

April 2011

Events list

Sun 17 Apr: **Annual astrophotography competition**
 Mon 18 Apr: Full Moon
 Fri 22 Apr: *Good Friday*. Lyrid meteor show peaks

As usual the society will be running a reduced schedule of events over May, June, July and August:

- Sunday 8 May, 2pm – Solar Observing
- Sat 11 June – Visit to Thomas Wright exhibition (TBC)
- Sunday 12 June, 2pm – Solar Observing
- Sat 09 July – Summer Benker Night at the Grey Horse
- Sunday 06 August, 2pm – Solar Observing

Sat 13 Aug: Full Moon; Perseid meteor shower peaks
 Sat 03 Sept: Starbeque at Derwent Reservoir -

The now traditional start to the new observing season.

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 has sprung, the sun is shining and the grass needs cutting. Which means it's that last chance to observe the Virgo cluster of galaxies before the nights get too light to do much deep-sky observing.

Spring and Summer bring along the opportunity for comfortable Solar observing. As in previous years, the Society will be running solar observing sessions at the WWT and the proposed dates are given in the diary on the left.

I'm pleased to hear that the video link between the Cygnus Observatory and the Discovery Room is now up and running (see Graham's update on the next page). Here's a picture of the First Light for the video link – it looks like a pretty good image of the Moon to me!



I'm sure this video link will get a lot of use in the months and years to come.

April 2011 sees the 50th Anniversary of manned spaceflight, with Yuri Gagarin becoming the first human to orbit the Earth on 12 April 1961. 2011 sees another anniversary, of the birth of celebrated astronomer Thomas Wright 300 years ago. An exhibition is being held later this spring at Durham University library and I would encourage members to join our trip. – Ed.

In this issue:

- **The Darke Side**
- **NASA's SpacePlace**
- **Secretary's report**
- **News: Comet controversy and time delayed jets**

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Registered Charity #1071527

Graham Darke (Chairman) 0191 416 2625
 Lynn Henderson (Secretary) 0191 426 1708
 Dave Newton (Publications) 0191 237 0355

chairman@sunderlandastro.com
secretary@sunderlandastro.com
double.cluster@tesco.net



There's more to astronomy than watching Prof Brian Cox



THE DARKE SIDE

Society Update with Chairman

February Lecture Meeting

On Sunday 20th February, we welcomed BBC Weather Presenter Paul Mooney who delivered a talk entitled "Clear Skies Predicted". Clear skies are essential to us as astronomers and Paul highlighted just how difficult it was to predict. The gremlins paid us a visit and Paul had to deliver his talk without the assistance of slides but did a great job. Paul described the network of weather professionals in the UK and how each region's weather presenters took part in a country wide telephone conference every day. Sophisticated computer modelling was supplemented with local knowledge and a comparison of how trends had developed over preceding hours with the model's predictions. There were many good questions at the end of the talk. With respect to observing conditions, I was particularly interested to learn that we should be watching for high pressure sitting to the west of the British Isles to encourage clear dry air down from the North.

March Lecture Meeting

Many thanks to Dave Newton, our President, for his talk entitled "Galaxies with proper names". Those names reveal much about the history/discoverer or just the appearance of the galaxies. We were treated some to great images during the talk and I for one observed several of those featured at Derwent Reservoir on Saturday 2nd April (see below). From the Milky Way and the local group of galaxies to the Virgo Supercluster and beyond, Dave's talk included galaxy structure and size information which I'm sure all found useful.

Observatory Visitors

1st Herrington Cubs, South Dinnington Rainbows and St Nicholas' Brownies from Sunderland all visited the observatory over the past few months and as ever enjoyed their time. Many thanks to all who assisted with these. On Saturday 26th March we participated in the first of what is hoped to be a number of a joint events with the WWT for Cubs and Brownies. This was a pilot event with a campfire and stargazing. Thanks to all who helped with all of these events.

Kielder Night Watch - Saturday 26th February

As if by magic the only clear night of that week coincided with this date which was great for the 54 members of the public who turned up. Many of them stayed until after 10.00pm to get their first glimpse of Saturn as it rose. Thanks again to all who came along and helped.

Derwent – Saturday 2nd April

It's always good to have a back-up plan! On the afternoon of Saturday 2nd April, it came to our

notice that our usual observing site at the reservoir was unavailable for safety reasons. This was the day of our joint observing evening with the members of the local astronomical societies. A few phone calls and a quickly assembled sign later and we were off to an alternative site located about 4 miles away. I don't think we lost anyone in the process and we had a great night with members of Northumberland, Newcastle, South Shields, Durham and Cleveland & Darlington Astronomical Societies joining our own members. I'm not sure of the total number in attendance but it was certainly close to 40 or maybe more. The weather improved as the night went on with the wind settling and the sky staying clear until well after midnight. There was a lot of enthusiasm for repeating the event.

Summer Schedule

Following the astrophotography competition, our traditional end of observing season event, we go onto our reduced Summer schedule. Please note that during May, June, July and August, normal society meetings on Sunday evenings are suspended. We do however have at least one event during those months for members to attend and details of all Summer events can be found on the front of your newsletter.

- On Sunday 8th May, Sunday 12th June and Sunday 6th August from 2.00pm we have solar observing at the Cygnus Observatory. Feel free to come along. Let reception at the Wildfowl Trust know that you are a member of the Society and there for the solar observing and they will let you in.
- On Saturday 9th July we are meeting up at the Grey Horse in East Boldon for a Summer social evening from 7.00pm onwards. All welcome.
- On Saturday 11th June we are proposing to visit Durham University Library as they are hosting an exhibition on **Thomas Wright**, the famous County Durham astronomer of the eighteenth century. There is a small charge for entry but it should be well worth it. We need an idea of numbers and David Hughes is coordinating this event. **Please inform David if you would like to attend:** skinmechanix@infectionmusic.com

Observatory Video Link

Well, we've been talking about it for long enough! I am delighted to report that on Sunday 10th April we succeeded in beaming a live webcam image from the observatory into the discovery centre. The first image was of some defocused clouds. On page 1 is the first image of an astronomical subject, namely the Moon, shown live on the big screen in the discovery centre. We also managed to watch some people walking around on Penshaw Monument! Thanks to John for conducting the test and thanks once again to Dave Dresser for installing the cabling and switches.

Hope to see you at one of our Summer events.

GOES-R, Zombie fighter

By Dr. Tony Phillips

On April 5, 2010, something eerie happened to the Galaxy 15 telecommunications satellite: It turned into a zombie.

The day began as usual, with industry-owned Galaxy 15 relaying TV signals to millions of viewers in North America, when suddenly the geosynchronous satellite stopped taking commands from Earth. It was brain dead! Like any good zombie, however, its body continued to function. Within days, Galaxy 15 began to meander among other satellites in geosynchronous orbit, transmitting its own signal on top of the others'. Satellite operators scrambled to deal with the interference, all the while wondering *what happened?*

In horror movies, zombies are usually produced by viruses.

"In this case, the culprit was probably the sun," says Bill Denig of the National Geophysical Data Center in Boulder, Colorado. He and colleague Janet Green of NOAA's Space Weather Prediction Center recently led a study of the Galaxy 15 anomaly, and here are their conclusions:

On April 3rd, a relatively minor solar flare launched a cloud of plasma toward Earth. Galaxy 15 had experienced many such events before, but this time there was a difference.

"Galaxy 15 was just emerging from the shadow of Earth when the cloud arrived and triggered a geomagnetic storm," explains Denig. Suddenly exposed to sunlight and the ongoing storm, "the spacecraft began to heat up and charge [up]."

Electrons swirling around Galaxy 15 stuck to and penetrated the spacecraft's surface. As more and more charged particles accumulated, voltages began to rise, and—zap!—an electrostatic discharge occurred. A zombie was born.

"At least, this is what we suspect happened based on data collected by GOES satellites in the vicinity," he says. "We'll be able to diagnose events like this much better, however, after GOES-R is launched by NASA in 2015."

GOES-R is NOAA's next-generation Geostationary Operational Environmental Satellite. One of the instruments it will carry, a low-energy electron counter, is crucial to "zombie fighting." Low

energy-electrons are the ones most likely to stick to a spacecraft's surface and cause brain-frying discharges. By monitoring these particles in Earth orbit, GOES-R will provide better post-mortems for future zombie outbreaks. This could help satellite designers figure out how to build spacecraft less susceptible to discharges. Also, GOES-R will be able to issue alerts when dangerous electrons appear. Satellite operators could then take protective action—for example, putting their birds in "safe mode"—to keep the zombie population at bay.

Meanwhile, Galaxy 15 is a zombie no more. In late December 2010, after 9 months of terrorizing nearby spacecraft, the comsat was rebooted, and began responding to commands from Earth again.

All's well that ends well? True zombie fighters know better than to relax. Says Denig, "we're looking forward to GOES-R."

You and the kids in your life can learn about space weather at <http://scijinks.gov/space-weather-and-us>



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: The Galaxy 15 communication satellite was "brainless" for several months in 2010 after being exposed to a geomagnetic storm. The new GOES-R satellite will warn of such dangers.

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 13/03/2011.

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:

Observatory Maintenance To be Carried Out: 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:

Mon 22 Aug - Watergate Forest, Lobley Hill Bat Watch and Nightwatch joint event 7:30 – 10:30

Oct 22 - Kielder Castle Night Watch (this will be the Saturday before StarCamp)

- Discussion was had about the future of the Kielder Castle nightwatch event now that Kielder Observatory AS run a full programme of events.
- 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.

Starcamp: It was suggested that for the next Spring Star Camp we provide a small marquee on site for Starcampers to set up their own Astroboot stalls. **LH** to suggest to Richard Darn as a possibility for the Autumn Star Camp too.

nsurance: **GD** has made an initial list of what we might want to insure for the society and their values. Discussions were had about whether to insure the Grubb Parsons *Perseus* telescope and its value. As this is a collectors' item it is difficult to value. **GD** to get a quote for the items on the list.

Next committee meeting: 10/04/11 at 6pm



Frozen Comet's Watery Past: Discovery Challenges Paradigm of Comets as 'Dirty Snowballs' Frozen in Time

For the first time, scientists have found convincing evidence for the presence of liquid water in a comet, shattering the current paradigm that comets never get warm enough to melt the ice that makes up the bulk of their material.

"Current thinking suggests that it is impossible to form liquid water inside of a comet," said Dante Laretta, an associate professor of cosmochemistry and planet formation at the UA's Lunar and Planetary Laboratory. Laretta is the principal investigator of the UA team involved in analysis of samples returned by NASA's Stardust

mission.

UA graduate student Eve Berger, who led the study, and her colleagues from Johnson Space Center and the Naval Research Laboratory made the discovery analyzing dust grains brought back to Earth from comet Wild-2 as part of the Stardust mission. Launched in 1999, the Stardust spacecraft scooped up tiny particles released from the comet's surface in 2004 and brought them back to Earth in a capsule that landed in Utah two years later.

"In our samples, we found minerals that formed in the presence of liquid water," Berger said. "At some point in its history, the comet must have harboured pockets of water."

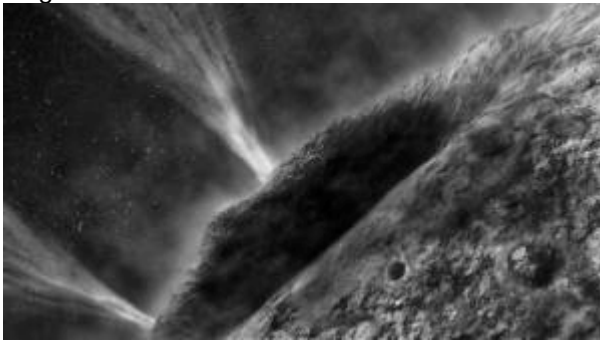
Comets are frequently called dirty snowballs because they consist of mostly water ice, peppered with rocky debris and frozen gases. Unlike asteroids, extraterrestrial chunks made up of rock and minerals, comets sport a tail -- jets of gas and vapour that the high-energy particle stream coming from the sun flushes out of their frozen bodies.

"When the ice melted on Wild-2, the resulting warm

water dissolved minerals that were present at the time and precipitated the iron and copper sulphide minerals we observed in our study," Lauretta said. "The sulphide minerals formed between 50 and 200 degrees Celsius, much warmer than the sub-zero temperatures predicted for the interior of a comet."

Discovered in 1978 by Swiss astronomer Paul Wild, Wild-2 (pronounced "Vilt") had travelled the outer reaches of the solar system for most of its 4.5 billion year history, until a close encounter with Jupiter's field of gravity sent the 3.4 mile-wide comet onto a new, highly elliptical orbit bringing it closer to the sun and the inner planets.

Scientists believe that like many other comets, Wild-2 originated in the Kuiper belt, a region extending from beyond Neptune's orbit into deep space, containing icy debris left over from the formation of the solar system. Wild-2 is thought to have spent most of its time in the Kuiper belt, transiting on unstable orbits within the planetary system before Jupiter's gravity hurled it into the neighbourhood of the sun.



The discovery of the low-temperature sulphide minerals is important for our understanding of how comets formed -- which in turn tells us about the origin of the solar system.

In addition to providing evidence of liquid water, the discovered ingredients put an upper limit to the temperatures Wild-2 encountered during its origin and history.

According to Berger, two ways to generate heat sources on comets are minor collisions with other objects and radioactive decay of elements present in the comet's mixture.

Heat generated at the site of minor impacts might generate pockets of water in which the sulphides could form very quickly, within about a year (as opposed to millions of years). This could happen at any point in the comet's history. Radioactive decay on the other hand, would point to a very early formation of the minerals since the radioactive nuclides would decay over time and cause the heat source to flicker out.

According to Lauretta, the findings show that comets experienced processes such as heating and chemical reactions in liquid water that changed the minerals they inherited from the time when the solar system was still a protoplanetary disk, a swirling mix of hot gases and dust, before it cooled down enough for planets to form.

The results demonstrate the increasingly apparent

connections between comets and asteroids.

"What we found makes us look at comets in a different way," Lauretta said. "We think they should be viewed as individual entities with their own unique geologic history."

Two Dying Stars to Be Reborn as One

White dwarfs are dead stars that pack a Sun's-worth of matter into an Earth-sized ball. Astronomers have just discovered an amazing pair of white dwarfs whirling around each other once every 39 minutes. This is the shortest-period pair of white dwarfs now known. Moreover, in a few million years they will collide and merge to create a single star.

"These stars have already lived a full life. When they merge, they'll essentially be 'reborn' and enjoy a second life," said Smithsonian astronomer Mukremin Kilic (Harvard-Smithsonian Center for Astrophysics), lead author on the paper announcing the discovery.

Out of the 100 billion stars in the Milky Way, only a handful of merging white dwarf systems are known to exist. Most were found by Kilic and his colleagues. The latest discovery will be the first of the group to merge and be reborn.

The newly identified binary star (designated SDSS J010657.39 -- 100003.3) is located about 7,800 light-years away in the constellation Cetus. It consists of two white dwarfs, a visible star and an unseen companion whose presence is betrayed by the visible star's motion around it. The visible white dwarf weighs about 17 percent as much as the Sun, while the second white dwarf weighs 43 percent as much. Astronomers believe that both are made of helium.

The two white dwarfs orbit each other at a distance of 140,000 miles -- less than the distance from Earth to the Moon. They whirl around at speeds of 270 miles per second (1 million miles per hour), completing one orbit in only 39 minutes.

The fate of these stars is already sealed. Because they wheel around so close to each other, the white dwarfs stir the space-time continuum, creating expanding ripples known as gravitational waves. Those waves carry away orbital energy, causing the stars to spiral closer and closer together. In about 37 million years, they will collide and merge.

When some white dwarfs collide, they explode as a supernova. However, to explode the two combined have to weigh 40 percent more than our Sun. This white dwarf pair isn't heavy enough to go supernova. Instead, they will experience a second life. The merged remnant will begin fusing helium and shine like a normal star once more. We will witness starlight reborn.

This binary white dwarf was discovered as part of a survey program being conducted with the MMT Observatory on Mount Hopkins, Ariz. The survey has uncovered a dozen previously unknown white dwarf pairs. Half of those are merging and might explode as supernovae in the astronomically near future.

NASA's Spitzer Discovers Time-delayed Jets Around Young Star

Astronomers have discovered that two symmetrical jets shooting away from opposite sides of a blossoming star are experiencing a time delay: knots of gas and dust from one jet blast off four-and-a-half years later than identical knots from the other jet.

The finding, which required the infrared vision of NASA's Spitzer Space Telescope, is helping astronomers understand how jets are produced around forming stars, including those resembling our sun when it was young.

"More studies are needed to determine if other jets have time delays," said Alberto Noriega-Crespo of NASA's Spitzer Science Center at the California Institute of Technology in Pasadena, who is a co-author of the new study to be published in the April 1 issue of *Astrophysical Journal Letters*. "Now we know that in at least one case, there appears to be a delay, which tells us that some sort of communication may be going on between the jets that takes time to occur."

Jets are an active phase in a young star's life. A star begins as a collapsing, roundish cloud of gas and dust. By ejecting supersonic jets of gas, the cloud slows down its spinning. As material falls onto the growing star, it develops a surrounding disk of swirling material and twin jets that shoot off from above and below the disk, like a spinning top.

Once the star ignites and shines with starlight, the jets will die off and the disk will thin out. Ultimately, planets may clump together out of material left in the spinning disk.

The discovery of the time delay, in the jets called Herbig-Haro 34, has also led the astronomers to narrow in on the size of the zone from which the jets originate. The new Spitzer observations limit this zone to a circle around the young star with a radius of 3 astronomical units. An astronomical unit is the distance between our sun and Earth. This is about 10 times smaller than previous estimates.

"Where we stand today on Earth was perhaps once a very violent place where high-velocity gas and dust were ejected from the disk circling around our very young sun," said Alex Raga of the Universidad Nacional Autónoma de México, the first author of the paper. "If so, the formation of planets like Earth depends on how and when this phenomenon ended. Essentially, every star like our own sun has gone through a similar cloud-disk-jets formation process."

One of the jets in Herbig-Haro 34 had been studied extensively for years, but the other remained hidden behind a dark cloud. Spitzer's sensitive infrared vision was able to pierce this cloud, revealing the obscured jet in greater detail than ever before. Spitzer images show that the newfound jet is perfectly symmetrical to its twin, with identical knots of ejected material.

This symmetry turned out to be key to the discovery of the jets' time delay. By measuring the exact distances from the knots to the star, the astronomy team was able to figure out that, for every knot of material punched out by one jet, a similar knot is shot out in the opposite direction 4.5 years later. This calculation also depended on the speed of the jets, which was known from previous studies by NASA's Hubble Space Telescope. Other symmetrical jets similar to Herbig-Haro 34 have been observed closely before, but it is not clear if they are also experiencing time delays.

The astronomers say that some kind of communication is going on between the Herbig-Haro 34 jets, likely carried by sound waves. Knowing the length of the time delay and the speed of sound allowed them to calculate the maximum size of the jet-making zone.

The astronomy team is currently analyzing other jets imaged by Spitzer, looking for more evidence of time delays.

The Spitzer observations were made before it used up its liquid coolant in May 2009 and began its warm mission.

For more information about Spitzer, visit <http://spitzer.caltech.edu/> and <http://www.nasa.gov/spitzer>.



Left: Spitzer images of the time-delayed jets