Editorial

Personal touch

Sue Bowler, Editor

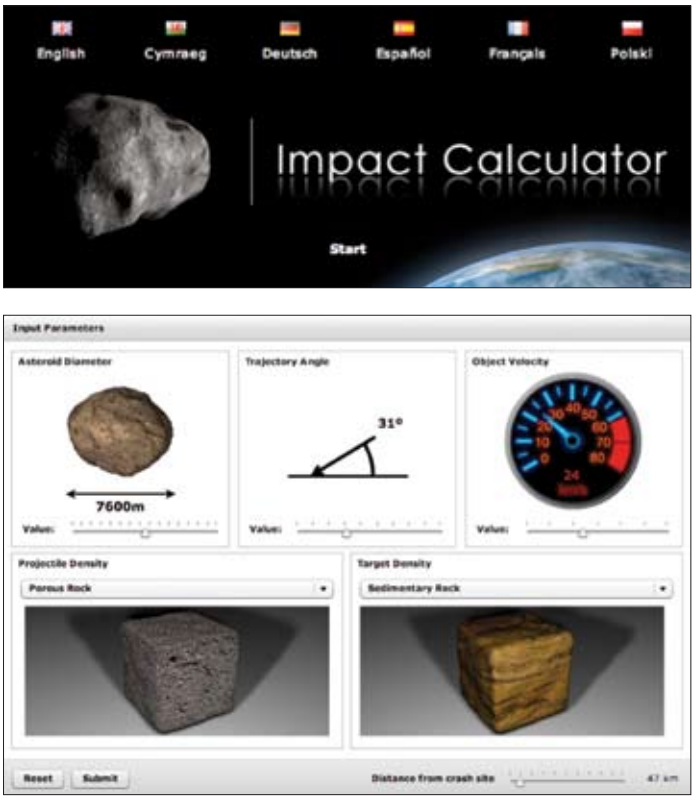
One of the features of the Royal Astronomical Society is the opportunity to make contacts. Chance encounters over coffee with people you might not otherwise meet can bring unimagined opportunities, especially if you follow them up with the other communication tools available to us all: email, weblinks, even telephone calls. All of these are easier if you have already made the personal contact. Just consider the research fields influenced by Michael Seaton, documented in a series of papers in this issue. The research prospered because it was good science, but it was links between people that got so many innovative projects started, and kept them going. At the meeting celebrating his career, speaker after speaker acknowledged the personal encouragement they received from Mike Seaton.

The RAS recognizes this important aspect of science by organizing meetings and sponsoring groups of scientists, often driven by enthusiastic early-career researchers, such as the UK Planetary Forum. The National Astronomy Meeting, under the aegis of the RAS, has become a magnet for early-career scientists across astronomy. Networking is essential in science, but networks embracing those outside academia are also important. Astronomy and geophysics draw in people who make their careers elsewhere. And, in a world where knowledge exchange is the key to funding success, we can all benefit from a broader view – listening to opinions and ideas that come from different perspectives. It is timely that the RAS is now offering membership to a wider range of people than would meet the scholarly criteria for Fellowship.

Anyone who supports the Society's aims can become a Friend of the RAS, and take part in activities, visits and talks. Tell your friends about the Friends, and let's welcome those with whom we share a common purpose. And let's make the most of the personal touch that the Society offers Fellows and Friends alike.

High impact astronomy

Would you like to pick out an asteroid and aim it at Earth, just to see what happens? Thanks to an interactive resource written by researchers in Wales, that's exactly what you can do – and such is the appeal that a resource intended for schoolchildren has become a viral hit worldwide.



Making science fun. The Impact Calculator allows you to choose various parameters for your asteroid, including size, trajectory, velocity and composition, before aiming it at anywhere on Earth.

Two topics guaranteed to grab the attention of schoolchildren are destruction and dinosaurs. This interactive online astronomy application combines them to demonstrate the science behind Earth impacts and the creation of impact craters.

Dr Edward Gomez and Jon Yardley of Los Cumbres Observatory Global Telescope Network created the interactive tool, called the Impact Calculator, with which users simulate smashing an asteroid into Earth and find out how big a crater their asteroid made. Users choose the asteroid velocity, diameter and composition as well as the composition of the ground it hits. So far, the Calculator allows users to smash an asteroid into London, Cardiff, Paris, New York and at a meteorite crater, the Barringer Crater in Arizona, using Google Maps.

Users can compare the depth of their impact crater with well-known landmarks such as the Eiffel Tower and Big Ben as well as finding out some of the effects of the impact – for example, whether or not the projectile has broken before reaching the ground or if the event has resulted in total mass destruction.

Behind the scenes, up-to-date impact physics is used to produce a scientifically accurate picture of the effects of collisions with the Earth. Whether the meteor breaks up in the atmosphere, by how much it is slowed down due to friction with the atmosphere, and whether the projectile is cometary or asteroidal in origin are all considered in the detailed calculations.

The frequency of such a collision event and the impact energy are also provided in the Data View section, allowing users to investigate how the different impact parameters for the asteroid change the details of the impact event and the aftereffects. There is also a brief description of what an observer would experience at whatever distance they choose from the crash site.

The Impact Calculator has been trialled successfully with schools and museum events across Wales. It has also caught the eye of the general public, who seem to be eager to use the tool and have a go at smashing large lumps of rock into the Earth. Google Analytics has been used to record the site statistics, such as traffic, referrals and country of origin of users, and the results were surprising. There has been no formal press release and publicity has been solely by "word-of-mouth" on the internet, yet since the Calculator was made available online in July 2008, it has had more than 110 000 hits from internet users in 153 countries/territories.

This may be a direct result of making the application available in six different languages (English, Welsh, Spanish, French, German and Polish). Most of the hits are from users in the USA and Poland (due to its prominent position on the latter's hugely popular astronomy site, http://www.Astronomia.pl) with the UK ranking third. Members of the public across South America and all of Asia have also accessed the Calculator, leaving only Greenland and most African nations as non-users.

The sheer number of hits has been driven mainly by the power of social networking sites such as Twitter, Digg and StumbleUpon. These sites allow users to "bookmark" their favourites and share this information with the rest of the internet community, hence a snowball effect can occur with popular sites being accessed far more frequently than ever before.

In the USA the site has featured on The Kim Komando Show: Cool Site of the Day, and on Phil Plait's popular astronomy blog Bad Astronomy. An appearance on blogs such as these can significantly increase the size of the target audience.

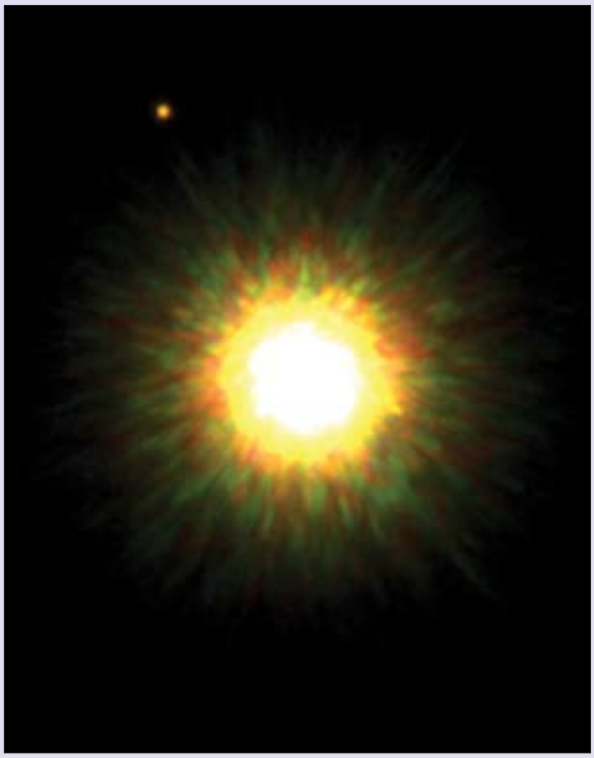
A huge benefit of using social networking is that the public has offered more than 100 honest comments about the Calculator, providing serious and immediate feedback and useful suggestions for future updates to the tool.

Go ahead and try out the Impact Calculator for yourself – see if you can create a crater the size of your town, or replicate the historic impact behind the demise of the dinosaurs.

More information

- The Impact Calculator was developed as part of Down2Earth, an educational project funded by STFC, held by the National Museum of Wales.
- It is based on the original research tool at http://www.lpl.arizona.edu/impacteffects with the science from Collins G S *et al.* 2005 *M&PS* **40** 817.
- Dr Edward Gomez can be contacted at egomez@lcogt.net.
- Impact Calculator is available for anyone to use at: **http://down2earth.eu/impact_calculator**

Gemini's possible planet portrait



This image of a planetary-mass object around another star (1RSX J160929.1-210524) is probably the first direct picture of another planetary system. It was taken using adaptive optics on Gemini North in Hawaii. The doubt about whether this object (with around eight times the mass of Jupiter) is a planet hinges on whether or not it is gravitationally tied to the young star, similar in mass to the Sun. The possible planet lies roughly 330 AU away from its star, whereas the most distant planet in our solar system, Neptune, orbits the Sun at only about 30 AU. Also, it is much hotter than any of our planets, at around 1800 K. Until now, the only planet-like bodies that have been directly imaged outside the solar system have been either free-floating in space (i.e. not around a star), or in orbit around brown dwarfs, which are dim and make it easier to detect planetary-mass companions. The research team, led by David Lafrenière of the University of Toronto, estimates that it will take up to two years to determine if this really is a planet in distant orbit around its star. This image is a composite of J-, H- and K-band near-infrared images, obtained with the Gemini Altair adaptive optics system and NIRI on the Gemini North telescope. (Gemini Observatory)

Bright but obscured chemical powerhouses

Ultraluminous infrared galaxies emit immense amounts of energy thanks to their speedy transformation of interstellar gas into young stars, and to their supermassive black holes. But their dense gas and dust clouds have obscured the details – and the products – of this intense star formation, until now.

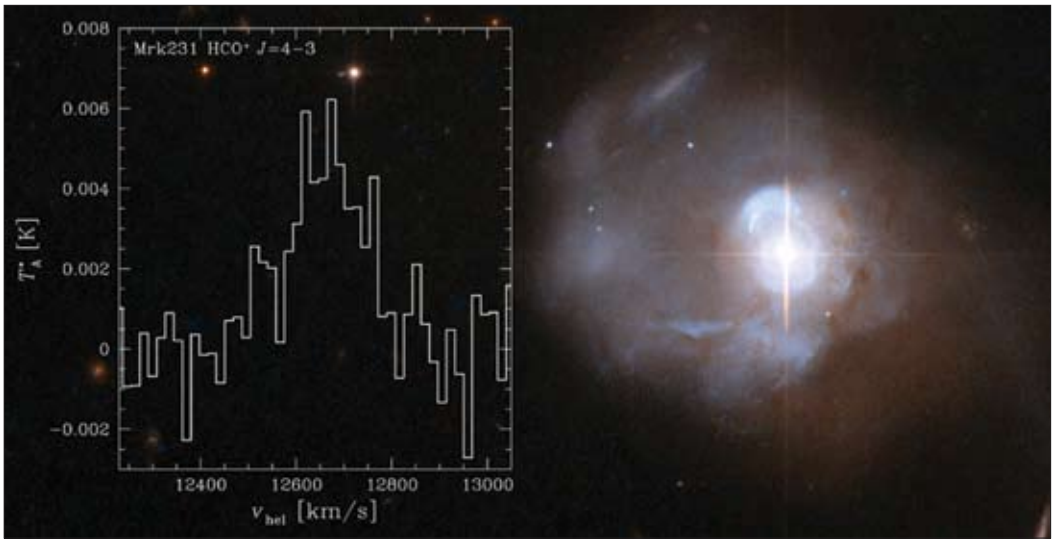
A new instrument on the James Clerk Maxwell Telescope on Hawaii – HARP – has penetrated the dust cloud to detect hydrogen cyanide, a significant but elusive species.

Ultraluminous infrared galaxies were more common in earlier stages of the evolution of the universe, so the species they formed could have influenced early star formation.

The JCMT team has so far found warm and dense carbon monoxide (CO), the formyl ion (HCO^+) and hydrogen cyanide (HCN).

The detection is a triumph for the powerful combination of the sensitivity of the HARP detector and the collecting area of the JCMT. No planned satellite instruments would do as well for these targets.

These galaxies are some 500 light-years away, and it took 12 hours of observing in very good atmospheric conditions to get a single line in a single galaxy. The observations are the first to detect these species in a substantial set of these galaxies.



Spectrum of HCO+(4-3) in the ultraluminous infrared galaxy Mrk231 (570 million light-years from the Milky Way), obtained with the JCMT and its HARP receiver. The background image shows Mrk231 as observed with the ACS on Hubble. The bright peak in the centre of this galaxy reveals the presence of an active nucleus, possibly powered by a supermassive black hole formed in the dense obscuring dust layer. (Image: NASA, ESA, Hubble Heritage STScI/AURA-ESA/Hubble Collaboration, and A Evans, Univ. of Virginia, Charlottesville/NRAO/Stony Brook Univ. Data: ESO)

News in Brief

Engineer the climate

Geo-engineering is a hot topic for geophysicists at the moment, with goverment and scientific interest (see *A&G* **49**.5), not least in what the term actually means. The Royal Society is seeking submissions for its "study on geo-engineering the Earth's climate", to be made directly to the Society by 11 December. This is a separate process from the IUSS parliamentary committee study to which the British Geophysical Association, RAS, IoP and Environmental and Industrial Geophysics Group of the Geological Society of London made an official submission (which is available on the BGA website, http://www.geophysics.org.uk). A four-page pdf guide outlining the Royal Society's interpretation of "geo-engineering" and the questions they want answered, with a list of the panel members, is available on their website.

http://royalsociety.org/page.asp?id=2556

IYA2009 seeks photos

The UK IYA2009 website now has an "Astropic of the Week" feature on its front page – and is asking UK enthusiasts for more. Each week the site will display an astronomy picture sent in from the UK, with an informative caption. The standard set is already high, with a superb image of M33, the Triangulum Galaxy, taken by Nick Howes of Wiltshire. The site also has details of IYA2009 events round the country, now with a searchable database to find out what's going on near you, as well as nationally.

http://www.astronomy2009.co.uk

NAM-JENAM gears up

Consult the NAM-JENAM website for details of next year's European Week of Astronomy and Space Science (20–23 April 2009) at the University of Hertfordshire, in Hatfield, incorporating the RAS National Astronomy Meeting and the Joint European and National Astronomy Meeting. The outline science programme is in place, including a dedicated Schools Day on the Friday, and the site has full details including registration and accommodation. Pre-registration is available from January 2009.

http://www.jenam2009.eu

News in Brief

Planets snapped

The Hubble Space Telescope has snapped the first visible-light picture of a planet around a star other than the Sun, and adaptive optics instruments on Gemini North and the Keck Observatory have found a multiplanet system. The HST discovery is of a Jupiter-mass planet orbiting Fomalhaut at 119 AU, detected by Paul Kalas of the University of California at Berkeley. The multiplanet system around massive star HR8799 consists of planets around 7 and 10 times the mass of Jupiter, orbiting at 25, 40 and 70 AU. Results from both groups were published online by *Science Express* on 14 November.

http://hubblesite.org

http://www.gemini.edu

Fewer turbulent times

Clear air turbulence is a significant problem for aircraft, because it is difficult for pilots to avoid. A new modelling approach – based on gravity waves generated around jet streams at the cruising heights of commercial flights – is already giving useful results and could be used operationally, according to Paul Williams of the Walker Institute for Climate Systems Research at the University of Reading. The study is published in *J. Atmospheric Sciences*.

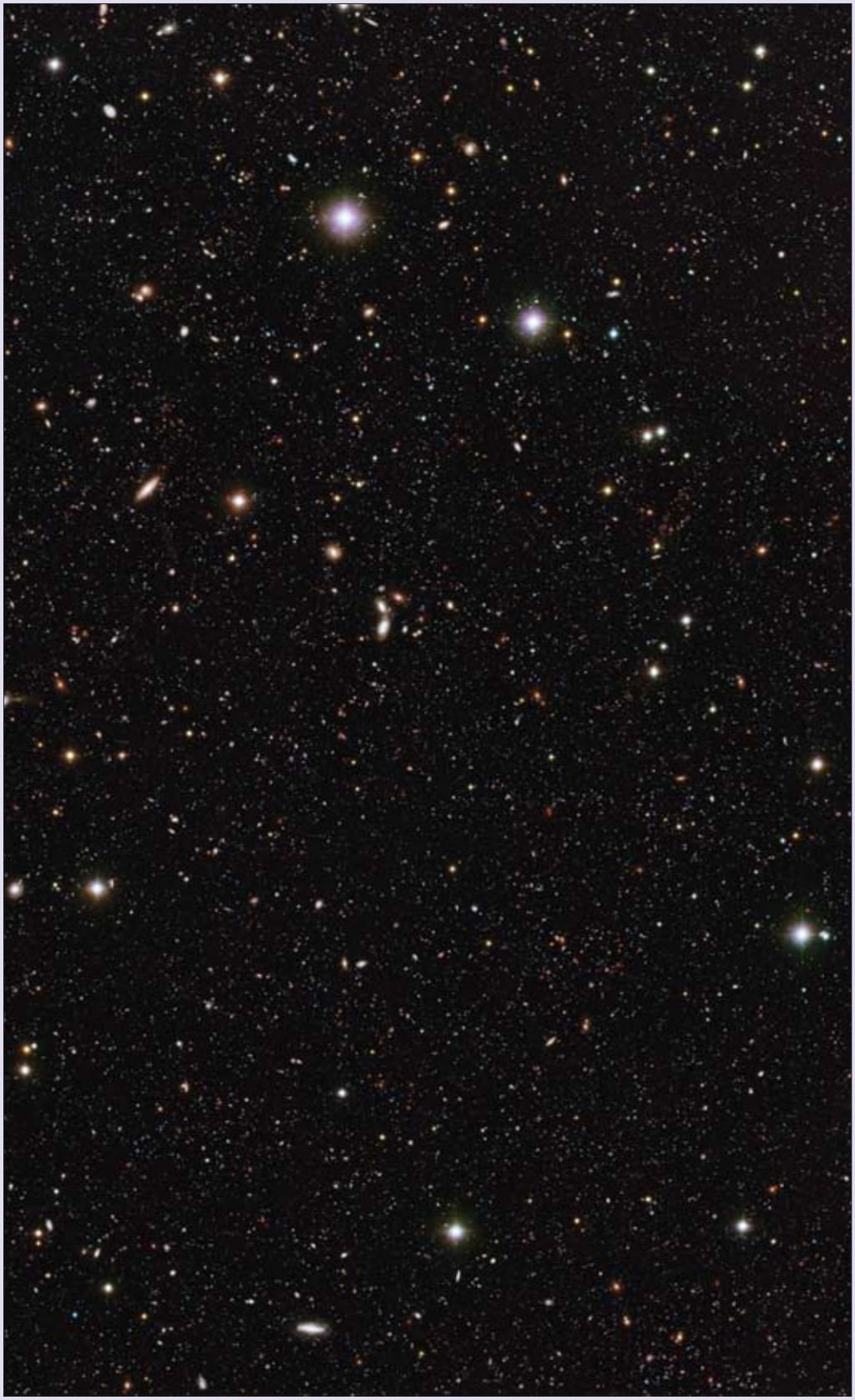
http://www.walker-institute.ac.uk

White meteorites?

Artificial meteorites suggest not only that traces of life could survive entering Earth's atmosphere, but also that a sedimentary rock meteorite from Mars, for example, could end up with a pale surface, rather than the expected blackened crusts. The STONE-6 experiment placed rock samples on the heat shield of a rocket: the two sedimentary rocks were a 3.5 billion-year-old sandstone with carbonaceous microfossils from Pilbara, and a 370 million-year-old Orkney mudstone containing chemical biomarkers. Both microfossils and biomarkers survived; living bacteria on the rocks did not, but left identifiable traces. And the heat of re-entry left a creamy-coloured fusion crust on the Pilbara specimen, suggesting that searches limited to dark rocks could miss meteorites of sedimentary origin.

http://www.esa.int/esaCP/SEMN5ZMPQ5F_FeatureWeek_0.html

Got the GOODS in the ultraviolet



The European Southern Observatory has released this image of the Chandra Deep Field South, as part of the Great Observatories Origins Deep Survey (GOODS). This image is the deepest image in this ultraviolet waveband ever taken from the ground, and is almost entirely made up of galaxies, looking back to a time when the universe was only 2 billion years old. There are a few stars from our own galaxy showing proper motion between the many images taken over several years that were combined to produce this image. The composite uses data obtained with the VIMOS instrument in the U- and R-bands, as well as data obtained in the B-band with the Wide-Field Imager (WFI) attached to the 2.2 m MPG/ESO telescope at La Silla. The image covers a region 14.1×21.6 arcmin.

New books to look out for

The RAS is pleased to announce the publication of the first book in its new publishing venture, the RAS Series.

The Cambridge N-Body Lectures, edited by Sverre J Aarseth, Christopher A Tout and Rosemary A Mardling, is a collection of papers arising from the 2006 Cambridge N-Body School.

The topics covered range from the classical few-body problem with discussions of resonance, chaos and stability, to realistic modelling of star clusters as well as descriptions of codes, algorithms and special hardware for *N*-body simulations.

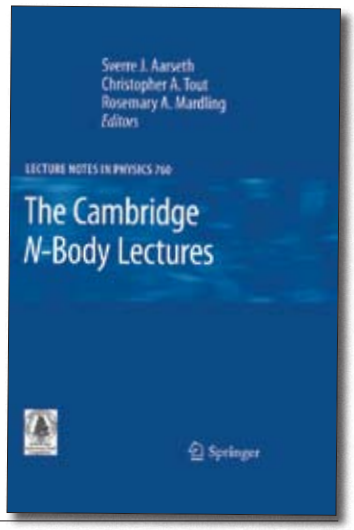
It is published in the Springer Lecture Notes in Physics series, suitable for students and researchers (2008, £55.99, 402p, hbk, ISBN 9781402084300).

The volume is available direct from Springer and through the usual booksellers, but is also published online. Individual papers can be downloaded individually, if readers wish, and, of course, the book will never be out of print.

The RAS Series is a joint venture between the RAS and Springer, and will comprise a series on astronomy and astrophysics, geophysics, solar and solar–terrestrial physics and planetary sciences. The books will include monographs, lecture notes, books on historical and educational themes, advanced amateur astronomy and conference proceedings (if there is need and they are high quality), in fields of concern to the Society. Books will be refereed and appear in the appropriate Springer series or imprint.

Prospective editors or authors, who need not be members of the Society to publish in the Series, should approach the Commissioning Editor, Simon Mitton at smitton@totalastronomy.com.

http://www.springer.com



Prizes waiting for environmental physics essays

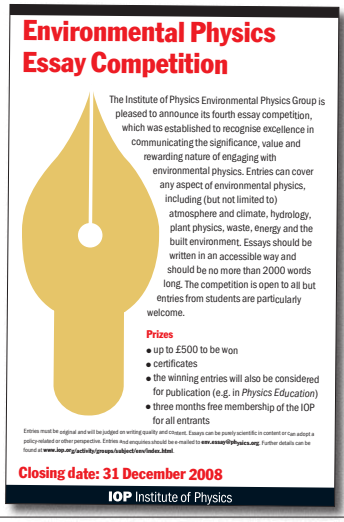
The Enviromental Physics Group of the Institute of Physics is again running an essay competition this year, and the deadline is approaching fast.

Enviromental physics is a deliberately broad topic, and one that is changing fast in a world increasingly aware of human interactions with the planet. This competition is open to all, but aimed at students, and covers such fields as atmosphere and climate, hydrology, plant physics, waste, energy and the built environment, but of course is not limited to these fields.

Essays can be concerned with fundamental science, or can take a policy-related or other perspective – the main aim of the competition is to recognize excellence in communicating the significance, value and rewarding nature of engaging with environmental physics.

There are prizes, including up to £500, and the chance to have your work published. And all entrants get three months free membership of the IoP. Entries should be no longer than 2000 words, written in an accessible way, and must be received by 31 December 2008. Entries and enquiries should be emailed to env.essay@physics.org.

Full details, including winners of previous years' competitions, are at http://www.iop.org/activity/groups/subject/env/index.html.



A cosmological challenge

What is dark energy? No-one really knows. Cosmologists around the world are tackling the problem through data collection, modelling and theory. Now a group of researchers from 19 international institutions has set a statistical challenge for colleagues from other disciplines, based on gravitational lensing: can you disentangle the various distortions in an astronomical image to isolate the dark energy contribution? And can you do so by 30 April 2009?

The GREAT08 PASCAL Challenge (GRavitational lEnsing Accuracy Testing 2008) is one approach to this major cosmological puzzle. "We realized that solving our image processing problem doesn't require knowledge of astronomy, so we're reaching out to attract novel approaches from other disciplines," says Dr Sarah Bridle, UCL Physics and Astronomy, who is leading the challenge alongside Prof. John Shawe-Taylor, Director of the UCL Centre for Computational Statistics and Machine Learning.

The observed galaxy images appear distorted by gravitational lenses and their shapes must be precisely disentangled from observational effects of sampling, convolution and noise. The problem being set, to measure these image distortions, involves image analysis and is ideally matched to experts in statistical inference, inverse problems and computational learning, among other scientific fields.

The GREAT08 Challenge contains 200 GB of simulated images, containing 30 million galaxy images. For the main competition, participants are asked to extract 5400 numbers from 170 GB of data. The competition can be accessed on the web:

http://www.great08challenge.info

Meeting encourages early career scientists

The UK Planetary Forum held its sixth Early Career Scientists' Meeting at University College London on 3 November 2008. 50 researchers attended, presenting and discussing their research, and making the contacts essential for future success. Katherine Joy, Vic Pearson and Caroline Smith report.

The aim of this annual meeting is to enable early-career scientists to meet, learn about planetary research being conducted in the UK, share experiences and explore possible collaborations. An important aim is to provide less experienced researchers with an opportunity to present their own work to fellow scientists at similar stages in their careers. This boosts the integration of the UK planetary community at the early-career level.

The meeting maintained a high turnout, attracting 50 researchers from across the UK. Most of the speakers were PhD students and post-doctoral research assistants (PDRAs). The general audience included research students (66%) and PDRAs (14%), with additional undergraduate students (4%), professionals and lecturers (16%).

The Chair of the UK Planetary Forum committee Katherine Joy (Birkbeck/UCL) and the Head of UCL's Faculty of Mathematics and Physical Sciences Richard Catlow opened the meeting. The 2008 plenary lecture was given by Tom Pike (Imperial College London), on NASA's Phoenix mission on Mars.

Early-career scientists then gave oral presentations, covering geophysical research on solar system bodies and topics relating to observational astronomy and theoretical modelling of planetary systems. Seven discussed cosmochemistry and meteorite-related research including isotope systematics and the petrology of lunar, martian and ureilite samples and analysis of Stardust mission material. Three presentations were made pertaining to planetary atmosphere research, and three to lunar science/exploration. Mars observational geology and NEO/asteroids science topics each attracted two talks. Other presentations included research related to astrobiology, instrument development and the theoretical modelling of stellar accretion discs. The meeting was a great success and networking continued afterwards in a nearby pub.

The UK Planetary Forum committee would like to thank Tom Pike, all speakers and attendees who made this meeting such a success. Many thanks are also extended to the UCL Faculty of MAPS for their generous financial support, to the UCL Centre for Planetary Sciences/RPIF for hosting the registration and refreshments events and to the RAS for supporting UKPF activities.

For more information on the UK Planetary Forum or to join it, see the website or contact the committee directly (ukpf@hotmail.co.uk). A full programme including an abstract booklet is available from http://shaper.bnsc.rl.ac.uk:8080/PF/forum/ukpf_young2008.html.

http://www.ukplanetaryforum.org