SAS NEWS
Sunderland Astronomical Society

September 2010

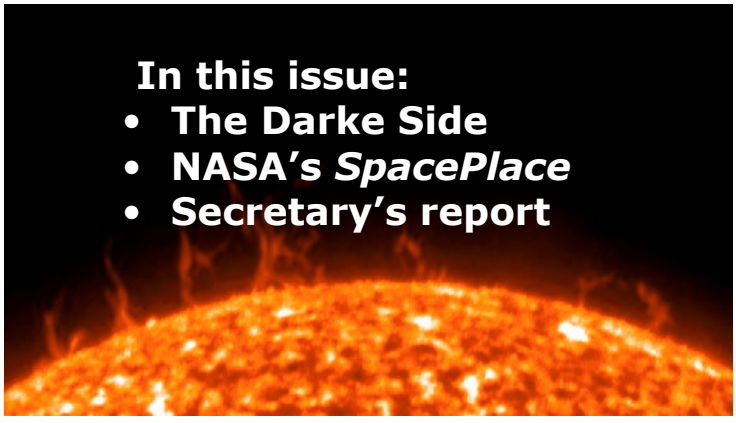
Events list

(Sat 11 – Sun 12 Sept: Main weekend, Equinox Star Camp, Kelling Heath, Norfolk)
Sun 12 Sept: Committee mtg 6pm, Workshop meeting, 7pm
Sun 19 Sept: **Speaker: Graham Darke,**
"My top ten favourite deep sky double acts"
Thu 23 Sept: Full Moon
Fri 24 / Sat 25 Sept: Deep sky observing opportunity
Sat 25 – Sun 26 Sept: Greenfest, all day, WWT

Wed 06 Oct – Sun 10 Oct: **Kielder Star Camp**
Thu 07 Oct: New Moon
Sun 17 Oct: **Speaker: Ryan Hickox,**
"Supermassive Black Holes and the Growth of Galaxies"
Sat 23 Oct: Full Moon

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.

Editorial address: Dave Newton, New Hartley Astrophysical Facility, 13 Alston Road, New Hartley, Whitley Bay, NE25 0ST
Tel: 0191 237 0355



Editorial

Dear Members,
It's that time of year when the children go back to school, the nights start to draw in and the telescopes get properly dusted down.
Late summer is one of my favourite times of year as the nights are still warm enough to observe in comfort. As dusk falls that little bit earlier each night, the Summer Triangle seems to linger overhead while the great square of Pegasus and the autumn stars rise up from the east.

This year, the autumn stars bring along Jupiter which currently shines very brightly near the circlet of Pisces. Jupiter also acts as a very useful signpost to observe Uranus. This pale greenish world is often overlooked as it is very small in the eyepiece and offers little in the way of markings. Uranus is not without interest though: It has moons, which can be spotted with a large enough scope and cloud markings *have* been seen on the surface in past years.

This is clearly an area where amateurs can keep an eye on a celestial body and be the first people to spot a new feature on the surface of the planet. This Autumn, when you are observing Jupiter, why not slew your scope a little way up and to the right, and spend a few minutes scrutinising Uranus. You may not get a better opportunity to track it down if, like me, you still rely on star-hopping to find your targets.

If daytime observing is more your thing, the Society will be opening the Cygnus observatory for the Greenfest at the WWT on the 25th and 26th September. The telescope will be used to view the Sun and hopefully Venus, weather permitting.

The annual lecture programme also kicks off this month with our Chairman, Graham Darke, giving his talk on deep sky double acts. I hope Lynn and Kev have made his list!

- Ed

www.sunderlandastro.com **Registered Charity #1071527**

Graham Darke (Chairman) 0191 416 2625 chairman@sunderlandastro.com
Lynn Henderson (Secretary) 0191 426 1708 secretary@sunderlandastro.com
Dave Newton (Publications) 0191 237 0355 double.cluster@tesco.net

There's more to astronomy than looking at fuzzy blobs

THE DARKE SIDE

Society Update with Chairman
Graham Darke

Here we are again: September is upon us and things are starting to get going again for the Society. I hope that you all had a pleasant Summer.
Could I remind everyone that **subscriptions** are now due for payment: Please see the Treasurer to pay the best £15 / £10 you'll ever spend!
At the time of writing this, the Starbeque is fast approaching and I certainly hope that we can top last year's turn out which was fantastic. Fingers crossed for good weather for Saturday 4th.
I will be kicking off the new lecture season with a talk which I first gave about 13 years ago – "My Top Ten Favourite Deep Sky Double Acts". This is a practical based talk rather than a theoretically based one. I've updated it and hope you enjoy it.

Events over the Summer
During our reduced Summer schedule we did have a number of events including the successful visit to the planetarium at the Centre for Life, Newcastle, on the 24th May. There was a good turnout of members and friends who enjoyed a live star show by Elin Roberts, a tour of the Southern hemisphere constellations by myself and a video presentation entitled "We are astronomers" – narrated by David Tenant of Dr Who fame. It was a great night. The Centre for Life have been working on some new presentations and would like very much for us to visit them again in the future.

Our Summer barbeque took place at the Wildfowl Trust on the evening of Saturday 19th June. A blustery but dry evening was enjoyed by all who attended.

On the afternoons of Sunday 11th July and Sunday 8th August we held solar observing sessions at the observatory. The weather was mixed on both days, with the 11th July probably being the better of the two. Solar activity has finally started to pick up this year with a number of sunspots and other activity being visible during the sessions.

Observatory Maintenance
Work is required to clear the remainder of the flaking paint from the inside of the observatory dome. Most of the very loose paint is now off but it is suggested that Saturday 18th September would be a good date to get the rest of it off. We are going to use the circular brush attachments which can be fitted to drills and angle grinders. Anyone who is available to help that day, please do come along.

Greenfest
Over the weekend of 25/26 September the Wildfowl and Wetlands Trust will be repeating the Greenfest event which they held last September. This is an event designed to promote sustainable living and we have been asked if we could open the observatory over the weekend which we have agreed to do. We can do some solar observing, try to locate Venus and Jupiter with the 14 inch telescope and introduce the public to the Society.
One issue which I thought would be relevant to draw attention to at this event is light pollution, which is not only the scourge of astronomers but also results in huge amounts of wasted energy and unnecessary CO_2 emissions.

- Around 800,000 tonnes of extra CO_2 is pumped into the atmosphere every year through poorly designed lighting.
- Any light fittings which result in a spill of light above the horizontal are inefficient.
- Light fittings should aim the light straight down. Security lights on houses are often angled to spread the light over the maximum area possible but this results in a lot of the light shining upwards which is simply wasted.

These are issues that we can use the weekend to raise awareness of. All are invited to come down to observatory over the weekend to help out.

Graham

2010 Starbeque:
Once again the Gods smiled upon the annual Starbeque and we were blessed with warm, dry weather. Despite the high cloud, some stars *were* seen: Always a favourable omen for the new observing season! – Ed.

NASA's Space Place

Black Holes No Joke

by Dr. Tony Phillips

Kip Thorne: Why was the black hole hungry?
Stephen Hawking: It had a light breakfast!

Black hole humour—you gotta love it. Unless you're an astronomer, that is. Black holes are among the most mysterious and influential objects in the cosmos, yet astronomers cannot see into them, frustrating their attempts to make progress in fields ranging from extreme gravity to cosmic evolution.

How *do* you observe an object that eats light for breakfast?

"Black holes are creatures of gravity," says physicist Marco Cavaglia of the University of Mississippi. "So we have to use gravitational waves to explore them."

Enter LIGO—the NSF-funded Laser Interferometer Gravitational-wave Observatory. According to Einstein's Theory of General Relativity, black holes and other massive objects can emit gravitational waves—ripples in the fabric of space-time that travel through the cosmos. LIGO was founded in the 1990s with stations in Washington state and Louisiana to detect these waves as they pass by Earth.

"The principle is simple," says Cavaglia, a member of the LIGO team. "Each LIGO detector is an L-shaped ultra-high vacuum system with arms four kilometers long. We use lasers to precisely measure changes in the length of the arms, which stretch or contract when a gravitational wave passes by."

Just one problem: Gravitational waves are so weak, they change the length of each detector by just 0.001 times the width of a proton! "It is a difficult measurement," allows Cavaglia.

Seismic activity, thunderstorms, ocean waves, even a truck driving by the observatory can overwhelm the effect of a genuine gravitational wave. Figuring out how to isolate LIGO from so much terrestrial noise has been a major undertaking, but after years of work the LIGO team has done it. Since 2006, LIGO has been ready to detect gravitational waves coming from spinning black holes, supernovas, and colliding neutron stars anywhere within about 30 million light years of Earth.

So far the results are … nil. Researchers working at dozens of collaborating institutions have yet to report a definite detection.

Does this mean Einstein was wrong? Cavaglia doesn't think so. "Einstein was probably right, as usual," he says. "We just need more sensitivity. Right now LIGO can only detect events in our little corner of the Universe. To succeed, LIGO needs to expand its range."

So, later this year LIGO will be shut down so researchers can begin work on Advanced LIGO—a next generation detector 10 times more sensitive than its predecessor. "We'll be monitoring a volume of space a thousand times greater than before," says Cavaglia. "This will transform LIGO into a real observational tool."

Above: Laser Interferometer Gravitational-wave Observatory in Livingston, Louisiana. Each of the two arms is 4 kilometers long. LIGO has another such observatory in Hanford, Washington.

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

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 9 May 2010.

Attendees: Kevin Baxter (KB), Graham Darke (GD), Lynn Henderson (LH), Ken Kirvan (KK) Paul Meade (PM), Michael Tweedy (MT), Peter Stokel (PS)

Apologies: Tom Crann (TC)

Items discussed –

- **Visits: GD** gave talks to South Shields AS (5th April) and Durham Rotary (29th April).
  - **PM** will give a public talk in Lempster Library on 22nd November 2011.
  - **Newcastle Building Society** would like us to do an event on 11th July at the Cobalt Business Park. This coincides with one of the Solar Observing sessions we have at WWT.

- **Notice Board:** We need a new poster for the Notice Board outside of the observatory. **MT** to produce the poster
- **Star Camp:** The sole topic for the July committee meeting will be preparation and organization of the Spring Star Camp 2011.
- **Observatory Clean:** The plan is to give the observatory a clean one evening during the Summer. Probably sometime w/c 17th May. **GD** and **KK** volunteered to come down.
- **Speakers for next season:** We have nearly finalized the list of speakers but need to agree two more. **PM** to contact Paul Mooneyand **LH** to contact Paul Lewis.

Date of next meeting: **13 June 2010, 6pm**

Tilting stars may explain backwards planets

Somersaulting stars could explain why some planets orbit backwards. Planets tend to form in a disc that surrounds their star's equator, and orbit the star in the same direction as its spin. But recently, astronomers have found about 10 stars that host planets in tilted orbits - some so extreme that the planets travel backwards. Some researchers suspected that gravitational encounters with other planets or a distant star were to blame.

Now Dong Lai at Cornell University in Ithaca, New York, and his colleagues say there is no need to invoke such violence. The researchers calculate that a newborn star's magnetic field interacts with its planet-forming disc, which is electrically conducting, causing the star to tilt and in some cases flip over. It is not clear how common the process might be, or how many of the unusual orbits it could explain. But it "might have happened in our solar system", says Lai. Earth's orbit is at an angle of 7.2 degrees to the solar equator, suggesting that the young sun may have tipped a bit.

Trojan asteroids make planetary scientist lose sleep

A family of asteroids that travels in lockstep with Jupiter appears to be different in one important respect from their purported kin in the outer solar system. The mismatch could spell trouble for the leading theory of how our solar system evolved.

This theory, called the Nice model, suggests that as Jupiter and Saturn moved to their current orbits, they wreaked gravitational havoc in the early solar system, scattering lumps of rock in their vicinity. Some of these ended up on tilted orbits in the distant Kuiper belt, beyond the orbit of Neptune. Others were hurled inwards, with more than 4000 getting trapped on Jupiter's orbital path as "Trojan" asteroids.

Now Wesley Fraser at the California Institute of Technology in Pasadena, and colleagues, say that the Trojans have a different size distribution to tilted Kuiper belt objects. That suggests that the Trojans have a different origin, but if so, the Nice model cannot say where they formed. All it can say is that they could not have formed where they are now, as they would have ended up being shunted elsewhere.

Fraser says he has "lost a lot of sleep" over the puzzle. Alessandro Morbidelli of the Côte d'Azur Observatory in France, who helped develop the

Nice model, says he "cannot imagine any scenario that has a chance to explain this result". But he says there is still some disagreement over the sizes of tilted objects in the Kuiper belt, so it may be premature for "modellers to bang their head against the wall".

Weird water lurking inside giant planets

What glows yellow and behaves like a liquid and a solid at the same time? Water - at least in the strange form it appears to take deep within Uranus and Neptune. This exotic stuff might help explain why both planets have bizarre magnetic fields.

Simulations in 1999 and an experiment in 2005 hinted that water might behave like both a solid and a liquid at very high pressures and temperatures. Under such conditions, the oxygen and hydrogen atoms in the water molecules would become ionised, with the oxygen ions forming a lattice-like crystal structure and the hydrogen ions able to flow through the lattice like a liquid. This "superionic" water, forming at temperatures above 2000 ℃ or so, should glow yellow.

The extreme conditions that exist deep within Uranus and Neptune could be ideal for superionic water to form. But whether it really occurs inside these planets, and in what quantities, has never been clear because of uncertainty over the exact pressures and temperatures needed to make it.

Now the most detailed computer models yet, created by a team led by Ronald Redmer of the University of Rostock in Germany, suggest both planets possess a thick layer of the stuff. The simulations assume the most extreme conditions possible inside both planets, with temperatures reaching up to 6000 ℃ and pressures 7 million times the atmospheric pressure on Earth. The results show that a layer of superionic water should extend from the rocky core of each planet out to about halfway to the surface.

That tallies nicely with the results of a 2006 study led by Sabine Stanley, now at the University of Toronto, Canada, and Jeremy Bloxham of Harvard University, attempting to explain both planets' curious magnetic fields. Whereas Earth's magnetic field resembles that of a bar magnet, on Uranus and Neptune nearby patches of the surface can have fields of opposite polarity.

Stanley and Bloxham's work suggested that the interiors of both planets contain a narrow layer of electrically conducting material that is constantly churning, which generates magnetic fields. This conducting layer would be made of ionic water, in which the molecules have broken down into oxygen and hydrogen ions. The study also indicated that the convecting zone cannot extend deeper than about halfway down to the planets' centres. If it were thicker, it would produce a more orderly field like that of a bar magnet.

The transition from convection to non-convection at the depth calculated by Stanley and Bloxham might seem irrelevant, since the superionic water takes over here. But superionic water also conducts electricity, via the flow of hydrogen ions. So something must be stopping the superionic water from churning and making the magnetic field more orderly.

One possibility is that superionic water is mostly transparent to infrared radiation, or heat. The electrons in superionic water can absorb infrared radiation, but simulations indicate they tend to stay near the oxygen atoms, making most of the space transparent to heat. That would make it easy for heat from the planets' cores to radiate through the superionic water rather than building up at its base, as would be needed for convection to occur.

Hints of life found on Saturn moon

Two potential signatures of life on Saturn's moon Titan have been found by the Cassini spacecraft. But scientists are quick to point out that non-biological chemical reactions could also be behind the observations. Titan is much too cold to support liquid water on its surface, but some scientists have suggested that exotic life-forms could live in the lakes of liquid methane or ethane that dot the moon's surface.

In 2005, Chris McKay of NASA's Ames Research Center in Moffett Field and Heather R Smith of the International Space University in Strasbourg, France, calculated that such microbes could eke out an existence by breathing in hydrogen gas and eating the organic molecule acetylene, creating methane in the process.

This would result in a lack of acetylene on Titan and a depletion of hydrogen close to the moon's surface, where the microbes would live, they said. Now, measurements from the Cassini spacecraft have borne out these predictions, hinting that life may be present.

Infrared spectra of Titan's surface taken with the Visual and Infrared Mapping Spectrometer (VIMS) showed no sign of acetylene, even though ultraviolet sunlight should constantly trigger its production in the moon's thick atmosphere. The VIMS study, led by Roger Clark of the US Geological Survey in Denver, Colorado, will appear in the Journal of Geophysical Research.

Cassini measurements also suggest hydrogen is disappearing near Titan's surface, according to a study to appear in Icarus by Darrell Strobel of Johns Hopkins University in Baltimore, Maryland.

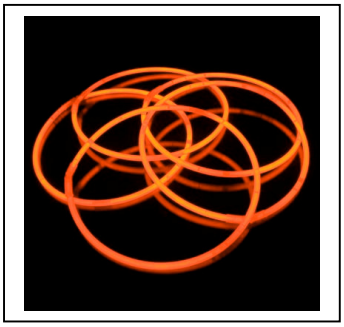
Observations with the spacecraft's Ion and Neutral Mass Spectrometer and its Composite Infrared Spectrometer revealed that hydrogen produced by UV-triggered chemical reactions in the atmosphere is flowing both upwards and off into space as well as down towards the surface.

Yet the hydrogen is not accumulating near the surface, hinting that something may be consuming it there. The results reveal "very unusual and currently unexplained chemistry", McKay told us. "Certainly not proof of life, but very interesting."

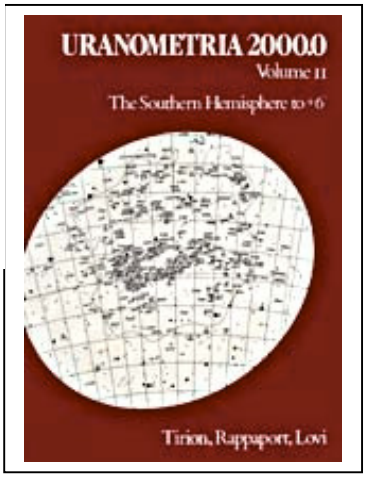
SAS Hot Products for 2010

← CosmoGalactic Space Watch
No-nonsense digital watch with big, red LED display and waterproof, non-metallic strap: ideal for observing £14.99

➔ Convex, solid glass surface aluminised mirror purchased many years ago from Sinden Optical Co. Unused, A1 condition. Seven inch diameter. Ideal for a meteor photography / all-sky camera project: £20



←Red glowsticks Make sure no-one trips over your tripod again by popping these handy red glow sticks on your equipment. Ooo-err. Ideal for star parties and public events. 3 for £2



➔ Uranometria 2000.0 Star charts - Volume 2 – The Southern Hemisphere £32.95
Postage options on request.
[Volume 1: **SOLD!**]

←Red Cellophane – ideal for covering your torches and screens with:
Sheet sizes 0.5m x 1m £4.99,
0.5m x 4.5m £14.99

SAS Hot Product

➔ Glove/mitts: Fingerless gloves with enclosure flap and knitted elastic cuff. Black, one size fits all. £9.99 inc p&p

← Moon and stars trolley coin keyrings
Show you're an astro-nut with one of these! £2 inc. p&p

All enquiries to ASEservices@aol.com or via the editorial contact details, 0191 2370355. A donation of 10% of the sales value will be made to the SAS for each item sold through this advert.