The newspaper of the physics community

interactions

November 2004

Institute *of* **Physics**

Climate forecast: better soon

Next year may be a turning point for action on climate change, reports *Ayala Ochert*.

There was great optimism when the Kyoto Protocol was signed in 1997 because it was the first international agreement that set out specific measures to reduce the greenhouse gases that cause climate change. But since then it has remained in limbo, waiting for key countries to ratify it. With Russia expected to put pen to paper any day now, which would break the impasse and bring the treaty into force, optimism for progress on climate change has now returned.

But the smiles cannot hide the fact that the biggest emitter of greenhouse gases – the US, which produces 25% of global CO_2 emissions – has no plans to take part in Kyoto. No-one can deny that the US must ultimately be involved in any international agreement on climate change and, in September, Prime Minister Tony Blair said that he plans to make that happen. He announced that he will use the UK's presidency of the G8 next year to "secure an agreement as to the basic science of climate change", which would then lead to an agreement on a "process to speed up the science, technology and other measures necessary to meet the threat".

If such an agreement can be made, in the future the name "Gleneagles" – the venue for the G8 summit in 2005 – may rival "Kyoto" in the international climate change shorthand. Collectively the G8 nations are responsible for around 50% of global greenhouse emissions, which isn't far off the 62% produced by those countries ratifying the Kyoto Protocol.

While Kyoto is generally recognised as an important first step, its significance is more political than it is practical. The emissions reductions that it requires – an average of 5.4% below 1990 levels by 2008–2012 – are extremely modest, and it is what happens next, following Kyoto, that matters most for the environment. In his speech, Blair declared: "We have to recognise that the commitments reflected in the Kyoto Protocol and current EU policy are insufficient and [we must] start urgently building a consensus based on the latest and best possible science."

In focusing attention on the basic science of climate change, Blair also announced that in February of next year, just before the G8 summit, the UK will be hosting an international scientific meeting at the Hadley Centre for Climate Prediction and Research in Exeter. This will address the "big questions", says Blair, and will "help inform discussion at the G8".

NOAA

Hurricane Ivan: the world's fastest supercomputer is calculating whether we'll see more like this in the future.

"Perceived uncertainty around climate-change modelling has been a stumbling block to progress, particularly in the US."

Some may be surprised by this focus on basic science because there is already a global scientific consensus that global warming is real, that its effects will be devastating and that it is caused by human activity. But perceived "uncertainty" around the science of climate modelling has been a stumbling block to progress, particularly in the US.

In a briefing paper commissioned by the Institute that will be published next month, former director of the Hadley Centre, Alan Thorpe, writes: "There is little doubt that lack of understanding of uncertainty is one of the greatest reasons for ill-informed comment on climate change." He summarises the state of knowledge on climate change and clarifies what climate scientists mean by "uncertainty".

Climate models are run on the world's fastest supercomputers and include mathematical descriptions of all known physical processes relating to the atmosphere and oceans. They process a vast array of climate data in an attempt to make detailed predictions of future climate. But there are parts of the globe where physical observations are not as detailed as they could be and parameters in the climate models each have a certain margin of error. There are also uncertainties that are not questions of physics, such as how much CO_2 will be produced over the next 100 years. These input uncertainties are dealt with by climate scientists through ensemble modelling, says Thorpe. They run separate climate models for a variety – an ensemble – of different initial conditions and for a range of parameters. "We explore the uncertainty space," he explained.

"Sometimes the ensembles line up in a narrow range, so we can be very confident in our predictions. Other times, when the atmosphere is less inherently predictable, the ensemble is wider," he said. These are the forecast uncertainties – how confident scientists are that their predictions will turn out to be correct. "When we talk about uncertainty, we're not saying we just don't know. Estimating error bars is a fundamental part of the scientific process, but it's getting that across to the public and to policymakers that's the issue."

When climate scientists talk of their hope of reducing uncertainty, the point that some things are not seriously in doubt can get lost. Climate models have been run backwards into the past and they closely match past climate. Moreover, says Thorpe, whichever way they run the models, the only way to simulate the rapid temperature rise of the last 25 years is by including the CO_2 that we have put into the atmosphere since the Industrial Revolution.

If Thorpe and fellow climate scientists can get that message across in Exeter next February, and if the G8 nations accept it, then 2005 could be remembered as the year that the US joined the rest of the world in taking action on climate change.

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HIGHLIGHTS

Physics teachers in the spotlight

In October a public row broke out over former physics professor David Wolfe, who had been told that he could only continue teaching physics at the Royal Grammar School in High Wycombe if he took a maths GCSE exam. Wolfe, a nuclear and particle physicist with a PhD from the University of Pennsylvania who was once head of physics at the University of New Mexico, had retired and moved to England. He was voted "most inspirational teacher" by students at the school, where almost one-third of sixth-formers are studying physics A-level. The case hit national headlines when the school's headmaster, Tim Dingle, decided to speak out over the case, saying that the Teacher Training Agency (TTA) told him that Prof. Wolfe would have to take the exam to achieve Qualified Teacher Status (QTS). The TTA later pointed out that it had a fast-track "assessment-only route" to QTS under which teachers could become qualified in as little as one day.

There is a huge shortage of physics teachers in the UK and the TTA is currently running a campaign to recruit more (see advert, above). It is offering inducements such as a £7000 training bursary and a £5000 "golden hello" for new physics teachers. Meanwhile, the Institute is also looking for inspirational teachers like Wolfe for its annual Teachers' Awards. "There are lots of exceptional physics teachers in the UK. The Institute's Teachers' Awards are a way of recognising their hard work and dedication, and showing potential teachers how rewarding the career can be," said education manager Daniel Sandford Smith. (See p8 for nominations details.)

Pi in the sky

The *New Journal of Physics* (www.njp.org) has just published the most compact and elegant explanation of one of nature's simplest phenomena – the way light behaves in the sky above us. Sir Michael Berry and Mark Dennis, both from the University of Bristol, in collaboration with Raymond Lee of the US Naval Academy, set out to predict the patterns of polarisation of skylight – first explained by Lord Rayleigh in 1871 – by focusing on the points in the sky where the pattern breaks down (singularities or zero points). "We wondered: what if you start with the singularities and write the simplest description of polarisation that puts the singularities in the right places?" said Berry. "We found that this gives a remarkably good fit to the observational data, and predicts the pattern across the whole sky." This "mathematics in the sky" uses elliptic integrals to replace pages of formulae with one simple solution that predicts the pattern very faithfully.

Fun and games rewarded

The Institute's *physics.org* website has won an award in the physics category of *Scientific American*'s 2004 Science and Technology Web Awards. The magazine's editors praised the site for its "smorgasbord of great links", adding that "user participation is a hallmark of *physics.org*". "Most fun is the animated 'Physics Life' section, which is almost like a video game in which users point and click around town, zooming in on points where they can find hidden facts about physics at work," they wrote.

physics.org is designed to help students, teachers and anyone else with an interest in physics to find good-quality information about the subject on the Web through its natural-language search facility and database of refereed sites. Editor-in-chief Nicola Hannam said that she was thrilled that the website had been recognised: "The citation shows that the editors really took time to explore the site and liked what they found."

Media overlook physics Nobels

By Michelle Cain

The Nobel Prize for Physics was announced on 5 October, although you'd be forgiven for not hearing about it. The prestigious award of 10 million Swedish Kroner (£765,000) was made to David J Gross, H David Politzer and Frank Wilczek for their "discovery of asymptotic freedom in the theory of the strong interaction". This work, carried out in 1973, laid the foundations of quantum chromodynamics by explaining why quarks behave as free particles at very high energies. Their work also made it possible to complete the Standard Model of particle physics.

Yet in contrast with last year's high-profile media coverage of the award, which was given to Alexei Abrikosov, Vitaly Ginzburg and Anthony Leggett for "pioneering contributions to the theory of superconductors and superfluids", this time it was barely reported in the UK press. Short news items were run in the *Financial Times*, the *Guardian*, and the *Telegraph*. The chemistry prize, announced the next day, also received little coverage. The prize for medicine – for research into the sense of smell – was widely reported.

The fact that one of the 2003 winners of the physics prize was British no doubt led to last year's media bonanza. None of this year's Nobel laureates is British. The apparently baffling term, "asymptotic freedom", may also have influenced journalists' decision to give more prominence to the prize for medicine.

"It's understandable," said Roger Barlow, chair of the Institute's High Energy Particle Physics Group. "It is up to the press to report what they think will interest readers. It would be nice to see the Nobel Prize for Physics on page one of the *Sun*, but unlikely."

The other fundamental forces in nature – gravity, the electromagnetic force and the weak force – all decrease in strength as the distance between objects involved increases. But Gross, Politzer and Wilczek showed that the strong force, which hold quarks together as hadrons like protons or neutrons, is different. The attraction between quarks actually increases with increasing distance between them. Despite the name "asymptotic freedom", the theory is simple and elegant, and it also explained why quarks are always found in twos and threes but never singly. The theory also predicted that when quarks are very close together (within a proton, say) they behave like free particles because their attraction is very weak. (See p5 of *Physics World* for full details of the prize-winning work.)

PHYSICS BUSKING

Robin Chanda

It's official: physics doesn't suck! Thirsty Institute staff members came up against the laws of physics as they competed to see who's got the most sucking power. Amusing tricks like this one have been collected together in the Institute's new "Physics to go" pack. This contains everything that you need to become a "physics busker" and take to the streets during Einstein Year, demonstrating the magic of physics. The packs will be available to download at www.einsteinyear.org from December 2004.

'Physics remains under threat' says new president

The Institute welcomed the nearly 100 new fellows who have been elected during the past year at a formal dinner held in their honour on 21 October. The event was a chance for fellows to meet Institute staff, the new president and each other.

The fellows were addressed by the new president, Sir John Enderby, who praised the work of his predecessor at the Institute, Sir David Wallace, and the recently departed chief executive, Julia King. "The Institute is in excellent shape," he told the fellows. "Physics in the UK, however, remains under threat."

Despite the importance of physics and other basic sciences to wealth creation and the quality of life, says Enderby, the number of students taking physics A-level continues to fall. "I have no doubt that there is considerable talent out there with which we have not yet engaged," he said, praising the Institute's proposed Undergraduate Bursary Scheme as a "groundbreaking idea".

Enderby also spoke of his commitment to finding out why fewer girls than boys take physics, and highlighted an Institute project that will assemble data on best practice in this area. He also says that he plans to use his role as president to press government finally to put in place the recommendations of former president Sir Gareth Roberts as outlined in his 2002 report on science education.

CERN reaches its half-century

Institute members recall some highs and lows of the last 50 years at CERN.

Particle physicists from across the country gathered at the Institute on 29 September to meet old friends, to share memories and to celebrate the first 50 years of CERN, Europe's premier particle physics laboratory. The meeting, which was organised by the High Energy Particle Physics Group, included an afternoon of reminiscences followed by a live Web link-up with CERN, in which former director Chris Llewellyn Smith addressed the crowds that had gathered for the birthday celebrations in Geneva.

Llewellyn Smith told the audience that CERN's aim from the beginning was not just to advance science but also to build bridges between nations – those who had just been at war and then later across the Iron Curtain. The laboratory now has 20 member states and hosts scientists from 80 different countries. Llewellyn Smith referred to CERN as a "model of international scientific collaboration" that now brings together scientists from Israel and Morocco, India and Pakistan.

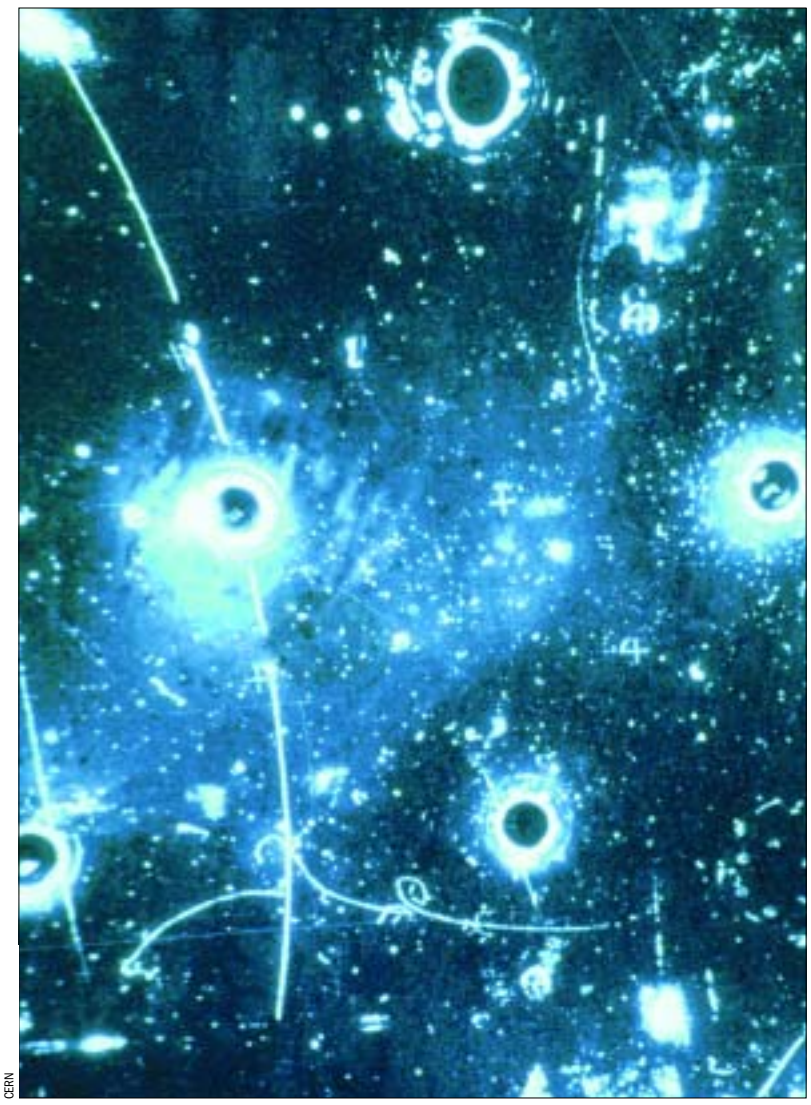
While the pre-eminence of CERN is not now in doubt – there are more Americans who come to CERN than Europeans who go to the US – this was not so in the first half of the laboratory's existence, said Nigel Calder, former editor of *New Scientist*. Well into the 1970s, institutions like Brookhaven and Berkeley in the US were far more successful, said Calder: "I hate to be a party pooper, but the sad fact is that Europe always seemed to be the runner-up."

Until 1977, CERN had just one major discovery to its name – the detection of neutral currents – compared with nine major discoveries during that time in the US. The neutral current, discovered in CERN's huge Gargamelle bubble chamber (right) was the first evidence of the unified electroweak force that had been predicted by theory.

"To get CERN out of its rut required the technical ingenuity and operatic zeal of a few individuals," said Calder. One such individual was Carlo Rubbia who, using the newly built Super Proton Synchrotron as a particle collider, detected both the W and Z particles and earned CERN its first Nobel Prize back in 1984.

The *New York Times* headline ran: "Europe – W, USA – not even Z_0". The tide had turned for CERN, and the next milestone in its history was the building of the Large Electron Positron collider (LEP), which was completed in 1989. The construction of this 27 km underground tunnel was the largest civil engineering undertaking in Europe at the time, said Peter Dornan of Imperial College, London, who was involved in its creation. He recalled the excitement and enjoyment of working on LEP, despite the fact that it didn't detect the top quark or the Higgs boson. Dornan descibed the formidable technical challenges faced by an experiment of this size – it was affected by the motion of the Moon, underground water levels in nearby Lake Geneva and the high-speed TGV trains that passed nearby.

Many of the questions left unanswered by LEP – the origin of mass, the nature of gravitation and the nature of the symmetry-breaking mechanism of the Standard Model – are expected to be answered by the Large Hadron Collider (LHC), said Andy Parker of Cambridge University. He called it the "project of a lifetime" because he began work on the LHC as a postdoc in 1985 and expects to be analysing its results well into his retirement.



CERN

Observation of neutral currents: a major breakthrough for CERN in 1973.

IN BRIEF

● **On 4 November Henry (Harry) Taylor will celebrate his 100th birthday**, joining seven other centenarians at the Institute. Born in Somerset, the son of a local Baptist minister, he left school at 14, but his potential was spotted at Vickers, where he spent three years as an apprentice. The company offered him a scholarship to study for a degree at Battersea Polytechnic. He gained a first-class BSc and then an MSc, and carried on working for Vickers in their research department in Manchester.

In 1930 Taylor moved to London to carry out research in electrical safety at the Electrical Research Association (ERA), work that was honoured in 1940 by London University with the award of a DSc in engineering. During the Second

World War he was sent to work for Phillips Lamps then later on was moved to Eindhoven in Holland – one of the first English civilians to enter the country since the Nazis took over. In 1947 he was appointed director of the British Welding Research Association (BRWA), where he stayed for 10 years before returning to the ERA as director, finally retiring in 1969. The BRWA recently opened the Harry Taylor Building in his honour.

Taylor became a fellow of the Institute in 1937. Last year the Institute's benevolent fund assisted him in the purchase of a chair-lift for his home in Chepstow, where he lives with his wife Gwendolyn, who is 96 years old.

● The Institute's 2005 **Best Practice in Professional Development Award** has been given to DSTL. The Professional Standards Committee commended DSTL on its Scheme for Technical Education and Professional Support (STEPS) and for its fellowship scheme and symposia.

Silver brooches celebrate physics

This beautiful brooch has been designed for the Institute by Mary Dean, one of the UK's foremost silversmiths. In creating her design, she took elements from the Institute's coat of arms, such as Rutherford's iconic atom, and arranged them organically into an elegant piece of jewellery. Dean made the brooches using the lost-wax method, casting them in sterling silver, and she has just completed a first run of 30.

http://shop.iop.org

Lab in a Lorry gears up for 2005

The Institute has just purchased three custom-built 14 m articulated trailers for Lab in a Lorry, an innovative new venture that is being developed in partnership with the Schlumberger Foundation. These mobile physics laboratories will hit the road in April 2005, initially as part of Einstein Year. The lorries will tour the UK and Ireland, visiting schools, youth centres and festivals, and the other venues where it can reach its primary audience of 11–14 year olds.

"Members told us that they want to get involved in demystifying and popularising physics and physicists in their local communities, and Lab in a Lorry does just that," commented John Brindley, the Institute's director of membership.

The lorries allow visitors to conduct real hands-on experiments, supported by volunteer guides who are practising scientists and engineers. "The goal is to give visitors and volunteers the opportunity to experience experimental physics the way it actually happens – it's exploratory, accidental and informed by curiosity and intuition," said programme manager Sarah Iredale.

The experiments include finding the resonant frequency of a wine glass, discovering patterns of stress and strain using polarised light, and using Hele–Shaw cells to simulate oil exploration and recovery. In addition to the experiments, the lorries also showcase novel materials to give visitors an idea of how physicists and engineers contribute to modern life.

The programme was the brainchild of Charles Jenkins, past chair of the Institute's East Anglia Branch, who with a group of branch volunteers conducted a pilot of Lab in a Lorry in the highlands of Scotland, west Wales and East Anglia. "Lab in a Lorry is not a show or a demonstration; rather, it offers freedom for curiosity. Key to this is the scientists who volunteer in the lab. Their breadth of knowledge underpins our whole approach," said Jenkins.

Scientists who volunteer for Lab in a Lorry are not expected to teach, but rather to direct the learning experience, providing guidance whenever experiments move in unexpected directions. "This is a great opportunity for members of the Institute to take some time out and have some fun with science," said Iredale, who intends to recruit an initial pool of volunteers before the end of the year. All volunteers will receive comprehensive training on how the lorry operates as well as in the experiments.

www.labinalorry.org.uk or **labinalorry@iop.org**

NEWSMAKERS

The Institute of Physics presented a special award for the "best project with substantial physics content" to **Martin Kršňák** of Slovakia at the EU Contest for Young Scientists held in Dublin in September. His project was titled "Mach's principle: varying speed of light theory as a new cosmological model".

On 28 September, 15 new chairs were named for the next Research Assessment Exercise (RAE 2008). They include **Dame Julia Higgins** (Imperial College, London), **Nigel Hitchin** (University of Oxford) and **Ann Dowling** (University of Cambridge).

Pete Vukusic of the University of Exeter has won a prize from L'Oreal worth £20,000 for his unique comparison of art and nature. He found that techniques used by some of the world's greatest artists mirror the way in which butterfly wings harness light.

CPhys reaches new standards


Andrew Wallard

"CPhys helps members to stand out from the crowd."

When the Institute launched the Chartered Physicist qualification (CPhys) in 1985, it filled an important gap, acknowledging and accrediting professional physicists for their expertise, their ability to carry out work safely and to a high standard, and their capacity both to work independently and to exercise leadership.

CPhys still stands for all of those things, but in the last 20 years the physics profession has moved on and CPhys must move with it. Physicists can now be found in a much broader range of sectors, they are more ethically and environmentally aware, and they now face stricter regulations in the workplace.

In devising a new CPhys standard we saw an excellent opportunity to ensure that the Professional Standards Committee includes stakeholders from across the physics community – representatives from universities, research councils, sector skills councils and employers, as well as Institute members.

On 1 November the set of standards agreed by that committee come into force. I believe that the new CPhys reflects current practice in the physics community and meets the needs of Institute members as well as employers. It is set out in a series of competences that cover every aspect of professional practice:

- general and specialist knowledge in relation to the use of physics knowledge;
- applying physics to the analysis and solution of problems;
- technical and managerial skills;
- communication and interpersonal skills;
- professional conduct.

Applicants for CPhys will have to demonstrate that they have acquired these competences and that they continue to use and develop them. Reflecting the needs of the physics community, the competences are now more inclusive. So, for example, an applicant from the research sector may wish to demonstrate specialist knowledge by presenting published research papers, while someone from the education sector may prefer to give evidence of their experience of teaching post-16 physics.

Why get chartered?

The letters CPhys after your name demonstrate your commitment to continuing professional development – that you plan to keep pace with advancing knowledge and increasing professional expectations. Those letters also demonstrate professional integrity – that you agree to abide by the Institute's Code of Conduct and its disciplinary procedures.

Motivations for getting chartered vary from physicist to physicist, but the message I often hear is that CPhys helps members to stand out from the crowd. In this increasingly competitive job market, it is a clear benchmark that helps employers to choose between candidates.

Employers know that CPhys can be valuable when bidding for contracts with external companies. Chartered status is also well respected overseas, and being able to say that staff are professionally qualified can be a great boon.

That's part of the reason why many companies now support existing employees in becoming chartered. The winner of the 2005 Best Practice in Professional Development award, DSTL, clearly understands the benefits. Their chief executive, Martin Earwicker, has been promoting chartered status and personal development among his staff for many years.

Coming to you soon

While the committee was revising the CPhys standard, it also made sense for us to review the many routes to Chartered Physicist. As physicists, we appreciate the beauty in simplicity, so from now on there will be just two routes – the standard route and the non-standard route. All candidates with an accredited degree in physics will progress through the standard route. Those with an unaccredited degree, no degree or some other combination of qualifications will progress through the non-standard route.

We also hope that the non-standard route will be more fair. One of the long-standing criticisms of the old "mature candidate route" for members with no degree was that it was too academically focused, requiring applicants to submit a paper on an undergraduate physics topic. The non-standard route instead concentrates on technical knowledge already gained and asks for four years of extra work experience in lieu of a degree.

We've made CPhys more relevant and we've made it simpler to apply so, if you haven't already, now's the time to get chartered.

Andrew Wallard is the Institute's vice-president for membership and qualifications. Institute staff are visiting 13 industrial and academic organisations during 2004. If you would like them to visit your organisation or to receive more information about chartered status, e-mail Alex Byrne at career.development@iop.org or visit http://careers.iop.org/chartered.

focal point: council

Institute appoints first-ever Science Board

On 21 October, Council met at 76 Portland Place for its first meeting under new president John Enderby and discussed the following:

- Last year Council approved the Strategic Plan 2004–2008, which set out five broad objectives for the Institute (*Physics World* October 2003 p51). Honorary treasurer Tony Scott explained that it was now time to "put flesh on the bones" and broadly plan how the Institute will spend its money in achieving those objectives over the next five years. The plans included a greater emphasis on reinforcing the Institute's presence and influence in Ireland, Scotland and the regions of England and Wales. They also proposed stronger support for schools in modernising practical work. While the Undergraduate Bursary Scheme is predicted to cost some £1 million a year, the five-year plan indicated that the Institute could achieve its objectives while also maintaining an operating surplus each year. Council broadly approved the plan but will need to approve detailed annual budgets in each of the next five years.
- It is a strange anomaly that the Institute has never had a Science Board, with responsibility for generating its science policy, said Peter Main, director of science and education. Up until now, such policies have been formulated on an ad hoc basis by Institute staff. Council agreed that this situation was undesirable and approved the creation of a Science Board, to be chaired by Carole Jordan, vice-president for science. Council expressed the wish that, wherever possible, the new board should engage in a broad dialogue with members on matters of science policy.
- Ian Marshall, groups representative, gave a presentation to Council on the groups and divisions. Groups range in size from a little over the minimum of 50 members to more than 1000, and they range from the technical to the professional, said Marshall. Collectively, the groups have 17,407 members (though some people are members of more than one group) but, surprisingly, most of these do not attend meetings. Marshall concluded that members join groups to "register their interest". Council agreed, therefore, that it should look into how the Institute can best reflect those interests.
- Tony Scott reported on the work of the Benevolent Fund and told Council how the fund provides extra support for recipients through additional gifts during the Christmas period. He also reported that the fund committee is working with the Daphne Jackson Trust to promote its work to members on career breaks who may be suffering financial hardship. Council also agreed that branch chairs should publicise the work of the fund at their branch meetings.

Other business included:

- appointment of new pension fund trustees, a new trustee to CR Barber Trust and non-executive directors to Institute of Physics Publishing
- new appointments to Boards and Committees (see http://about.iop.org/IOP/council.html)
- approved minutes of 2004 AGM and SGM
- approved plan to review and simplify charter and bylaws.

Minutes of Council meetings are available at http://members.iop.org/governance.html.

profile: Herbert Lang

A life well worth emulating

The centenary of the birth of the Institute's longest-standing secretary.

Herbert Lang relaxing in the chair presented to him after 25 years at the Institute (left) and as a boy (far right).

There is no room at the Institute named after him, no portrait or bust in the members' room and no prize or medal that bears his name. You could be forgiven for never having heard of Herbert Lang, but for nearly 35 years he was the Institute of Physics. From 1931 until his death in 1965, he served tirelessly as its secretary, turning it from a handful of small societies into the large professional and learned body that it is today.

It is not a thoughtless oversight that no formal memorial exists. Lang insisted during his lifetime that it should be no other way. He was a modest man who was happy to dedicate his life to the Institute, but he neither expected nor sought recognition. Even now, almost 40 years after his death, he is still spoken of with genuine affection and great respect by those who knew him.

Herbert Raphael Lang was born on 28 February 1904 in London, the son of an electrical salesman. He developed an early interest in physics and, it seems, in the Institute of Physics – he attended a lecture by J J Thomson at its inaugural meeting in 1921. He went on to study physics at Imperial College, London, where he stayed for his PhD. While at Imperial he became the very first student admitted to the Institute, as he would proudly recall later on. After his PhD he took up a research fellowship at the Institute of Petroleum Technologists, investigating the thermal properties of oils. Then, in 1931, he was asked by Lord Rutherford – then president of the Institute – to fill the position of secretary temporarily. He agreed, and the following year he was chosen from more than 100 candidates for the permanent position.

Lang was an observant Jew, and as a young man he hoped that he might one day teach at the Hebrew University in Jerusalem. However, his wife, Ruth – also a physicist – preferred to stay in London, so he threw himself into the job of secretary. "He was dedicated to the Institute all his life and believed in it 200 percent," said his son Charles. Lang is also remembered as a family man, whose devotion to the Institute was second only to his devotion to his wife and family.

During the Second World War, when the Institute moved temporarily to Reading, Lang had to make what he later called the "hardest decision of his life" – whether to send his wife and sons to Canada. In the end, the Langs chose to stay in Reading. When he had become secretary in the early 1930s, the physics profession barely existed, but by the time the war began the Institute's work was already considered vital by the government, and he was instructed to continue it rather than enter the armed forces. Nor did it go unnoticed by the enemy – it was later revealed that Lang was on the Gestapo's list of those who would be interned if the Nazis invaded Britain.

Friend to the physics community

For the nearly 35 years that Lang was secretary, the Institute was his life. Apart from gardening, he didn't really have hobbies, his son recalls. Very often he would bring work home, especially his journals – he was editor of the *Journal of Scientific Instruments* and the *British Journal of Applied Physics*, which he founded – and, while the family often had dinner parties at their home, the guests were usually members of staff from the Institute or visiting physicists.

Lang's warmth and hospitality led to friendships throughout the physics community, both in the UK and abroad. Shortly before his death he was elected an honorary fellow of the Australian Institute of Physics in recognition of his assistance in setting up that body.

Lang's secretary during the 1950s, Betty Preston, also recalls how he made staff at the Institute feel part of a family. Though he was strict and tolerated no nonsense, Preston remembers him as "a very just man" who never lost his temper. Despite his seriousness, Lang also had a great sense of humour. With his glasses and moustache, many were reminded of Groucho Marx, but Lang never played the clown. He had a dry, penetrating wit and was a master of the one-liner.

In his "commonplace books" – scrapbooks in which he collected newspaper cuttings and quotes that range from the inspiring to the humorous – one finds some insight into the man. He clearly valued the pithy remark and perceptive comment, like this one from Sir Henry Tizard in1944: "Scientists are frightened of large expenditures, as a rule; they are so unused to it."

Lang's biggest achievement as secretary was the amalgamation of the Institute of Physics with the Physical Society of London in 1960. The Institute had been set up by the council of the Physical Society and, in his role as secretary, Lang was also senior executive officer of the Physical Society. However, despite these close associations, the amalgamation took many years to achieve because of distrust between the "scholars" of the Physical Society and the "professionals" of the Institute. His son Charles recalls his father setting up a card table in his bedroom and working through the evening during the amalgamation.

"He had a dry, penetrating wit and was a master of the one-liner."

When Lang's wife became ill with jaundice in 1957, the stress got the better of him and he went through a period of depression and took a leave of absence for several months. When he returned home after his first day back and his family asked how it had gone, he replied: "They got on disappointingly well." He clearly had not lost his sense of humour.

Colleagues at the Institute remember Lang as being full of energy. Clive Jones, a former member of staff, recalls how Lang would bound up the stairs at Belgrave Square, two at a time. When, on 18 November 1965, he died suddenly of a heart attack at the age of 61, it was a huge shock to everyone – his family, Institute staff and the many friends whom he had made in the world of physics. His obituaries speak touchingly of a man of great humility, humanity, hospitality and wit, who was completely dedicated to the Institute. His tombstone says simply: "A life to emulate".

At the time of his death, the Institute had grown to 11,000 members. According to Sir Sam Edwards, Lang also came up with the idea of a single, large publishing house, which was realised after his death. "This transformed the Institute's finances, and the much bigger and financially successful Institute of today is a memorial to Dr Lang's work in the 50s and 60s," said Edwards. Herbert Lang's obituary in *Nature* summed up his contribution this way: "He could have made an outstanding career in research or in industry but, fortunately for the physics profession, he was persuaded to become secretary of the Institute. It is difficult to imagine anyone better suited to such a post."

FAREWELL

Tony Scott bids farewell to Julia King.

Over the past 84 years just seven people have held the post of executive secretary or chief executive of the Institute. Herbert Lang was the longest-serving post-holder, but all seven in their own way left their mark on the Institute. Although she was only in the post for two short years, Julia King, who left the Institute at the end of September, certainly made a significant impact.

When she arrived, one of the tasks facing her was to complete the refurbishment of 80 Portland Place. The project was behind schedule, but Julia helped to move it along. The building opened last year, providing superb meeting and conference facilities, as well as valuable additional income for the Institute.

Julia quickly set about forming her management team, using her considerable experience gained both from her academic career and her industrial experience at Rolls-Royce plc. She then completed the Institute's Strategic Plan 2004–2008, which has as its vision "Physics at the heart of science and society".

Julia has always been able to spot a good idea, and to encourage and support it, ensuring the necessary funds are made available to get it off the ground. So when UNESCO deemed 2005 the International Year of Physics, Julia set up a small group to maximise the opportunity provided by this designation. Using the brand "Einstein Year", she put various programmes in place. These promise to provide exciting opportunities for all in the Institute to become involved with, particularly through the branches.

Unfortunately, Julia's hands will not be on the reins when these projects come into play, but, thanks to her enthusiasm and "can do" attitude, I'm sure they will be successful. The Institute's loss is Imperial College's gain as she leaves us to become principal of their Faculty of Engineering. We thank her for all that she has achieved at the Institute.

Tony Scott is the Institute's honorary treasurer.

interactions

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Good careers advice?

As a recent graduate in applied physics, I read with interest your article in the October issue on the falling number of physics graduates ("Careers advice hinders physics", cover). It made the point that physics graduates today are highly sought after, and employers are falling over themselves to employ them. Am I alone in thinking that this simply is not the case? Many of my fellow graduates – some with first-class MPhys qualifications – are finding it incredibly difficult to secure a job. So where are all these great jobs that desperately need physics graduates?

One careers adviser told me that a physics degree is far too "vague" and few employers know what skills you acquire in doing such a degree.

Tamsin Suleyman
Nottingham

I read October's cover article on careers with interest. But, while I share the concerns expressed, I strongly disagree with the second line of your headline. I cannot see that it is the responsibility of careers departments to counter the imbalance in numbers of students wishing to study physics. If over half of all careers are open to students of any discipline, why should they advise them to study a subject which is perceived to be one of the most difficult to achieve in? The responsibility of the careers adviser should, unfortunately, be to dissuade them from considering the subject!

Tim Peters
Sidcup, Kent

I was amazed to read in *Interactions* the suggestion that you don't study science just to become a scientist – amazed because for 30 years I have been aware that the Institute considers the main point of being a physicist is to do research in physics, and anyone who does not is a second-class citizen. So more power to your elbow, but I'm afraid you will have to convince the rest of the Institute first.

Frank Allen
Warrington, Cheshire

True blue

I have finally got around to reading *Interactions* from July this year, and on the back page found the "Got the blues?" panel. I would question the equivalence of UV fluorescence and shining a torch through a glass of G&T. The torches I have are decidedly lacking in their UV output.

Richard Bytheway
Durham

Collective approach

In October's *Interactions* you invited comments on matters of general strategy ("Letters", p6). The Institute's campaign to promote physics in schools deserves our full support. Where I am uneasy, however, is the possibility that many of the 30 or so professional institutions within the orbit of the Engineering and Technology Board (etb) might each make separate approaches to schools to promote their own particular subject. I doubt if schools and pupils would be able to handle the resulting volume of information.

A collective approach to schools through the etb to encourage a return to maths, physics and chemistry would be in the interests of all these institutions.

John Catterall
Ross-on-Wye, Herefordshire

Awards bar

Following the non-listing on the AGM agenda of my very early request to comment on discrimination against Institute employees in regard to its awards and medals – and the veto on comment and discussion by members subsequent to my presentation at the AGM – I was invited to Loughborough University to discuss the matter further with the president (now immediate past-president) and to hear why Council unanimously confirmed such a bar at their meeting following the AGM.

Although the Institute's Strategy 2001–2005 has as one of its objectives "to maintain and develop schemes to recognise and reward excellence by physicists wherever they are employed", Council felt that Institute employees should be barred from awards as they were just doing their jobs. Presumably no-one else receiving awards could be construed as "just doing their job" when they received such medals – Nobel prizes, knighthoods and the like.

On this basis it was also odd, though very just in my view, that a recent Institute employee who has moved on received the Bragg medal and prize for doing his job at the Institute. The other ground for the bar was insider knowledge – also very odd when the Awards Committee makes its recommendations on merit alone and when nominations and support would most often come from non-staff members.

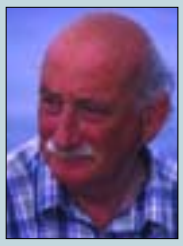
As very few members knew of my concerns, and even those at the AGM weren't allowed to discuss the matter or be enlightened on reasons for the bar, I invite members to let the Institute and me know of your views.

Chris Butlin
Sutton upon Derwent

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

OBITUARY

Harry Block 1931–2004



Harry (Herman) Block, professor of molecular electronics at Cranfield University from 1985 until his retirement in 1994, died on 1 September. Born in Düsseldorf in 1931, he fled Nazi Germany in 1938 and obtained a BSc and a PhD from King's College, London, and lectured there before moving to the chemical firm Courtaulds in 1959. In 1962 he joined the chemistry department at Liverpool University, where he established himself as an authority in polymer chemistry and developed an international reputation in the field of dielectric properties. At Cranfield, his main area of research was electro-rheology, the applications of which include clutches and vibration control. Harry was a sensitive and caring man who combined deep scholarship with a wry sense of humour. One of his stories concerned a walk from his office to Liverpool Station in the 1970s, when he saw "DESTROY H BLOCK" written on the side of a tenement building. He experienced a moment of alarm, before he realised that it was a protest against Irish prisons. Harry was an accomplished painter, photographer and chess-player. He will be remembered with affection by his family and his numerous friends and colleagues. He is survived by his wife, Edyth, and three children.

Remembered by **Clive Bucknall**.

interactions IS ON HOLIDAY IN DECEMBER BUT BACK IN JANUARY

To get listed here, go to whatson.iop.org and register your event

What's on in physics is the Institute's online calendar for the physics community, with information on the many interesting meetings, lectures and conferences held throughout the UK and elsewhere.

NOVEMBER 04

Quant Congress Europe
Incisive Media, London, UK
8–9 November
www.incisive-events.com/quanteurope

Chartered Status at British Energy
Institute of Physics (Professional Standards), Barnwood, UK
9 November
http://careers.iop.org

Chartered Status at DML Ltd
Institute of Physics (Professional Standards), Plymouth, UK
9 November
http://careers.iop.org

Low Temperature Techniques Course
Institute of Physics Low Temperature Group, Aston University, UK
10 November
http://conferences.iop.org/LT04/

Harmonics and Flicker Measurement Workshop
National Physical Laboratory, Teddington, UK
10 November – 10 December

physics
University of Warwick
10–14 April 2005

Poster submissions now invited for the themes Relativity & Cosmology, Physics in Biology, Light & Matter and Quantum Physics. (There is also a fifth General category for work that falls outside these areas.)
www.physics2005.iop.org/submission.htm.

http://www.npl.co.uk/electromagnetic/dclf

Dark Energy
Sheffield University, UK
10 November
http://www.shef.ac.uk/~ap1ew/darkenergy.html

Printing, Packaging and Papermaking Group Student Conference
Institute of Physics Printing, Packaging and Papermaking Group, Swansea, UK
11 November
E-mail: pj.green@lcc.arts.ac.uk

First Presentation Skills
Skillstudio Ltd, Glasgow, UK
15 November
http://www.skillstudio.co.uk/course/presentation-skills-1.htm

Synthetic Diamonds
Institute of Physics in Scotland, Edinburgh, UK
16 November
http://www.phy.hw.ac.uk/~phydtr/iop

First Presentation Skills
Skillstudio Ltd, London, UK
16 November
http://www.skillstudio.co.uk/course/presentation-skills-1.htm

Accelerating Sustainable Development
Sustainability Alliance, Birmingham, UK
16–17 November
http://conferences.iee.org/sustain/

The Daphne Jackson Memorial Lecture and Karen Burt Award
IEE, London, UK
17 November
http://www.iee.org/Events/daphnejackson.cfm

International Conference of

Energy Demand: Spiralling out of Control?
76 Portland Place, London, UK
17 November

A seminar to focus attention on the increasingly urgent energy demand situation in the UK and across the world. Organised by the Institute of Physics Energy Management Group* and co-sponsored by the Adam Smith Institute.
http://conferences.iop.org/ENE or e-mail Terri Jackson at jacksont@utvinternet.com.

* The Energy Management Group wishes to point out that it does not endorse the political views of the Adam Smith Institute.

Computational Methods in Sciences and Engineering 2004
Vravrona, Attica, Greece
19–23 November
http://www.uop.gr/~iccmse/

Chartered Status at NNC
Institute of Physics (Professional Standards), Knutsford, UK
19 November
http://careers.iop.org

Young Physicists Conference
Institute of Physics (Nexus and Young Professionals), Glasgow, UK
19–21 November
http://yp.iop.org/ypc2004.htm

Marketing for Non-Marketers
CustomerClix, London, UK
22 November
http://www.customerclix.com/Marketing_training_london.html

Making the Sale: Techniques for Non-Sales people
CustomerClix, London, UK
23 November
http://www.CustomerClix.com/Sales_training_london.html

Experimental Techniques of Semiconductor Research
Institute of Physics Semiconductor Physics Group, Aston Business School, UK
24 November
http://conferences.iop.org/ETS/

Current Research in Magnetism
Institute of Physics Magnetism Group, London, UK
24 November
http://conferences.iop.org/CRIM04/

Democs: Science Card Game
New Economics Foundation, London, UK
24 November
http://www.neweconomics.org

Fracture of Polymers
Institute of Physics Polymer Physics Group, London, UK
25 November
http://conferences.iop.org/FRP/

Laser Transmutation Studies of Nuclear Materials
University of Strathclyde, Glasgow, UK
1 December
http://phys.strath.ac.uk/information/colloquia.html

DECEMBER 04

Laser Transmutation Studies of Nuclear Materials
University of Strathclyde, Glasgow, UK
1 December
http://phys.strath.ac.uk/information/colloquia.html

Public Speaking: Protocol for Being a Master of Ceremony
CustomerClix, London, UK
2 December
http://www.CustomerClix.com/Training_courses_london.html

Plastics Pricing and LME Futures
Marriott Hotel, London, UK
2–3 December
www.lmefuturesconference.com

Future Challenges in Tribology: Exploring the Boundaries of our Experimental and Modelling Expertise
Institute of Physics Tribology Group, London, UK
2 December
E-mail: p.cann@imperial.ac.uk

First Presentation Skills
Skillstudio Ltd, London, UK
3 December
http://www.skillstudio.co.uk/course/presentation-skills-1.htm

BRSG Christmas Meeting
Institute of Physics Magnetic Resonance Group, London, UK
8 December
http://groups.iop.org/BR/

Institute of Physics
BUSINESS PARTNERS

Key Insight Business Briefing: The Government's 10-year Science and Innovation Framework
76 Portland Place, London, UK
29 November, 4.15–9.15 p.m.

The Institute's renowned series of business briefings is delighted to welcome Sir David King, who will talk about the government's 10-year science strategy. Joining him on the panel with industry perspectives will be Sir David Brown, Dr Andrew Mackintosh and Prof. John O'Reilly.

There will be ample opportunity for networking, discussion and debate, followed by dinner. Priority will be given to the Institute's Business Partners, but additional places may be available for £60. E-mail clair.collins@iop.org for further information.

Effective Presentation Skills
Skillstudio Ltd, London, UK
9–10 December
http://www.skillstudio.co.uk/course/presentation-skills-2.htm

Opticks 04
The Royal Society, London, UK
9 December
http://conferences.iop.org/OPK/

Democs (Science Card Game)
New Economics Foundation, London, UK
10 December
http://www.neweconomics.org

The Physics Behind Computer Games
Institute of Physics in Scotland, Edinburgh, UK
14 & 15 December
http://www.phy.hw.ac.uk/~phydtr/iop/

The Structure, Form and Beauty of Optical Vortices
University of Strathclyde, Glasgow, UK
15 December
http://phys.strath.ac.uk/information/colloquia.html

Advanced Sensors & Instrumentation Systems for the Food and Beverage Industries
Institute of Physics Instrument Science and Technology Group, London, UK
15 December
http://conferences.iop.org/ASI

Theory of Condensed Matter Group Annual Scientific Meeting
Institute of Physics Theory of Condensed Matter Group, University of Warwick, UK
17 December
E-mail: s.crampin@bath.ac.uk

notices

Announcements are free to Institute members. E-mail interactions@iop.org or send to *Interactions*, 76 Portland Place, London W1B 1NT, UK; fax: +44 (0)20 7470 4991.

NEW BUSINESS PARTNER
A-Metrics.

NEW MEMBERS
Chandrakant Bhosale, Jackie Bull, Richard Grose, Stephen Hepworth, Panayiotis Kyriacou, Vivienne Lyons, Davide Mariotti, Latika Menon, Richard Thompson.

IN MEMORIAM
Colin Taylor, Clive Gateley, Barrie Taylor, Alan Greig, Brian Scarlett, D Blair.

AVAILABLE
● **European Physical Society offer** Individual membership of the EPS is being reduced from €36.40 to €20 (£14) for members of the Institute and €15 (£10.50) for students, under 30s, teachers and retired members. See Institute renewal notice.

WANTED
● **Science and Engineering Ambassadors** On 19 October, find out more about becoming an ambassador and sharing your passion for physics with your local community. Volunteering opportunities during Einstein Year include Lab in a Lorry. See http://www.setnet.org.uk.

● **Chartered Scientist applications** The "grandparent application route", only available to members who currently hold chartered status, expires on 31 December. Don't miss out – visit careers.iop.org/chartered.

● **Nominations for the Culham Thesis prize** Sponsored by the Plasma Physics Group and UKAEA, this is open to physicists who have been awarded a PhD by a UK or Irish university for a thesis in the general area of plasma physics in 2003 or 2004. For further details, contact Ken McClements at k.g.mcclements@ukaea.org.uk. Closing date: 10 December.

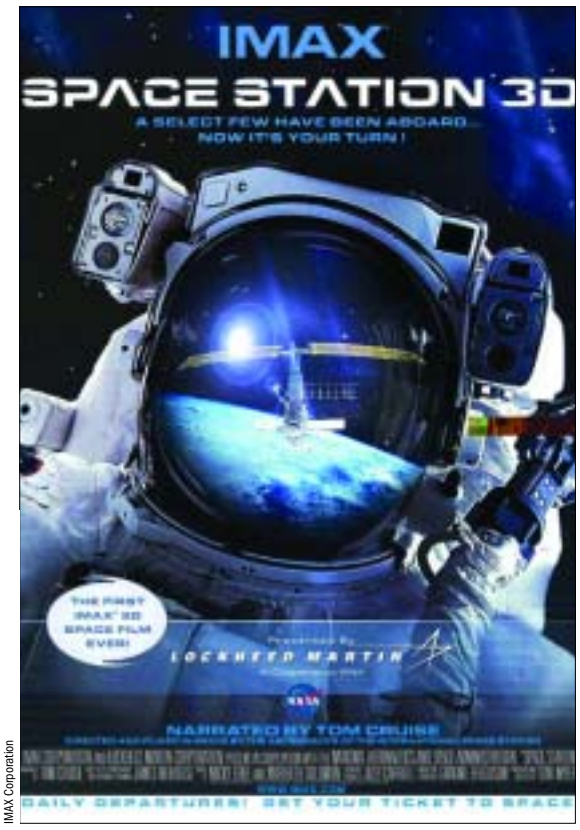
Cruising on the International Space Station

Michelle Cain reports back from her trip into space via the IMAX cinema in London's Science Museum.

A 3D IMAX documentary about the International Space Station, narrated by Tom Cruise. Sounds a bit dubious to me. Is there any point in my going? Surely I've heard it all before. And what does "the Cruiser" know about space anyway? With these thoughts in my head, I trundled off to the Science Museum in London on a wet Sunday to find out whether IMAX 3D technology, combined with the International Space Station (ISS) and Tom Cruise, would be enough to impress this sceptical astrophysics graduate.

Sitting in the gargantuan cinema in the museum's Wellcome Wing, waiting for the lights to go down, I amused myself using my 3D glasses to impersonate Elton John. I'd never seen a 3D movie before, so it took me a while to settle into the film – especially as tilting your head even slightly makes you see double.

The movie begins with the first crew that went up to assemble the space station. They launched in a Soyuz rocket from Kazakhstan in October 2000 and docked with a part of the ISS called Zarya, which had been in orbit 350 km above the Earth since 1998, we were told. The Soyuz blast-off revealed the full force of the IMAX 3D experience. With the high-quality surround sound and debris hurtling towards my face, I had to resist the strong urge to take cover under my seat. The words on the poster "Get your ticket to space!" might sound like hype, but I really did feel like I was actually there (and I'm sure some flying debris damaged the camera).



IMAX Corporation

Once we're in orbit, the movie becomes more intimate because it is filmed by the ISS astronauts and cosmonauts themselves. Again, you really do feel like you're there and get a sense of what it might be like to live on the space station. Food goes astray and flies straight at you, so close that you feel you could catch it in your mouth. One scene, though mundane, stood out for me: two male crew members having their "morning wash". The shaving cream and disposable razor looked bizarre as they hovered in zero gravity.

What struck me most was how messy it was. Somehow I had thought that life on the ISS would be sterile and futuristic. I was shocked to see popcorn set free and left to escape, water squirted about carelessly and the crew's personal items – soft toys, paperbacks and CD players – strewn about. I had imagined that it would be a pristine environment, with strict rules about not releasing food and drink that might damage equipment. My science-fiction-inspired imaginings were brought back to reality on discovering that it is apparently sufficient to clean out the filters in the circulation system once in a while.

"I had to resist the strong urge to take cover under my seat."

The space walks, on the other hand, provided plenty of sci-fi action – a classic scene involved testing out a jet pack. One crew member was fixed onto a platform on the end of a robotic arm while the other floated several metres away from the ISS. Even though they were joined by a tether, I felt the lone astronaut's sense of isolation. The jet pack worked perfectly, and it was satisfying to see one in action. I'm as happy as the next person to suspend my disbelief at the cinema, but when Hollywood throws the laws of nature out of the window – with noisy jet packs in space, for example – the physicist in me pipes up and shatters the illusion. For me, the reality of space turned out to be much more captivating than the Hollywood version.

The documentary then follows the next crew, who make the two-day flight to the ISS on the space shuttle *Discovery*. It was strange to hear about the wonders of the space shuttle, now grounded following the Columbia tragedy. The launch went without a hitch, the shuttle docking safely to deliver supplies and equipment.

The film includes some details of the scientific experiments to be carried out on the ISS, including investigations of crystal formation in zero gravity, life in low gravity and even onion growth. Somehow the onions on board started sprouting, and the crew decided to find out what would happen if they wrapped them in wet towels and put them in plastic bags. We don't find out the results of this experiment, but we're told that the research done on the ISS is a vital step on the way to sending people to Mars.

Emerging from the cinema after the film, I was pleased to realise that my earlier doubts had been unfounded. This was an awe-inspiring spectacle for both adults and children, physicists and non-physicists. True, I didn't learn a lot about the science – I could probably have found out more on the Internet – but to judge it purely as a factual documentary misses the point. It's not so much a film as an experience, and probably the closest most of us will get to space. At £7.50, I think it compares favourably with Richard Branson's planned £115,000 two-hour space flight.

Michelle Cain is the Institute of Physics communications officer.

particles

Watery world

In October, *Interactions* posed this problem: We live in a universe that is mostly empty space, in which objects attract each other gravitationally. In a universe that has the same physical laws but which is mostly water with small bubbles in it, do the bubbles attract or repel each other, or neither?

The solution:

Imagine a small volume of water in an infinite universe of water with no bubbles. By symmetry, there is no net force upon it. If there is a single bubble, the balance of the forces on the small test volume will be broken, and it will be repelled by the bubble. If you introduce another bubble, the water will try to get as far as possible from the two bubbles. Therefore, the bubbles will attract each other.

If you have an interesting physics puzzle that you'd like to share with fellow members, please send it to interactions@iop.org. If yours gets published, we'll send you a bottle of champagne or £30 worth of your choice of Institute of Physics merchandise.

Do you know a great physics teacher?

Every year the Institute of Physics celebrates the work of exceptional physics teachers with its Teachers' Awards. If you know of an excellent teacher who deserves recognition, we would be delighted to hear from you. For more details, please contact Ian Cuthbert, Education Department, Institute of Physics, 76 Portland Place, London W1B 1NT; e-mail Ian.Cuthbert@iop.org. The closing date for nominations is 30 November.