

PHYSICS IN SCOTLAND

The newsletter of the Institute of Physics in Scotland

October 2004



Tom Dickson completes the line-up of coordinators in Scotland.

Teacher Network appoints last of the coordinators

A seventh regional coordinator was appointed to the Teachers Network in Scotland in the summer to complete the nationwide coverage of the network. Tom Dickson took up his position at the beginning of September, taking responsibility for providing a range of support activities for teachers of physics in Angus, Clackmannanshire, Dundee, Fife, Perth & Kinross and Stirling.

Dickson is a science development officer in Fife Council. He has been training teachers in the Cognitive Acceleration through Science Education (CASE) initiative and also working with primary teachers using "Lets Think", "Lets Think through Science" and "Concept Cartoons", as well as supporting the 5–14 science curriculum.

He has taught in Fife for 28 years, the last 20 as principal teacher of physics at Buckhaven High School, and for the last year he has been a full-time science development officer.

Heather honoured twice

On the day that the population and civic dignitaries of Tonbridge were celebrating Kelly Holmes' achievements in Athens, the Institute of Physics announced its 2004 medal and prizewinners.

In awarding Heather Reid the Kelvin medal and prize for her work in helping to promote physics to schoolchildren and the public through public lectures, workshops and the media, the Institute created Paisley's and the Institute of Physics in Scotland's own double medal/prizewinner – Reid was awarded the annual Chairs of Branches prize in May.

A former chair of the Institute of Physics in Scotland, Reid was awarded an honorary doctorate by the University of Paisley in 2003. With her experience of the media and Scottish education, her most outstanding contributions have been to public lectures, workshops and media coverage of physics.

Blending the physics of weather forecasting with the IT workings of live TV, her lectures have inspired thousands of school pupils throughout Scotland and farther afield.

She is a faithful promoter and supporter of the Paperclip Physics Competition and has



Doubling up: Heather Reid has won both the Kelvin medal and prize and the Chair of Branches prize.

also, for example, awarded the prizes at the final of the West of Scotland Physics Education Group's Live Wire quiz.

Reid's contribution to the popularization of science is directed through a number of organizations, including the Royal Society of Edinburgh (Christmas Lectures, Saturday morning physics masterclasses), the British Association, the Edinburgh International Science Festival and most of Scotland's universities. She also serves on the Science and Society panel of the Particle Physics and Astronomy Research Council.

Since 1996 Reid has

organized and/or presented on average more than 10 events a year. Nearly all of this has been on a voluntary basis, often using her annual leave to promote physics and the Institute to the public at large, and to school pupils in particular.

The Kelvin medal and prize was instituted by the Council of the Institute in October 1994 in recognition of the importance of promoting public awareness of the place of physics in the world, of its contributions to the quality of life and its advancement of an understanding of the physical world and the place of humanity within it. The award is made annually for outstanding contributions to the public understanding of physics.

The Chairs of Branches prize was established in 2001 in recognition of the voluntary contributions that are made by members to the work of branches. Such work is undertaken in their own time and is rarely regarded as part of their career development. The prize is given annually to one or more branch members who have made exceptional contributions to activities within a branch to enhance the promotion of physics.

Keyhole surgery pioneer talks to Science and Parliament

The pioneer of keyhole surgery, Prof. Sir Alfred Cuschieri, is to address this year's Science and the Parliament event on Wednesday 10 November.

Sir Alfred will make his speech to the annual gathering of scientists and politicians, organized by the Royal Society

of Chemistry in association with the Institute of Physics in Scotland and Scotland's other leading science organizations.

The event, to be held in Edinburgh's science centre, Our Dynamic Earth, will focus on the progress of the Scottish Executive's Science Strategy,

three years on from its launch.

This is an opportunity for scientists and those with an interest in science policy to mix and debate with Scotland's political decision makers. A limited number of invitations will be available nearer the time (e-mail: peter.ball@iop.org).

More volunteers needed to inspire

Have you got what it takes to inspire the scientists, engineers, technology specialists and mathematicians of the future?

If you would like to ensure that there is a flow of motivated, capable people into science, technology, engineering and maths-related careers, SETPOINT Scotland would like to hear from you. It is looking for enthusiastic and dynamic individuals of all ages and backgrounds to join the Science and Engineering Ambassadors (SEAs) scheme.

The programme is coordinated nationally by SETNET, a UK charity set up by the DTI that currently has more than 100 member organizations, including the Institute of Physics.

The key aim of the SEAs programme is to promote science, technology, engineering and maths (STEM). The scheme does this by providing enthusiastic, vetted volunteers to work with pupils and teachers in schools. SEAs can have a background in any aspect of STEM. Crucially, they should have a desire to inspire and excite young people about the



Inspiring: SEA Debs McNeil presenting Alien Atmospheres to pupils from Lomond School, Helensburgh.

possibilities that these subjects and the related careers can offer. The main qualities required by ambassadors are enthusiasm and commitment, and a passion for what they do.

Recognizing that SEAs are giving up their valuable time, the programme is flexible and built round each individual's availability and interests, thus allowing them to do as much or as little as they wish. They need

only get involved in activities with which they are comfortable.

The only commitment is that they are available for at least one activity a year. They need to complete a registration form, have a short induction and undergo a Criminal Records Bureau check before going into schools. In return, SEAs receive support for and advice about working with schools from their local SETPOINT; have access to

SEAs insurance when undertaking ambassadors activities; and are part of a high-profile, rewarding and extremely worthwhile national programme.

SEA activities are increasingly being recognized by employers and professional bodies as contributing to Continuing Professional Development, particularly in the area of "soft skills", such as confidence building, presentation, personal

Environmental Physics Group visits the observatory

On 17 July this year, members of the Institute's Environmental Physics Group (EPG) visited the Eskdalemuir Geophysical Observatory at Eskdale in the Borders to celebrate the centenary – give or take a couple of days – of the commencement of the construction of the observatory.

In the early 1900s, electrical interference from trams was causing difficulties with geomagnetic measurements that were being made by the National Physical Laboratory (NPL) at the long-established Kew Observatory near London.

Using £10,000 compensation money from the Electric Tram Company, a search began for a suitable and accessible replacement site that would ideally be at least 10 miles from any potential magnetic disturbances, such as railways.

The site that was finally chosen was Eskdalemuir, and

construction of a new observatory eventually commenced on 19 July 1904.

Our visit commemorated the centenary of the cutting of the first sod, but the observatory did not start operation until 1908, when the NPL began recording under the supervision of the original superintendent, G Walker.

Since then the observatory has been the responsibility of the NPL (1908–1915), the Meteorological Office (1915–1967), the NERC Institute of Geological Sciences (1967–1982) and the British Geological Society (since 1982), taking seismic, geomagnetic, meteorological and atmospheric electrical measurements.

Following substantial refreshments, our visit began at 1.00 p.m. with an outline of the history of the site by John Riddick. Giles Harrison of the Department of Meteorology at

the University of Reading and secretary of the EPG then described his work on atmospheric electricity, in particular the potential gradient from the ionosphere to Earth and the causes of its variation.

We went on to visit the control room for the meteorological work, before going outdoors to view and record four different aspects of the observatory's work, starting with the extensive range of standard and specialist meteorological instruments, including several for monitoring atmospheric pollution.

We proceeded to the geomagnetic underground chamber, which contains proton and fluxgate magnetometers that provide scalar and vector data, respectively, in a shielded environment with little temperature variation throughout the year.

It was then up the hill to the absolute huts where, fortnightly,

manual measurements that are taken with a fluxgate theodolite magnetometer allow absolute values of the vertical and horizontal components of the Earth's magnetic field, together with the declination from true north, to be recorded.

Our last visit was to the seismic vault to inspect the various seismometers and to learn how to distinguish earthquake events from disturbances that are caused by underground nuclear tests and other activities, such as explosions in local quarries.

We then returned to the main building for an informative and entertaining talk by Lord Julian Hunt about the life and work of L F Richardson, who spent some years at Eskdalemuir before the First World War.

Richardson developed many important techniques and ways of thinking about the natural world during his auspicious

children



Science & Engineering
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effectiveness and teamwork. At the same time the activities can be enormous fun.

More details and a registration form can be accessed via <http://www.setnet.org>, but it would be helpful if members joining the scheme could indicate on their application that they are members of Institute of Physics in Scotland and advise Peter Ball (e-mail: peter.ball@iop.org) that they have applied so that the Institute can keep a register of members who are SEAS.

at Eskdale

career, from approximate methods for solving differential equations (1910), through the theory of the development of plumes (giving rise to the Richardson number), to nonlinear dynamics, fractals and mathematical psychology.

Our visit concluded with a tour of the museum.

Many thanks are due to Giles Harrison for arranging the trip, past and present members of staff of the observatory for their enthusiastic participation, and Julian Hunt for his stimulating lecture. The two-dozen or so participants thoroughly enjoyed the day – a joint venture between the EPG and the Institute of Physics in Scotland – particularly as the weather was so kind to us.

Dr Derek Rose, Department of Agricultural and Environmental Science, University of Newcastle upon Tyne and an EPG committee member

Young Physicists choose Glasgow for conference

The Institute's sixth annual Young Physicists Conference will be held at the University of Glasgow this year on 19–21 November.

This will be an opportunity for undergraduates, postgraduates and young professionals to get together for a weekend of physics, networking and fun. Last year a highly successful conference was held in Bristol and was attended by in excess of 50 delegates from across the UK. The challenge is now on to demonstrate that "Glasgow is miles better".

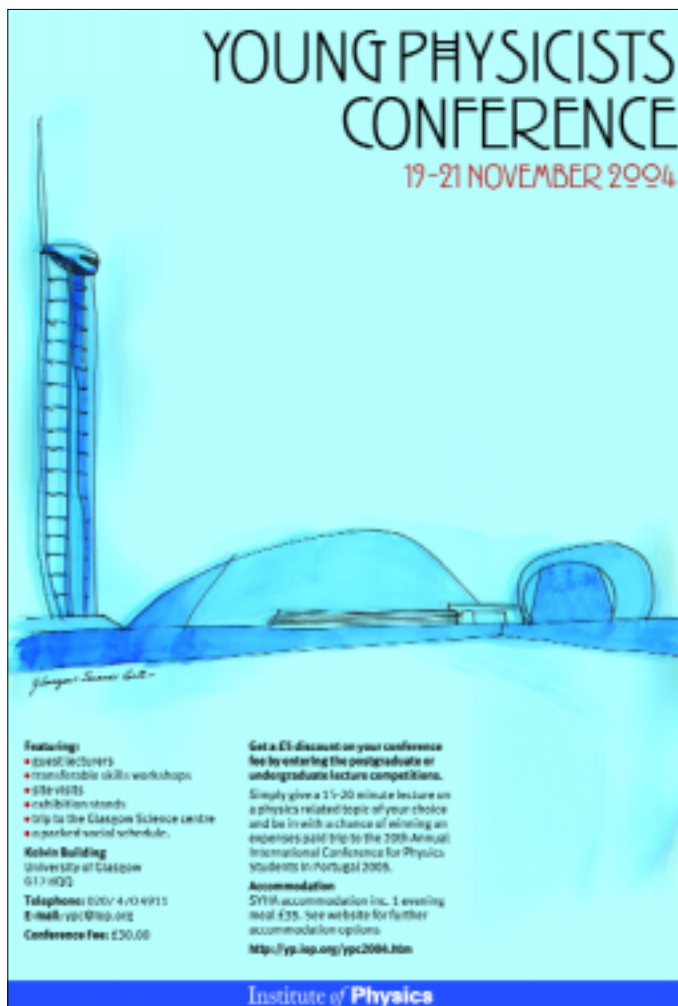
The Young Professionals section of the Institute's membership exists to help physicists who are in the early part of their careers and who are generally under the age of 32. It follows on from, and links with, the Institute's Nexus section, which caters for students.

The section offers a range of services and activities for recent graduates with a physics-related background, whatever their current area of employment, and gives them opportunities to network with young members of the other major science and engineering institutions.

A Young Professionals Forum has been established to identify the best way forward for the Institute's Young Professional members, and to input their opinions to the Institute. The Institute uses this information to identify, review and tailor services for members and to support the recruitment and retention of its younger members. The forum meets every few months to discuss relevant issues and to assist in the organization of Young Professionals events. For further information, visit <http://yp.iop.org/forum.htm>.

The conference will feature, among other things:

- guest lecturers (including Dr Simon Singh MBE, author, journalist and TV producer);
- transferable skills workshops and exercises;
- an industry visit or a visit to



- the Glasgow Science Centre;
- exhibition stands from employers of physics graduates;
- a packed social schedule.

The provisional conference programme is as follows:

Friday 19 evening Arrival and dinner in Youth Hostel followed by drinks in town.

Saturday 20 Site visits and exhibition in the morning; guest lectures, workshops on transferable skills for young professionals and students in the afternoon; and optional dinner and drinks in the evening.

Sunday 21 Postgraduate and Undergraduate lecture competitions in the morning followed by more guest lectures and workshops in the afternoon.

The conference fee is £30 (or

get a £5 discount by entering the postgraduate or undergraduate lecture competition; e-mail ypc@iop.org for the rules and guidelines).

Accommodation costs £35 for two nights in an SYHA hostel, including an evening meal. A list of nearby hotels is also available from Sarah Connolly (e-mail: sarah.connolly@iop.org).

If you give a 15–20 minute lecture on a physics-related topic of your choice then you'll be in with a chance of winning an expenses-paid trip to the 20th Annual International Conference for Physics Students in Portugal next year.

For full registration details, please see <http://yp.iop.org/ypc2004registration.htm>.

If you're looking for financial help for an Einstein Year

Stirling Physics Meeting continues



Left to right: Heather Reid presents pupil prizes to Paul Paterson of Hamilton Grammar School, Richard Bowman of Douglas Academy and Sandy Smillie of Dollar Academy.

The Stirling Physics Meeting yet again broke all records when the 30th event in this popular series, at the University of Stirling on 2 June, attracted more than 280 delegates from across Scotland.

Billy Higgins, quality improvement officer for the Lothian region, opened with a view of "Life after primary science". In an overview of the primary/secondary interface, he began by describing a time – the late 1990s and before – when primary science barely existed and the new S1 entry had merely to catch sight of a lit Bunsen burner for their jaws to drop.

Noting that primary science had profoundly changed, and that primary pupils now make extensive use of Information and Communications Technology (ICT; e.g. webcams to create PowerPoint presentations [primary 6!] and spreadsheets to plot graphs), he went on to venture that, for the new ICT-literate generation, the Bunsen no longer cuts the mustard.

Suggesting that secondary teachers have a lot to learn from the primary, child-centred approach to learning and teaching, he posed the following strategic, rhetorical questions:

- How do we build on prior learning?
- How do we maintain interest and challenge?
- How do we use and build on ICT skills?
- How do we make science accessible to all learners?

He concluded an amusing and often controversial presentation by inviting delegates to ask:

- Are we child-centred or subject-centred?
- Are we open or closed to new ideas?
- Are we willing to put ourselves into the discomfort zone?

David Lawson, advisor in science for the Glasgow region, followed with a summary of the revised 5–14 report and its strands and targets. He then described the failure of the now-discredited resource-based learning approach to science as an introduction to Roseleen Kennedy, staff tutor for the Glasgow region. She gave a detailed description of the S1 Glasgow Science Programme. Available on CD-rom to Glasgow schools, this was developed in response to the revised guidelines in 5–14 science.

Kennedy described the use of the CD and components of the course/associated materials, which include:

- comprehensive teachers guides;
- activity support sheets to achieve specific learning outcomes;
- homework sheets;
- assessment sheets;
- an investigation for each unit.

Rhona Goss, principal teacher physics, Monifieth High School, then described her practical experience of the Cognitive Acceleration through Science Education (CASE) scheme.

This programme of lessons is aimed exclusively at the P7 to S2 age range. It presents pupils with observations to challenge their preconceptions in order to establish higher-order reasoning

patterns, such that pupils are accelerated from concrete (lower-order) to formal (higher-order) operational thinking.

Every CASE lesson has the same five essential components:

- concrete preparation;
- cognitive conflict;
- construction;
- metacognition;
- bridging.

CASE was rolled out in Monifieth with S1 in October 2001 and S2 the following year. Benefits achieved included familiarization with, and frequent use of, technical scientific terms (e.g. "variable", "ratio" and "proportion") and clear links with the content of investigations undertaken in later year groups. Constraints were found to be:

- the need for technician support;
- the need for a programme manager;
- the difficulty of managing the "cognitive conflict" part of the lesson.

Dick Dougal, formerly of Edinburgh University and now a Trustee of the James Clerk Maxwell Foundation, took as his topic "Maxwell's contribution to the understanding of colour", highlighting some of the little-known achievements of Maxwell in colour composition and perception. Maxwell was hugely influenced by Thomas Young. He used a "colour top" – a disc with three segments of primary colour and a black-and-white inner central disc – to visually superimpose varying amounts of each of the primary colours to

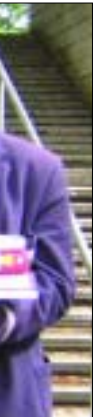
develop a set of colour "equations". These correlated the amount of each colour and the resultant effect.

He later improved this method with his "colour box" – the first double-pass spectrometer – in which he split light using prisms to capture the individual spectral components of pure colour. He obtained sufficiently accurate data to plot colour synthesis graphs of his own and his wife's colour perception. Noting the difference between their responses, he was able to underpin the thinking that was later to make him an authority on colour blindness.

Delegates were shown the effect of combining three images of a ribbon – one red, one green and one blue – to give one of a white ribbon using copies of Maxwell's original slides as used at King's College, London, in 1861. Some 140 years later this method was used to make a colour composite image of Saturn using images taken by the Cassini spacecraft in the red, green and blue regions of the spectrum.

The afternoon session began, as is traditional, with the prizes. Heather Reid, BBC Scotland meteorologist, presented the Institute of Physics in Scotland prizes for the top candidates in the SQA May 2003 Higher and Advanced Higher physics exams. Receiving prizes at the meeting were Richard Bowman of Douglas Academy and Sandy Smillie of Dollar Academy, first and second respectively at Higher, and Paul Paterson of Hamilton Grammar School, second

es to break all records



Academy. Gemmill Millar presents a prize to Jenny Sillitto of Mary Erskine School and displays his own Teachers award.

equal at Advanced Higher.

Jenny Sillitto, second equal at Advanced Higher, was unable to attend the meeting so received her award at her former school, the Mary Erskine School, Edinburgh. In doing so she is believed to be the Institute's first pupil double award winner, having received a Higher Grade award the previous year.

Malcolm Littlejohn of Banchory Academy was presented with his Institute of Physics Technician award (see May 2004 newsletter) by Catherine Wilson, the Institute's Teacher Network coordinator for Scotland.

Gemmell Millar, formerly head of physics at Stewart's Melville College, was presented with his Institute of Physics Teachers award (see May newsletter) by Jack Woolsey, formerly of the University of Stirling and a founding "father" of the Stirling Physics Meeting. By coincidence, Millar was Jenny Sillitto's physics teacher.

In answering his own question, "Is there anybody out there?", cosmologist Dr Martin Hendry of Glasgow University stated that mankind has always been fascinated by the idea of extraterrestrial life. Noting that Giordano Bruno was burned at the stake in 1548 for speculating that there might be life on other worlds, and that we have since moved on from mere philosophical speculation to the rigours of scientific investigation, he went on to address:

- the search for extrasolar planets;
- why are we here?;

- where is everybody?

Liquid water on the surface of a planet is a prerequisite for carbon-based life. This is possible only if the planet occupies a habitable zone or region of space surrounding a star where the surface temperature allows water to exist as a liquid. In our solar system this is a region around 150,000,000 km from the Sun, which includes Mars, Venus and, of course, Earth.

Venus is dismissed as a hostile non-starter, leaving only Mars as a possible cradle of life. The detection of water ice at the south pole of Mars was a major success of the Mars Express mission, but sadly the ill-fated *Beagle 2* was the biological probe rather than the robot landers, *Spirit* and *Opportunity*.

Another possible haven for carbon-based lifeforms in our solar system is Europa – a moon of Jupiter with a water-ice surface and the suspicion of an ocean under its surface. Plans are under way to send a lander, *Proteus*, in 20–30 years time to drill through Europa's surface ice and determine what lies in the ocean beneath.

Exoplanets (i.e. those that belong to other star systems) are the next port of call in the search for life. Currently even the largest telescopes are unable to cope with the masking effect of the parent star and plans are being developed to build an overwhelmingly large telescope (OWL) in about 2020 with a mirror diameter of 100 m.

Massive exoplanets are detected by observing their

gravitational effect on their parent star by analysing the stellar spectra and the Doppler shift resulting from the stellar wobble. Hendry reported that the number of known exoplanets has increased from 29 to 120 over the previous four years.

He went on to indicate that current thinking about why we are here is that the universe has three components:

- cold dark matter;
- atoms;
- dark energy.

Cold dark matter and atoms produce normal gravity in which matter attracts other matter. Dark energy has the opposite effect and tends to force the universe apart, hence the accelerating and expanding universe. According to the concordance model, the amounts of cold dark matter and dark energy in the universe were essentially currently almost the same. In the past, cold dark matter predominated; in the future, dark energy will predominate. The hypothesis is that life on Earth could not have developed if either had dominated.

Finally, Hendry made brief reference to Fermi's Paradox – "Where is everyone?" – and the Weak Anthropic Principle – one of the many potential solutions relating to the "special" nature of life on Earth.

Prof. Peter Main, the Institute's director of science and education, then described the Institute's current activities relating to education and the support of physics across the country, before formally closing the meeting.

Institute award recognizes Young Professionals

Are you, or do you work with, a great ambassador for physics? Are you, or do you know, an exceptional young professional physicist? If your answer to either question is "yes", then the Young Professionals Forum wants to hear from you.

The Young Professionals Forum seeks to identify ways to support Institute members who are in the early part of their careers – Young Professionals are typically under the age of 32. The forum acts as a sounding board for Young Professionals, ensuring both an awareness and an appreciation of their opinions and concerns so that the Institute is better able to match its services to their needs and both recruit and retain Young Professionals.

The forum meets every few months to discuss relevant issues and to help in the organization of events.

To match the existing awards for young physicists who have made significant achievements in research, the Institute's Young Professionals Forum has introduced a new award for outstanding community work or for increasing public awareness of physics.

The forum is looking for a young physicist in industry, academia or elsewhere who is active in one or more of the following ways:

- improving the public perception of physics;
- organizing events that promote physics in their local area;
- working in schools to aid pupils' understanding of physics.

To nominate someone for this award, or to be nominated yourself, please contact Sarah Connolly (e-mail: sarah.connolly@iop.org), who will supply the necessary nomination forms. Two are required: one for the proposer and one for the nominee.

Completed forms should be returned to Sarah Connolly at the Institute of Physics and received by her no later than 30 October 2004.

Albert celebrates top physicists and promotes Einstein Year 2005



Earlier this year the Institute ran a contest to find Great Britain and Ireland's top 12 physics heroes of all time – the scientists who helped to make the world a better place in which to live.

The local and national branches of the Institute nominated a shortlist of scientists from their regions/nations and a panel of experts including physicists, educators, and communicators, selected one genius from each region who had made the most important contribution to society in general.

The results of the contest, announced in August, included individuals who had given us, or been associated with:

- the electric light bulb;
- radio;
- television;
- an accurate knowledge of the positions of the stars;
- an understanding of how gravity and motion work;
- an appreciation of how matter is formed at the most basic level.

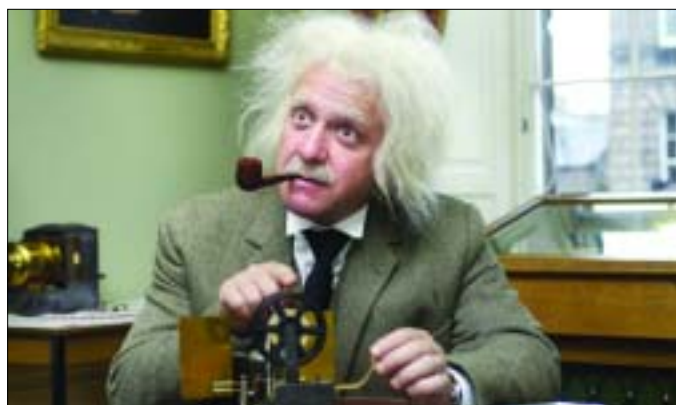
The contest was held to promote Einstein Year, Great Britain and Ireland's contribution to the celebration of the World Year of Physics – a celebration of the physics exemplified by the heroes in this list.

The list of winners was:

- Sir Joseph Swan (North East)
- Sir Edward Appleton



Preparing for a lecture, Einstein asks: "Where's the laptop input socket?"



TXT MSG 4 Einstein: getting to grips with an early Morse code receiver.

- (Yorkshire)
- Sir Isaac Newton (East Anglia)
- Michael Faraday (London and South East)
- Paul Dirac (South West)
- John Flamsteed (Midlands)

- William Robert Grove (Wales)
- Sir Ernest Rutherford (Lancashire and Cumbria/ Merseyside/ Manchester)
- James Clerk Maxwell (Scotland)

- Robert Hooke (South Central)
- Lord Kelvin (William Thomson; Northern Ireland)
- Kathleen Lonsdale (Republic of Ireland)

On being informed of the winners, Albert Einstein, in the form of actor Gary Barber, undertook a two-week whistle-stop tour of Britain and Ireland to visit the homes of these heroes and to encourage local communities to organize events and participate in Einstein Year.

He briefly visited James Clerk Maxwell's birthplace, now home to the James Clerk Maxwell Foundation, at 14 India Street, Edinburgh. As far as we can tell, this was only his second visit to Scotland, having previously been in Glasgow in 1933 when he delivered an address at the University of Glasgow.

Individuals and organizations can apply to the Institute of Physics in Scotland for small grants to organize, promote or support Einstein Year or other outreach activities. Bids should be submitted to Peter Ball (e-mail: peter.ball@iop.org) by 30 November.

Grants of up to £1500 are available for Einstein Year events/activities through the Institute of Physics Einstein Year Grant Scheme. Details are available at www.einsteinyear.org. The closing date for the first round has now passed; that for the second round is 25 February.

Further rendezvous for Seniors Group members

Following the successful Lunchtime Rendezvous held in Glasgow and Edinburgh, two more have been arranged for members, partners and friends.

The first is to be held in the Senate Room, Gilbert Scott Building, University of Glasgow, on 26 January. Following coffee/tea, available from 10.00 a.m., Prof. David Saxon, Dean of the Faculty of Physical Sciences and Kelvin Professor of Physics at the University of Glasgow, will present a lecture on Lord Kelvin.

There will then be a guided tour of the new display, "Lord Kelvin: revolutionary scientist", in the university's Hunterian Museum. Mrs Aileen Hamilton of SETPOINT Scotland will then give a presentation on SETPOINT and the SETNET Science and Engineering Ambassadors Scheme. A four-course lunch with wine will follow.

The second Lunchtime Rendezvous is to be held at the James Clerk Maxwell Foundation, 14 India Street, Edinburgh, on

30 March, with coffee/tea at 10.00 a.m. Prof. David Ritchie, chairman of the Clerk Maxwell Cancer Research Fund, will chair a session of reports on projects financed by the fund, showing progress on the effects of electromagnetic radiation in the diagnosing and treating cancer.

Ms Rosalind Newton, director of the High Blood Pressure Foundation, a registered charity based at the Department of Medical Sciences, Western General Hospital, Edinburgh, will

then talk about "Relieving the pressure". A four-course lunch with wine will follow.

Further details, including booking forms, menus and prices, will be available from <http://scotland.iop.org> and also sent to Senior Group members in the Edinburgh and Glasgow areas.

Suggestions for other activities are always welcome. For further information, contact the Seniors Group Coordinator, Dr John Higinbotham (e-mail: john.higinbotham@physics.org).

Edinburgh hosts branch's AGM and Annual Dinner

The AGM of the Institute of Physics in Scotland was held at the National e-Science Centre in Edinburgh back in mid-June with 19 members in attendance.

Following the submission of reports by the office bearers and representatives, the committee for 2004/5 was elected. It should be noted that the list of office bearers and committee members (p10) also includes committee members and representatives subsequently co-opted at a committee meeting held on 25 June.

Prof. Peter Main, the Institute's director of science and education, then gave an overview of recent and current activities and initiatives, particularly in the field of education, that are being undertaken by the Institute.

Prof. Toy Doyle, University of Glasgow, followed this with a talk on "Physics and the computer grid", outlining current progress and the future potential for harnessing truly awesome computing power to support the hunt for the Higgs boson and other such experiments and applications.

Following the AGM, 26 members and guests attended the Annual Dinner, which was held at the newly opened Edinburgh Novotel, where Prof. David Saxon, the Institute of Physics in Scotland chair, presented Dr Carol Trager-Cowan of the University of Strathclyde and Dr Andrew Harvey of Heriot-Watt University, both recently elected fellows of the Institute, with their fellows' scarf and tie, respectively.

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Teachers enjoy the char

Physics teachers from across Scotland converged on Edinburgh in late June for the fourth annual Physics Summer School. The event, hosted by the University of Edinburgh, is run as a collaboration between the universities of Glasgow and Edinburgh, the Scottish Schools Equipment Research Centre (SSERC) and the Institute of Physics in Scotland.

The programme for the week was designed to provide continuing professional development for physics teachers through a rich blend of practical challenges, industrial updates, formal lectures, workshops on teaching issues, visits and time for social engagement, thereby enriching both the teaching and the learning of physics in Scottish schools. This year, for the first time, special emphasis was also placed on activities suited to the 11–14 curriculum.

Providing an insight into areas of current physics research is an important element of the programme and, in keeping with the benchmark that has been set by previous Summer Schools, leading experts in their respective areas of research took on this challenge.

Prof. Jim Hough of the University of Glasgow, Prof. Jim Dunlop of the Royal Observatory, Edinburgh, and Prof. Miles Padgett of the University of Glasgow delivered lectures on "The search for gravitational waves", "Advances in observational cosmology" and "Optical tweezers", respectively. The lectures were thoroughly enjoyed by all of those present and stimulated many questions and much discussion.

A number of external visits were included in the programme, including "industry updates" hosted by BAE SYSTEMS in their new state-of-the-art laboratories and manufacturing plant at Edinburgh Crewe Toll, and by Microemissive Displays, an Edinburgh-based optoelectronic start-up company.

Delegates were also able to visit the newly opened Centre



for Physics in Extreme Conditions at the University of Edinburgh and the Royal Observatory Edinburgh, where delegates were amazed to be able to view and handle first editions of the works of luminaries such as Galileo, Kepler, Brahe, Copernicus, Al-Hakim and Newton.

Leaving the confines of Edinburgh, visits to Glasgow Science Centre, the Institute for Gravitational Research and other research facilities of the University of Glasgow were included in the programme.

A central element in the week was the ongoing hands-on laboratory sessions housed in the University of Edinburgh's James Clerk Maxwell building. The laboratories included more than 50 hands-on experiments that spanned physics across the entire 5–18 age range.

Jim Jamieson of the SSERC must be congratulated on the quality of the laboratory

experience. Seven hours were available during the week for these practical laboratory sessions and teachers were presented with a laboratory handbook, including details of all experiments – a resource that many said that they would make use of in their schools.

Novel ideas for teaching made several appearances during the week. The Monday evening bring-and-show session, which was so successful at last year's Summer School, was repeated, with many participants eager to demonstrate their own gimmicks and teaching tips. A full range of ideas – from a hopping kangaroo story to explain phase differences to the use of a spreadsheet to model radioactive decay – were on offer.

To top all of this, Tom Dickson, with inimitable enthusiasm, demonstrated that his time at Physics on Stage was well spent as he crashed his way through demonstrations too

nce to go back to school

Paperclip Physics gets new sponsor and higher profile



An action-packed week (clockwise from top left): a sighting shot with the trebuchet; Jim Jamieson of the SSERC supervises a novel experiment to demonstrate the relatively poor conductivity of gases (steam); summoned to the headmaster's (Bob Kibble of the Faculty of Education at the University of Edinburgh) study; and a musical soirée to finish up.



sponsorship for the event.

It is clear from the feedback that the week provided teachers with a rich series of experiences – experiences that will influence their professional actions and shape their teaching. If you are, or know of, a physics teacher who didn't manage to get to this year's Summer School, planning is already in hand for the fifth one, which will be hosted by the University of Glasgow on 27 June – 1 July next year.

As previously, the purpose of the fifth Summer School will be to bring together physics teachers from across Scotland and to give them the opportunity to discuss contemporary issues in physics, physics education and applied physics. In providing a forum for teachers to meet, share, discuss and enjoy physics together, the Summer School will aim to draw physics teachers into the wider group of professional physicists, helping them to feel that they are part of the physics community, and from this to enrich their work as school-based scientific educators.

A particular feature of the programme will be an opportunity for participants to explore and develop new skills through the production of a CD-rom-based resource to enrich a particular area of teaching and learning selected by the delegates themselves.

If you are interested in either booking a place or supporting the event, contact Lucy Murray, Room 317, Department of Physics and Astronomy, Kelvin Building, University of Glasgow, Glasgow G12 8QQ, Scotland (email: lucym@physics.gla.ac.uk; tel: +44 141 330 4707; fax: +44 141 330 4464).

Aventure Scientifique, the organizer of scientific summer camps, will for the first time be sponsoring the Paperclip Physics Competition in 2004/5, and the first prize at the Great Britain and Ireland Grand Final will be a trip to one of its scientific camps in France.

A documentary following one of the teams that was entered in last year's competition from the local heats through to the Grand Final has been distributed as a CD-rom to the Institute's Affiliated Schools, Institute of Physics in Scotland local representatives, SETPOINTS and Teacher Network coordinators.

Following the increased interest shown in the competition last year and in light of the above, it is hoped that, in addition to heats in Glasgow and Edinburgh, it will be possible to run others in Aberdeen, Dundee and/or St Andrews. The closing date for this year's competition is 8 October and full details, together with links to entry forms/online entry, are available at <http://paperclip.iop.org>.

Entry is open to teams of three to five S4/S5 pupils, who are required to present a demonstration that will explain to a non-scientist an application or principle of physics using only items that can be found in a typical home. Presentations are limited to five minutes. Members' support in promoting the competition, especially those with sons or daughters currently in S4/S5, would be particularly welcome.

Local heats will be held in late November or early to mid-December, and the Scottish National Final in either late December or February 2005 on a date that is compatible with the timetable constraints of the finalist schools and pupils.

The Great Britain and Ireland Grand Final will be held at the Thinktank in Birmingham on Wednesday 16 March 2005. The Institute will meet all travel expenses and any necessary overnight accommodation expenses for the Grand Final.

numerous to mention.

Billy McClune of Queen's University Belfast and Bob Kibble of Moray House each ran workshops on teaching and learning, the former showing how newspapers can be a rich source of science while the latter demonstrated how medieval machines can offer a new slant on projectiles.

In planning the Summer School, the organizers recognize that it is important to provide opportunities for teachers to meet and talk. Accordingly, a number of social interludes are built into the programme, not least the residential element, allowing friendships to form and lively discussions to develop.

Accommodation and meals at Pollock Halls in Edinburgh were of the usual high standard, and the programme allowed time for refreshment and reflection.

Dr Peter Hughes, chief executive of Scottish Engineering, was the guest

speaker at the course dinner on the final evening and his entertaining and musical anecdotes led seamlessly into a folksy soirée and singalong, where he was joined and accompanied by Bob Kibble and Dave Spittal of Dunfermline High School for several harmonious favourites. Some delegates were reportedly to continue in the bar in a similar vein until the small hours of the following morning.

Events such as the Summer School require considerable planning and financial support. This year's could not have been run without the time and energy of the organizing committee and the generosity of the sponsors.

The committee comprised representatives from the universities of Edinburgh and Glasgow, SCI-FUN, the SSERC and the Institute of Physics in Scotland. The Institute of Physics and the Institute of Physics in Scotland, the ISE 5–14 project and ESPRC provided

CALENDAR OF EVENTS OCTOBER 2004 – JULY 2005

View an up-to-date listing of Institute of Physics in Scotland events by searching for Scotland at <http://whatson.iop.org>.

Friday 8 October 2004

Closing date for entries for 2004/5 **Paperclip Physics Competition**
<http://paperclip.iop.org>

Wednesday 13 October 2004

Slow-light solitons
Ulf Leonhardt, University of St Andrews
4.00 p.m. (3.45 p.m. doughnuts)
Lecture Theatre 222, Kelvin Building, University of Glasgow
<http://www.physics.gla.ac.uk/Colloquium/>

Wednesday 20 October 2004

Present accelerator/FEL activity at MAX-Lab
Dr Mikael Eriksson, University of Lund, Sweden
4.00 p.m. (3.45 p.m. coffee/tea)
Room 3.14, John Anderson Building, University of Strathclyde
<http://phys.strath.ac.uk/information/colloquia.html>

Thursday 21 October 2004

The physics of motorbikes: are we reaching the limits?
Prof. Jan Evans-Freeman, Sheffield Hallam University
5.15 p.m. Tower Extension Lecture Theatre, University of Dundee

Wednesday 3 November 2004

Ultra-high Q erbium-doped toroidal microlaser on silicon
Prof. Albert Polman, California Institute of Technology
4.00 p.m. (3.45 p.m. coffee/tea)
Room 3.14, John Anderson Building, University of Strathclyde
<http://phys.strath.ac.uk/information/colloquia.html>

Wednesday 10 November 2004

Science and the Parliament
2.00 p.m. – 7.30 p.m. Our Dynamic Earth, Edinburgh

Tuesday 16 November 2004

Synthetic diamonds
Prof. Philip John, Heriot-Watt University
Sherry reception 7.00 for 7.30 p.m. Royal Society of Edinburgh, 22–26 George Street, Edinburgh

<http://www.phy.hw.ac.uk/~phydtr/iop/>

Wednesday 17 November 2004

Quantum dots, photonic molecules and living cells
Prof. John Donegon, Trinity College, Ireland
4.00 p.m. (3.45 p.m. coffee/tea)
Room 3.14, John Anderson Building, University of Strathclyde
<http://phys.strath.ac.uk/information/colloquia.html>

Friday 19 – Sunday 21

November 2004 Young Physicists Conference
University of Glasgow
<http://yp.iop.org/ypc2004.htm>

Wednesday 1 December 2004

Laser transmutation studies of nuclear materials
Dr Joe Magill, European Commission, Joint Research Centre, Institute for Transuranium Elements, Karlsruhe
4.00 p.m. (3.45 p.m. coffee/tea)
Room 3.14, John Anderson Building, University of Strathclyde
<http://phys.strath.ac.uk/information/colloquia.html>

Tuesday 14 December 2004

The physics behind computer games
John Sutherland and Dr David Allison, University of Abertay
Sherry reception 7.00 for 7.30 p.m. Royal Society of Edinburgh, 22–26 George Street, Edinburgh
<http://www.phy.hw.ac.uk/~phydtr/iop/>

Wednesday 15 December 2004

The structure, form and beauty of optical vortices
Prof. Miles Padgett, Department of Physics, University of Glasgow
4.00 p.m. (3.45 p.m. coffee/tea)
Room 3.14, John Anderson Building, University of Strathclyde
<http://phys.strath.ac.uk/information/colloquia.html>

Tuesday 11 January 2005

Controlling the flow of colour: photonics in nature
Dr Pete Vukusic, University of Exeter
Sherry reception 7.00 for 7.30 p.m. Royal Society of Edinburgh, 22–26 George Street

Edinburgh
<http://www.phy.hw.ac.uk/~phydtr/iop/>

Wednesday 19 January 2005

Anomalous Doppler effects
Dr Nigel Seddon, BAE Systems, Bristol
4.00 p.m. (3.45 p.m. coffee/tea)
Room 3.14, John Anderson Building, University of Strathclyde
<http://phys.strath.ac.uk/information/colloquia.html>

Wednesday 26 January 2005

Seniors Group Lunchtime Rendezvous
10.25 a.m. (10.00 a.m. coffee/tea)
Senate Room, Gilbert Scott Building
University of Glasgow

Wednesday 9 February 2005

Neurobionics: restoring vision in the blind
Christopher Kennard, Imperial College
4.00 p.m. (3.45 p.m. doughnuts)
Lecture Theatre 222, Kelvin Building, University of Glasgow
<http://www.physics.gla.ac.uk/Colloquium/>

Tuesday 22 February 2005

Tour of the UK Astronomy Technology Centre
Colin Cunningham, UK ATC
Royal Observatory, Edinburgh
<http://www.phy.hw.ac.uk/~phydtr/iop/>

Wednesday 23 February 2005

Particle physics during the last decade and future accelerators (preliminary title)
Brian Foster, University of Oxford
4.00 p.m. (3.45 p.m. doughnuts)
Lecture Theatre 222, Kelvin Building, University of Glasgow
<http://www.physics.gla.ac.uk/Colloquium/>

Wednesday 2 March 2005

Controlling electrons with lasers
Prof. Helen Fielding, University College London
4.00 p.m. (3.45 p.m. coffee/tea)
Room 3.14, John Anderson Building, University of Strathclyde
<http://phys.strath.ac.uk/information/colloquia.html>

Friday 11 – Saturday 19 March

2005 National Science Week

Tuesday 15 March 2005

Laser fusion
Dr Mike Dunne, Atomic Weapons Establishment
Sherry reception 7.00 for 7.30 p.m. Royal Society of Edinburgh, 22–26 George Street
<http://www.phy.hw.ac.uk/~phydtr/iop/>

Wednesday 16 March 2005

E-teaching and e-learning in physics at Edinburgh
Dr Simon Bates, School of Physics, University of Edinburgh
4.00 p.m. (3.45 p.m. coffee/tea)
Room 3.14, John Anderson Building, University of Strathclyde
<http://phys.strath.ac.uk/information/colloquia.html>

Thursday 24 March 2005

IoPIS/IMEchE joint seminar
Thin films: the 100 billion dollar industry no one knows about
Prof. Frank Placido, director of the Thin Film Centre, University of Paisley
6.00 for 6.30 p.m. University of Paisley (to be followed by a tour of The Thin Film Centre)

Wednesday 30 March 2005

Seniors Group Lunchtime Rendezvous
10.30 a.m. (10.00 a.m. coffee/tea)
James Clerk Maxwell Foundation, 14 India Street
Edinburgh EH3 6EZ

Saturday 2 – Tuesday 12 April

2005 Edinburgh International Science Festival
<http://www.sciencefestival.co.uk/>

Wednesday 13 April 2005

Cold antihydrogen
Prof. Mike Charlton, University of Wales
4.00 p.m. (3.45 p.m. coffee/tea)
Room 3.14, John Anderson Building, University of Strathclyde
<http://phys.strath.ac.uk/information/colloquia.html>

Wednesday 1 June 2005

Stirling Physics Meeting
University of Stirling

Monday 27 June – Friday 1 July 2005

Summer School for Physics Teachers
University of Glasgow

Physics and sport generate interesting questions

"How do the rules of physics control sport?" was the title of the Institute's 2004 annual Schools Lecture, presented at the University of St Andrews in May and attended by about 220 pupils from secondary schools in Fife and the former Tayside.

It asked questions like:

- How does a pole-vaulter appear to break the laws of physics?
- How does spin help David Beckham and Serena Williams fool their opponents?
- How is technology helping British Olympic hopes for gold?

These were addressed by Dave James of the University of Sheffield's Sports Engineering Research Group. James, who had recently completed a PhD on



On the ball: Dave James tackles questions from some enthusiastic pupils while Dr Bruce Sinclair (left) of the University of St Andrews looks on.

cricket sponsored by the England and Wales Cricket Board, is a former international cycle competitor and has acted as an EPSRC ambassador for science and technology, giving

many lectures on this subject, particularly to schools.

As the recent Olympic Games in Athens demonstrated, the extra millimetre or split-second can make the difference

between gold and silver, or separate victory from defeat.

In his lecture James examined how science and technology are helping athletes to push the boundaries of what is possible in various Olympic events, such as javelin, pole-vault, football and tennis.

By using simple experiments to bring the physics of sport to life, he was able to demonstrate to an audience of S3 pupils the link between science and sporting success, and how the laws of physics are at work.

James's lecture was delivered in association with the Engineering and Technology Board as part of its Engineering in the Olympics campaign.

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