

# SPACEWATCH

the newsletter of the Abingdon Astronomical Society

14<sup>th</sup> December 2009

## *The 2009 Stan Cocking Memorial Lecture:*

**Malcolm McCallum (QMUL),  
'Was Einstein 100% right?'**

Stan Cocking, a founder member of this society, was always fascinated by big questions, how the universe started, how it works, astrophysics, cosmology and relativity. He would have been fascinated by this lecture tonight by Malcolm McCallum of Queen Mary University of London.

May I also take this opportunity to wish you all a Merry Christmas and a Happy New Year. I hope Santa brings you all those astronomical gifts you are hoping for. A shame he can't bring clear skies too, but there should be plenty over the winter, so make the most of them.

## THE NIGHT SKY THIS MONTH

by Bob Dryden

**Earth:** The Sun is at its lowest point on the ecliptic in Sagittarius on 21<sup>st</sup> December at 17.47 UT. In other words, that is the winter solstice, and the days will slowly become longer again. The Earth's orbit around the Sun is not quite circular. As a result, there comes a point when Earth is closer to the Sun than the rest of the year. This is known as perihelion, which is reached on 3<sup>rd</sup> January at which time our planet is just 147 million kilometres from the Sun (conversely, when at aphelion, the Earth is 152 million kilometres away).

**Mercury:** The very poor evening showing of Mercury continues. Mercury reaches greatest eastern elongation on 18<sup>th</sup> December (at 20°) but it will be a paltry 8° high at sunset which will make it very difficult to see the planet at all. However, on the evening of the 18<sup>th</sup>, there is a guide in the shape of a thin crescent Moon. It will be just above, and to the left of Mercury and as Mercury will be magnitude -0.5 that evening, you may be able to find it in binoculars. It is certainly an interesting observational challenge. Inferior conjunction is on 4<sup>th</sup> January, after which the planet climbs into the morning sky but will probably be still hard to see during the first part of the month.

**Venus:** With a solar elongation of just 7° in mid December, Venus is as good as unobservable this session. Superior conjunction is reached on 11<sup>th</sup> January.

**Mars:** As opposition is at the end of January you would expect Mars to be gaining brightness and size by now, which indeed it is. It increases its magnitude from -0.4 to -1.1 by early January and its size grows from 11" to 14". This makes it an easy naked eye object in Leo in December, moving to the

Leo/Cancer border by mid January. Telescopically, you should be able to make out surface markings and the north polar cap. It is best to let the planet gain some height above the horizon before attempting to view it with your telescope so that the seeing will be better. In mid December Mars rises at about 20.30 UT, but this becomes around 18.30 UT by mid January. Mars has been moving in an easterly direction up to now, but on 20<sup>th</sup> December it becomes stationary, before it becomes retrograde (ie: backwards) in motion, moving back towards Cancer.

**Jupiter:** Jupiter is low in the south east at dusk, eventually crossing from Capricornus into Aquarius. At magnitude -2.1, it is easy to see but getting rather low for good telescopic views. There is an interesting meeting with Neptune on 20<sup>th</sup> December. They will be 0.5° apart so they will both be in the same eyepiece field of view which does not happen very often. Try comparing their apparent size. Jupiter is a whopping 36" across while Neptune is a measly 2.2". In fact, in all probability you will not be able to make out Neptune's disc. Neptune will be just to the right of Jupiter. The next evening (21<sup>st</sup>) a crescent Moon will join the two planets giving a nice vista.

**Saturn:** You will have to be an early riser to see Saturn as it is in the morning sky at the moment. Crossing Virgo, it doesn't rise until about 01.00 UT in December, and 23.00UT in January. The rings are opening up again though and they will be at about +4.7° which means a small telescope should reveal them OK.

**Uranus + Neptune:** Uranus continues to be on view in the evening sky while Neptune is gradually dropping towards the evening twilight. Close to the Aquarius/Pisces border, Uranus is easily visible in binoculars at magnitude +5.7 if you have a decent finder chart. Neptune resides in Capricornus and is still close to the relatively bright stars F142, 44, & 45 which help to guide you to it. You need to look for Neptune fairly early after sunset because it sets by 21.00UT in December, decreasing to 19.00UT by mid January.

**Eclipse:** There is a partial eclipse of the Moon on 31<sup>st</sup> December. Unfortunately it is only a small eclipse, with just 8% of the Moon entering the umbral shadow of the Earth. However, lunar eclipses are not that frequent so if it is clear, make the effort to see it. The eclipse officially starts at 17.15UT as the Moon starts to enter the penumbral shadow. In practice, it is usually very difficult to see this part of an eclipse as the brightness change on the lunar disc is very subtle. The Moon starts to enter the darker umbral shadow at 18.52UT and this is when most people will notice anything happening. Mid eclipse is at 19.22UT, and the umbral phase ends at 19.53UT. The Moon finally leaves the penumbral shadow at 21.30UT. The whole event will occur while the Moon is in Taurus,

starting in the east at about 20° above the horizon, and ending in the south east at about 55° high.

**Meteors:** There are two major meteor showers this session, one very favourable, and one not so.

The Geminids have been active from 7<sup>th</sup> December and will remain so until 16<sup>th</sup>. Maximum night has just passed (13<sup>th</sup>/14<sup>th</sup>) but there should still be plenty of Geminid meteors to see. There is no Moon to spoil the view so if it is clear make the most of the situation because Geminids are often spectacularly bright and slow.

The Quadrantids produce lots of meteors (about 80 an hour at maximum) but they are usually fast and reasonably faint. Active between 1<sup>st</sup> and 6<sup>th</sup> January, maximum is on 3<sup>rd</sup> at 18.00UT. Sadly, this year the Moon ruins the show as it is 18 days old on 3<sup>rd</sup>, rising about 20.00UT, and will drown out most of the meteors.

**Comets:** The two comets I mentioned last Spacewatch continue to be visible, and both are in the morning sky.

81P/Wild crosses Leo and Virgo this session which makes it a morning object. It starts at +10.4 magnitude, but brightens to +9.6 mag by mid January (and will continue to brighten until the end of March) so a small telescope may be enough for you to find this one.

The second comet is 2007 Q3 Siding Spring which is currently in Coma Berenices, but crosses into Bootes by January. This comet is also brightening, from +10 to +9 magnitude (probably the brightest it is going to get) so, again, only a small telescope will be needed.

**Asteroids:** Again, as with last session, the same asteroid, 4 Vesta, is on view. It remains in Leo, and brightens from magnitude +7.5 to +7.1 by January so you will only need binoculars and a finder chart to find it. It will continue to get brighter until the end of February when it will reach magnitude +6.1.

**Algol:** For those who want to try their hand at a variable star observation, Algol is the easiest to measure. Minimum is reached on 24<sup>th</sup> December at 5.6UT, 27<sup>th</sup> at 2.4UT, 29<sup>th</sup> at 23.2UT and 1<sup>st</sup> January at 20.1UT.

**MOON PHASES:**

New: 16<sup>th</sup> Dec.; First Qtr: 24<sup>th</sup> Dec.; Full: 31<sup>st</sup> Dec.; Last Qtr: 7<sup>th</sup> Jan.

**LAST MONTH'S TALK**

by Gwyneth Hueter

Mr Kim Ward is head of the Space Engineering and Technology Division at Rutherford Appleton Labs, and his talk was about RAL's involvement in designing and building scientific instruments to be carried on craft in Earth orbit and beyond.

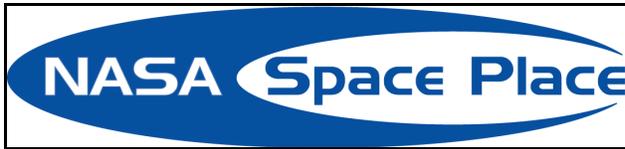
He gave a very detailed account of all the variables that have to be borne in mind when sending an instrument package into space:

- The location of any space junk that might cause damage.
- Is the Sun very active? Will its radiation damage equipment? Did you know in 1972, in the period between the Apollo 16 and 17 missions, there was a long spell of high solar activity that would have killed any crew who went up at that time? Not that we knew at that time.
- Small is best. Minimise everything and mill out holes in any aluminium or carbon fibre structures in order to reduce weight.
- Power expenditure needs to be kept as low as possible. Mobile phone technology has helped a lot with this.
- How do the materials react to a vacuum or high ultra-violet radiation? Certain plastics and lubrications can emit gases which could damage optics or machinery.

Once you have your instrument planned you have to build it and test it, so you need to create a suitable space environment and carry out vibration checks to check it will survive the launch. Then check adjacent instruments won't interfere with its function or that dirt or other outgassings don't get into the works or onto the optics when it's finally deployed. RAL has a space test chamber which can simulate vacuum conditions with a temperature range of -170°C to +150°C. RAL also has a vibration tester which can create various types of vibration.

Our after-tea speaker was our ever-intrepid Bob, who went to the grand opening of the Hanwell Observatory, north of Banbury. We were treated to views of rather unusual telescopes in the open air, including a 30-inch John Wall folded refractor (I had to check my notes!) and a 12½-inch reflector whose support looks like three beehives one on top of the other. There is also the 30" Millennium reflector for public use. It has a platform you stand on so you rotate with the telescope as you look through the eyepiece.

Christopher Taylor owns the ground and has some good connections when it comes to getting grants for public equipment. He got some commercial telescopes and wants to use CCDs on them but the location is dubious in its suitability (as well as there being no power source anyway). Bob amused us with lots of slides of trees blocking the views and the small bit of southern view he did find will give you superb views of Banbury's light pollution, two miles south....- that's if you haven't fallen down one of the banks by the path in your half mile walk from the car park. Well done Bob for surviving to tell the tale.



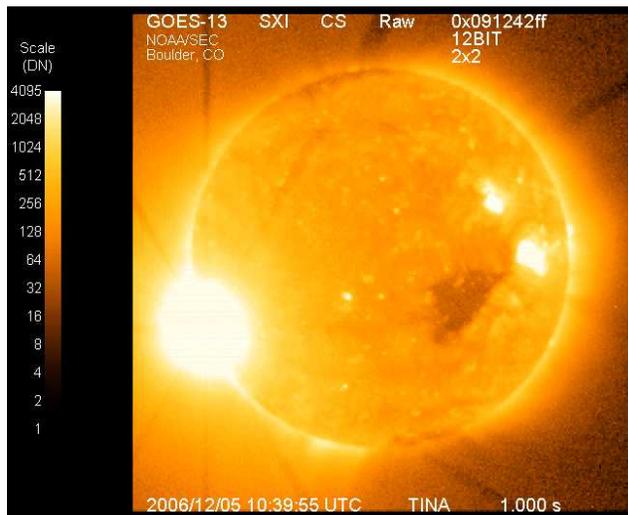
## SUNGLASSES FOR A SOLAR OBSERVATORY

In December 2006, an enormous solar flare erupted on the Sun's surface. The blast hurled a billion-ton cloud of gas (a coronal mass ejection, or CME) toward Earth and sparked days of intense geomagnetic activity with Northern Lights appearing across much of the United States.

While sky watchers enjoyed the show from Earth's surface, something ironic was happening in Earth orbit.

At the onset of the storm, the solar flare unleashed an intense pulse of X-rays. The flash blinded the Solar X-Ray Imager (SXI) on NOAA's GOES-13 satellite, damaging several rows of pixels. SXI was designed to monitor solar flares, but it must also be able to protect itself in extreme cases.

That's why NASA engineers gave the newest Geostationary Operational Environmental Satellite a new set of sophisticated "sunglasses." The new GOES-14 launched June 27 and reached geosynchronous orbit July 8.



*X-9 class solar flare December 6, 2006, as seen by GOES-13's Solar X-ray Imager. It was one of the strongest flares in the past 30 years.*

Its "sunglasses" are a new flight-software package that will enable the SXI sensor to observe even intense solar flares safely. Radiation from these largest flares can endanger military and civilian communications satellites, threaten astronauts in orbit, and even knock out cities' power grids. SXI serves as an early warning system for these flares and helps scientists better understand what causes them.

"We wanted to protect the sensor from overexposure, but we didn't want to shield it so much that it couldn't gather data when a flare is occurring," says Cynthia Tanner, SXI instrument systems manager for the GOES-NOP series at NASA's Goddard Space Flight Center in Greenbelt,

Maryland. (GOES-14 was called GOES-O before achieving orbit).

Shielding the sensor from X-rays also reduces the amount of data it can gather about the flare. It's like stargazing with dark sunglasses on. So NASA engineers must strike a balance between protecting the sensor and gathering useful data.

When a dangerous flare occurs, the new SXI sensor can protect itself with five levels of gradually "darker" sunglasses. Each level is a combination of filters and exposure times carefully calibrated to control the sensor's exposure to harmful high-energy X-rays.

As the blast of X-rays from a major solar flare swells, GOES-14 can step up the protection for SXI through these five levels. The damaged sensor on GOES-13 had only two levels of protection—low and high. Rather than gradually increasing the amount of protection, the older sensor would remain at the low level of protection, switching to the high level only when the X-ray dose was very high.

"You through the levels of protection," Tanner says. "We've really fine-tuned it."

Forecasters anticipate a new solar maximum in 2012-2013, with plenty of sunspots and even more solar flares. "GOES-14 is ready," says Tanner.

For a great kid-level explanation of solar "indigestion" and space weather, check out:  
<http://spaceplace.nasa.gov/en/kids/goes/spaceweather>.

*This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.*

## FURTHER DISCUSSION

If you are not already on our internet mailing list, then why not log on to YahooGroups. The list is called 'abingdonas'. Members use the list to alert each other about celestial events and to chat about amateur astronomy. The list is quite active, with several messages most weeks. To read through previous messages click on:  
<http://groups.yahoo.com/group/abingdonas/>.

To join the abastro list, please go to <http://www.yahogroups.com>. You can also unsubscribe from the list here.

To post messages to the list, please send them to [abingdonas@yahogroups.com](mailto:abingdonas@yahogroups.com). Please note that you will need to sign up with a YahooID if you do not already have one. You can do this on the above page.

Further information about the mailing list can be found on the abingdonas webpage at :  
<http://groups.yahoo.com/group/abingdonas/>.

Further discussion on astronomy and many other topics takes place at the Spread Eagle pub in Northcourt Road after the meeting. You are most welcome to join us.

## DATES FOR YOUR DIARY

**11<sup>th</sup> Jan.** 8pm Speaker meeting: Dr Frazer Pearce (Univ. Nottingham), 'Exoplanets'

**18<sup>th</sup> Jan.** 8pm Beginners' Meeting in the Perry Room.

The editor of "SpaceWatch" is Andrew Ramsey, who would very much appreciate your stories & contributions. Please send any news, observations, photos, etc. to:

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## STAR CHART



**The Night Sky at 21:00pm (GMT) next Saturday (19<sup>th</sup> December)**

With the Milky Way still high, M31 almost overhead and Orion getting higher in the winter sky, this is a great time to sweep the sky with binoculars, or explore with a telescope on those clear frosty nights.