



## January 2011

### Events list

Sun 16 Jan: **Speaker – Dr Paul Lewis:**  
"Measuring the Crab Nebula"

Wed 19 Jan: Full Moon

Thurs 03 Feb: New Moon

Tue 08 Feb: Herrington Cubs visit Cygnus Obs, 6:30pm start.  
Helpers requested

Sat 12 Feb: Winlaton Mill observing event, 6:30pm start

Fri 18 Feb: Full Moon

Sun 20 Feb: **Speaker – BBC weatherman Paul Mooney**  
"Clear skies predicted"

Sat 26 Feb: Kielder Nightwatch, 5:30pm start

02 – 06 March: Kielder Star Camp

**All** Society events are free, are held in the Washington WWT facilities, and evening meetings start at 7:00pm unless otherwise noted. Please bring a torch and warm clothing to any night-time observing sessions. All observing sessions are dependent upon favourable weather and may be subject to cancellation.

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- **Secretary's report**
- **News: The Solar Corona mystery – solved? Plus High energy particles from The Crab Nebula**

## Editorial

Happy New Year to everyone, and 2011 seems to have got off to a flying start.

Despite the cloud for the partial eclipse on the fourth of January, the Society had some great television coverage of the event. Two of the clips can be seen on our website's news pages.



**Above:** TV stars: Paul Meade and BBC's Hannah Bayman

The Society's website has had a major overhaul, so please take a look if you haven't visited it for a while, and please check regularly for any updates.

December and January have seen some very clear nights for anyone who has been brave enough to venture out into the snow and ice (not me, I'm slightly ashamed to admit!) Jupiter is still very bright in the evening sky and the morning sky is now graced with Venus and, much lower and closer to the Sun, Mercury. Good hunting to anyone trying to track down the more elusive planets like Mercury and Uranus, when the winter sky is blessed with so many other distractions like Orion and Taurus, Perseus and Cepheus to name a few.

On a personal level, I send my gratitude to Tom Crann who stepped into the Editor's shoes last month and did such a great job with the December issue. Thanks, Tom.

- Ed

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*There's more to astronomy than sea front eclipses*



# THE DARKE SIDE

*Society Update* with Chairman  
**Graham Darke**

Happy New Year to all! I hope that 2011 will bring peace, happiness, health and of course clear skies. We have a busy few months coming up as I'll expand upon below.

## December Lecture Meeting

The sudden snow on the afternoon of the meeting didn't prevent our speaker, Gary Fildes from making it along. Special thanks must go to him for making the effort. Numbers were low but those who were there enjoyed Gary's talk entitled "The Big Universe" which explored the development of the human race's understanding of the universe around us. We met some famous and interesting characters along the way and also some of the unsung heroes of astronomy. There were plenty of questions at the end which highlighted both how far we've come as a race and how much more there is still to learn.

January sees **Paul Lewis** talking to us about **measuring the Crab Nebula** and in February we have BBC Weather Presenter **Paul Mooney** coming along to give us a talk entitled "**Clear Skies Predicted**".

## BBC Stargazing LIVE

Over the nights of 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> January 2011, BBC 2 showed 3 live evenings of astronomy hosted by Professor Brian Cox and comedian Dara O'Briain. Astronomical societies and groups around the UK were asked to put on public events to coincide with the shows and SAS held two events during the week of the programmes.

Firstly, we attempted to observe the partially eclipsed Sun as it rose on the morning of Tuesday 4<sup>th</sup> January. We met up at cliff park, Seaburn and BBC weather presenter Hannah Bayman came along and did a live broadcast to the BBC Breakfast show and the BBC News Channel. Our members gave a fine account of themselves and the Society. Shame about the weather conditions that morning but it was good exposure for the club. Video footage can be seen on the SAS website.

Secondly, we took telescopes to Hamsterley Forest in County Durham on the evening of Saturday 8<sup>th</sup> January. This event was run in conjunction with the Forestry Commission. The Stargazing Live programmes seem to have done the trick with the event being completely sold out. The weather was great leading up to the start of the event but around 30 minutes in the sleet started which had members reaching for their scope covers! Clear spells only lasted a few minutes for the next hour or so and most of the public decided to leave. After the last of the

public had gone and with conditions seemingly worsening, members also packed away and headed off. Frustratingly, not long after this, there was a prolonged spell of clear weather lasting a few hours. I would like to thank all of our members who came along to these events, especially to Hamsterley where the roads were particularly tricky with ice.

Stargazing Live does seem to have generated a lot of renewed interest in the night sky among the public. The TV programmes themselves received a mixed press. From my perspective, I would have liked to have seen more of the amateur organised events featured in the programmes and particularly more plugging of the events. This aside, the thought of 3 hours of astronomy programming in prime time slots during a single week has to be a great way to start off 2011.

## Winlaton Mill Public Event – Saturday 12<sup>th</sup> February at 6.30pm

We are going to hold another observing event at Winlaton Mill on the above date. We are suggesting that members of the public meet at the car park at 6.30pm for a start to observing at close to 7.00pm. We are going to set up the telescopes closer to the main car park this time so it is not as far for the public to walk and, once again, the local scouts are going to set up a marquee for us. Anyone who can help out by bringing a telescope along would be more than welcome. We should aim to be there for about 6.00pm.

## Observatory Visitors

We have **Herrington Cubs** visiting the Cygnus Observatory at 6.30pm on **Tuesday 8<sup>th</sup> February**. If anyone can help out, it would be appreciated. I'll be at the WWT just before 6.00pm to set up.

## Kielder Night Watch - Saturday 26<sup>th</sup> February

The night watch event at Kielder Castle which was scheduled to take place in December but which was cancelled due to the snow has been rearranged to take place on **Saturday 26<sup>th</sup> February** starting at 5.30pm. This is the weekend before the Spring Star Camp. Again the call is going out to all members who are able to assist to come along.



## Astronomer stumble onto huge space molecules

By Trudy E. Bell and Tony Phillips

Deep in interstellar space, in the swirling gaseous envelope of a planetary nebula, hosts of carbon atoms have joined together to form large three-dimensional molecules of a special type previously seen only on Earth. Astronomers discovered them almost accidentally using NASA's Spitzer Space Telescope.

"They are the largest molecules known in space," declared Jan Cami of the University of Western Ontario, lead author of a paper with three colleagues published in *Science* online on July 22, 2010, and in print on September 3.

Not only are the molecules big; they are of a special class of carbon molecules known as "fullerenes" because their structure resembles the geodesic domes popularized by architect Buckminster Fuller. Spitzer found evidence of two types of fullerenes. The smaller type, nicknamed the "buckyball," is chemical formula  $C_{60}$ , made of 60 carbon atoms joined in a series of hexagons and pentagons to form a spherical closed cage exactly like a black-and-white soccer ball. Spitzer also found a larger fullerene, chemical formula  $C_{70}$ , consisting of 70 carbon atoms in an elongated closed cage more resembling an oval rugby ball.

Neither type of fullerene is rigid; instead, their carbon atoms vibrate in and out, rather like the surface of a large soap bubble changes shape as it floats through the air. "Those vibrations correspond to wavelengths of infrared light emitted or absorbed—and that infrared emission is what Spitzer recorded," Cami explained.

Although fullerenes have been sought in space for the last 25 years, ever since they were first identified in the laboratory, the astronomers practically stumbled into the discovery. Co-author Jeronimo Bernard-Salas of Cornell University, an expert in gas and dust in planetary nebulae, was doing routine research with Spitzer's infrared observations of planetary nebulae with its spectroscopy instrument. When he studied the spectrum (infrared signature) of a dim planetary nebula called Tc 1 in the southern-hemisphere

constellation of Ara, he noticed several clear peaks he had not seen before in the spectra of other planetary nebulae.

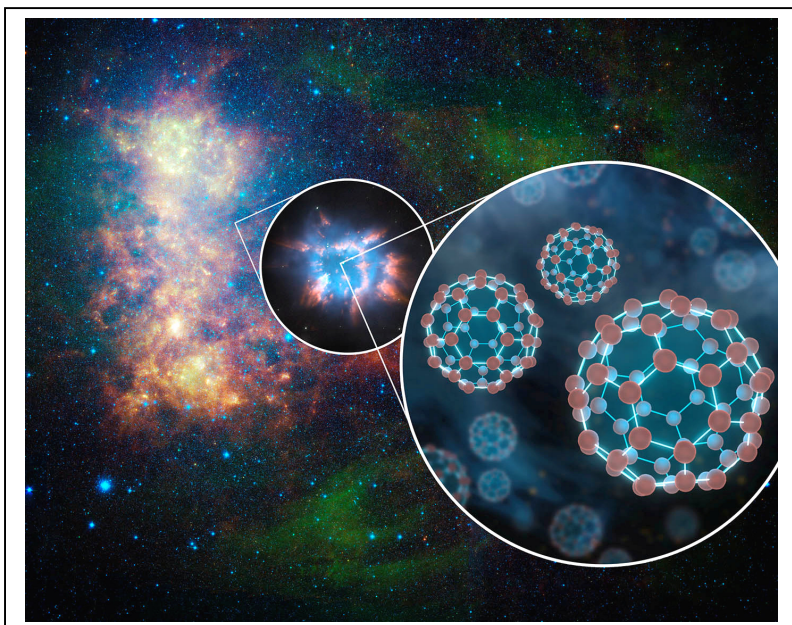
"When he came to me," recounted Cami, an astrophysicist who specializes in molecular chemistry, "I immediately and intuitively knew it I was looking at buckyballs in space. I've never been that excited!" The authors confirmed his hunch by carefully comparing the Tc 1 spectrum to laboratory experiments described in the literature.

"This discovery shows that it is possible—even easy—for complex carbonaceous molecules to form spontaneously in space," Cami said. "Now that we know fullerenes are out there, we can figure out their roles in the physics and chemistry of deep space. Who knows what other complex chemical compounds exist—maybe even some relevant to the formation of life in the universe!" Stay tuned!

Learn more about this discovery at <http://www.spitzer.caltech.edu>. For kids, there are lots of beautiful Spitzer images to match up in the Spitzer Concentration game at <http://spaceplace.nasa.gov/en/kids/spitzer/concentration>.

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

**Left:** Superimposed on a Spitzer infrared photo of the Small Magellanic Cloud is an artist's illustration depicting a magnified view of a planetary nebula and an even further magnified view of buckyballs, which consist of 60 carbon atoms arranged like soccer balls.



## SAS Yahoo Forum

The Society's Yahoo group provides a forum for members to exchange ideas, ask questions, and a place to post their pics:

<http://tech.groups.yahoo.com/group/SunderlandAstronomicalSociety/>

## Secretary's Report

### A summary of the Committee Meeting held on 12/12/10 .

**Attendees:** Kevin Baxter (KB), Graham Darke (GD), Lynn Henderson (LH), Ken Kirvan (KK), Paul Meade (PM)

**Apologies:** Tom Crann (TC), David Hughes (DH), Peter Stokel (PS), Michael Tweedy (MT)

### Items discussed:

#### Observatory Maintenance

- **GD** has sourced the 2 laptop needed to complete the networking of the dome with the classroom and these should be available in the New Year.
- A coating of PVA has now been applied to 1 panel of the observatory dome and this looks OK. All the loose and flaking covering has now been removed. We will now go ahead with applying PVA to the rest of the inside of the dome.

#### Visits and Events

- **GD** Did a talk for Cleveland and Darlington AS on 10<sup>th</sup> December on the subject of Meteor Crater in the US
- There is a potential event at Durham on Palace Green sometime in the New Year. More details to follow.
- There is a potential society event at Derwent in April which would include invites to all other local societies.
- The Kielder Castle Nightwatch Event has been rearranged to 26<sup>th</sup> February, 6pm Start.

**General Queries:** **GD** has received a request from a lady wishing to celebrate her 60<sup>th</sup> birthday at the observatory. As part of the visit GD is to find a star for the lady to observe which is 60 Light Years away. On this theme GD is going to build up a catalogue of similar close stars which could coincide distance wise with peoples birth years.

**Club Donation:** The club is donating one of its small scopes to a young girl raising funds to go to India. As part of the donation we will also donate 1 years free club membership.

Date of next meeting: 07 January 2011, 6pm



### Longstanding Mystery of Sun's Hot Outer Atmosphere Solved

One of the most enduring mysteries in solar physics is why the Sun's outer atmosphere, or corona, is millions of degrees hotter than its surface.

Now scientists believe they have discovered a major source of hot gas that replenishes the corona: jets of plasma shooting up from just above the Sun's surface.

The finding addresses a fundamental question in astrophysics: how energy is moved from the Sun's

interior to create its hot outer atmosphere.

"It's always been quite a puzzle to figure out why the Sun's atmosphere is hotter than its surface," says Scott McIntosh, a solar physicist at the High Altitude Observatory of the National Center for Atmospheric Research (NCAR) in Boulder, Colorado, who was involved in the study.

"By identifying that these jets insert heated plasma into the Sun's outer atmosphere, we can gain a much greater understanding of that region and possibly improve our knowledge of the Sun's subtle influence on the Earth's upper atmosphere."

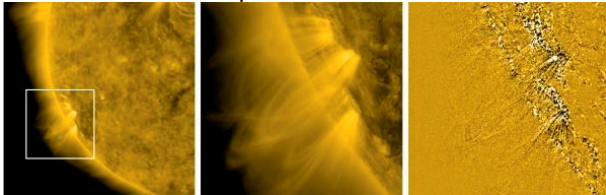
The research, results of which are published in the journal *Science*, was conducted by scientists from Lockheed Martin's Solar and Astrophysics Laboratory (LMSAL), NCAR, and the University of Oslo. It was supported by NASA and the National Science Foundation (NSF), NCAR's sponsor.

"These observations are a significant step in understanding observed temperatures in the solar

corona," says Rich Behnke of NSF's Division of Atmospheric and Geospace Sciences, which funded the research.

"They provide new insight about the energy output of the Sun and other stars. The results are also a great example of the power of collaboration among university, private industry and government scientists and organizations."

The research team focused on jets of plasma known as spicules, which are fountains of plasma propelled upward from near the surface of the Sun into the outer atmosphere.



For decades scientists believed spicules could send heat into the corona. However, following observational research in the 1980s, it was found that spicule plasma did not reach coronal temperatures, and so the theory largely fell out of vogue.

"Heating of spicules to millions of degrees has never been directly observed, so their role in coronal heating had been dismissed as unlikely," says Bart De Pontieu, the lead researcher and a solar physicist at LMSAL.

In 2007, De Pontieu, McIntosh, and their colleagues identified a new class of spicules that moved much faster and were shorter-lived than the traditional spicules.

These "Type II" spicules shoot upward at high speeds, often in excess of 100 kilometers per second, before disappearing.

The rapid disappearance of these jets suggested that the plasma they carried might get very hot, but direct observational evidence of this process was missing.

The researchers used new observations from the Atmospheric Imaging Assembly on NASA's recently launched Solar Dynamics Observatory and NASA's Focal Plane Package for the Solar Optical Telescope (SOT) on the Japanese Hinode satellite to test their hypothesis.

"The high spatial and temporal resolution of the newer instruments was crucial in revealing this previously hidden coronal mass supply," says McIntosh.

"Our observations reveal, for the first time, the one-to-one connection between plasma that is heated to millions of degrees and the spicules that insert this plasma into the corona."

The findings provide an observational challenge to the existing theories of coronal heating.

During the past few decades, scientists proposed a wide variety of theoretical models, but the lack of detailed observation significantly hampered progress.

"One of our biggest challenges is to understand what drives and heats the material in the spicules,"

says De Pontieu.

A key step, according to De Pontieu, will be to better understand the interface region between the Sun's visible surface, or photosphere, and its corona.

Another NASA mission, the Interface Region Imaging Spectrograph (IRIS), is scheduled for launch in 2012 to provide high-fidelity data on the complex processes and enormous contrasts of density, temperature and magnetic field between the photosphere and corona. Researchers hope this will reveal more about the spicule heating and launch mechanism.

## Surprising Flares in Crab Nebula

The Crab Nebula, one of our best-known and most stable neighbours in the winter sky, is shocking scientists with a propensity for fireworks -- gamma-ray flares set off by the most energetic particles ever traced to a specific astronomical object. The discovery, reported by scientists working with two orbiting telescopes, is leading researchers to rethink their ideas of how cosmic particles are accelerated.



Each of the two flares the LAT observed lasted mere days before the Crab Nebula's gamma-ray output returned to more normal levels. According to Funk, the short duration of the flares points to synchrotron radiation, or radiation emitted by electrons accelerating in the magnetic field of the nebula, as the cause. And not just any accelerated electrons: the flares were caused by super-charged electrons of up to 10 peta-electron volts, or 10 quadrillion electron volts, 1,000 times more energetic than anything the world's most powerful man-made particle accelerator, the Large Hadron Collider in Europe, can produce, and more than 15 orders of magnitude more energetic than photons of visible light.

"The strength of the gamma-ray flares shows us they were emitted by the highest-energy particles we can associate with any discrete astrophysical object," Funk said.

Not only are the electrons surprisingly energetic, added Buehler, but, "the fact that the intensity is varying so rapidly means the acceleration has to happen extremely fast."

"We thought we knew the essential ingredients of the Crab Nebula," Funk said, "but that's no longer true. It's still surprising us."