

EDITORIAL

Your science needs you



Sue Bowler, Editor.

Maybe it's election fever taking hold of the UK, but there's a lot of talk at the moment about

community involvement. Research councils have been seeking "big ideas" for the future, and concepts ripe for commercial exploitation, there's debate on plans for research funds (not least in this issue of *A&G*, where the case for ESA's Aurora programme is forcefully made) and no shortage of opportunities to promote astronomy and geophysics in schools and elsewhere. Many of these opportunities also benefit the scientist who takes them up: work done for the community – such as refereeing papers – is recognized as part of a sound professional career; a higher profile among your peers can also come in handy for your own networking.

Yet people are often reluctant to get involved. In part this is a result of pressure, either of "main-stream" work or the sheer volume of requests to referee, or sit on this committee, organize that conference. But we would all be much the poorer without people willing to set up meetings to discuss funding priorities, or collate a list of speakers prepared to brave a primary school to talk about astronomy. This is community work, but it is also how the community works. Scientists have to act together and make it clear that we do have common cause; otherwise we risk looking like children squabbling over pieces of cake or, worse, politicians scoring party points.

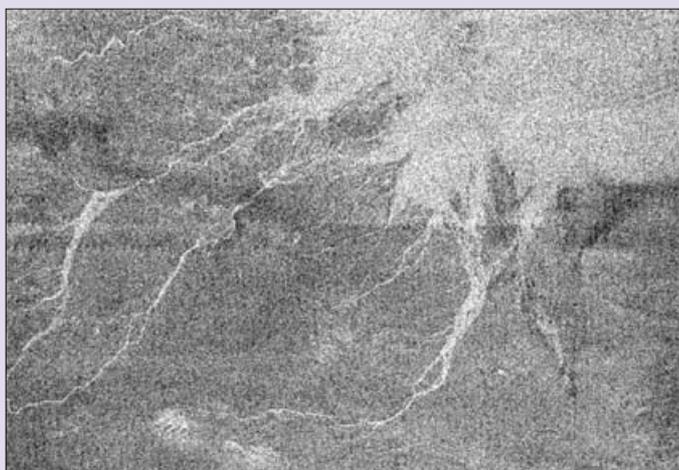
The debate over participation in Aurora is heartening in the sense that every contributor welcomes the opportunity to discuss the issues; no-one wants the UK to spend money on poor science, or even good science that is not in our best national interests to pursue. Everyone wants to discuss the possibilities for future research fields as widely as possible, drawing in the funding of science as a whole relative to other priority national areas, such as health, if possible. This unity is a sign that the UK science community is in a fairly healthy state – and anyone feeling left out of the debate should take action. Turn those grumbles over coffee into forceful expressions of your opinion, be open to argument and ideas and go out and see if you can change someone's mind.

Cassini-Huygens at work

The joint NASA-ESA-ASI Cassini-Huygens mission continues to produce lots of amazing data from the Saturnian system. The last couple of months have seen several milestones, reports Ralph Lorenz.

A few days after the probe release on Christmas day, Cassini (and the dormant Huygens probe, slowly drifting away from it) passed 120 000 km from the moon Iapetus. Spectacular images show breathtaking details of its enigmatic bright and dark areas, and several huge impact structures, some containing immense landslides. The rock-steady spacecraft was able to take minutes-long exposures with Cassini's sensitive camera to image the nightside of Iapetus, using Saturn-shine. The most prominent puzzling feature is a ridge, some 20 km high going around Iapetus's equator. A much closer flyby will take place in 2007.

Possibly the highlight of the entire four-year Cassini mission was the descent of the European-built Huygens probe through Titan's thick



Looks familiar: although faint, this Cassini radar image of the surface of Titan shows patterns characteristic of liquid drainage. (ESA/NASA)

atmosphere. Scientists were jubilant when an early direct detection of Huygens' signal by the Green Bank radio telescope in Virginia showed that the probe had survived its fiery descent to Titan, its parachute had deployed and its transmitters had come on.

Data from the probe were relayed down by Cassini a few hours later. Some had been lost due to a problem with one of the two receivers on-board, but a network of radio telescopes on the ground will be able to recover the main objectives of the wind measurement, albeit with more extensive data processing – this analysis has already indicated a remarkable layer of wind shear at

about 80 km altitude.

The probe's instruments worked well, measuring the atmosphere and haze composition, light levels, and the electrical environment. The descent from about 150 km altitude took about 2 hours and 27 minutes. Remarkably, Huygens (never designed as a lander – Titan's surface was just too unknown) survived impact with the ground. Its accelerometers recorded a peak of about 15g, suggesting a somewhat soft surface – perhaps like tar or packed snow. The surface temperature was some -180°C , as expected, and the probe detected an increase in methane abundance, suggesting that this compound (acting at these con-

White House scraps Hubble servicing mission

NASA's departing administrator, Sean O'Keefe went out with a bang when his final budget ruled out the fourth shuttle missions to service the Hubble Space Telescope. NASA will investigate a robotic mission to HST, but only to ensure that it leaves orbit safely.

While NASA fared better than many federal agencies in its 2006 budget request, the White House is not seeking as much money as previously planned. The agency's budget request of \$16.45 bn is an increase of almost \$386 m over the 2005 appropriation.

The largest increases are planned for the International Space Station and the Exploration Systems directorate, with a major boost for the Constellation Systems programme charged with developing hardware to send humans to the Moon and Mars. There is also a significant increase for the 2008 Lunar Reconnaissance Orbiter and other robotic missions to the Moon. The budget for space and Earth sciences remains fairly flat, keeping the James Webb space tele-

scope on track for a 2011 launch.

On the other hand, the White House has eliminated funding for a Hubble Space Telescope servicing mission from the budget request. Instead, NASA has been directed to focus solely on de-orbiting the observatory at the end of its life.

Another casualty is the Jupiter Icy Moons Orbiter, which receives no funding and is effectively postponed indefinitely. This was the last NASA budget presented by Administrator O'Keefe, who left in February.

<http://www.nasa.gov/about/budget/>

- The American Astronomical Society has formally protested about the decision to scrap the Hubble servicing mission.

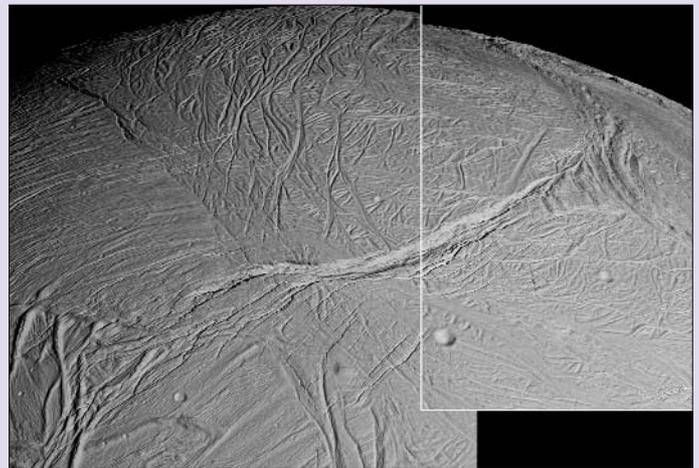
The AAS released a strongly worded policy statement expressing confidence in NASA's commitment to astronomy goals, but regret at the loss of the HST, "an important element of NASA's planned activity". The AAS called the decision "particularly unfortunate and difficult to

accept", and pointed out that the decision affects not only the existing and successful instruments on the HST, but also two key replacement instruments already developed to enable important and exciting new science.

The AAS notes that this servicing mission is among the priorities identified by the recent report *Astronomy and Astrophysics in the New Millennium*, prepared by the US National Research Council's Committee to Assess Progress Toward the Decadal Vision in Astronomy and Astrophysics. The astronomers are arguing for a mature approach to budget constraints, noting that much of NASA's success comes from its strong community support and involvement. If there are consequences arising from the costs of the HST servicing mission, they argue, NASA should "include the space science communities in an assessment of the relative scientific merits of all impacted missions, in line with the decadal survey process".



Dark and light colours in this ultraviolet image of the atmosphere of Titan near the south pole indicate varying haze concentrations. (ESA/NASA)



Enceladus, the Europa of Saturn? The fissured icy surface certainly looks like Jupiter's enigmatic moon in this Cassini image. (ESA/NASA)

ditions much as water does on Earth) made the surface "damp".

Huygens' Descent Imager and Spectral Radiometer (DISR) indicated that Titan's atmosphere was hazy or cloudy down to fairly low altitudes. But as the probe drifted down to low altitudes, sent back pictures (albeit small and highly compressed to fit in the 8 kbps datalink) that seem to show river valleys and what looks like a coastline. But the major surprise was that the probe managed to return pictures from the surface, showing a scene looking for all the world like a pebbly beach with the tide out.

Huygens' data will take years to fully digest, but have already

revealed an evocative environment shaped by familiar processes with an exotic chemistry. So far, no conclusive expanses of surface liquid have been found (presenting us with a faintly martian puzzle of a dry landscape shaped by rivers), but like the phase of martian exploration after the early Mariner probes, Titan may not have shown us a representative sample of its surface yet.

Titan revisited

A month later Cassini flew by Titan again, at an altitude of about 1600 km, and collected a new imaging radar swath. Titan has proved to be a little more radar-reflective than anticipated, so that the radar works

better and further away. The new data show a 440 km complex impact structure, together with a 60 km crater with a parabolic ejecta blanket. What appear to be sinuous, possibly braided, river valleys also appear, as well as mysterious dark striations dubbed "cat scratches" by the radar team. The origin of these subparallel dark lanes is presently unknown. Optical images with Cassini's camera showed details on the surface that are being correlated with radar data, and new wave-like features in its hazy atmosphere. On this flyby, Titan's sporadic clouds seemed to be largely absent.

No sooner had Cassini dumped down more than 3 GB of data stored

onboard from its Titan encounter than it filled up its data recorders with observations from a fortuitous close encounter with Enceladus – passing just 1180 km away. Enceladus may be the Europa of the Saturnian system – its bright icy surface shows cracks and ridges in a bright, perhaps fresh, icy surface.

As we go to press, Cassini is closing in for a targeted encounter just 500 km from Enceladus on 9 March. Ongoing studies of Saturn and its rings are revealing interesting time-variable phenomena, and with several more encounters with Titan and the "naked" satellites in coming months, Cassini's bonanza of exploration is set to keep us busy and enthralled.

Government review brings good news, probably

The announcement of proposals for the government's Comprehensive Spending Review contained an increase in funds for UK science – and good news for Aurora.

PPARC has received direct budget allocations of £293.9 million, £306.5 m and £315.2 m for the three years starting with 2005/6, representing an increase of £10 billion

over three years. The allocation for the current year is £274 m, so the increases are around 3–6% each year. In addition, from September this year research councils will pay universities 80% of the full economic cost of successful research grants.

PPARC will publish its delivery plans in May 2005 in conjunction with the publication by the OST of

the Science Budget allocations booklet up to 2007/8.

PPARC's Chief Executive Officer Prof. Ian Halliday said: "We welcome the move to paying the full economic costs of research. This places greater responsibility on the universities to support our science through their infrastructure. We are also delighted at the prospect of extra

funding for the Aurora programme, particularly in the light of the stunning success of both Mars Express and Cassini Huygens."

PPARC has established an Aurora Advisory Committee to identify national science and industrial priorities, in order to shape the development of the programme, with a focus on robotic exploration of Mars. And PPARC says that, subject to meeting these requirements, additional funds would be available.

Trust offers £1 250 000 in prizes

Outstanding young scholars in astronomy and astrophysics are invited to apply for a Philip Leverhulme Prize. Winners receive £50 000 to spend on research.

The Leverhulme Trustees award up to 25 Philip Leverhulme Prizes each year, in selected disciplines. Astronomy and astrophysics research is eligible in 2005. To apply you need to have a post in a UK institution of higher education or research, and to be under 36 years old on 16 May

2005. Those aged 36–39 can be included if they have had a distinct career break or change. The awards are given in recognition of past research achievement and current standing. They are intended to further the prize-winners' research, but cannot be used to augment the winners' salary, for capital items and equipment, or for institutional overheads. The prize has to be spent within two years.

Nominations must reach the Lever-

hulme Trust by 4 p.m. on 16 May 2005 and must be endorsed by the head of the nominee's institution. Full details can be found on the web. <http://www.leverhulme.ac.uk>.

• Last year's Philip Leverhulme Prizes included the category Earth, Ocean and Atmospheric Sciences. Prizes were awarded to:

Dr Joanna Bullard of the Dept of Geography, Loughborough University, for her work on geomorphology; **Dr David Dobson** of the Dept of Earth Sciences, University College London, for his work on experimental geo-

physics in high-pressure experiments; **Dr Philip Donoghue** of the Dept of Earth Sciences, University of Bristol, for his work on palaeontology;

Dr Caroline Lear of the School of Earth, Ocean and Planetary Sciences, Cardiff University, for her work on palaeoceanography;

Dr Timothy Lenton of the School of Environmental Sciences, University of East Anglia, for his work on Earth system science;

Dr Alastair Lewis of the Dept of Chemistry, University of York, for his work on analytical atmospheric chemistry.

NEWS IN BRIEF

Swift's first burst

All three instruments on the Swift γ -ray observatory are now functioning. Swift detected and imaged its first γ -ray burst on 17 January, less than two months after launch. The satellite manoeuvred fast enough – in less than 200 seconds – to capture an image of the event with its X-Ray Telescope (XRT), while γ -rays were still being detected with the Burst Alert Telescope. "This is the first time an X-ray telescope has imaged a gamma-ray burst, while it was bursting," said Neil Gehrels, Swift's Principal Investigator. "Previous X-ray images have captured the afterglow, not the burst itself."

<http://www.swift.ac.uk> and
<http://nasa.gov/swift>

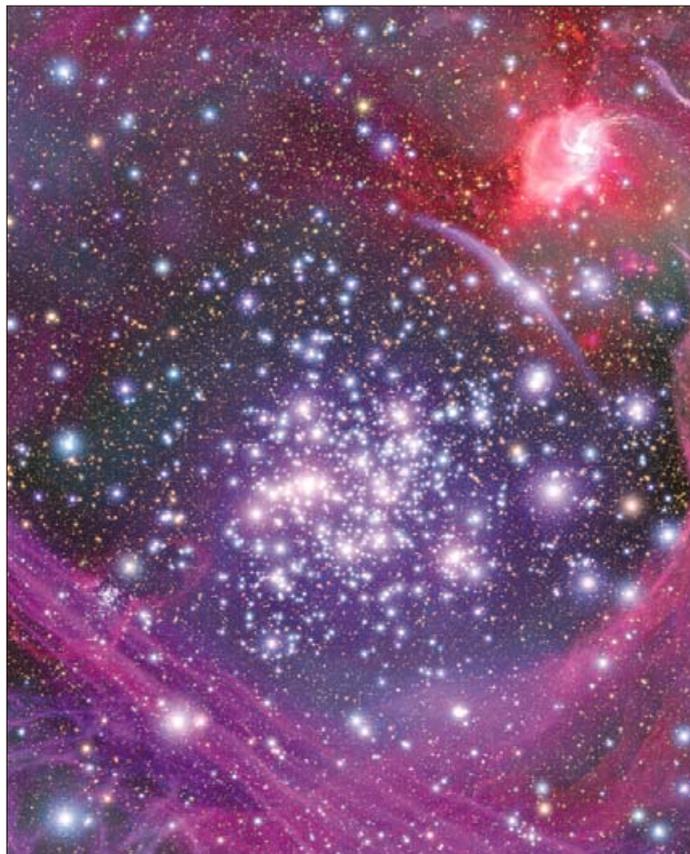
Shuttle map finale

After more than four years of processing data, NASA and the National Geospatial-Intelligence Agency have completed Earth's most extensive global topographic map. The digital elevation maps, which cover 80% of Earth's land mass, were produced from data that was gathered during the February 2000 Shuttle Radar Topography Mission. The final release covers the areas of Australia and New Zealand, more than 1000 islands that are scattered across much of Polynesia and Melanesia, together with islands situated in the South Indian and Atlantic oceans. Many of these islands have never before had their topography mapped. The resolution of the publicly available data is three arc-seconds (that is, 1/1200th of a degree of latitude and longitude, which is about 90 m at the equator).

<http://photojournal.jpl.nasa.gov/mission/SRTM>

A mistake corrected

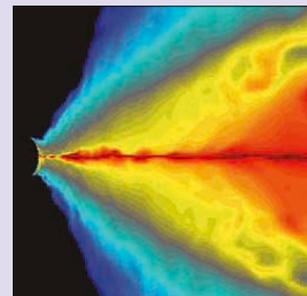
Editorial negligence in the production of the February A&G resulted in a mix-up of contributors names in the article entitled "Recent advances in star formation studies" by David A Williams and Serena Viti. Apologies to the authors and, especially, the speakers concerned: Mark Thompson and Helen Roberts. A corrected version of the paper is available online and through electronic archiving systems.

**How big can a star become?**

Astronomers in search of a weight limit for stars have found a promising sign.

Donald Figer of the Space Telescope Science Institute measured the masses of stars in the Arches cluster (shown in an artist's impression above), the densest part of the Milky Way, using the infrared camera and spectrometer NICMOS on the Hubble Space Tele-

scope. He found no stars more than 130 times the mass of the Sun, but set the limit conservatively at 150 times the solar mass. This drop-off conflicts with accepted theories about star masses and poses questions about star formation. Figer picked the Arches cluster because massive clusters contain massive stars. See the March 10 issue of *Nature* for more.

Rough stuff round black holes

Black holes are renowned for swallowing up nearby matter thanks to their huge gravitational fields, and spitting out immense amounts of radiation as a result. New simulations by a team at Johns Hopkins and the University of Virginia have shown that the process is anything but smooth, however, as relativistic effects magnify random motions within the fluid to create violent disturbances in density, velocity and magnetic field strength, driving waves of matter and magnetic field to and fro. This turbulence results in detectable higher temperatures just outside the black hole. The team is publishing in *The Astrophysical Journal* and have made animations of their models showing turbulent flow.

http://www.jhu.edu/news_info/news/audio-video/blackholes.html

Fluid flow thesis takes prize

Paul Williams (below) of the University of Reading received the RAS Blackwell Prize 2004 for his Oxford University thesis entitled "Nonlinear interactions of fast and slow modes in rotating, stratified fluid flows". The prize was awarded at the January A&G meeting of the RAS, by the RAS President, Kathy Whaler.

<http://www.ras.org.uk/html/education/edcomm2.html>

**Share your visions of science**

Spectacular images are a feature of so many branches of science that there is now a competition for the best images in a range of fields. There are prizes, as well as the opportunity to get wider attention for your work through exposure on the web and in exhibitions. The annual Visions of Science Photographic Awards attracts many entries from across the scientific disciplines. The first prize is £1000 with a runner-up getting £400 in each of five main categories. And because this is Einstein Year, there's an extra award for images of contemporary physics, worth £500.

Find out how to enter at the website below. The closing date is 6 May 2005, and pictures must have been taken after 1 January 2000. The award is sponsored by Novartis and the *Daily Telegraph*.

<http://www.visions-of-science.co.uk>



A vortex in water, photographed by Robert Anderson, for the "Concepts" section of the competition.

Archives: Thomas Wright's observatory

There are relatively few physical relics of astronomical activity visible in Britain outside the major observatory centres but there are some minor sites that are evocative and well worth visiting, writes Peter Hingley.

In the small County Durham village of Westerton stands this "observatory" tower, really more of a folly. It was erected by the 18th-century astronomer, architect and landscape gardener Thomas Wright of Durham (1711–86), started in 1785 to commemorate the publication in 1750 of his most famous work *An Original Theory ... of the Universe...* (Wright 1750). Wright was born and died in the nearby village of Byers Green, but alas his home has been demolished, though a plaque marks the site; a modern stained-glass window in the Church of St Peter the Apostle, Byers Green, also commemorates Wright's work (*A&G* 2000 41 2.9) following an earlier appeal (*A&G* 1998 39 3.4). Headley and Meulenkamp (1999) in their standard work on follies describe it as "a small, round, stone tower with tiny buttresses,



Wright's observatory tower near Byers Green, Co. Durham. (Peter Hingley)

cruciform arrowslits, a rather martial-looking doorway..." and they also mention the commemorative plaque fixed by the University of Durham in 1950 to commemorate the bicentenary of Wright's work.

The tower stands on an airy eminence overlooking the plains of the Wear valley and is well worth a visit if only for the sweeping views it commands. The National Grid Reference is NZ 241 310.

NEWS IN BRIEF

Biggest interferometer

The VLTI at Paranal has got its second moveable 1.8 m telescope up and running. The European Southern Observatory now has the world's largest interferometer using moving optical telescopes, and is on the way to completion of the flexible four-instrument array planned by the end of 2006. The two telescopes have already performed well in testing and should be available to astronomers in October this year. When complete, the four telescopes will have 30 different positions, offering enormous flexibility and, potentially, resolution good enough to pick out an astronaut on the Moon.

<http://www.eso.org/outreach/press-rel/pr-2005/pr-06-05.html>

Schools competition

This year's RAS newspaper competition for schools is on the theme of global warming. The task is to write about its causes and effects and to be critical of the reports and evidence you find, in the form of a newspaper (primary schools), or as a feature article (secondary students). The Newspaper Competition is for ages 7–11 and 11–14, and the Feature Article Competition for ages 14–16 and 16–19. The closing date is 30 September 2005. Full competition rules can be found on the RAS website, via the Education Committee links.

<http://www.ras.org.uk>

Smart-1 hits orbit

In late February, ESA's Smart-1 spacecraft reached its final operational orbit around the Moon, capturing some fairly detailed images of the lunar surface on the way. The mission has been extended until August 2006, including two six-month periods with different orbits and illumination conditions. In the first period, the southern survey will be finished, with multi-angle, stereo, and polar illumination studies. In the second period, Smart-1 will concentrate on the equator and part of the northern hemisphere. There will also be high-resolution observations of specific targets, as well as observations to assist future international lunar missions.

<http://www.esa.int/export/SPECIALS/SMART-1/>

Get *The Herschel Archive* on CD or DVD

■ The papers of **Caroline, William and John Herschel** held by the Society were transferred to microfilm some years ago to secure this unique collection and make it available to libraries. Now the microfilm has been scanned and stored on CD and DVD.

■ The collection's images have been saved as **PDF files** and come with a fully **searchable index**. The sets also include the text of Dr J A Bennett's original catalogue and a foreword by Dr D W Dewhirst.

■ *The Herschel Archive* is available as a **3-DVD set** for £100, or a **17-CD set** for £125. Prices include postage and packing. Sets are made to order and delivery will take 4–8 weeks from receipt of order.

Please send orders to: The Membership Secretary, Royal Astronomical Society, Burlington House, Piccadilly, London W1J 0BQ, UK.

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