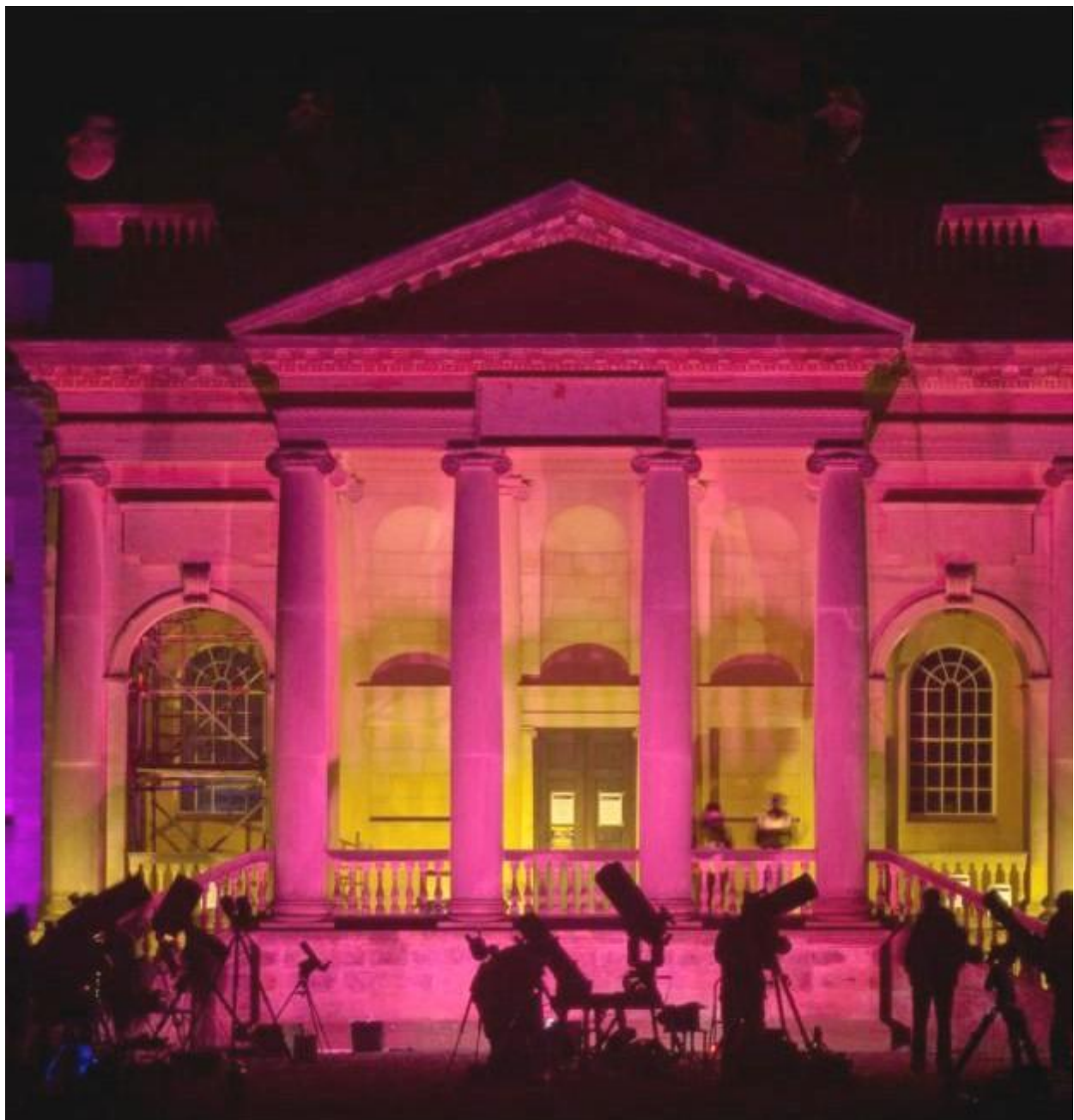


# SAS NEWS

Sunderland Astronomical Society



**In this issue: Society events + The Darke Side +  
NASA's *SpacePlace* + Astro news roundup**

**Cover Photograph: SAS Members at Gibside Chapel, for BBC Stargazing  
Live! 16 January 2012. Photographer: David Beedham**

## February 2012



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### Events list

Tuesday 07 Feb: Full Moon  
Sunday 12 Feb: 6pm Committee meeting / 7pm workshop meeting  
Fri 17 / Sat 18 Feb: Deep sky observing opportunity  
Sunday 19 Feb: Speaker – **Dave Newton**, “The Sky at Sirius Hour”  
Tuesday 21 Feb: New Moon  
Saturday 25 Feb: Public observing session at Winlaton Mill.  
Set up from 6pm onwards for a 7pm start.

Thursday 8 March: Full Moon  
Sunday 11 Mar: 6pm Committee meeting / 7pm workshop meeting  
Monday 12<sup>th</sup> March: Brownies visit to Cygnus observatory, 6 – 8pm.  
All help appreciated  
Sunday 18 March: Speaker – **David Hughes**,  
“David Sinden: Master optician”  
Wed 21 – Sun 25 March: Spring Star Camp at Kielder Camp site  
Thursday 22 March: New 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

Greetings, fellow astronomers! The New Year has got off to a flying start with all of the BBC Stargazing Live events around the region, and what popular events they have turned out to be. Due to work commitments I missed the big regional event at Gibside Chapel but the reports I've heard are that it was an excellent night. My thanks to SAS member Dave Beedham for providing this month's cover photograph – and what a dramatic picture it is, capturing the silhouettes of SAS (and, I believe, some NASTRO) members against the lit up Chapel.

Our Society organised some follow up events on the Thursday to Saturday nights at the Cygnus Observatory, which also proved extremely popular. The turnout on the Saturday night, at which I attended with my 120mm refractor, was fantastic and a constant queue of people kept me busy all evening. I believe that poor Peter Stokel had the job of manning the Cygnus dome itself, in which he would have been trapped all evening by the huge queue of people snaking out of the door. Good job, Peter, I imagine you were exhausted by the end of the night. Thanks are due to all of the SAS members who organised and contributed to these events, and I hope the SAS membership list will benefit from all the hard work and interest this has generated.

I also had the chance to attend the Stargazing Live star party at Seaton Sluice Middle School, organised by Newcastle AS member Jason Russell, with support from former Headteacher Tom Moran, Simon Murray and the Institute of Physics. It was another great night, and thanks are due to everyone involved for making this such a friendly, interesting and worthwhile event. Of course, the relatively mild but clear weather recently has helped tremendously. If only you could guarantee it for every event! I think that as a Society, we can be pleased with our efforts; having got off to such a great start, now to try and build on our successes in the rest of 2012. Thank you all & best wishes, – Dave N., Ed.

#### 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/>

## **Dawn Takes a Closer Look** By Dr. Marc Rayman

Dawn is the first space mission with an itinerary that includes orbiting two separate solar system destinations. It is also the only spacecraft ever to orbit an object in the main asteroid belt between Mars and Jupiter. The spacecraft accomplishes this feat using ion propulsion, a technology first proven in space on the highly successful Deep Space 1 mission, part of NASA's New Millennium program.

Launched in September 2007, Dawn arrived at proto-planet Vesta in July 2011. It will orbit and study Vesta until July 2012, when it will leave orbit for dwarf planet Ceres, also in the asteroid belt. Dawn can manoeuvre to the orbit best suited for conducting each of its scientific observations. After months mapping this alien world from higher altitudes, Dawn spiralled closer to Vesta to attain a low altitude orbit, the better to study Vesta's composition and map its complicated gravity field.

Changing and refining Dawn's orbit of this massive, irregular, heterogeneous body is one of the most complicated parts of the mission. In addition, to meet all the scientific objectives, the orientation of this orbit needs to change.

These differing orientations are a crucial element of the strategy for gathering the most scientifically valuable data on Vesta. It generally requires a great deal of manoeuvring to change the plane of a spacecraft's orbit. The ion propulsion system allows the probe to fly from one orbit to another without the penalty of carrying a massive supply of propellant. Indeed, one of the reasons that travelling from Earth to Vesta (and later Ceres) requires ion propulsion is the challenge of tilting the orbit around the sun.

Although the ion propulsion system accomplishes the majority of the orbit change, Dawn's navigators are enlisting Vesta itself. Some of the ion thrusting was designed in part to put the spacecraft in certain locations from which Vesta would twist its orbit toward the target angle for the low-altitude orbit. As Dawn rotates and the

world underneath it revolves, the spacecraft feels a changing pull. There is always a tug downward, but because of Vesta's heterogeneous interior structure, sometimes there is also a slight force to one side or another. With their knowledge of the gravity field, the mission team plotted a course that took advantage of these variations to get a free ride.

The flight plan is a complex affair of carefully timed thrusting and coasting. Very far from home, the spacecraft is making excellent progress in its expedition at a fascinating world that, until a few months ago, had never seen a probe from Earth.

Keep up with Dawn's progress by following the Chief Engineer's (yours truly's) journal at <http://dawn.jpl.nasa.gov/mission/journal.asp>.

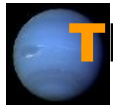
And check out the illustrated story in verse of "Professor Starr's Dream Trip: Or, how a little technology goes a long way," at <http://spaceplace.nasa.gov/story-prof-starr>

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:** This full view of the giant asteroid Vesta was taken by NASA's Dawn spacecraft, as part of a rotation characterization sequence on July 24, 2011, at a distance of 5,200 kilometres (3,200 miles).

Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA



# THE DARKE SIDE

*Society Update* with Chairman  
Graham Darke

## Happy New Year!

My very best wishes to all members for 2012 and let's hope it's another great year for SAS, I'm sure it will be.

## Winlaton Mill – Saturday 25<sup>th</sup> February 6.00pm meet for a 7.00pm start.

Once again we are holding an observing event for the public at Winlaton Mill. We are meeting at 6.00pm for set up ahead of a 7.00pm start to observing. As ever, all are welcome to come along.

## Brownies at the Observatory 12<sup>th</sup> March

Our next Brownies visit is Monday 12<sup>th</sup> March from 6.00pm until 8.00pm. All help appreciated for that one.

## April Lecture

I'm delighted to say that Sir Arnold Wolfendale, 14<sup>th</sup> Astronomer Royal, has kindly agreed to come and talk to us in April. This means that the astrophotography competition will be put back a month giving everyone an extra month to obtain picture entries for this year's competition.

## December Lecture Meeting

On Sunday 18<sup>th</sup> December we had a talk given by Rachel Livermore, a PHD student at Durham University. She described her research in the field of using gravitational lensing to observe distant galaxies at high redshifts. Rachel explained how the resolution of telescopes improved with size but the largest current telescopes' resolving power could be improved up to ten times by using naturally occurring gravitational lenses. This talk followed on from Simon Waim's talk in October where he introduced us to the concept. A useful feature of gravitational lenses is that they do not dim the lensed object despite increasing their angular size. It's incredible to think that massive foreground objects can act in this way (Mr Einstein predicted this) and even more incredible that we have devised computer programs to unpick the warped image and reassemble it from the map of the matter distribution within the foreground object (usually a galaxy cluster). Even Mr Einstein might be impressed to know that we were

doing that. Many thanks to Rachel for braving a cold December evening (with a cold herself) to tell us all about her research.

## Friday 2<sup>nd</sup> December – WWT Staff Event

This event went off well. We did manage to grab a quick look at the Moon before the clouds rolled in and it was most enjoyable, especially the food and quiz afterwards. Thanks to those members who helped out.

## January Lecture Meeting

On Sunday 15<sup>th</sup> January we welcomed Juergen Schmoll back to the Society for a talk on adaptive optics. Juergen talked us through the development of astronomy from naked eye studies, through to the invention of the telescope and then bigger and bigger telescopes. The bigger telescopes became, however, the more they become limited by the effects of the atmosphere which introduced a number of aberrations. Correcting for these became easier as computers became more powerful and allowed the wavefront, as altered by the motion of atmospheric cells, to be deduced and corrected through the use of deformable mirrors. It was interesting to hear how US President Ronald Reagan's "Star Wars" initiative, although a complete flop, laid the groundwork for the technology which would allow ground based telescopes to see clearer than ever before.

## Stargazing Live! 2012 - Gibside

A massive thank you to all of our members (most of whom were there I think!) for answering the call and making such a brilliant night. We could hardly have asked for better sky conditions and, as those who were there will know, one or two members of the public turned up! The BBC tell us that 762 people came along. The feedback which the BBC has received about the event has been overwhelmingly supportive. One of the organisers told me that it was one of the best BBC Learning events they had ever held and wanted to thank our members for making it so special.

## Jupiter Nights at Cygnus

Again thank you all who helped out for our three Stargazing Live nights at Washington. On Thursday 19<sup>th</sup>, the skies cleared, changed its mind twice and then finally cleared away to allow the 160 people who came along to enjoy the views.

Many Stargazing Live observing guides, activity cards, society leaflets and applications for membership were handed out. I noticed from the BBC feedback forms that there were many complimentary remarks made about SAS.

On Friday 20<sup>th</sup>, the skies were much cloudier and unfortunately did not permit any observing. This did not put off the 135 people who still came along and enjoyed the talks and Institute of Physics activities. There was much interest shown in the Telescopes for Ethiopia project too.

On Saturday 21<sup>st</sup> under clear skies, once more, we surpassed the previous nights with 270 people coming along to the event. The queue stretched from the observatory down the path, through the visitor centre and back to the front door at one stage.

Membership numbers will rise considerably as a result of the events we attended and put on over the Stargazing Live week.

SAS is a fantastic society - friendly, helpful, willing and now growing substantially! Well done everyone.

### Stay up to date

Keep up to date with all society developments on the website [www.sunderlandastro.com](http://www.sunderlandastro.com) and why not sign up for the news group.

Clear Skies,



### Hyperactive sun clears space junk

Low Earth orbit just got a free spring-clean, thanks to the sun. It turns out that increased solar activity in recent years has removed some of the satellite debris that clogs this region, making it temporarily safer for other satellites and astronauts.

The sun will hit an 11-year peak in its activity – the solar maximum – in 2013. As this approaches, small increases in solar radiation warm the outer layer of Earth's atmosphere, called the thermosphere, forcing it to expand into space. This places atmospheric molecules in the path of low orbiting debris, which brake their orbital velocity and cause them to re-enter the atmosphere sooner than expected, where they usually burn up.



In the latest edition of NASA's Orbital Debris Quarterly News, the agency's Nicholas Johnson notes that the billowing thermosphere has accelerated the rate of burn up of debris from Fengyun-1C, a satellite China destroyed in an anti-satellite missile test in 2007, and from the 2009 collision between Russia's Kosmos 2251 and the US Iridium 33. This is a "welcome, albeit brief, respite from an otherwise growing orbital debris population", he says.

It's a short-lived respite since, in the long term, climate change will warm the planet while cooling the thermosphere – and so keep junk aloft longer – says space debris researcher Hugh Lewis at the University of Southampton, UK.

### Opportunity begins Ninth Year of Mars Work

Eight years after landing on Mars for what was planned as a three-month mission, NASA's enduring Mars Exploration Rover Opportunity is working on what essentially became a new mission five months ago.

Opportunity reached a multi-year driving destination, Endeavour Crater, in August 2011. At Endeavour's rim, it has gained access to geological deposits from an earlier period of Martian history than anything it examined during its first seven years. It also has begun an investigation of the planet's deep interior that takes advantage of staying in one place for the Martian winter.

Opportunity landed in Eagle Crater on Mars on Jan. 25, 2004, Universal Time and EST (Jan. 24, PST), three weeks after its rover twin, Spirit, landed halfway around the planet. In backyard-size Eagle Crater, Opportunity found evidence of an ancient wet environment. The mission met all

its goals within the originally planned span of three months. During most of the next four years, it explored successively larger and deeper craters, adding evidence about wet and dry periods from the same era as the Eagle Crater deposits.

In mid-2008, researchers drove Opportunity out of Victoria Crater, half a mile (800 meters) in diameter, and set course for Endeavour Crater, 14 miles (22 kilometres) in diameter.

"Endeavour is a window further into Mars' past," said Mars Exploration Rover Program Manager John Callas, of NASA's Jet Propulsion Laboratory, Pasadena.

The trek took three years. In a push to finish it, Opportunity drove farther during its eighth year on Mars -- 4.8 miles (7.7 kilometres) -- than in any prior year, bringing its total driving distance to 21.4 miles (34.4 kilometres).

The "Cape York" segment of Endeavour's rim, where Opportunity has been working since August 2011, has already validated the choice of Endeavour as a long-term goal. "It's like starting a new mission, and we hit pay dirt right out of the gate," Callas said.

The first outcrop that Opportunity examined on Cape York differs from any the rover had seen previously. Its high zinc content suggests effects of water. Weeks later, at the edge of Cape York, a bright mineral vein identified as hydrated calcium sulphate provided what the mission's principal investigator, Steve Squyres of Cornell University, Ithaca, N.Y., calls "the clearest evidence for liquid water on Mars that we have found in our eight years on the planet."

Mars years last nearly twice as long as Earth years. Entering its ninth Earth year on Mars, Opportunity is also heading into its fifth Martian winter. Its solar panels have accumulated so much dust since Martian winds last cleaned them -- more than in previous winters -- the rover needs to stay on a sun-facing slope to have enough energy to keep active through the winter.

The rover team has not had to use this strategy with Opportunity in past winters, though it did so with Spirit, farther from the equator, for the three Martian winters that Spirit survived. By the beginning of the rovers' fourth Martian winter, drive motors in two of Spirit's six wheels had ceased working, long past their design lifespan. The impaired mobility kept the rover from manoeuvring to an energy-favourable slope. Spirit stopped communicating in March 2010.

All six of Opportunity's wheels are still useful for driving, but the rover will stay on an outcrop called "Greeley Haven" until mid-2012 to take advantage of the outcrop's favourable slope and targets of scientific interest during the Martian winter. After the winter, or earlier if wind cleans dust off the solar panels,

researchers plan to drive Opportunity in search of clay minerals that a Mars orbiter's observations indicate lie on Endeavour's rim.

"The top priority at Greeley Haven is the radio-science campaign to provide information about Mars' interior," said JPL's Diana Blaney, deputy project scientist for the mission. This study uses weeks of tracking radio signals from the stationary rover to measure wobble in the planet's rotation. The amount of wobble is an indicator of whether the core of the planet is molten, similar to the way spinning an egg can be used to determine whether it is raw or hard-boiled.

Other research at Greeley Haven includes long-term data gathering to investigate mineral ingredients of the outcrop with spectrometers on Opportunity's arm, and repeated observations to monitor wind-caused changes at various scales.

The Moessbauer spectrometer, which identifies iron-containing minerals, uses radiation from cobalt-57 in the instrument to elicit a response from molecules in the rock. The half-life of cobalt-57 is only about nine months, so this source has diminished greatly. A measurement that could have been made in less than an hour during the rover's first year now requires weeks of holding the spectrometer on the target.

Observations for the campaign to monitor wind-caused changes range in scale from dunes in the distance to individual grains seen with the rover's microscopic imager. "Wind is the most active process on Mars today," Blaney said. "It is harder to watch for changes when the rover is driving every day. We are taking advantage of staying at one place for a while."

NASA's Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the Mars Exploration Rover Project for the NASA Science Mission Directorate, Washington. More information about Opportunity is online at: <http://www.nasa.gov/rovers> and <http://marsrovers.jpl.nasa.gov>.

### **Cassini Sees the Two Faces of Titan's Dunes**

A new analysis of radar data from NASA's Cassini mission, in partnership with the European Space Agency and the Italian Space Agency, has revealed regional variations among sand dunes on Saturn's moon Titan. The result gives new clues about the moon's climatic and geological history.

Dune fields are the second most dominant landform on Titan, after the seemingly uniform plains, so they offer a large-scale insight into the moon's peculiar environment. The dunes cover about 13 percent of the surface, stretching over an area of 4 million square miles (10 million square kilometres). For

Earthly comparison, that's about the surface area of the United States.

Though similar in shape to the linear dunes found on Earth in Namibia or the Arabian Peninsula, Titan's dunes are gigantic by our standards. They are on average 0.6 to 1.2 miles (1 to 2 kilometres) wide, hundreds of miles (kilometres) long and around 300 feet (100 meters) high. However, their size and spacing vary across the surface, betraying the environment in which they have formed and evolved.

Using radar data from the Cassini spacecraft, Alice Le Gall, a former postdoctoral fellow at NASA's Jet Propulsion Laboratory, Pasadena, Calif., who is currently at the French research laboratory LATMOS, Paris, and collaborators have discovered that the size of Titan's dunes is controlled by at least two factors: altitude and latitude.

In terms of altitude, the more elevated dunes tend to be thinner and more widely separated. The gaps between the dunes seem to appear to Cassini's radar, indicating a thinner covering of sand. This suggests that the sand needed to build the dunes is mostly found in the lowlands of Titan.

Scientists think the sand on Titan is not made of silicates as on Earth, but of solid hydrocarbons, precipitated out of the atmosphere. These have then aggregated into grains 0.04 inch in size by a still unknown process.

In terms of latitude, the sand dunes on Titan are confined to its equatorial region, in a band between 30 degrees south latitude and 30 degrees north latitude. However, the dunes tend to be less voluminous toward the north. Le Gall and colleagues think that this may be due to Saturn's elliptical orbit.

Titan is in orbit around Saturn, and so the moon's seasons are controlled by Saturn's path around the sun. Because Saturn takes about 30 years to complete an orbit, each season on Titan lasts for about seven years. The slightly elliptical nature of Saturn's orbit means that the southern hemisphere of Titan has shorter but more intense summers. So the southern regions are probably drier, which implies they have less ground moisture. The drier the sand grains, the more easily they can be transported by the winds to make dunes. "As one goes to the north, we believe the soil moisture probably increases, making the sand particles less mobile and, as a consequence, the development of dunes more difficult," says Le Gall.

Backing this hypothesis is the fact that Titan's lakes and seas are not distributed symmetrically by latitude. These reserves of liquid ethane and methane are predominantly found in the northern hemisphere, suggesting

again that the soil is moister toward the north and so, again, the sand grains are less easy to transport by the wind.

"Understanding how the dunes form as well as explaining their shape, size and distribution on Titan's surface is of great importance to understanding Titan's climate and geology because the dunes are a significant atmosphere-surface exchange interface," says Nicolas Altobelli, ESA's Cassini-Huygens project scientist. "In particular, as their material is made out of frozen atmospheric hydrocarbon, the dunes might provide us with important clues on the still puzzling methane/ethane cycle on Titan, comparable in many aspects with the water cycle on Earth."

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. NASA's Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the mission for NASA's Science Mission Directorate, Washington, D.C. The Cassini orbiter was designed, developed and assembled at JPL. The radar instrument was built by JPL and the Italian Space Agency, working with team members from the U.S. and several European countries.

### **Evaporating planet may show Mercury's fate**

A rocky exoplanet about the size of Mercury appears to be evaporating before our eyes. If confirmed, this would be the first time a rocky planet has been found turning to gas, demonstrating just how wacky alien planets can be. The provocative suggestion may also foreshadow the fate of Mercury.

"My first reaction was disbelief," says Dan Fabrycky of the University of California, Santa Cruz, who was not involved in the new analysis. After playing with the data himself, however, he has come around – though he is still cautious. "After turning it over in my mind a few days, I cannot come up with a more natural theoretical explanation," he says.

The evaporation was inferred from observations by NASA's Kepler space telescope. These show that a star called KIC 12557548, which is slightly smaller than the sun, is dimming every 15.685 hours precisely. That suggests an orbiting companion is transiting, or passing in front of the star. Unlike other transits seen by Kepler, though, the dimming in this system varies wildly from one pass to another.

The best explanation is a rocky planet about the size of Mercury that is subliming – turning directly to a gas – due to the intense radiation from its star, conclude a team led by Saul Rappaport of the Massachusetts Institute of Technology.

# The A to Z of



The **Telescopes for Ethiopia** project is being run by the SAS in conjunction with David Kidd from South Shields, who is currently teaching in Ethiopia. Binoculars form an important part of the project, along with the 18-inch mirror we hope to donate to a new telescope at the university in Addis Ababa, the capital of Ethiopia.

Because the Ethiopian government charges an import tax on binoculars, the plan is to take out the optics here in the UK and ship the parts to Africa. Once they have arrived there, they can be reassembled into simple telescopes. For the first time, many school children – and adults – will be able to see the night sky with optical aid – a pleasure that we have had in Europe since 1609, when Galileo first turned a simple refractor up to the heavens.

# B is for... Binoculars



If anyone has any spare or old binoculars and wishes to donate them, please either pass them on to a committee member at one of the SAS meetings or get in touch with the Society webmaster and Chairman of Vice, David Hughes.

## Telescopes for Ethiopia: An update from David Kidd

I've been training teachers how to observe the Sun by projection. I do it this way with the telescope on the shoulder because we don't have proper mounts and I like to have everyone looking away from the Sun, not staring at it. It's easy to aim the telescope using the shadow and it's safe even for quite young children to use.

I hope to have telescopes in all local schools for the eclipse and I want to teach them to use this method as it works well with small groups and will stop children damaging their eyes by staring at the Sun. The eclipse will be in the evening just before sunset so the angles are just right. Human "tripods" work well at night too with the telescope on the shoulder of one child and another looking through it. They like to work together and I like to encourage them to talk about what they can see.

The telescope is my old Ross watch keeper telescope. It was made by Ross when they were owned by Charles Parsons so I like to think of it as a link with Grubb Parsons even though it was made in London. The chief optical designer from Ross's supervised the figuring of the second 74 inch mirror as all the original Grubb's men from St Albans retired before it was completed. – David Kidd





# Astro Products for 2012

Limited supplies of these useful items still available!

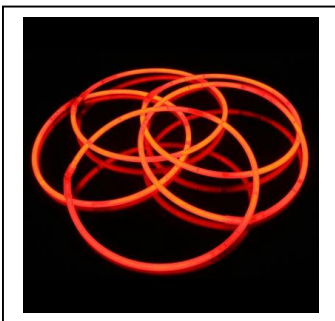


## ← CosmoGalactic Space Watch

No-nonsense digital watch with big, red LED display and waterproof, non-metallic strap: ideal for observing £9.99

→ **Glove/mitts:** Fingerless gloves with enclosure flap and knitted elastic cuff. Black, one size fits all. £5.99 inc p&p

**SAS Hot Product**



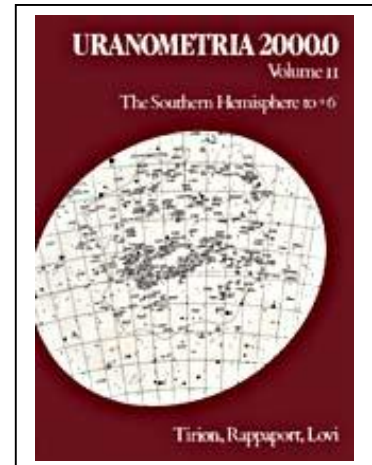
← **Red glowsticks** Make sure no-one trips over your tripod again by popping these handy red glow sticks on your equipment. Ooo-err. Ideal for star parties and public events. 3 for £1

→ **Uranometria 2000.0 Star charts - Volume 2 – The Southern Hemisphere** £20.00

Postage options on request.  
[Volume 1: **SOLD!**]



← **Red film** – red cellophane, ideal for covering your torches and monitors with: Sheet sizes 0.5m x 1m £3, 0.5m x 4.5m £9.99



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