The newspaper of the physics community

October 2006

interactions

Institute of Physics

# Physicists say no to RAE metrics

*Ayala Ochert* reports on a meeting about the future of the Research Assessment Exercise.

A meeting of physics and astronomy professors has unanimously rejected the government's plan to replace the peer-review based Research Assessment Exercise (RAE) with a system for evaluating research based on largely on metrics.

The announcement of the plan to do away with peer review and move to a purely quantitative metrics-based system was made in March in the Treasury's *Next Steps* document, which sets out details of the government's 10-year strategy for science and technology. The physicists and astronomers met at the Institute on 8 September to debate the community's response to the consultation on the new proposals.

They found that they were in complete agreement that the new policy was ill thought-out and that the consultation itself is "asking the wrong questions". The consultation takes as a starting point the idea of moving to metrics and asks detailed questions about how such an approach might work. It does not ask the more fundamental question of whether peer review could, or should, be replaced by metrics at all. The overwhelming view of the meeting, which included many heads of physics departments, was that it could not and should not.

The RAE was first introduced in 1986 and has been used to assess the quality of research in higher education institutions. The quality ratings are used to allocate so-called "QR funding", which is given to universities to cover overheads as well as to provide seedcorn money for blue-skies research. The RAE has often been criticised for being burdensome on academics; the idea behind the new proposals is to save time and money while measuring the quality of research done.

Each of the government's five metrics-based models takes research income as its primary measure, arguing that there is a "strong correlation" between overall research income and QR income. This suggested the possibility of bypassing the RAE peer-review process altogether in favour of metrics such as research income.

The speakers at the meeting were highly critical of the government's reasoning here, pointing out that the correlation exists only for the largest institutions. Bahram Bekhradnia of the Higher Education Policy Institute ridiculed the government's conclusions, suggesting that the same correlation could be found between QR income and the total cups of tea drunk in university departments. Sir John Pendry, professor of physics at Imperial College and chair of the physics sub-panel for RAE 2008 put it more seriously: "If you want to clobber small and medium-sized departments, this is the way to do it."

Tax/Howard Kingsnorth

**The government wants to introduce purely quantitative measures of the quality of research in UK universities.**

**The same correlation could be found between QR income and the total cups of tea drunk in university departments.**

Bekhradnia went further: "It's a disgrace. There is no rationale provided for these proposals. They are just based on what people have been saying about the RAE, a lot of which has proven unfounded." He also pointed out that the announcement to scrap the RAE came in a Budget statement, and alleged that the Department for Education and Skills knew nothing about it beforehand. Pendry called on the Institute of Physics to be vigorous in its response to the consultation and to make a public statement expressing the strong objections of the physics community to the proposals.

### Peer review essential

Despite criticism of the RAE by academics over the past 20 years, the meeting acknowledged the benefits it has accrued during that time. The process had improved the quality of research, and the UK is now ranked third in the world for the physical sciences. But despite the apparent attraction of a "lighter touch" metrics-based approach, the physicists and astronomers said that no set of metrics could reliably measure the quality of research. Only peer review could do that, it was agreed, and it must be at the heart of any future exercise to measure quality.

Pendry pointed out that the cost of running the RAE panels themselves was just £5m every five to seven years – a tiny amount considering the billions in research money it helps to allocate. The main cost and administrative burden of the RAE is borne by the universities themselves, yet this is likely to continue beyond 2008 as universities need the same information for the management of their own budgets, he explained.

A metrics-based approach, far from solving existing problems, would create new ones, the meeting heard. It would encourage expensive research, it would reward a high volume of research over high-quality research and it would make curiosity-driven research harder to do. Those working in theoretical physics would be particularly hard hit as their research grants tend to be smaller.

The Royal Society and the Royal Astronomical Society are among those who have already expressed similar concerns, and the Institute is preparing a strongly worded response to the consultation to reflect the views of the recent meeting. Opposition from scientists will come as a blow to the government, which had thought that science subjects were the best suited to a metrics approach. It is planning to run a "shadow" metrics-based assessment alongside RAE 2008 and had been hoping to start the rollout of the new scheme from 2009 for the sciences.

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## HIGHLIGHTS

### Physics dance moves onto DVD

The Rambert Dance Company has produced an educational DVD of its production *Constant Speed*, commissioned by the Institute of Physics Publishing for Einstein Year. The dance was inspired by Einstein's three seminal works of 1905 – on Brownian motion, the photoelectric effect and special relativity. It has been performed in front of nearly 60 000 people across the country as part of the company's on-going tour.

The DVD includes a recording of a live performance of *Constant Speed* at Sadler's Wells Theatre, London, and interviews with choreographer Mark Baldwin and physics teacher David Richardson, who explains the physics behind the dance. The Rambert Dance Company has a strong educational programme, including dance workshops in schools and youth groups across the country. It is hoped that teachers will be able to use the DVD to inspire young people about dance – and about physics. It is available to the general public for £27 plus VAT from www.rambert.org.uk.

### Citations boost for *New Journal of Physics*

*New Journal of Physics* (*NJP*), which is co-owned by the Institute and the German Physical Society, has achieved the highest percentage increase in citations out of all research journals in physics. An analysis by Essential Science Indicators[SM], reveals that 829 *NJP* articles have now been cited 3187 times. The news comes as article downloads at the online open-access journal have just reached the one million mark. In the five years since it was founded, the journal has grown by more than 900%, its annual readership extends to more than 180 countries and its impact factor has risen to 3.585. "We are delighted to receive this very welcome news," said Eberhard Bodenschatz, editor-in-chief of *NJP*. "This latest citation data, together with the on-going growth in the journal's readership and authorship, provides yet further indication of *NJP*'s rising stature within the physics community."
**www.njp.org**

### Theory matches data on universe's first days

Computer models of how large-scale structure in the universe might have formed have been shown to be broadly accurate by observations from the Hubble telescope, though there are points of disagreement, explained Brad Gibson in a talk to the Institute's Lancashire and Cumbria Branch last month. Gibson, professor in theoretical astrophysics at the University of Central Lancashire, showed computer images of how the universe might have evolved and outlined the different theories that govern the modelling sequence. Unanswered questions, including the nature of dark matter, are driving the UK's participation in billion-dollar projects such as the Square Kilometer Array and the James Webb Telescope, said Gibson.

### Teachers praise resourceful physics websites

Three websites developed by the Institute have been named among the top 10 sites for teaching science by Teachers' TV. In its programme *Top 10 on the Web*, teachers from Greensward College, Essex, will give a quick-fire run-down of their 10 favourites, chosen from 60 sites offering resources for teaching science. Number two was Kung Fu Science (www.kungfuscience.org), a site exploring the physics behind kung fu, developed by the Institute for Einstein Year. Resourceful Physics (www.resourcefulphysics.org), which offers resources for secondary school students and teachers, came in sixth. At number 10

was Teaching Physics (teachingphysics.iop.org), Institute's Education Department site, which has links to its activities, such as the Physics Teacher Network and Teaching Advanced Physics – a site full of ideas for teaching physics at 16–19. The programme airs on 16 October at 8.45 p.m.
**www.teachers.tv**

# Grants to communicate physics

**By Ayala Ochert**

The Institute is once again making grants available to help physicists who are passionate about their subject to communicate with the public. Public engagement grants were given a boost during Einstein Year in 2005 and proved very successful, supporting more than 50 events and activities across the UK and Ireland. This year the grants supported another 16 groups with outstanding ideas for making physics accessible to the public.

The grants are worth up to £1000 and are awarded to individuals and organisations who want to organise a physics-based outreach activity in the UK and Ireland during 2007. The scheme is open to everyone but the projects must appeal to the local community. "These grants aren't for delivering the science curriculum to school children. We're looking for something more. We're looking for great communicators with fantastic ideas who can inspire people with their enthusiasm," says Caitlin Watson, the Institute's physics in society manager.

Previous projects supported by these grants have covered a wide range of activities. They include a trip for 200 girl guides to Space Science, an event exploring space science research at Surrey University; a series of three discussions on the philosophy of physics in a London pub; a giant outdoor physics poem in Bristol and a workshop on the physics of transport at the London Science Museum.

Bec Gee, arts and ceremonies manager at Once, an arts-based company in Bristol, was one of those who received a public engagement grant last year: "Thanks to the grant from the Institute, Once was able to create an arts-inspired physics outreach project, called The Physics Poem, involving members of the public. The poem sparked lively debate on the meaning of physics and created a fun activity for many different people."

Watson is hoping that the applications for 2007 are as strong as they have been in the last two years. "I'm always impressed by the range of physics-based activities that we're able to support through the grant scheme and the commitment of organisers to promoting physics in their communities. The feedback from these projects has been very positive, from both children and adults, and we hope to be able to reach out to even more people during 2007."

The closing date for applications to the scheme is 3 November 2006.
**physics.society@iop.org**

**SOAP SCENES**

Tim Durham

**When *Interactions* first reported on artist Tim Durham's photographs of soap films last November, we received lots of interest in his stunning images. He's had several exhibitions in Ireland, and now the UK debut of *Soap Opera* is to be held, appropriately enough, at the Institute of Physics. The images will be on display, along with a description of the physics involved, from 1 November 2006 to 20 February 2007. For details, e-mail jenny.hullock@iop.org.**

# Science of colour to inspire students

**By Ayala Ochert**

The Institute's Schools Lecturer for 2007 says he plans to open up children's eyes to the science of light and colour. Pete Vukusic, a physicist at the University of Exeter, is well placed to do so – his research covers the optics and photonics of animals and plants, and he is also a former physics teacher.

Vukusic was chosen from a list of hopefuls for the coveted role in which he will give an interactive lecture to around 10 000 school students across the country next year. "Pete presented the physics very clearly and linked colour, a topic which is engaging and interesting to young people, to the frontier research that he is involved in," says Daniel Sandford Smith, the Institute's education manager and one of the judges.

In 2004 Vukusic won the international L'Oreal Art and Science of Colour prize, and he has given dozens of lectures and presentations on the science of colour to audiences of all ages and across the world.

His Schools Lecture goes a step further than his previous talks. Aimed at 14- to 16-year-olds, it will cover the physics of waves and particles, the electromagnetic spectrum, the physics of human vision, how colour is produced in light and art and how it is used in the natural world. But the talk will steer clear of jargon and will instead be driven by colourful images – including photos of butterflies, whose properties Vukusic has studied, and neo-impressionist paintings.

Vukusic also hopes to transmit his passion for the science of colour. "Each one of us takes light and colour very much for granted. We should try to appreciate it, but to do this we first need to understand it," he says.
**http://teachingphysics.iop.org**

# Optics meeting lights up city of Manchester

*Heather Pinnell* reports on a conference to explore the latest advances in photonics.

Scanners for detecting vCJD residues on surgical instruments, a device to manufacture flat-screen televisions more quickly and cleanly, and discoveries that could one day lead to quantum computing were discussed at the Photon06 conference held in Manchester in September.

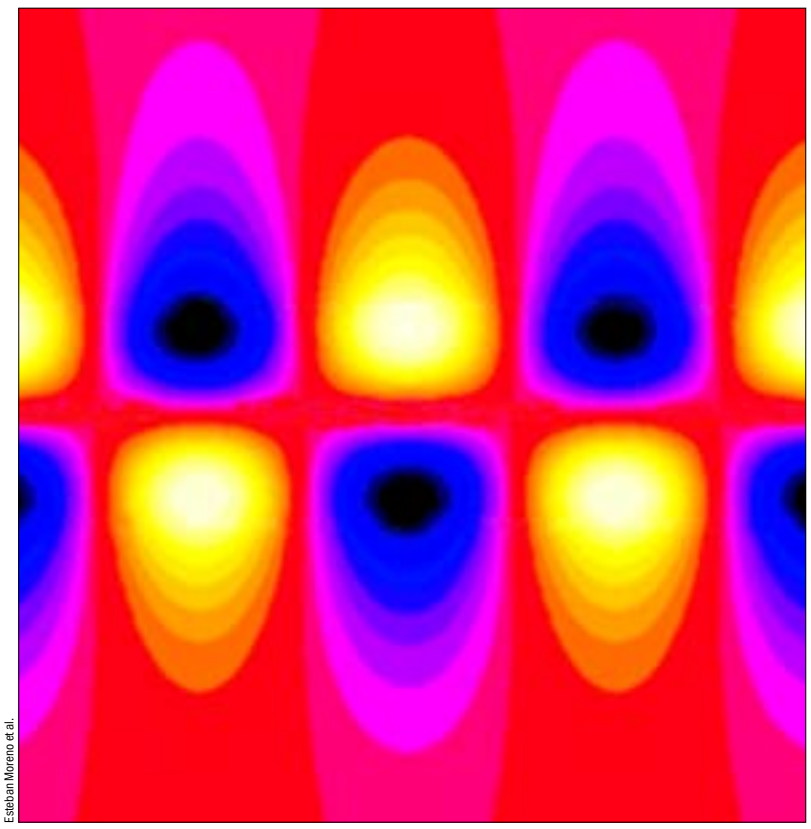
More than 500 delegates gathered for the four-day meeting, the third in the series of biennial international conferences organised by the UK Consortium for Photonics and Optics. The meeting encompassed Optics and Photonics 2006 – the biennial conference of the Institute's Optics and Photonics Division – and QEP-17, organised by the Institute's Quantum Electronics and Photonics Group.

A highlight of the event was the plenary session by Sir John Pendry of Imperial College London, who described the remarkable properties of metamaterials – artificially produced substances that can have a negative refractive index. These could be used to make "perfect lenses" that can produce images with arbitrarily high resolution, overcoming the diffraction limit.

Until now this limit has placed a fundamental boundary on the amount of data that can be stored on a recording medium such as a CD. Metamaterials could open the way to greatly improved storage devices. Negative refraction could also lead to practical cloaking devices that could make objects effectively invisible, Pendry explained, as well as the ability to introduce artificial magnetism, which could enhance MRI scans.

In another plenary session, Philip Russell of the University of Erlangen-Nuremberg described recent work on photonic crystal fibres (PCFs), metamaterials that consist of hair-thin threads of glass into which hollow capillaries are packed. The fibres can be used to trap light in a way that has the potential to transform fibre optics. They could, for example, lead to gas-laser devices that are coiled up inside a credit card. PCFs can also be used in conjunction with laser pulses to produce intense white light brighter than the Sun, and they are an efficient source of entangled photon pairs for interference experiments.

John Rarity of Bristol University explained how his team had developed a high-brightness-pair photon source that should enable the creation of multi-photon states needed for linear optical logic schemes. These could play an important part in quantum computing in the future.



Esteban Moreno et al.

**From the paper "Extraordinary optical transmission without plasmons: the S-polarisation case" given at Photon06.**

An optical scanner that can detect proteins such as the prions implicated in new-variant Creutzfeldt–Jakob disease (vCJD) was described by researchers from Heriot-Watt and Edinburgh universities. It could be used to ensure surgical instruments are clean enough for re-use and is quicker and much more sensitive than current methods. The scanner is able to handle instruments of any shape and can be operated by people with limited skills.

A new technique for creating the circuitry used in flat-panel television displays and solar cells was described by Matt Henry of the Sussex-based company Powerlase. The circuitry is made by etching a pattern on conductive thin films, such as indium tin oxide (ITO), on a glass substrate. The old method relies on wet-etch lithographic techniques, which require large, expensive machinery, use toxic chemicals and are costly and involve multiple stages. Their alternative method of rapid laser patterning uses a high-intensity laser pulse to remove a section of the ITO from its glass substrate very quickly and without damaging it.

For the first time this year Photon06 included an Industry Technology Programme run by the Institute's Business and Innovation department, which provided opportunities for networking as well as a range of speakers on UK and global market opportunities and the commercialisation and funding barriers for photonics.

## Plaque celebrates Churchill's adviser


The life of Frederick Lindemann, chief scientific adviser to Winston Churchill, was celebrated on 23 September at the unveiling of an Institute memorial plaque at the Sidholme Hotel, Sidmouth, where Lindemann grew up.

Lindemann's father was also a scientist, and it was in his father's laboratory (now the hotel annex) that he created the Lindemann Glass – a development of the X-ray tube. He later became Lord Cherwell, and his life is recounted in Adrian Fort's recent book *Prof*.

The plaque, arranged by the South West Branch of the Institute, was unveiled by Sir Peter Knight of Imperial College.

# New teacher fellows appointed

**By Heather Pinnell**

Four physics teachers have just started secondments as the first "teacher fellows" in a new scheme designed to improve the links between schools and university physics departments. The teacher fellowship scheme is being delivered by the Institute as part of the Stimulating Physics project, funded by the Higher Education Funding Council for England, which aims to increase the number of physics undergraduates.

The crossover from school to university physics often presents difficulties, and it is hoped that forming partnerships between between teachers and their local university physics department will smooth this transition.

The teacher fellows will help with teaching introductory degree-level physics courses at the universities and advise and assist on recruitment of students and on adapting its curriculum and teaching practices to improve retention. It is also hoped the experience will enable teachers to enrich their physics teaching in school, to broaden their own students' horizons with concrete examples of university physics, and to provide better advice on university applications.

In their turn, the universities should gain a better understanding of the aspirations and motivations of school students, improve their awareness of recent changes in school curricula and students' capabilities, and increase their retention rates.

It is also hoped that the participating university departments will develop sustainable links with their local schools, and make their departments more accessible by bringing exciting lectures and demonstrations to participating schools.

The scheme will run as a pilot for the first two years and, if successful, will be extended. This term teacher fellows have started their secondments at Birmingham, Manchester and Southampton universities and Queen Mary College, University of London. Two others have been accepted to start at Bristol University and Royal Holloway, University of London, next autumn. The Institute is seeking at least four more for the September 2007 start.

The teachers will spend at least two days a week at their local university for at least two terms, and the scheme will cover the cost of a replacement teacher at each school.

Victoria Adrienne, the manager of the scheme, said: "We had about 20 applicants in this round, and next year we expect a larger response. Headteachers have been quite supportive and often it was the applicant's head of science or headteacher who said: 'Why don't you go for this?' as it's seen as career development. The host universities have been really enthusiastic about the scheme and we've had no trouble recruiting them."

victoria.adrienne@iop.org

## NEWSMAKERS

**Stephen Hawking**, Lucasian Professor of Mathematics at the University of Cambridge, has been awarded the Royal Society's Copley medal for his outstanding contribution to theoretical physics and theoretical cosmology. The Copley medal was first awarded in 1731, making it the world's oldest scientific award. In its time the Copley medal has been given to Michael Faraday, Louis Pasteur, Charles Darwin and Albert Einstein. In recognition of Hawking's work in cosmology, the medal was taken on board the International Space Station earlier this year by British-born astronaut Piers Sellers.

The Royal Society has awarded one of three Royal Medals, to be given by the Queen, to **Sir John Pendry** (right) of Imperial College, London, for his seminal contributions in surface science, disordered systems, photonics and in metamaterials and the concept of the perfect lens. The society also awarded its Hughes Medal to **Michael Kelly** of the Department of Engineering at the University of Cambridge for his work in the fundamental physics of electron transport. Next year, **Joseph Silk** of the University of Oxford will give the society's Bakerian prize lecture – its premier lecture in the physical sciences.

**Kathy Sykes**, professor of public engagement in science and engineering at the University of Bristol and a fellow of the Institute, has been awarded the Royal Society's Kohn Award for her work on encouraging a better understanding between scientists and public audiences.

**Julia King**, chief executive at the Institute of Physics from 2002 to 2004, has been appointed vice-chancellor of Aston University. Since leaving the Institute she has been Principal of the Faculty of Engineering at Imperial College, London.

**John Turner** has been appointed as the new pro vice-chancellor at the University of Portsmouth. Turner gained his first degree in physics from Reading University and is a fellow of the Institute. Most recently he was Dean of Science, Engineering and the Built Environment at London South Bank University.

**Catherine Fitzpatrick** of the University of Surrey has won the National Physical Laboratory Award for the Best Physics Student at the 2006 SET Awards. Her entry, "Understanding the microscopic origins of nuclear collectivity", was judged as the best in the category by the Institute of Physics.

# Institute of Physics awards 2007

## DIRAC

### David Sherrington
*University of Oxford*

The Dirac medal and prize, for outstanding contributions to theoretical physics, has been awarded to David Sherrington for his pioneering work in spin glasses.

David Sherrington has been active at the forefront of theoretical physics for more than 40 years, and he is best known for his pioneering work in spin glasses in the 1970s. The puzzle of how the physical characteristics of glasses – disordered systems – differ from those of regular crystals has long interested physicists. In a seminal paper with Scott Kirkpatrick in 1975, Sherrington addressed the problem by looking at a simpler, more tractable system – the infinite-range spin glass. In a spin glass, the spins of the dopant ions act like tiny magnets, and the disorder in the system is due to the random nature of the interactions between the magnets. By construction the spin glass has no ordered ground state and therefore its "glassiness" can be studied in isolation from the kinetics of the system. The infinite-range feature led to a new mean-field solubility, which in turn exposed many subtleties.

The Sherrington–Kirkpatrick model has underpinned our understanding of complex behaviour arising from disorder and frustration in many-body systems. The subtleties it has exposed have led to new applications – both theoretical and practical – not only in physics but also in computer science, information theory, biology and economics.

Throughout his career Sherrington has regularly introduced new and fundamental questions and studies, including the first application of modern many-body theory to molecules, the development of the concept of self-consistent maximal randomness, the demonstration of the existence and differences of Bose condensation and superfluid character in Fermi systems, the prediction of new magnetic order in rare earth metals, the introduction of recurrent Boolean analogues of neural networks and the demonstration of the role of uncertainty in a model market. His work on Bose condensation, published more than 35 years ago, is also currently attracting the interest of the present generation of theoretical physicists.

## GLAZEBROOK

### Colin Carlile
*The Institut Laue-Langevin, Grenoble*

The Glazebrook medal and prize, for outstanding contributions to the organisation, use or application of physics in an industrial, commercial or educational environment, has been awarded to Colin Carlile for his contributions to neutron science, in particular through his leadership of the Institut Laue-Langevin.

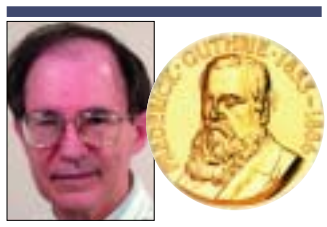
Colin Carlile has pursued a highly successful career in neutron science, conducting both original research and designing novel neutron instruments, as well as managing instrumentation suites at the ISIS neutron source near Oxford. The pinnacle of his career has been his leadership over the last seven years at the Institut Laue-Langevin (ILL) – the world's premier source of neutron beams for research.

A European research centre, ILL includes the UK, France and Germany as principal partners as well as nine other national scientific partners.

During his time at the ILL, Carlile has revolutionised the outlook of the institute. He has pushed through a programme of instrument upgrades, which has increased their average performance by a factor of seven, and further advances are on the way. He has also created an environment in which highly motivated staff – and new initiatives such as the deuteration laboratory – can flourish. In addition he has introduced a series of new security measures and initiated the design of an improved fuel element, ensuring that the long established ILL neutron source will remain competitive with other sources that are due to be built.

As a result the ILL has a secure long-term future and will continue to contribute to our understanding of everything from unconventional superconductors to biological macromolecules, from nuclear reactions to the origin of matter in the universe, and from the binding of bio-molecules to tests of quantum mechanics.

## GUTHRIE



### Gilbert Lonzarich
*University of Cambridge*

The Guthrie medal and prize, for contributions to physics by a physicist of international reputation, has been awarded to Gilbert Lonzarich for his experimental and theoretical contributions to condensed-matter physics, in particular to strongly correlated electron systems.

Gilbert Lonzarich is recognised internationally as one of the UK's leading condensed-matter physicists, both as an experimentalist and as a theoretician.

He received his first degree from the University of California, Berkeley, and his PhD from the University of British Columbia in 1973. In 1974 he moved to the University of Cambridge.

Throughout his career he has made seminal contributions to the understanding of some of the most challenging areas of condensed-matter physics: itinerant magnetism, the physics of heavy fermion metals, quantum critical magnetism and superconductivity.

He has identified, employed and mastered key experimental techniques, especially in connection with quantum oscillations, inelastic neutron scattering and high pressure studies – all of which are difficult and demanding. Much of his success can be attributed to his appreciation of the importance of high quality, well characterised materials, which he has often produced in his own laboratory. For example, he developed facilities for the growth of the best crystals of $UPt_3$ that are available worldwide.

In his most recent work, Lonzarich has been concerned with pressure-induced, magnetically mediated superconductivity. He recognised the theoretical case for such phenomena more than 10 years before they were discovered and, under his leadership, his group has led the way in the associated worldwide experimental effort.

Lonzarich also has a remarkable ability to inspire a new generation of condensed-matter physicists. His former students now hold senior positions across the world, and they continue to benefit from his advice and insight.

## BRAGG

### Philip Britton
*The Grammar School at Leeds*

The Bragg medal and prize, for significant contributions to physics education, has been awarded to Philip Britton for his many contributions to physics teaching in schools.

After receiving his BA from the University of Oxford, Philip Britton went on to get his his postgraduate certificate in education from the University of Cambridge in 1991. He went straight into teaching at Leeds Grammar School, where he is now deputy head.

He is an extremely able physicist, who is fascinated by his subject and able to transmit that fascination and enthusiasm to others in a wide variety of ways. Britton has a sharp analytical mind as well as a wide knowledge of the curriculum and of teaching issues.

He has been a staunch supporter of the Institute of Physics since his student days: he has been secretary and chair of the Education Group Committee and has organised the group's annual conference. He was a key member to the Institute working party that contributed to the revision of the science component of the national curriculum.

In the 1990s he established the Institute's first effective local physics teacher network – a significant achievement at a time when increasing pressure on teachers meant they were less inclined to take part in extra-curricular activities.

Britton was also a key member of the team that developed the Institute's A-level course, Advancing Physics. His ability to entertain radical new ideas about teaching, combined with a sensitivity to their impact on teachers, was particularly important to the success of the project. He has since led a talented and diverse team in a project to produce materials to support physics teaching in the years up to GCSE.

Britton has also played an important role in cementing Anglo-Japanese links and has spoken at numerous conferences on physics teaching, both in the UK and abroad, where he has represented the UK with distinction.

## CHREE

### Michele Dougherty
*Imperial College, London*

The Chree medal and prize, for distinguished research in environmental physics, terrestrial magnetism, atmospheric electricity and related subjects, has been awarded to Michele Dougherty for her contributions to the field of planetary magnetic fields and atmospheres and their interactions with the solar wind, in particular through scientific leadership of the Cassini mission to Saturn and its moons.

Michele Dougherty has made numerous and important contributions to the Cassini mission to Saturn and its moons. She and her team made the initial identification of the atmosphere of the moon Enceladus through her innovative use of magnetic field data. This subsequently led to the realisation that the moon is a major source of water and is responsible for the replenishment of the E-ring. She has made pioneering observations of the Kronian magnetic field, demonstrating its near-axial symmetry and so providing a further puzzle to theorists who wish to explain how Saturn's dynamo works.

Magnetic field observations of Titan have confirmed the picture of its interaction with the Kronian magnetosphere through the ion pick-up process. Dougherty's magnetic field measurements of the Jovian and Kronian bow shock demonstrate their turbulent nature and provide a unique database of strong shocks in the solar system.

Throughout the Cassini mission she has shown outstanding leadership qualities in her management of the magnetic field experiment, and she enabled the large and diverse international team investigating the magnetic field of Saturn and its satellites to deliver top quality science.

Dougherty has also made pioneering contributions to the study of the Jovian system, especially in the field of aurora on Jupiter. This work demonstrated the clear connection between field-aligned currents in the Jovian magnetosphere and the aurora – the first time such a phenomenon was identified on a planet other than Earth.

## DUDDELL

### Richard Nelmes
*University of Edinburgh*

The Duddell medal and prize, for outstanding contributions to the advancement of knowledge through the application of physics, has been awarded to Richard Nelmes for pioneering new techniques and instrumentation that have transformed high-pressure structural science.

Richard Nelmes has pioneered techniques and instrumentation that have transformed international high-pressure structural science. Where earlier results were often somewhat qualitative, his work from the 1980s led to the production of quantitative diffraction data that can now be analysed to pressures beyond a megabar, revealing remarkable structural complexity in many materials.

From 1989, he led developments of powerful new methods for synchrotron X-ray powder diffraction that fully exploited 2D detectors and overcame the effects of pressure cells on data quality. This has since become the way that all such work is done worldwide. His own group's research has achieved striking new structural insights, first in semiconductors like Si, Ge, InSb and GaAs under pressure, and more recently in elemental metals. For example, at very high pressures the group discovered an extraordinary new structure in Ba, and then in several other metallic elements, of a type previously known only in binary systems. He has since developed new single-crystal X-ray techniques to address the complexity of some high-pressure metal phases.

Nelmes has also made extensive use of neutron diffraction methods. These were limited to much lower pressures than X-ray studies for many years but, through collaboration with colleagues in Paris since 1988, he has achieved an order of magnitude increase in pressure and spurred international efforts to take neutron techniques to a megabar. His group's research with neutrons includes numerous studies of high-pressure structures in ice and water, as well as discoveries about methane hydrate that are important for understanding the atmosphere of Saturn's moon Titan. He also led the recent establishment of the Centre for Science at Extreme Conditions at the University of Edinburgh.

# The Institute honours the following physicists, each of whom has made a remarkable contribution to their field. The Institute's awards aim to recognise and reward outstanding achievements in physics and to encourage younger members of the community towards greater success in the future.

## KELVIN

**Charles Jenkins**
*Australian National University*

The Kelvin medal and prize, for outstanding contributions to the public understanding of physics, has been awarded to Charles Jenkins for his development of Lab in a Lorry.

Charles Jenkins read physics at the University of Witwatersrand, Johannesburg, and then moved to the University of Cambridge, where he received his PhD in astrophysics in 1981.

He is an enthusiastic physicist who has spent his career in a variety of work environments, both industrial and academic. His most widely known contribution to raising the profile of physics in the wider community is his development of Lab in a Lorry – a mobile science laboratory.

The idea was novel in that the lorry was to be a self-contained laboratory in which young people could perform hands-on experiments. Each of the experiments was designed to present science as relevant and approachable. A fundamental principle in the design of the experiments was that they should embrace all the complications, failures and bafflement of real science as an essential part of their appeal. Also fundamental to the project was the use of practising scientists to work as volunteer demonstrators. The project's ability to empower volunteers has been one of the great successes of Lab in a Lorry.

In 2001 Charles Jenkins ran a very successful pilot programme with financial support and volunteers from Schlumberger Cambridge Research, the Cavendish Laboratory and the East Anglia Branch of the Institute of Physics.

With support from the Schlumberger Foundation and the Institute, three custom-built lorries were put on the road in May 2005. To date, Lab in a Lorry has hosted more than 42 000 visitors from 350 schools and attended 50 public events in the UK and Ireland. More than 360 scientists from industry and academia have volunteered as guides.

## MOTT

**Andre Geim**
*University of Manchester*

The Mott medal and prize, for distinguished research in condensed-matter or materials physics, has been awarded to Andre Geim for his discovery of a new class of materials – free-standing two-dimensional crystals, in particular graphene.

During the last two years Andre Geim has played a crucial role in opening up a new field of condensed-matter physics through his discovery of a new class of materials – strictly two-dimensional atomic crystals. Among them graphene – a free-standing single layer of graphite – occupies a very special place due to its truly remarkable properties.

Graphene is only one atom thick but highly stable under ambient conditions and exhibits nearly perfect crystal quality. It is also highly conductive so electrons confined within this atomic gauze travel submicron distances without scattering. Geim has demonstrated a ballistic ambipolar transistor based on graphene, which has significantly improved the prospects of carbon-based electronics, although major applications of graphene and other two-dimensional materials await further development.

There is, however, no doubt about the exceptional new physics that graphene offers. Quasiparticles in graphene are not like normal electrons described by the Schrödinger equation but behave as massless relativistic fermions described by the Dirac equation.

Geim and colleagues have proven this in a series of elaborate experiments in which they reported two new types of the quantum Hall effect (dubbed as half-integer and chiral) as well as the minimum (or Mott's) quantum conductivity in the limit of no charge carriers. The latter discoveries have opened a new paradigm of "relativistic-like condensed matter" in which quantum relativistic phenomena can now be studied in bench-top experiments.

Geim works extensively to embed science in society, with educational demonstrations on magnetic levitation (the "flying frog" experiment) as well as research on biomimetic adhesives exploiting the same physical mechanism as that used by geckos when they climb ("gecko tape"). Through this, and his discovery of graphene, Geim has attracted worldwide media attention.

## YOUNG

**James Roy Taylor**
*Imperial College London*

The Young medal and prize, for distinguished research in the field of optics, including physics outside the visible region, has been awarded to James Roy Taylor for his contributions to the development of modern solid-state lasers.

Roy Taylor has been a pioneer in developing lasers to generate ultra-short pulses of light and in using them to improve our understanding of highly non-linear pulse propagation in optical fibres. His work has led to the development of commercially successful laser systems, and he pioneered the use of several measurement techniques that are now used worldwide.

Taylor's innovative contributions to ultra-short pulse dye lasers early in his career helped make possible their practical development and widespread use. He then led the field towards more stable and versatile solid-state systems with a series of record-setting ultra-short pulse demonstrations based on Ti:sapphire, Cr:LiSAF and Cr:YAG lasers.

At this time he was also doing the research that would lay the groundwork for dramatic successes in fibre-optic lasers, non-linear optics in fibres and frequency conversion devices.

More recently Taylor has achieved notable success in developing fibre lasers with exceptional spectral, temporal and power-output characteristics. These sources have proven to have excellent properties for a range of applications, including ultra-high resolution depth-profiled optical coherence tomography – a technique with exciting potential in ophthalmology.

The range and depth of his expertise are particularly noteworthy because he has chosen to remain intimately involved in both planning and undertaking the research carried out by his group.

After more than 30 years of leading research he remains at the forefront of his field – inventing new devices, advancing fundamental understanding and influencing system development.

## BOYS

**Amalia Patanè**
*University of Nottingham*

The Boys medal and prize, for distinguished research in experimental physics and which recognises physicists early in their careers, has been awarded to Amalia Patanè for her innovative experimental studies of the quantum behaviour of electrons in novel semiconductor heterostructures.

Amalia Patanè received her Lauria degree and PhD from the University of Rome and then, in 1998, she moved to the physics department at the University of Nottingham, where she is now reader in physics.

She has carried out internationally acclaimed research in semiconductor physics, and in 2004 she was awarded a prestigious five-year advanced fellowship by the Engineering and Physical Sciences Research Council.

Her experiments have provided new insights into the quantum behaviour of electrons in some of the novel semiconductor materials and devices that have emerged in the last decade.

During her PhD studies at the University of Rome, she used photoluminescence spectroscopy to investigate electron localisation in artificial atoms called quantum dots. She further developed this work at the University of Nottingham, where she used magneto-tunnelling spectroscopy to obtain images of the wave function of electrons bound in the ground and excited states of a quantum dot.

These exciting results have set the benchmark for further theoretical and experimental studies of electrons in nanostructures.

Recent research highlights include the observation of rare chaotic electron dynamics in artificial superlattices, called non-KAM chaos, and of the unusual effect of a very small concentration (1 part per 1000) of nitrogen atoms on electron dynamics in GaAs.

In these systems an electron can, paradoxically, be slowed down by giving it more energy. These novel effects may have practical applications in high-frequency (terahertz) electronics.

## MAXWELL

**Nigel Cooper**
*Cavendish Laboratory, University of Cambridge*

The Maxwell medal and prize, which recognises outstanding contributions to theoretical physics in the last 10 years, has been awarded to Nigel Cooper for his work on topological excitations in quantum Hall fluids and related systems, in particular rotating Bose–Einstein condensates.

Nigel Cooper's work demonstrates a rare degree of physical insight and imagination. He is also unusual as a theorist in having close links with and an understanding of the experimental situation in his subject. A highly respected theorist recently said of him: "With most theorists you know that if you had studied the same scientific problem you could have done what they did. With Nigel you know that you would never have been able to do what he did."

His early research covered a range of phenomena associated with the quantum Hall effect. Among his contributions in this area, he predicted that skyrmions are stable topological defects in quantum Hall fluids under a variety of conditions, including optical excitation – predictions that have since been verified experimentally.

More recently he has applied quantum Hall concepts to the phase diagram of the rotating dilute gas Bose–Einstein condensates. This field started with Nobel prize-winning experiments in 1995 and has revolutionised atomic physics and its connections with condensed-matter physics. It has set the scene for a whole metastable "periodic table" of quantum liquids and gases, extended from the conventional periodic table as every isotope of an element behaves differently.

Nigel Cooper showed convincingly for the first time that the ground state of a rapidly rotating Bose gas is not Bose-condensed and is in fact a "peculiar" phase in which the excitations have unusual non-Abelian statistics. This has had considerable impact on the field. The regime of rapid rotation is difficult to study experimentally, but Cooper has recently demonstrated a new way of understanding the results that will have a major impact on the field.

## PATERSON

**Kurt Haselwimmer**
*Cambridge Magnetic Refrigeration Ltd*

The Paterson medal and prize, for outstanding contributions by a physicist early in their career to the application of physics and its commercial exploitation, has been awarded to Kurt Haselwimmer for establishing the successful scientific instruments company Cambridge Magnetic Refrigeration.

Kurt Haselwimmer's scientific research has always been in the strongest traditions of scientific instrument development. As an undergraduate he developed designs for supercomputers, subsequently used by Philips for radar beam forming. As a postgraduate he worked with Gilbert Lonzarich to establish a programme of research at ultra-high pressure and ultra-low temperature on materials known as heavy fermions, which display behaviour analogous to that of high-temperature superconductors. The highlight of this work was the development of an instrument that could cool samples to temperatures of 50 mK above absolute zero and with pressures controllable up to 500 000 atmospheres, allowing the behaviour of the material to be mapped in a few days rather than many months.

Realising the potential that existed with the cooling technique that the team had re-established, Haselwimmer left Cambridge and founded Cambridge Magnetic Refrigeration. He saw the advantages of exploiting adiabatic demagnetisation as a route to millikelvin research that did not require the heavy infrastructure that is usual in this field. This helped many university research groups that would otherwise have found it very difficult to join this rapidly expanding area.

Cambridge Magnetic Refrigeration now has an international reputation characterised by its responsiveness to the community it serves through partnership rather than acting as an external force. He is a constant presence at international meetings and, through his company, provides support for the activities of the scientific community.

interactions

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LETTER FROM

## ...the groups coordinator

If you're among the 34% of Institute members who belong to at least one group, you'll know how valuable they can be in keeping you in touch with the areas of physics that interest you. But the other two out of every three of you may be missing out.

There are more than 50 groups, covering a wide range of subjects and interests. Many are specialist subject groups, such as the Optical Group, the Low Temperature Group or the Environmental Physics Group. But there are also "professional" groups – such as the Consultancy Group, which supports people who use their physics in consultancy, or the Physics and Law Group. Whether you work in research or in industry, there's a group for you.

You don't have to pick just one group in your own specialist area – you can join as many groups as you like. Perhaps you're not a teacher but you're interested in physics education. If so, you can join our very active Education Group. Or maybe you've always wanted to know more about the history of your subject – if so, the History of Physics Group may be for you. And you don't even need to be female to join our Women in Physics Group.

Despite their wide range of subjects, all the groups share a key feature – they provide great opportunities for networking and discussion about physics. Many also arrange conferences and workshops, like the recent "Physics by the Lake", a summer school beside Lake Windermere, organised by the Theory of Condensed Matter Group.

Joining a group also gives you the chance to meet some of the UK's foremost physics experts. But if you're a student, don't worry that you'll be out of your depth. All the groups actively encourage student members and many even offer bursaries to help them attend conferences or award PhD prizes, like the Culham Thesis Prize offered by the Plasma Physics Group.

Groups also provide an opportunity to get involved in and influence Institute activities – the Medical Physics Group recently developed a CD for schools, and this year the Women in Physics Group created a web-based resource for primary schools.

Check out the list of groups at www.iop.org as we have new ones forming all the time, like the brand new Biological Physics Group. And if there's an area of physics missing that you think we should represent, please get in touch.

Joining your first group is free right now, so it's a great time to join. Just contact the membership department or log on to the website and sign up online.

**Sarah Verth** is the Institute's science support officer. For information on starting a group, e-mail sarah.verth@iop.org.

## Don't keep it simple

I read with interest Jon Ogborn's article about teaching energy (July 2006) and I'm pleased that he's made the point that all is not well. Many words in the public domain have a precise scientific definition – pressure, force, power, momentum. No serious science teacher would dream of using these words imprecisely, but when it comes to energy things have got out of hand. Layman's language is often used to teach children, and energy is treated as a magic fluid that is soaked up by things and which flows from one thing to another. In science, energy has always been the capacity for work. It requires an understanding of force, displacement, vectors and scalar products, so the present requirement to teach energy before A-level is hopelessly misplaced. Formal ideas can only be expressed in formal language. Oversimplification has gone mad.

**Keith Bamford**
Eldwick, Bingley

## Funny business

I chuckled at the article "University physics runs at a loss" (September 2006). Of course it does. Universities are not in the business of making returns for shareholders; they are there to educate. If you want to assess the value proposition of a university education in physics, you need to measure the wealth created by physicists working in industry. I am confident that you will find that the small investment in our education has been paid back many times over.

**Simon Bennett**
Moscow, Russia

## Phoney physics?

I was saddened but not surprised to see on your September cover that well known phoney experiment – evacuating a bell jar to show that sound cannot travel in a vacuum. I believe it is phoney because, under the conditions produced, sound could travel from the buzzer to the jar through the air at low pressure inside the jar. That the sound becomes fainter, I'm told, is because the acoustic matching between the emitter and the air at lower pressure becomes poor. I'm not necessarily against making physics courses easier, but not at expense of the truth.

**David Tawney**
Windsor

Write to interactions@iop.org or the address above. Letters may be edited for length.

OBITUARY

# Sir James Menter (1921–2006)

Sir James Woodham Menter – a former president of the Institute of Physics (1970–72) and a pioneer in the use of electron microscopy to study crystalline structure – died on 18 July. He was an outstanding physicist as well as an educational and scientific administrator of unusual versatility and efficacy, whose landmark paper in 1956 demonstrated the reality of the edge dislocation in crystals, postulated by theorists 22 years earlier.

Menter was born in Teynham, Kent, and educated at Dover Grammar School. He won an open scholarship to study natural sciences at Peterhouse College, Cambridge, but his studies were interrupted by the Second World War. During that time he worked on the detection of submarines as an experimental officer with the Admiralty. Returning to Cambridge in 1945, he completed a PhD and then an ICI fellowship at the Cavendish Laboratory.

In 1954 he joined Tube Investments Research Laboratories (TIRL), where he used a powerful new electron microscope to examine platinum phthalocyanine and so made a sensational breakthrough, bringing the reality of the edge dislocation vividly to light by direct space imaging. Theorists had earlier postulated the existence of this phenomenon to explain why metals failed to be as strong in practice as they should have been in theory.

Menter's 1956 paper caused great excitement, especially among physicists and those we would now call materials scientists. I well recall the thrill that I experienced when I "discovered" it. He and his colleagues went on to reveal otherwise invisible dislocations in metals by creating moiré patterns, generated using overlapping thin metal films. Menter became research director at TIRL in 1961, and while there he investigated radiation damage in solids and oversaw the development of a new technique for obtaining fine-scale composition analysis of materials using scanning electron microscopy allied to electron-stimulated X-ray emission spectroscopy. TIRL developed this into the electron probe microanalyser, which was sold worldwide.

In 1966 he was elected a fellow of the Royal Society and he was knighted in 1973. His awards include the Institute's Glazebrooke Medal (1977), honorary degrees from Brunel and Stirling universities and honorary fellowships of the Royal Microscopial Society and the Royal Society of Edinburgh.

Menter was an ardent supporter of the Royal Institution (RI) and was its vice-president and treasurer during the 1970s. He gave me tremendous support in my days as director, and he and his wife Jean were a joy to have as guests in the director's flat prior to the RI's Friday Evening Discourses.

He was principal of Queen Mary College, University of London from 1976 until his retirement in 1986. During this period he was variously deputy chairman of the Cabinet Office's Advisory Council for Applied Research and Development, a member of the board of governors of London Hospital Medical Colleges and a member of the Committee of Enquiry into the Engineering Profession.

Jim Menter was a man blessed with sensitive antennae, a razor-sharp mind, generosity of spirit and a shrewd sense of opportunity. He also had a splendid sense of humour.

Remembered by **Sir John Meurig Thomas**.

# Visit whatson.iop.org for full details of all Institute of Physics events.

## OCTOBER 2006

**Einstein: Man of the Century**
Free exhibition with rarely seen images.
Midland Branch
*Physics and Astronomy Department, Leicester University*
Weekdays until 6 October
http://midland.iop.org

**Following the Rainbow: Halos and Glories**
Talk by Prof. Alan Davies of the University of Hertfordshire.
London and South East Branch
*The Weston Auditorium, de Havilland Campus, University of Hertfordshire*
4 October
d.crann@herts.ac.uk

**The Music of the Primes**
Talk by Prof. Marcus du Sautoy of the University of Oxford.
London and South East Branch
*76 Portland Place, London W1*
4 October
B.J.Harker@open.ac.uk
**Please e-mail if you plan to attend.**

**Nature to Nanotechnology and Back**
Talk by Alan Dalton of Surrey University.
South Central Branch
*Lecture Theatre M, Surrey University*
4 October
http://scentral.iop.org/guildford.html

**Physics of Life**
Talk by Prof. Peter Weightman of the University of Liverpool.
Merseyside Branch
*Chadwick Lecture Theatre, University of Liverpool*
5 October
http://merseyside.iop.org

lab in a lorry
get connected to science

Lab in a Lorry – the interactive mobile laboratory for 11–14-year-olds – will be touring the UK and Ireland throughout 2006. For details on how to register your interest, or to volunteer, see **www.labinalorry.org.uk.**

**Engineering and Physics: Synergy for Success**
Conference on interdisciplinary work.
Engineering Physics Group
*76 Portland Place, London W1*
5 October
www.iop.org/Conferences
**Registration required**

**Commercialising Research for Healthcare Biotechnologies**
Speakers, networking and discussion.
Business and Innovation Department
*76 Portland Place, London W1*
9 October
www.iop.org/Our_Activities/Business_and_Innovation
**Booking required**

**How Einstein Revolutionised Physics in 1905**
Talk by Vincent Smith of Bristol University and Peter Ford of Bath University.
South Central Branch
*Pevensey 1 Lecture Theatre, Sussex University*
10 October
http://scentral.iop.org/brighton.html

**Physics and Public Engagement**
Meeting to survey current efforts in public engagement and to offer practical advice.
Higher Education Group
*76 Portland Place, London W1*
11 October
www.iop.org/conferences
**Booking required**

**Is it Possible to Keep the Lights On and Save the Planet?**
Talk by Prof. Maxwell Irvine of Manchester University.
Lancashire and Cumbria Branch
*Frankland Colloquium Room, Lancaster University*
11 October
http://manchester.iop.org

**A Theoretical Physicist's Perspective on Catastrophes**
Talk by Gordon Woo of Risk Management Solutions.
Physics in Finance Group
*76 Portland Place, London W1*
12 October
www.iop.org/Our_Activities/Groups_and_Divisions

**Nuclear–Renewable Debate**
Joint meeting with Manchester Branch.
Merseyside Branch
*Daresbury Laboratory, Cheshire*
17 October
http://merseyside.iop.org

**Developments in Microscopial Imaging: Applications in Forensics**
Meeting on advances in instrumentation.
Materials and Characterisation Group
*Cranfield University, Oxfordshire*
17 October
www.dcmt.cranfield.ac.uk/dmms/imagemeet
**Registration required**

**The Perfect Lens**
Talk by Prof. John Pendry of Imperial College London.
IOP in Wales
*Large Chemistry Lecture Theatre, Cardiff University*
18 October
http://wales.iop.org

**Conflict in the Cosmos: the Turbulent Scientific Life of Fred Hoyle**
Talk by biographer Simon Mitton.
London and South East Branch
*76 Portland Place, London W1*
18 October
B.J.Harker@open.ac.uk
**Please e-mail if you plan to attend.**

**ONE-DAY MEETING**

**Biotribology**
Meeting to give a snapshot of the current state of the art in biotribology.
Tribology Group
*76 Portland Place, London W1*
18 October
**www.iop.org/Conferences**
**Registration required**

**Why Invent?**
Talk by Trevor Baylis, inventor of the clockwork radio.
Physics and Law Group
*76 Portland Place, London W1*
19 October
http://groups.iop.org/PL/pages/seminar.html
**Booking required**

**The Huygens Encounter with Titan**
Talk by Andrew Ball of the Open University.
South Central Branch
*Lecture Theatre 1-01, St Michael's Building, University of Portsmouth*
19 October
http://scentral.iop.org/guildford.html

**War and Peace**
One-day conference on the life and work of Sir Joseph Rotblat.
Merseyside Branch
*Liverpool Medical Institution, Liverpool*
20 October
ara@liv.ac.uk

**Postgraduate Workshop on Imaging in Magnetics**
Workshop in background and generic knowledge.
Magnetism Group
*76 Portland Place, London W1*
23 October
www.iop.org/Conferences
**Registration required**

**Alchemy in the 21st Century: the Quest for Superheavy Elements**
Talk by Rolf-Dietmar Herzberg of the University of Liverpool.
South Central Branch
*Lecture Theatre M, University of Surrey*
25 October
http://scentral.iop.org/guildford.html

## NOVEMBER 2006

**The Magic of Bubbles**
Talk by Cyril Isenberg of the University of Kent, followed by branch dinner.
London and South East Branch
*76 Portland Place, London W1*
1 November
B.J.Harker@open.ac.uk
**Please e-mail if you plan to attend.**

**ONE-DAY MEETING**

**The Future of Fossil Fuels**
A meeting to explore the role of fossil fuels in the energy mix for the next century.
Energy Management Group
*76 Portland Place, London W1*
26 October
**www.iop.org/Conferences**
**Registration required**

**History of High-Speed Photography**
Lecture by Bill Proud of the Cavendish Laboratory, Cambridge.
Merseyside Branch
*Surface Science Research Centre, University of Liverpool*
7 November
http://merseyside.iop.org

**Careers Fair**
For science, technology and engineering students and recent graduates.
Professional Standards Department
*76 Portland Place, London W1*
8 November
http://careers.iop.org/careers_fair

**Climate Change: How Do We Tell it is Really Happening?**
Talk by Ellie Highwood of the University of Reading.
South Central Branch
*Lecture Theatre 1-01, St Michael's Building, University of Portsmouth*
8 November
http://scentral.iop.org/portsmouth.html

# notices

## NEW BUSINESS AFFILIATES

SPIE Europe, Oxford Instruments, Isis Innovations.

## NEW MEMBERS

Erika Andersson, Nigel Bowen, Jolyon Carroll, Jeremy Carter, Anthony Chefles, Catherine Dandy, Robert Fear, Andrew Glover, Philip Gribbon, Alison Hodrien, Duncan Housden, Hedieh Jazaeri, Mark Jones, Sian Jones, Jennifer Kisalu, Sophia Kobylec, Juan Valiente Kroon, Sergio Leon-Saval, Stuart Lunt, Alan Marson, Gary Mathlin, Stuart McAlpin, Gianluca Memoli, Alan Miles, Simon Ogier, Iain Paton, Yurgos Politis, John Quinn, Stewart Reed, Nathan Routley, David Short, Dominic Steele, Nedunchezhian Swaminathan, Naoshi Takahashi, John Tighe, Ian Watson, Sieghard Weinketz, Steven Worland.

## NEW FELLOWS

Roland Appel, Swapan Chattopadhyay, Bahram Javidi, Mohammad Karim, Noor Mohammad, Anthony Paxton, Paul Spencer, Richard Strange, David Thomas, Marek Trippenbach, Anatoly Zayats.

## IN MEMORIAM

Stephen Cox (Culham), Raymond Cyster, David Gill (Marlow), William Greening, Alan Jenner, Alan Pengelly, Gerhard Soff, John Strong, George Wrigley.

## WANTED

● **Male and female scientists, engineers, medics and technologists** to take part in a survey on the differences between men's and women's career progression experiences and ambitions. The Athena Project's ASSET 2006 survey (supported by the Institute) aims to understand and address the barriers to women in scientific careers. Participants from all career stages and sectors, or on a career break, are welcome. The survey takes about 25 minutes and is open till 20 October at www.surveysathenaproject.org.uk/asset2006.

● **Postgraduate students to apply for a three-month work placement** funded by the Institute and the Parliamentary Office of Science & Technology (POST). The selected POST fellow will produce a POSTnote – a short paper briefing MPs and peers on the background to a science or technology issue – or contribute to a longer report or help a select committee in an enquiry. Applicants must be UK- or Ireland-based, and second or third year postgraduate physicists. For details, e-mail tajinder.panesor@iop.org. Closing date: 27 October.

# How physics became "groovy" this summer

## Physics and folk festivals might seem unlikely bedfellows but they can prove a winning combination, says *Helen MacBain*.

The Green Man Festival in Brecon, Wales, is billed as having a "traditional folksy and family feel", so it's not the sort of place where you'd imagine physics would fit in. But when four members of the Institute's staff (myself included) pitched up to run the science tent at the three-day festival in August, we found a warm welcome from festival-goers, young and old.

We spent most of our time presenting physics tricks to passers-by in a walled garden area of the site, competing for attention with the literature tent, the bongo band tent, puppet shows and craft tents showing kids how to make lanterns and the like. We decided to get in on the craft act ourselves and put up a table outside the tent with glitter, glue and crayons for kids to make postcards about the science demonstrations they enjoyed (the adults seemed to get into this as much as the children). By the end we had more than 150 cards pinned to our board. My favourite was addressed to "Dad" and simply said: "I'm in the science tent and I'm having a better time than you."

All of our physics tricks followed what you might call a "festival theme". We decided to do these outside, and not just because of the lovely hot weather – our Alka Seltzer rockets kept hitting the roof of the tent. It's a little known fact that the popular hangover cure makes an excellent rocket when teamed with an empty film canister and a drop or two of water. By the end of the weekend we'd got through more than 20 boxes of the stuff, most of it for making rockets (with just a couple being used in the more traditional way by one of our team on the Sunday morning). The rockets were a daily favourite and some kids would return each morning to make more and proudly explain to their friends how they worked.

Festivals are notorious for the vast quantities of mud they can generate. At the science tent we treated our visitors to an alternative, but equally messy, version – white "slime" made from cornflour mixed with water. So long as you keep it moving the slime stays solid, but as soon as you stop mixing it round it liquefies. It was great fun to play catch with but the Institute's conference tablecloths will never be the same again.

Of course, no festival would be complete without a dodgy kebab or, in our case, a balloon kebab. The trick here was to skewer a balloon with a wooden stick without bursting it. Amazement turned to fascination when we explained how to achieve the trick, by putting the skewer in at either end of the balloon, where the tension is lowest. Admittedly, there were some unhappy faces when the balloons slowly began to wilt as the air escaped.

When we performed our "levitating lemon" trick we got a bit of heckling from some children in the back row. As a piece of lemon floating on water in an ash tray was sucked up into a pint glass using a few matches, one of them called out: "You're all witches! That's magic." Not magic, just physics, we explained. We were delighted to perform it again an hour later when they brought their friends over to see what was going on.

We weren't the only ones showing off the wonders of physics. Also there was Mark Lewney, the 2005 winner of FameLab, a competition to find the nation's most promising young science communicators. Lewney kicked off on Friday afternoon with his very loud and demonstrative talk on rock guitar. Playing guitar chords, blowing up lots of balloons and brandishing several whips, he explained the physics of sound and vibrations to a rapt audience. Luckily for Mark, a lot of the festival-goers had long hair, which was ideal for showing off his "air bazooka" – a sort of catapult crossed with a drum for firing blasts of air to demonstrate how air particles carry sound by bumping into each other. This all went down very well, and after the talk I even saw a couple of kids running after him for his autograph. Another person leaving the tent commented: "I don't think I've ever heard White Snake and Vivaldi performed on the same stage in the same half hour." It was a truly unique performance.

Pete Edwards, the Institute's 2006 Schools Lecturer, gave his Gravity, Gas and Stardust talk, with which he's been touring the country. Although it's aimed at 14- to 16-year-olds, it managed to attract large audiences of adults and children. We were all astounded by, but very pleased with, the rapturous applause and whooping at the end. His 3D films proved almost as popular as the French cinema they showed in the tent each evening.

Helen MacBain

**A lot of the festival-goers had long hair – ideal for showing off the "air bazooka".**

Another group, Science Made Simple, turned up with a large supply of toilet paper – and not just because they were about to spend three days at a music festival. They used the rolls as props in their science-inspired show *Visualise*, which they created in 2005 for Einstein Year. The show has no words – just music, movement, some very inventive uses for power tools and lots of smoke and fire, which went down very well with the audience. They performed various scenes from *Visualise* several times a day for 15 minutes in between Mark and Pete's lectures. It's the first time I've heard science described as "groovy", but this weekend was full of surprises and showed just how entertaining physics can be.

**Helen MacBain** is the Institute's press officer. To try out the tricks yourself, visit www.einsteinyear.org/get_involved/physicstogo.

# particles