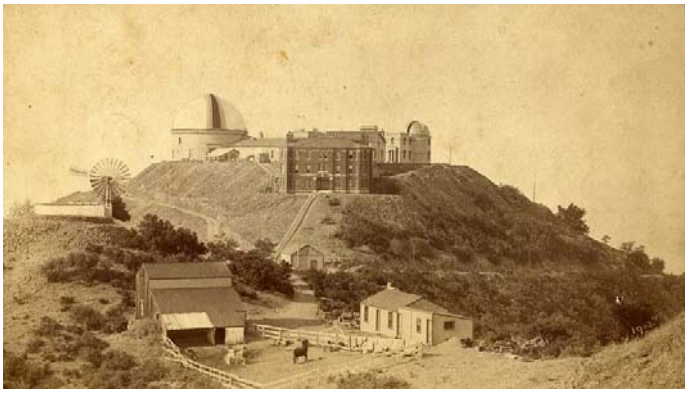
So the first telescope at Lick observatory was chosen to be a 36-inch refractor, the largest telescope in the world at that time and to be housed in the first mountain top observatory.

Work began in 1876 but sadly James Lick died in February and never saw the completion of the observatory although his remains are interred beneath the great telescope.

Construction began in 1879 and first, roads had to be made for access, then in 1881 the glass was ordered from France, the French being thought to be the best at producing the glass disks.

The construction of the telescope was given to a firm in California called Alvin Clark who also figured the glass disks. Bob said that at this time, there were no large telescope manufacturers in the States so this was a huge learning curve for Alvin and Clark but they were successful. Many attempts were made to produce the satisfactory blank but finally the main lens was ready. Unfortunately the glass shattered on the way up to the top of the mountain on the rough road and another mirror had to be made The mirror cost $50,000.

To facilitate viewing from the eyepiece, the floor was made to rise and fall as the telescope was driven at higher or lower angles.



Lick observatory in 1902

The telescope saw first light on the 3rd of January 1888 but alarmingly it couldn't be focused and this was finally achieved by "sawing off" part of the lower end of the tube.

James Lick had originally intended that the telescope should be open at times to the public and visits were begun in 1889.

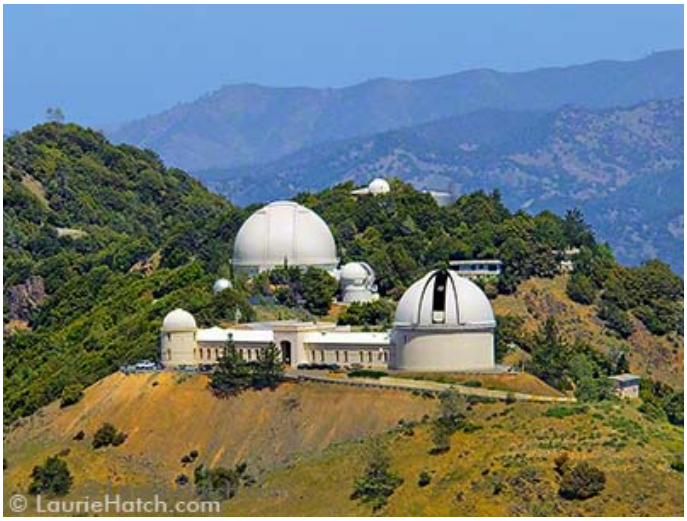
The 36-inch telescope in place

Bob then talked about how he became so interested in the Lick observatory. He had met an American friend at a meeting in Livermore, not far from Mount Hamilton. His friend said that amongst his grandfather's possessions where discovered glass mounted lantern slides made through the telescope at Lick observatory at the start of the twentieth century. On the death of Bob's friend a few years ago, his wife kindly sent Bob the slides and he was able to show us the actual slides so that we could see how detailed the images were. One was of the solar eclipse at the beginning of the 1900s. Others were of the moon and showed remarkable detail for the time.

Finally, Bob took us on an imaginary trip up to the observatory as would have been arranged for visitors in the early 1900s and read the hilarious Wells Fargo instructions given by the hotel manager at the start of their journey by stage coach from San Jose and with an overnight's stay at Smith Creek hotel. Here are some examples of those instructions:

- If you must drink, share the bottle.
- Guns are permitted for personal safety but must not be fired for pleasure.
- Do not smoke as it can offend the gentle sex.

During the evening's viewing members of the public would have been able to look through a 12-inch refractor and if conditions were good, through the 36-inch refractor.



Lick observatory today

Bob said today the observatory is now well funded and is mainly used for training. It houses a 120-inch reflector, an astrograph, a spectrograph and more recently, distant planet detection equipment.

John Wayte snippets

More of John Wayte's enjoyable snippets from the world of science.

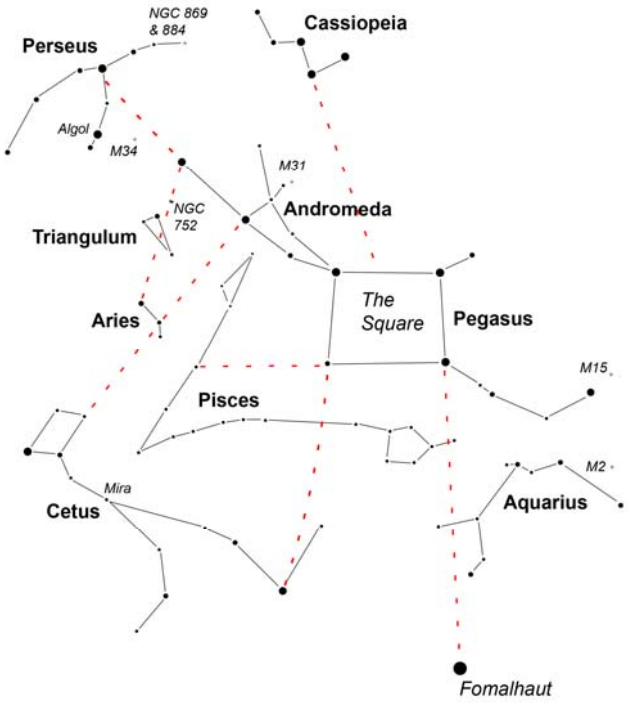
John referred to Brian Mills' talk on the moon last month and thought members might be interested to know the name of the object or planet that "bashed" into the earth 3.8 billion years ago. The colliding object is called Theia from the mythical god, Titan who was mother of Selene, the goddess of the moon.

At the centre of our galaxy is a black hole, Sagittarius A, and a star, SO-102 has been located that is travelling around it closer than any other object. The star orbits in 11.2 years and at a speed of 6,600 miles per second. It has a stable but changeable orbit. Sagittarius A itself has a mass of 4 million suns but is only ten times larger!

Finally, John brought up a useful suggestion. Most people carry a mobile phone and if you are involved in an accident or are taken ill, the emergency services look at the mobile phone to see who to contact. During his recent recuperation from an operation, it was recommended that amongst the numbers on his mobile phone he included **ICE** (**I**n **C**ase of **E**mergency) followed by the name of a contact and then their relationship followed by their number. It is possible to have ICE2, ICE3 and so on. This would considerably aid the Emergency Services.

Constellation Recognition

Brian gave another of his talks about Constellation Recognition. This month he talked about the Andromeda and Pegasus region.



As Brian has mentioned previously, by taking the back two stars of the Plough and projecting a line through Polaris the Pole Star, we come to the "W" of Cassiopeia.

Use the two brighter stars in Cassiopeia to point down to the "**Square of Pegasus**" the winged horse. The head of the horse, although upside down, lies to the west of the right hand corners.

From the top left hand corner of the square, a line of brighter stars lead up to the left and takes us to the constellation of **Andromeda**. Continuing in a line we come to Alpha Perseii. From that you will be able to identify the upside down "Y" shape of the constellation **Perseus**. You can also use two of the stars

in Cassiopeia to point to the "sword handle" in Perseus as shown in the above chart.

From the star on the extreme left of Andromeda, draw a line in the general direction of the horizon that makes a 60º angle with Andromeda itself. This line will pass through **Triangulum** and then **Aries**.

Drawing a line down from the two right hand stars in the Square of Pegasus southwards leads to **Fomalhaut** the brightest star in **Pisces** and fairly close to the horizon.

About midway along this line from Pegasus to Fomalhaut are two faint stars either side the line that help make up the constellation of **Aquarius.** On this same line, midway between Pegasus and Aquarius are two faint stars, again one either side the line and these form one end of the constellation of **Pisces.** To find the other end, extend a line through the bottom two stars of the square of Pegasus and to the left and the faint star. The rest of Pisces lies between these two limits.

Using the left two stars of the square of Pegasus, draw a line towards the horizon, curving it a little to the left you will reach only a modestly bright star near one end of the constellation of **Cetus**, the whale. The other end can be found by drawing a line from the second star in Andromeda, through Aries and continue it until you reach a faint parallelogram of stars that makes up the whale's head.

Brian provided the meeting with handouts to cover this talk and in this he mentioned a number of objects of interest to be found in the region.

Mira otherwise known as Omicron Ceti, was one of the first variables to be identified back in 1596. It is a long period variable with a period of 332 days. It consists of an eclipsing binary with one component that pulsates over a very long period. It is travelling through the interstellar medium at a speed of 130 Km/s creating a bow wave ahead of it and a tail of matter streaming behind it that is 13 light years in length.

NGC 752 This is an open cluster of magnitude 5.7, so is just visible to the naked eye although it is well seen in binoculars.

M34 An open cluster at magnitude 5.5 with around 400 members.

NGC 869 & 884 This is the famous double cluster, magnitude 5.3, in the sword handle of Perseus, containing 200 and 150 stars respectively. It is around 7,500 light years away from us.

M31 This is the Great Andromeda Spiral Galaxy and at magnitude 3.5 it is the most distant object visible to the naked eye at a distance of 2.5 million light years. **M32** and **M110** are its satellite galaxies.

Algol Known as the "Demon Star", it is an eclipsing binary with a magnitude range between 2.1 and 3.4. It is in fact a three star system.

M15 A globular cluster containing some 100,000 stars and thought to be 12 billion years old. At magnitude 6.4, binoculars are needed to show it but a telescope is required to begin to resolve some of the stars.

M2 Another large globular cluster, magnitude 6.5, although it is slightly elliptical in shape. It contains 150,000 stars and is thought to be 13 billion years old making it one of the oldest known globulars.

NOVEMBER MEETING

Wednesday 21st November 2012 – Member, Jan Drozd talks about "Early Pioneers in Astronomy". Jan has given a number of enjoyable talks in the past and this promises to take us back to the early beginnings of astronomy.

Meetings begin at 1930 although members are invited to arrive anytime after 1900 as this is a good time to exchange ideas and discuss problems and also relax before the meeting.

The venue as always is held in the Upper Room of the Methodist Church at the east end of Wadhurst Lower High Street, opposite the entrance to Uplands College. (For those with SatNav – the post code is TN5 6AT)

Anyone is welcome but non-members are asked if they wouldn't mind contributing £2 towards costs.

FUTURE MEETINGS

Wednesday 12th of December 2012, the second Wednesday of this month – Society member Paul Treadaway continues his story of building his own telescope. His talk is called "The T200 Telescope First Light". Everyone is welcome and there will be mince pies as well!

Wednesday 16th January 2013 The meeting begins with our Annual General Meeting. Then our Secretary, Phil Berry is talking about "Astronomical apps for Android Mobiles". With smart phones gaining in popularity Phil proposes to introduce some of these impressive applications available for use in astronomy and intended for Android mobiles.

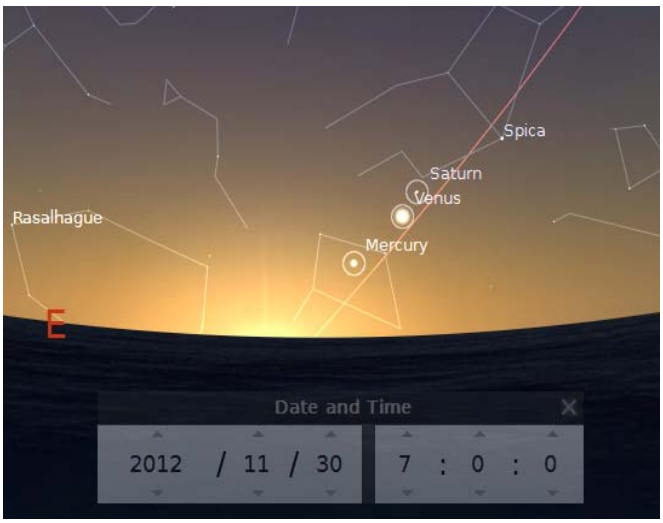
Wednesday 20th February 2012. Details to follow.

OTHER NOTES AND INFORMATION

SKY NOTES FOR NOVEMBER

Planets

Mercury passes through an inferior conjunction on the 17th of this month. After this it moves to the west of the Sun to become a morning object, visible in the dawn skies from the end of November. The map below, which is a screenshot from Stellarium, shows the positions of Mercury, Venus and Saturn at 07.00 on November 30th when the Sun is still 6° below the south eastern horizon. The red line shows the track of the ecliptic, illustrating that the planets never stray very far from it.



Venus is still a superb sight in the early morning skies at magnitude of -3.9 in the constellation of Virgo. Throughout the month it rises three hours before the Sun and is so bright it is impossible to confuse it with any other astronomical body.

Mars still lies in a difficult position for observation from these latitudes. It is in the constellation of Ophiuchus at magnitude +1.2. As I described last month, the shallow angle of the ecliptic

at this time of year in the early evening means that the planet sets just an hour and a half after the Sun.

Jupiter rises at 18.00 hrs at the beginning of the month, but by the end this has become 16.00. The Moon lies close to the planet on the 1st and 28th. During November its magnitude increases very slightly from -2.7 to -2.8 as it heads towards opposition on December 3rd.

Saturn suffered a superior conjunction on October 25th and will appear in the morning skies later this month in the constellation of Virgo at magnitude +0.6. Its position is shown above in the map for Mercury and Venus.

Lunar Occultations

In the table below I've listed events for stars down to magnitude 7.0 that occur before midnight although there are others that are either of fainter stars or occur at more unsociable hours. DD = **d**isappearance at the **d**ark limb. There is now an extra column headed "mm" (millimetres) to show the minimum aperture telescope required for each event. **Times are in GMT.**

Nov	Time	Star	Mag	Ph	Alt °	% illu	mm
16th	16.05	Mu Sagittarii	3.8	DD	15	11	120
17th	17.05	43 Sagittarii	4.9	DD	17	20	40
17th	17.22	SAO 162432	7.0	DD	16	20	60
23rd	21.48	51 Piscium	5.8	DD	42	81	50
24th	16.44	SAO 92304	6.5	DD	25	87	80

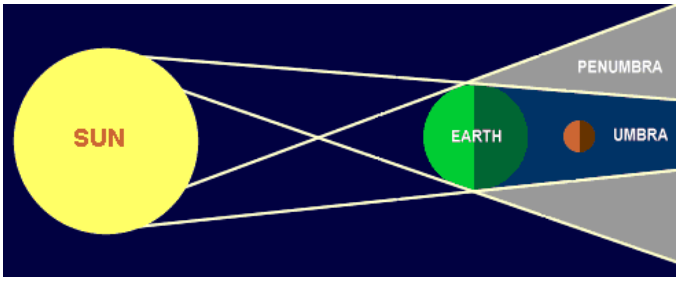
Phases of the Moon for November

Last ¼	New	First ¼	Full
7th	13th	20th	28th

Penumbral Eclipse of the Moon

This occurs on November 28th when the Moon passes into the penumbral shadow that the Earth casts out into space. It is unlikely that the casual observer will notice anything unusual as the drop in brightness is minimal. The Moon rises at 16.00 on that day and the event is over by 16.51 with the Moon just 6° above the eastern horizon.

The diagram below shows the position of the Moon during a *total* lunar eclipse when it is fully immersed in the umbral shadow. If the event were a *partial* lunar eclipse then the body of the Moon would be partly in the umbral shadow and partly in the penumbral shadow. The Moon always has to pass through the penumbral shadow before reaching the umbral section, for a partial or total eclipse to occur.



ISS

There are no evening passes of the ISS as seen from Wadhurst this month. The details of all passes including those visible from other areas can be found at:
www.heavens-above.com

Iridium Flares

The flares that I've listed are magnitude -4 or brighter although there are a lot more that are fainter, occur after midnight or at a lower altitude. If you wish to see a complete list, or obtain timings for somewhere other than Wadhurst, go to:
www.heavens-above.com

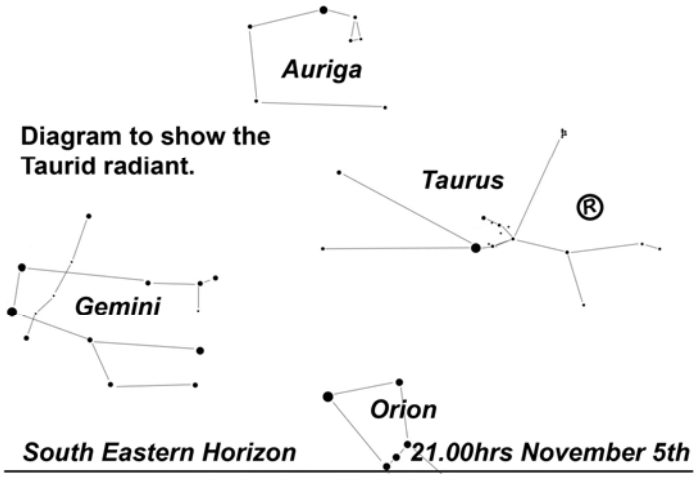
Remember that when one of these events is due it is sometimes possible to see the satellite in advance of the "flare", although of course it will be much fainter at that time. **Times are in GMT.**

Nov	Time	Mag	Alt°	Az.
1st	17.38	-7	58	NNE
12th	18.35	-4	38	NNE
13th	18.29	-8	39	NNE
14th	18.23	-7	41	NNE
17th	16.09	-8	76	E
27th	17.13	-6	61	NE

Meteor Showers

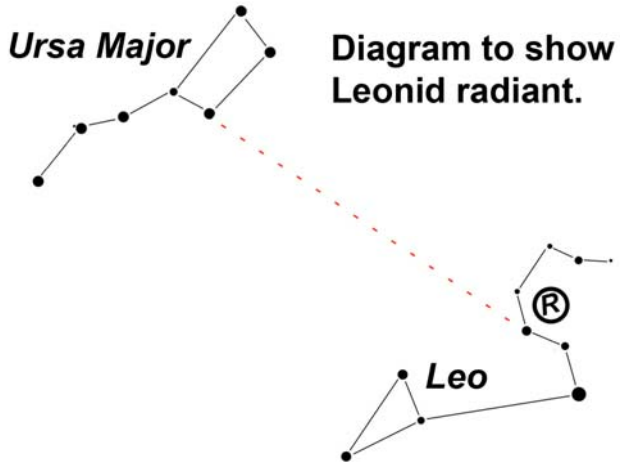
1. The Taurids.

This shower, as the name suggests, has its radiant in the constellation of Taurus. The shower is active from October 20th until November 30th and has two maxima - occurring on the 5th and 12th of November. At these times the zenithal hourly rate (ZHR) is expected to be around 10 meteors per hour. A slightly gibbous waning Moon rises at 22.00 on the 5th whilst on the 12th the Moon is almost new and so poses no problem. The position of the radiant is shown below by an ®. This is the point that all meteors associated with the shower appear to come from. You do not, however, need to look specifically at the radiant - meteors can appear a long way from it. Taurids are normally slow moving but can often be bright.



2. The Leonids.

The Leonids are well known for their occasional outbursts, most notably with the 1833 event when the ZHR was estimated to be over one hundred thousand meteors per hour! There were also "storms" in 1966, 2001 and 2002 although not on the scale of the earlier shower. The variations in the number of events seen is due to the trails of dust left by the parent comet (in this case Tempel-Tuttle) and the effect that other planets have in perturbing these trails which the Earth passes through at the same time each year. Sadly this year nothing unusual has been predicted. The shower is short in duration only lasting from November 15th to 20th with maximum at 13.00hrs on the 17th. The radiant (as shown in the diagram below by an ®) rises at approximately 22.30 hrs. The Moon will not cause any problems this year.



The Night Sky in November (Written for 22.00hrs GMT mid month)

In the east the brilliant star Capella in the constellation of Auriga is some 50° above the horizon, whilst below it Taurus, Orion and Gemini are now fully risen. Above Capella lies the constellation of Perseus, with the double cluster only 10° from the zenith.

Looking south both Andromeda and Pisces are straddling the meridian with the largely faint constellations of Cetus and Eridanus lying below them. With Andromeda so high, now is a good time to locate M31. Cassiopeia can be used to locate the "Square of Pegasus", after which find the top left star in the square which is actually Alpha Andromedae (the brightest star in Andromeda). If you now count 2 stars to the left and two stars up you will see a small misty patch a little above and to the right of this last star. This is the Great Andromeda Spiral - the most distant object that we can see with the naked eye lying 2.5 million light years from us. This means that when you see it, the light that enters your eye will have started on its journey 2.5 million years ago.

Towards the west the stars of the Summer Triangle can still be seen although Altair will soon be setting.

In the north Ursa Major is beginning to climb away from the horizon whilst Cassiopeia is at its greatest altitude on the opposite side of the pole. Ursa Minor points down towards the horizon as Draco winds its way between the two bears.

Forthcoming Occultations

There are some occultations of reasonably bright stars, in the coming months, that I have listed below and some of which are mentioned above in the occultation section. If you are interested in joining us to observe some or all of them (possibly from Ashdown Forest) please let me know. Maps are available of the location that we use.

Date	Time	Mag	Moon data	mm
16th Nov. 2012	16.05 GMT	3.8	Moon 11% 15° high	120
17th Nov. 2012	17.05 GMT	4.9	Moon 20% 17° high	40
23rd Nov. 2012	21.48 GMT	5.8	Moon 81% 42° high	50

Advance Warning for December.

December 3rd - Jupiter at opposition.
December 4th - Mercury at greatest western elongation - close to Venus in the morning sky.
December 13th - Geminid maximum (ZHR = 100).

Brian Mills

NASA SPACE PLACE

A Cosmic Tease:
Trials of the Herschel Space Telescope Science Teams
By Dr. Marc J. Kuchner

Vast fields of marble-sized chunks of ice and rock spun slowly in the darkness this week, and I sat in the back of a grey conference room with white plastic tables spread with papers and laptops. I was sitting in on a meeting of an international team of astronomers gathered to analyze data from the Herschel Infrared Observatory. This telescope, sometimes just called Herschel, orbits the Sun about a million miles from the Earth.

The meeting began with dinner at Karl's house. Karl charred chorizo on the backyard grill while the airplanes dribbled into Dulles airport. Our colleagues arrived, jetlagged and yawning, from Germany, Sweden, and Spain, and we sat on Karl's couches catching up on the latest gossip. The unemployment level in Spain is about twenty percent, so research funding there is hard to come by these days. That's not nice to hear. But it cheered us up to be with old friends.

The meeting commenced the next morning, as the vast fields of ice and rock continued to spin—shards glinting in the starlight. Or maybe they didn't. Maybe they didn't exist at all.

You see, this team is looking at a series of images of stars taken by a device called a bolometer that is blind to ordinary starlight. Instead, the bolometer inside Herschel senses infrared light, a kind of light that we would probably refer to as heat if we could feel it. But the idea of pointing the bolometer at the stars was not to collect ordinary starlight. It was to measure heat coming from the vicinity of these stars, like an infrared security camera, in case there was something else to be found lurking nearby.

And lo and behold, for a handful of stars, the bolometer measurements were off the charts! Maybe something was orbiting these stars. From the details of the bolometer readings—which channels lit up and so on—you would guess that this stuff took the form of majestic fields or rings of icy and rocky particles. It would be a new kind of disk, a discovery worth writing home to Madrid about.

There are several teams of astronomers analyzing data from the Herschel Space Telescope. They call themselves by oddly inappropriate sounding acronyms: GASPS, DUNES, DEBRIS. For the time being, the scientists on these teams are the only ones with access to the Herschel data. But in January, all the data these teams are working on will suddenly be released to the public. So they are all under pressure to finish their work by then. The team whose meeting I was sitting in on would like to publish a paper about the new disks by then.

But it's not so simple. The stars that this team had measured were relatively nearby as stars go, less than a few hundred light years. But the universe is big, and full of galaxies of all kinds—a sea of galaxies starting from maybe a hundred thousand light years away, and stretching on and on. Maybe one of those background galaxies was lined up with each of the stars that had lit up the bolometer—fooling us into thinking they were seeing disks around these stars.

The team argued and paced, and then broke for lunch. We marched to the cafeteria through the rain. Meanwhile, vast fields of marble-sized chunks of ice and rock spun slowly in the darkness. Or maybe they didn't.

What else did Herschel recently uncover? Find out at:
http://spaceplace.nasa.gov/comet-ocean

Dr. Marc J. Kuchner is an astrophysicist at the Exoplanets and Stellar Astrophysics Laboratory at NASA's Goddard Space Flight Centre. NASA's Astrophysics Division works on big questions about the origin and evolution of the universe, galaxies, and planetary systems. Explore more at:
http://www.science.nasa.gov/astrophysics/

Caption:

Samuel Pierpoint Langley, who developed the bolometer in 1878. His instrument detects a broad range of infrared wavelengths, sensitive to differences in temperature of one hundred-thousandth of a degree Celsius (0.00001 C). In 1961, Frank Low developed the germanium bolometer, which is hundreds of times more sensitive than previous detectors and capable of detecting far-infrared radiation.

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Any material for inclusion in the December 2012 Newsletter should be with the Editor by November 28th 2012