SAS NEWS
Sunderland Astronomical Society

March 2011

Events list

02 – 06 March: Kielder Star Camp
Wed 09 Mar: Visit to Newcastle School for Boys, Gosforth
Sun 13 Mar: Committee meeting, 6pm
Fri 18 Mar: South Dinnington Rainbows visit observatory
Sun 20 Mar: Speaker: Dave Newton - **"Galaxies with names"**
Sat 26 Mar: Girl Guides visit WWT, 7pm

Sat 02 April: **Observing evening**, Derwent Reservoir - for members of Cleveland & Darlington, Durham, Kielder, Newcastle, Northumberland, South Shields and Sunderland Astronomical Societies. From 7.00pm
Sun 03 Apr: New Moon
Sun 10 Apr: Committee meeting, 6pm
Sun 17 Apr: **Annual astrophotography competition**

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

Spring is in the air and the nights are starting to grow shorter. This is a sure sign that the Kielder star camp is just around the corner and galaxy-hunting season is upon us. With the Society's astrophoto festival on the third Sunday in April, now is a good time for you to try your hand at astroimaging while the nights remain relatively long and dark.

Last month I was invited to speak to an A-level physics class at St Peter's Sixth Form College. As well as being a very enjoyable event (for me at least!) I had the opportunity to see some of the astrophotos taken by one of the students, Grant Hardy. Grant has kindly allowed me to use some of his Moon shots in the newsletter:

It's always good to see young people getting interested in astronomy and one day we might see some of them joining our Society. Good work Grant, keep it up! – 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 pretty pictures

THE DARKE SIDE

Society Update with Chairman
Graham Darke

January Lecture Meeting

On Sunday 16th January, we welcomed Dr Paul Lewis back to the Society to speak to us about measuring the Crab Nebula. This was a very different and most interesting talk, which showed how simple techniques and equipment could be utilised to perform real science on two images of the crab nebula taken many years apart. Paul explained how the expansion of the nebula over time could be tracked by measuring the movement of knots of material across the field of the two images when the two were superimposed. In order to do this, the image scale had to be determined first. Field stars were used to set this and also to ensure that the field around the nebula had not changed significantly. The next step was to measure the shift in position of the knots and average these out. The results showed that the expansion rate of the nebula had not been uniform over time and that it appeared to be increasing. Synchrotron radiation was suspected to be the cause of this. Next the spectra of the knots were analysed to determine the distance to the nebula and the brightness of the supernova. The results showed that the supernova would have appeared as bright as the planet Venus in the sky and as such would have been visible in day time. After the talk, we tried to get the crab nebula in the telescope in the observatory but unfortunately a gibbous Moon was located around 5 degrees away from it at the time and, try as we might, we simply couldn't overcome the glare of the Moon.

Thanks again to Paul for a most enlightening talk.

A Cracking Night at Derwent Reservoir

On Friday 28th January, after a whole day of the weather forecasts changing from clear to cloudy and back again, it did turn out to be clear. The forecasters might have got it wrong but the members who travelled up for the evening made the right decision. It was the best night at Derwent for a long time. It was good to see some of our new members making the trip to see what a dark site has to offer. I personally managed to observe the Horsehead Nebula, the Flame Nebula, M78, the Orion Nebula, Hubble's Variable Nebula, NGC4565, M1, M35, M37, NGC2169, the Double Cluster, the Christmas Tree Cluster, the Rosette Nebula, NGC2362, the Eskimo Nebula, M65, M66 so not a bad night! I can't remember seeing the winter Milky Way running past Orion being so well defined.

Winlaton Mill Public Event – Saturday 12th February

This was a well attended event with around 30 members of the public coming along, some of them bringing their own telescopes. Clear skies permitted fine views of the Moon and the brighter deep sky objects. There was much interest in the Society a couple of people who came along made it to the workshop meeting the next night!

Observatory Visitors

2nd Herrington Cubs came to the Cygnus Observatory on Tuesday 8th February. Although there was a thin layer of cloud, this did not stop observing of Jupiter and the Moon which the kids really enjoyed. Thank you to those who helped on the night.

Newcastle School for Boys are interested in running an event with us again on Wednesday 9th March. Details to follow. We have had some good evenings with this school over the past few years.

South Dinnington Rainbows would like to visit us on Friday 18th March.

Finally, on Saturday 26th March we are participating in a joint event with the WWT for girl guides. This is a pilot event with a campfire and stargazing. More details to follow.

Graham

NASA's Space Place

Thank Goodness the Sun is Single

By Trudy E. Bell

It's a good thing the Sun is single. According to new research, Sun-like stars in close double-star systems "can be okay for a few billion years—but then they go bad," says Jeremy Drake of the Harvard-Smithsonian Astrophysical Observatory in Cambridge, Mass.

How bad? According to data from NASA's Spitzer Space Telescope, close binary stars can destroy their planets along with any life. Drake and four colleagues reported the results in the September 10, 2010, issue of *The Astrophysical Journal Letters.*

Our Sun, about 864,000 miles across, rotates on its axis once in 24.5 days. "Three billion years ago, roughly when bacteria evolved on Earth, the Sun rotated in only 5 days," explains Drake. Its rotation rate has been gradually slowing because the solar wind gets tangled up in the solar magnetic field, and acts as a brake.

But some sun-like stars occur in close pairs only a few million miles apart. That's only about five times the diameter of each star—so close the stars are gravitationally distorted. They are actually elongated toward each other. They also interact tidally, keeping just one face toward the other, as the Moon does toward Earth.

Such a close binary is "a built-in time bomb," Drake declares. The continuous loss of mass from the two stars via solar wind carries away some of the double-star system's angular momentum, causing the two stars to spiral inward toward each other, orbiting faster and faster as the distance shrinks. When each star's rotation period on its axis is the same as its orbital period around the other, the pair effectively rotates as a single body in just 3 or 4 days.

Then, watch out! Such fast spinning intensifies the magnetic dynamo inside each star. The stars "generate bigger, stronger 'star spots' 5 to 10 percent the size of the star—so big they can be detected from Earth," Drake says. "The stars also interact magnetically very violently, shooting out monster flares."

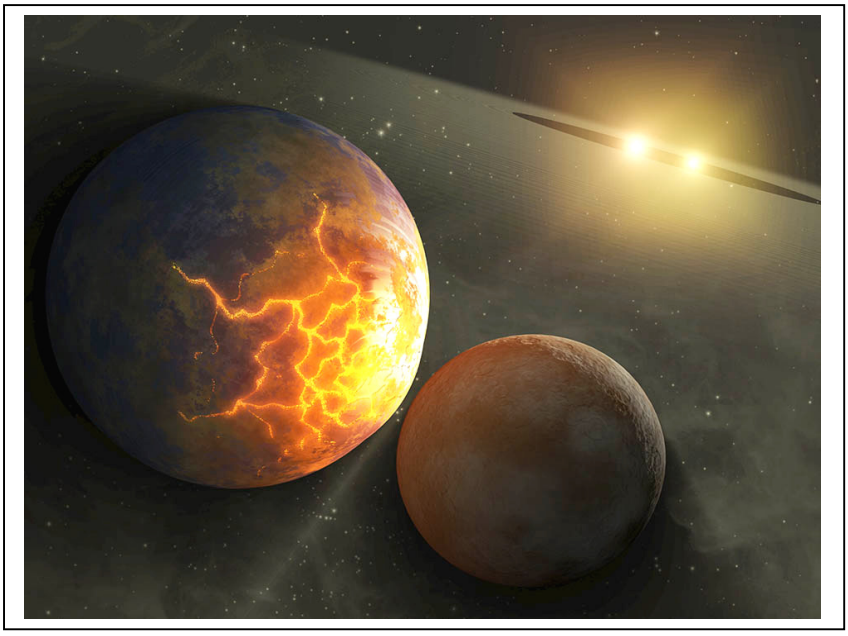
Worst of all, the decreasing distance between the two stars "changes the gravitational resonances of the planetary system," Drake continued, destabilizing the orbits of any planets circling the pair. Planets may so strongly perturbed they are sent into collision paths. As they repeatedly slam into each other, they shatter into red-hot asteroid-sized bodies, killing any life. In as short as a century, the repeated collisions pulverize the planets into a ring of warm dust.

The infrared glow from this pulverized debris is what Spitzer has seen in some self-destructing star systems. Drake and his colleagues now want to examine a much bigger sample of binaries to see just how bad double star systems really are.

They're already sure of one thing: "We're glad the Sun is single!"

Read more about these findings at the NASA Spitzer site at www.spitzer.caltech.edu/news/1182-ssc2010-07-Pulverized-Planet-Dust-May-Lie-Around-Double-Stars .

For kids, the Spitzer Concentration game shows a big collection of memorable (if you're good at the game) images from the Spitzer Space Telescope. Visit 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: Planetary collisions such as shown in this artist's rendering could be quite common in binary star systems where the stars are very close.

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 13/02/11.

Attendees: Kevin Baxter (KB), Graham Darke (GD), Lynn Henderson (LH), Ken Kirvan (KK), Paul Meade (PM), Peter Stokel (PS), Michael Tweedy (MT)
Apologies: Tom Crann (TC), David Hughes (DH),

Items discussed:
Equipment - GD has obtained prices for additional equipment for the observatory: Astrotrac pier, head & wedge, Vixen plate, 19mm Panoptic eyepiece, 14mm Radian eyepiece. The committee unanimously agreed to go ahead with the purchases.

Visits and Events
Wed 9th Mar - Visit to Newcastle School 6:30 start
Fri 18th Mar - South Dinnington Rainbows 6:30 start
Sat 26th Mar - Joint event with WWT. Guides visit to WWT 7pm start
Apr - Joint NE societies observing event at Derwent. Date to be confirmed.
Mon 22nd Aug - Watergate Forest, Lobley Hill Bat Watch and Nightwatch joint event 7:30 – 10:30

- After a very successful event at Winlaton Mill the organizers have asked if we would like to run this as an annual event. The committee decided this would be a good idea and that for next year we should arrange it to coincide with a Dark Sky Weekend.
- Newcastle Building Society would like us to do another Solar Observing day some time during the Summer. Date to be Confirmed.

Star Camp
Bookings for starcamp still progressing
KK Two vendors have now confirmed, Astronomica and Astrodevelopments. GD suggested we have an "Astroboot" area where Star Camp attendees can bring along their own equipment to sell.
PS has confirmed **David Hughes** and **Ryan Hickox** as speakers.
Gary Fildes has had offers from Durham University to do a 3D film show. However due to the time to set up and take down the equipment it was felt that this may impact on the speakers already booked and so the committee decided not to go ahead with this at this time.
Additionally Juergen Schmoll has offered to bring up a collection of telescope to set up a display. Again due to the logistics of getting these to Kielder it was decided not to go ahead with the offer at this time.

Insurance
The society currently has no insurance on its equipment. Nastro use a company called Glover and Howe. **GD** to investigate the cost of insurance through this company

FAS Membership and PLI

- **KB** confirmed that this years FAS Membership and PLI premium had been paid.

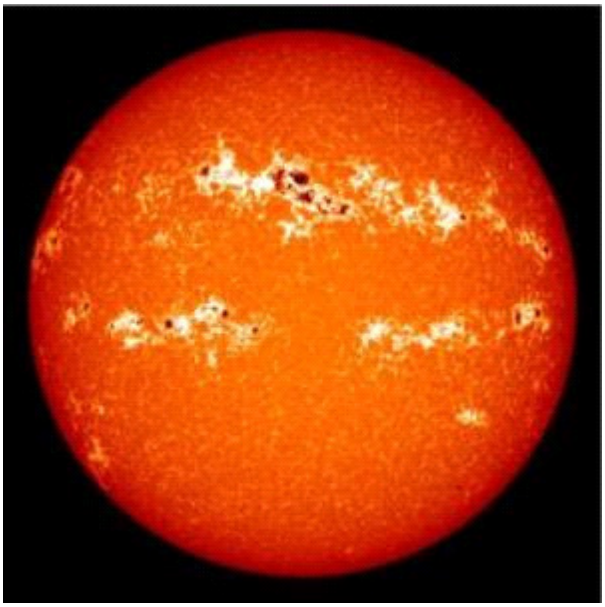
Next committee meeting: 13/03/11, 6pm

Solar Flare: Space Weather Disrupts Communications

A powerful solar flare has ushered in the largest space weather storm in at least four years and has already disrupted some ground communications on Earth, said University of Colorado Boulder Professor Daniel Baker, an internationally known space weather expert.

Classified as a Class X flare, the 15th Feb event also spewed billions of tons of charged particles toward Earth in what are called coronal mass ejections and ignited a geomagnetic storm in Earth's magnetic field, said Baker, director of CU-Boulder's Laboratory for Atmospheric and Space Physics. Such powerful ejections can cause a variety of socioeconomic and safety issues ranging from the disruption of airline navigation systems and power grids to the safety of airline crews and astronauts.

"The sun is coming back to life," said Baker, who chaired a 2008 National Research Council committee that produced a report titled "Severe Space Weather Events -- Understanding Societal and Economic Impacts." For the past several years the sun has been in its most quiescent state since early in the 20th century, said Baker.



From a scientific standpoint a class X event -- the most powerful kind of solar flare -- is exciting, said Baker, also a CU-Boulder professor in the astrophysical and planetary sciences department. "But as a society, we can't afford to let our guard down when operating spacecraft in the near-Earth environment."

"Human dependence on technology makes society more susceptible to the effects of space weather," Baker said. "But scientists and engineers have made great strides in recent decades regarding this phenomenon.
"We understand much more about what is happening and can build more robust systems to withstand the effects," Baker said. "It will be interesting to see how well our technological systems will withstand the rigors of space weather as the sun gets back to higher activity levels."

Waiter, There's Metal in My Moon Water

Bring a filter if you plan on drinking water from the Moon. Water ice recently discovered in dust at the bottom of a crater near the Moon's south pole is accompanied by metallic elements like mercury, magnesium, calcium, and even a bit of silver. Now you can add sodium to the mix, according to Dr. Rosemary Killen of NASA's Goddard Space Flight Centre.

Recent discoveries of significant deposits of water on the moon were surprising because our moon has had a tough life. Intense asteroid bombardments in its youth, coupled with its weak gravity and the Sun's powerful radiation, have left the moon with almost no atmosphere. This rendered the lunar surface barren and dry, compared to Earth.

However, due to the moon's orientation to the Sun, scientists theorized that deep craters at the lunar poles would be in permanent shadow and thus extremely cold, and able to trap volatile material like water as ice if such material were somehow transported there, perhaps by comet impacts or chemical reactions with hydrogen, a major component of the solar wind.

The 9th October 2009 impact of NASA's Lunar CRater Observation and Sensing Satellite (LCROSS) spacecraft into the permanently shadowed region of the Cabeus crater confirmed that a surprisingly large amount of water ice exists in this region, along with small amounts of many other elements, including metallic ones.

LCROSS was launched June 18, 2009 as a companion mission to NASA's Lunar Reconnaissance Orbiter, or LRO, from NASA's Kennedy Space Center in Florida. After separating from LRO, the LCROSS spacecraft held onto the spent Centaur upper stage rocket of the launch vehicle, executed a lunar swingby, and entered into a series of long looping orbits around Earth.

After traveling approximately 113 days and nearly 5.6 million miles (9 million km), the Centaur and LCROSS separated on final approach to the moon. Moving faster than most rifle bullets, the Centaur impacted the lunar surface with LCROSS and LRO watching using their onboard instruments. Approximately four minutes of data were collected by LCROSS before the spacecraft itself impacted the lunar surface.

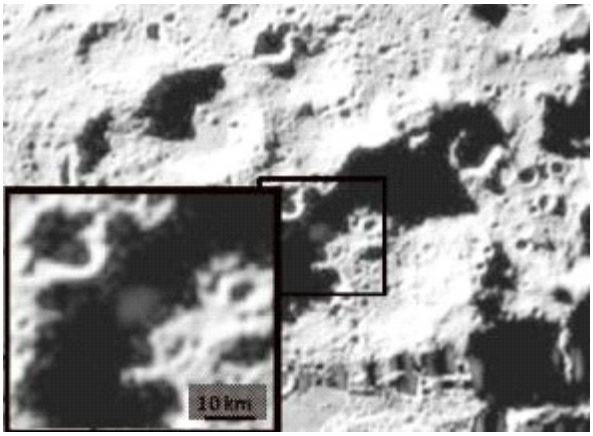
Killen and her team observed the LCROSS impacts with the National Solar Observatory's McMath-Pierce solar telescope at the Kitt Peak National Observatory, Tucson. They were the only team able to see the results of the impacts from the ground.

The impacts vaporized volatile material from the bottom of Cabeus crater, including water and sodium. After the vapour plume rose about 800 metres -- high enough to clear the shadow from the crater rim -- sunlight stimulated the sodium atoms, causing them to emit their signature yellow-orange glow. A high-resolution Echelle spectrometer attached to the telescope detected this unique glow. The instrument separates light into its component colours to identify materials by the characteristic colours they emit when energized by radiation or other events in space.

The spectrometer views the sky through a narrow slit to separate the colours, so the team had to make assumptions about the shape and temperature of the plume to estimate the total amount of sodium liberated by the impacts. Using a computer model of the impact and other data on the impacts from instruments on LCROSS and LRO to guide their assumptions, the team calculated that about one to two kilograms (about

2.2 to 4.4 pounds) of sodium were released. "This is one to two percent of the amount of water released by the impacts," said Killen. "Our oceans have a comparable sodium to water ratio -- about one percent." (The amount of sodium derived from the observations depends on the assumed temperature of the vapour.)

This much sodium raises the question: where did it all come from? Sodium atoms from comet impacts could bounce across the lunar surface until they landed in the permanently shadowed regions, where they would get "cold trapped" -- frozen in place. The solar wind carries small amounts of sodium, which could become embedded in the lunar surface, and it might also liberate sodium from lunar rocks, which are about 0.4 percent sodium. Sodium is also liberated from lunar rocks by meteoroid impacts. (The LCROSS impacts didn't have enough energy to vaporize rock, so it's unlikely the sodium vapour plume simply came from rocks at the impact site, according to Killen.)



"Two percent sodium to water is consistent with the amount of sodium in comets, so perhaps the bulk of the sodium and water came from comet impacts," said Killen. She makes it clear that this is just speculation at this point, and that it's possible they came from a different source or even a variety of sources, including cold-trapped lunar volatiles and solar-wind-induced chemistry. Better evidence for a cometary origin would come from an analysis of the hydrogen isotopes in lunar water, according to Killen.

Isotopes are versions of an element with different weights, or masses. For example, a deuterium atom is a heavier version of a common hydrogen atom because it has an extra particle -- a neutron -- in its nucleus at the centre. Deuterium can be substituted for the regular form of hydrogen in a water molecule, but it is much less common than hydrogen, and its concentration varies in objects across the solar system. If the deuterium to hydrogen ratio in lunar water is similar to the ratio in comets, it would suggest the water came from comet impacts. Since comets as "dirty snowballs" carry many other materials, it would imply that much of the sodium and other volatiles came from comets as well.

The team plans to shed light on the origin of lunar water and other volatiles using data from the upcoming Lunar Atmosphere and Dust Environment Explorer (LADEE) mission, scheduled to be launched in May, 2013. The mission will orbit the moon and observe its tenuous atmosphere (technically called an exosphere, because it is so thin, atoms rarely collide with each other above the surface).

The research was funded by NASA's Dynamic Response of the Environment At the Moon (DREAM) project. "This discovery highlights a particular value of the DREAM program -- we can rapidly support missions like the LCROSS impact with additional observations and analysis," said Dr. William Farrell of NASA Goddard, lead of the DREAM institute.

Black holes put new spin on light

Light curls up into corkscrew patterns when it passes near black holes, offering a powerful new way to probe the distorted space around them.

In an ordinary light beam observed far from its source, successive peaks of light waves form essentially flat wave fronts. Not so for light with so-called orbital angular momentum, which has long been produced in the lab. Its peaks spiral around to form a corkscrew pattern.

According to general relativity, spinning black holes drag the fabric of the surrounding space around with them. Fabrizio Tamburini of the University of Padua in Italy, and colleagues, calculated how light rays emitted by matter spiralling into a black hole are distorted by this effect, called frame dragging. They calculated that it transforms ordinary light into the corkscrew type that possesses orbital angular momentum.

In future, telescopes could be equipped with detectors to measure this light, says Martin Bojowald of Pennsylvania State University in University Park.

Physicists have measured frame dragging around black holes before by observing the rotation of discs of matter around them. But hydrodynamical processes also affect this rotation, muddying the frame dragging signal. "The new results will allow stricter tests of general relativity thanks to their higher precision," says Bojowald.

Such light could also be used to measure a black hole's spin more accurately, he adds. Currently, astronomers infer the spin by measuring the distance between the black hole and the nearest matter around it, a technique that requires high-resolution observations. Using twisted light would require less spatial resolution and therefore "should make it possible to measure the spin of black holes farther away", Bojowald says.