IOP Institute of Physics
Education *Supporting Teachers*

Classroomphysics
The newsletter for affiliated schools
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Teachers learn how to radiate confidence in the classroom

"With a bit of practice, now I feel confident enough to perform the practicals and demonstrations safely."

Comment from Jules Bushnell, a science teacher who is new to teaching radioactivity

Do you have a cupboard or drawer marked "radioactivity" that contains some rather unloved and dusty-looking bits of equipment? The spark counter, with its polished wooden base and gauze above it, is one of those mysterious items that looks as though it comes from the 19th century. However, now is your chance to dust it off, along with the Geiger–Müller tube, and discover how to use them to amaze your students with the properties of ionising radiations. The enclosed DVD, "Teaching Radioactivity" has been produced to help and support you in doing just that. The content is built around a *Teachers TV* programme in which David Richardson, an experienced physics specialist, leads a group of teachers through a series of activities that illustrate the properties of ionising radiations.

Many teachers are wary of carrying out these activities in the laboratory, either because they are worried that the practicals won't work or because they are concerned about safety and feel that they lack the expertise to work with radioactive sources. Our aim is to allay these concerns by demonstrating safe practice in the use and handling of such materials as well as giving advice about getting the most from activities that demonstrate the properties of these ionising radiations. Although there are plenty of simulations and videos out there, these are no substitute for giving your students a live demonstration and letting them see you handle radioactive sources in a safe way.

The resources on this DVD fall into two categories:

A Geiger–Müller tube (left) and cloud chamber (right) demonstrate the properties of ionising radiations.

Resources for CPD and preparation for lessons

- ***Teachers TV* programme** The presenter shows teachers how to set up and manage demonstrations and activities that could be used to teach radioactivity at KS4.
- **Individual clips** These excerpts of each individual activity could be used in conjunction with the teachers' notes to help with preparation for a lesson.
- All of the activities are based on notes and further guidance from *practicalphysics.org*. These provide tips and suggestions for managing the activities in the laboratory to get the best from learners, as well as information about pieces of apparatus, safety and the background to the activities. There are also commentaries from CLEAPSS (http://www.cleapss.org.uk/) on practical science and technology safety guidelines for schools and colleges, and their rationale.

Resources for use in lessons

- **Animations** There are four high-quality 3D animations, which also appear in the programme. They aim to help both teachers and students to visualise what is happening at a microscopic and an atomic level. They would work well in a lesson when the teacher and students can be given control of the pace and provide their own commentary.
- **Medical physics presentation** This PowerPoint presentation and the accompanying teachers' and students' guides can be used to show some of the practical applications of this topic.
- **Background radiation worksheet and teachers' notes** This worksheet gives information for students to calculate their annual background radiation dose. The teachers' notes give guidance on using this as a classroom activity and sources of further information about the subject.
- **Virtual Physical Laboratory** These simulations allow students to discover the properties of radiation.
- **Physics Ethics Education Project teachers' notes** At *peep.org.uk* you will find information to support scientific debate. The notes highlight sections of the site that may be useful when discussing this topic.

Our hope is that this DVD will encourage teachers to use these activities and give more students an authentic and enriched experience of ionising radiations and subatomic particles. The programme was produced by Glasshead on behalf of the Institute and *Teachers TV*, with collaboration from CLEAPSS. The background radiation worksheet and teachers' notes are included in this issue of *Classroom Physics*.

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Editorial

Welcome to the start of a new academic year. In this issue there is plenty to inspire and support you in engaging with your students.

Our front-page story is the publication of our enclosed "Teaching Radioactivity" DVD. We hope that this will encourage teachers to use live demonstrations rather than relying on video or simulations. One of the DVD resources is also included in the newsletter as an insert. "Background radiation: measuring your annual dose" allows students to look critically at sources of background radiation. Teacher notes to accompany this worksheet and to offer additional support are on p8.

If your students enjoy adventure, they might be inspired by Team QinetiQ's race to the South Pole. You can follow its progress by joining the project (p2). We also have details of the Rolls-Royce Science Prize for 2009, along with details of this year's winners (p4).

You will be pleased to hear about the launch of the STEM Directories. These give information about quality-controlled resources and activities, including contact details (p3). One of the recent developments in this area is the rapid increase in the number of Science and Engineering Ambassadors (SEAs), who share their time and expertise to help to inspire young people. Victoria Hodges, a young physics graduate, describes her experiences as an SEA (p5).

There are resource updates from Earthlearningidea (p2) and the Gatsby Science Enhancement Programme (p7). Learning Skills for Science resources have been extended to subject-specific material for post-16 students. They will be useful for supporting the new AS specifications and the "How Science Works" strand (p5).

If you are concerned about student choices at 16, there are details of the Institute's *Relative Difficulty Report* (p3).

Upcoming Science Learning Centre courses for teachers and technicians are highlighted (p4) along with events for teachers and students (p6), and there is news from our Teacher Network (p7).

Clare Thomson, editor (tel 020 7470 4981, e-mail clare.thomson@iop.org).

Earth-science project is a global hit with teachers

"I know it's Monday when a new Earthlearningidea appears."
Comment from a teacher in India

Earthlearningidea was set up for the International Year of Planet Earth with the intention of reaching as many children throughout the world as possible, particularly those who suffer from both a lack of resources and thought-provoking teaching. Our aim is to foster a better understanding and appreciation of our natural world and how it works, encouraging the joy of knowledge about the Earth.

We have developed a website (http://www.earthlearningidea.com) for teacher trainers and teachers of Earth science and geography across the globe. This provides resources that will promote interactive teaching and the development of investigative and thinking skills, while encouraging educational debate. All of the activities assume minimal equipment and resources.

Earth-related activities are published every Monday evening in both English and Spanish. They are also being translated into Norwegian and Italian. Some activities have video demonstrations and, where the exercise has resulted in comments from teachers, these have been published as "extension" ideas. Our first sample was published last June, followed by four more in 2007. Since the beginning of 2008 we have been publishing an activity every Monday and we will continue to do so until the end of December this year. So far we have uploaded topics ranging from "The Himalayas in 30 seconds" to "How to weigh a dinosaur". All of our activities are free to download from our website.

We are now over a third of the way through the year and we want teachers to know the value of Earthlearningidea while weekly activities are still being posted.

For more information: If you have any ideas about how to reach more teachers or have comments about the project, contact the Earthlearningidea team (Chris King, Peter Kennett and Elizabeth Devon) at Keele University (e-mail info@earthlearningidea.com). Further details about our objectives and a link to our blog site can be found at http://earthlearningidea.pbwiki.com/About%20Us.

Polar race calls for cool heads

Team QinetiQ will be taking part in the first race to the Geographic South Pole since Scott and Amundsen's legendary duel nearly 100 years ago. The race will cover 420 miles across one of the harshest environments in the world and will take place during the short Antarctic summer between December 2008 and January 2009.

Register your school with Team QinetiQ and be part of one of the most exciting projects of the new academic year. This is your chance to follow Ben Fogle and James Cracknell as Team QinetiQ in Antarctica and bring them into your classroom.

The project starts in September and is tailored to address National Curriculum guidelines, primarily for 11–16-year-olds. Your school can receive resource material to help you and your classes learn all about the Antarctic environment and how scientists are applying science and technology to help to prepare the team for this epic race. Registered schools will also receive a wall chart and quiz download to encourage fun, interactive learning among students.

James Cracknell (left) and Ben Fogle (right) invite schools to take an active part in the polar project.

In addition, you can enter our competition to win a visit from Team QinetiQ during National Science and Engineering week in March 2009.

For more information: visit http://www.teamqinetiq.com/school_registration/ for further details about the project and to register your school.

THE STEM DIRECTORIES

Ongoing project will provide a central database for resources

The 2008/2009 STEM Directories, a family of three publications about science, technology, engineering and mathematics (STEM) enrichment and enhancement activities, are being launched at the British Academy (BA) Festival of Science in Liverpool in September 2008. They have been created directly to serve the needs of UK science, mathematics, and design and technology teachers.

"We've heard from so many teachers over the years who have wanted to know more about how to get involved with activities that can help them to inspire students about STEM subjects," said Annette Smith, director at the BA, a major provider of STEM enrichment activities. "There are literally hundreds of these activities run by organisations up and down the country and it's true that the sheer scale and variety is daunting. That's why we're delighted to be taking part in helping teachers to understand and experience more of these activities for the benefit of their students."

The BA, along with consortium partners the Royal Institution of Great Britain and the University of the West of England, is managing the STEM Directories project over three years for the mathematics, science and engineering communities. "It's just the beginning of the project," said Smith, "and we're very keen to hear from teachers about what they find useful in the directories and what else they'd like to see."

The publications were created following research from the Department of Children, Schools and Families, which showed that teachers and lecturers want clear coordination and signposting of support and resources that they can trust. They also need events or experiences that cannot be delivered with school contacts; resources, schemes and activities that are relevant to them and their students; and ways to tie these to the curriculum so that the impact and outcomes can be sustained.

A STEM enrichment activity inspires some pupils.

The directories aim to do this by providing clear, easily accessible information for schools and colleges in three distinct volumes – one each for science, technology and engineering, and mathematics, with enough detail for teachers to identify quickly and easily the activities and support that are likely to meet their needs.

For more information: visit http://www.stemdirectories.org.uk/.

New report analyses relative difficulty of examinations in different subjects

Many young people and their teachers believe that the sciences, along with some other subjects, including mathematics and foreign languages, are more difficult than other A-level courses and, as a consequence, are discouraged from studying them. The Institute and the Royal Society commissioned a report from the University of Durham to collate and analyse the most recent evidence as to whether or not some GCSE and A-level subjects are more difficult than others.

In particular, it asks whether STEM subjects are the hardest courses of study. However, the background to that question is a concern that such relative difficulty is part of the reason for the decline in take-up of many STEM subjects and that, by implication, addressing the problem of difficulty would help to redress the decline.

The research has found that, overall, there are substantial differences in the average grades achieved by the same (or comparable) candidates in examinations in different subjects, at both GCSE and A-level, and that the variance between subjects appears to be extremely stable over time.

At A-level, the sciences, plus maths, are among the hardest of all A-level courses. On average, science subjects are nearly two grades harder than the easiest A-level subjects, whereas this is not so clearly the case at GCSE.

This suggests that a good grade in maths or a science subject recognises a higher level of achievement than the same grade in almost all other subjects. This may indicate that qualifications in these subjects have greater currency with employers and universities, but it also means that they are perceived as being more difficult.

With UCAS points, which are derived from A-level grades and viewed as the clearest determinant of where a student will attend university, there is concern that students are being influenced to take "softer" subjects to obtain the highest points score, and hence the best university places. High grades also assist a school's position in annual examination results-based league tables.

There are significant implications for taking any immediate or direct action to resolve this issue. Lowering standards in certain subjects would be unacceptable to higher education and others, while increasing the difficulty of other subjects could have a serious impact on participation in tertiary education.

Nonetheless, the current situation is unacceptable and the Institute and others have called on government to collect and publish annual data showing the relative difficulty of different subjects at both GCSE and A-level. These data could be used by universities and others to compare performance across subjects, and to make their own decisions about entry/recruitment criteria. This market-led approach, as long as it is coupled with the availability of appropriate information for teachers and young people when they are making subject choices, should rebalance the comparability of the different subjects at the point of use.

For more information: To see the full report, visit http://www.cemcentre.org/score2008report.pdf. If you have any comments, contact Daniel Sandford Smith (e-mail daniel.sandfordsmith@iop.org).

Rolls-Royce awards prestigious science prize

On 18 June, guests from the science education community, industry, government and hopeful finalist teams gathered together at London's Science Museum for the announcement of the winner of the 2008 Rolls-Royce Science Prize.

St Anne's Primary School, Corkey, Northern Ireland, swept the board, winning both the prestigious Rolls-Royce Science Prize and the Eden Project Prize for the most successful project encompassing Eden's values. The small primary school won the £15 000 award after the team's year-long commitment to delivering its superb "Investigating water" project, in which students explored the water cycle and analysed the quality and treatment of water in their local community.

Prize-winning team members from St Anne's Primary School collect their award at the Science Museum.

On receiving the award that evening from Sir John Rose, chief executive of Rolls-Royce, project team leader Cieran Kinney praised the competition and the efforts of his team, saying: "Taking part in the Rolls-Royce Science Prize has drawn the whole school together and children who had little interest in science are now telling me that they want to be science teachers. Winning the award is a real incentive to continue to inspire children about the importance of science."

The runner-up prize of £10 000 went to the team from St Michaels Roman Catholic School, Billingham, for its project exploring "Science teaching and industry" in the north east. The team wanted to help to connect its students with the wealth of active industry and real-world science taking place in the community. By investigating science in the workplace, the team was able to create a valuable resource for the new applied science GCSE, and to inspire students to pursue the subject further.

Every year, Rolls-Royce awards an array of fantastic science prizes, among them £15 000 to the winner, £10 000 to the runner-up and £5000 to the nine finalists. There are also 50 special-merit awards of £1000 for teams that are commended by the judges. Entries are now being taken for 2009.

Rolls-Royce is looking for innovative projects that engage students and spark their interest in science. The inaugural prize-winning team, Crown Woods School, came up with the idea of turning itself into a CSI department. Judges rewarded the imaginative project for its enterprise.

Participating teachers have found that the process helped them with their professional development. Entrants think that the time spent entering the competition has been beneficial to teachers, pupils and their schools. It is also a great way for Scottish teachers to fulfil their CPD requirements, both during their working week and as part of their additional 35 hours per annum.

For more information: For your chance to take part and to access free teaching resources, visit http://www.rolls-royce.com/scienceprize. Alternatively, contact the science prize helpline for teachers (tel 0800 028 0759) or Vaughan Lewis (e-mail vaughan.lewis@rolls-royce.com).

Learning centres help teachers to update skills

Science Learning Centres offer high-quality physics CPD. Whatever your role in science education, we are sure to have the perfect course to suit you. With a network of 10 centres across the country, access to innovative and inspiring physics courses is within easy reach.

Based on research undertaken by the Institute of Physics, our "Girls in physics" course explores tried-and-tested techniques, and provides experience of innovative methods of classroom practice that can lead to increased engagement and achievement of girls studying physics. Practical ways are suggested to examine these issues in the context of the school, the physics department and the classroom.

"Physics for non-specialists" is an opportunity for non-specialist teachers of physics to develop greater confidence and competence in their teaching of the subject to inspire and enthuse the pupils that they teach at both KS3 and KS4. Participants will look at key, basic principles in physics to develop their own knowledge of the subject. They will also spend time looking at pupils' common alternative conceptions.

"Bringing cutting-edge science into the classroom: astrophysics" outlines some of the more recent scientific advances. It covers the fundamentals of astrophysics, which appear in the new specifications, such as origins and expansion of the universe, gravitation, measurement and scale.

Covering topics including radiation in the environment, physical changes and energy, "New practical techniques in physics" is designed to enable science teachers and technicians to gain an insight into a range of new practical techniques in physics using resources, publications and software, including those produced by the Science Enhancement Programme.

Teachers and technicians enhance their expertise.

With Impact Awards available to your school for all of these courses, there has never been a better time to update and develop your physics skills.

Haley Cox

For more information: For the full list of physics courses available, visit http://www.slcs.ac.uk/network/courses/physics.

Learning Skills for Science

Learning Skills for Science (LSS) was originally devised at the Weizmann Institute in Israel. Between 2005 and 2007, the Science Enhancement Programme (SEP) team worked with Weizmann and the Nuffield Foundation to translate, adapt and significantly develop the programme for UK teachers working at KS4 (14–16-year-old pupils). LSS focuses on a two-day training programme for teachers, supported by a classroom-activity book and website with resources for student projects.

LSS aims to integrate higher-order learning skills into the delivery of scientific content. The programme offers teaching methods and materials that foster specific skills development in six key areas: information retrieval; scientific reading; data representation; listening and observing; scientific writing; and knowledge presentation. Each skills area is divided into subskills. For example, scientific writing covers how to prepare a report, write an abstract and construct a bibliography.

During the past 18 months the KS4 LSS programme has been rolled out across schools in England, largely through partnership agreements with individual regional science learning centres (SLCs). The national network of SLCs has included LSS in its core programme of science teacher professional development. This means that, from September 2008, the regional SLCs will offer LSS courses throughout the year. To date, more than 1100 KS4 teachers have been trained in LSS and we expect this number to reach 3000 by July 2010.

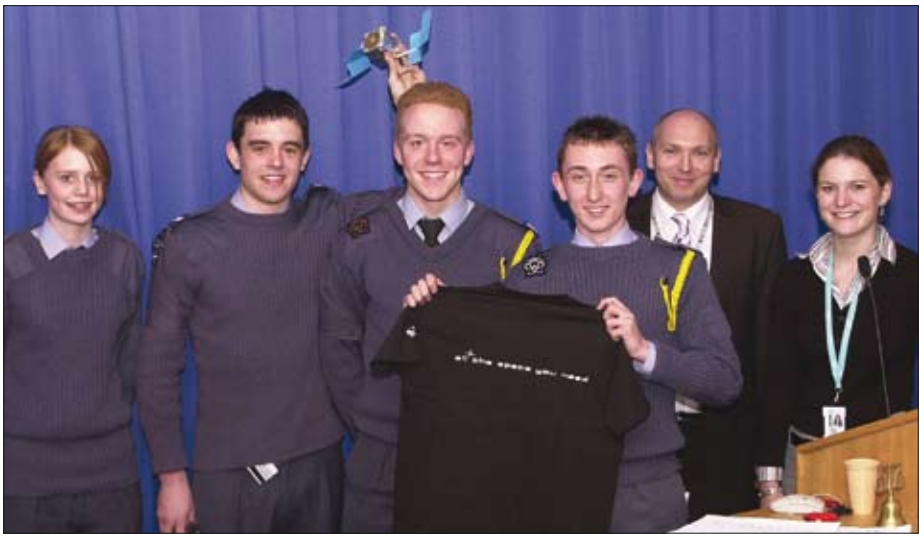
A two-year independent evaluation of LSS is nearly complete. Evidence from the assessment confirms the success of LSS at KS4 and identifies that teachers are asking for similar materials at KS3 (11–14-year-olds) and at KS5 (AS- and A-level) in particular.

The Gatsby SEP together with the Nuffield Curriculum Centre have developed subject-specific LSS projects applicable to KS5, and in particular A-levels in biology, chemistry, physics and applied science. These activities will be available from September and will continue to be piloted in schools and colleges during the 2008/2009 academic year. In addition, a tailored programme of KS5 LSS training to support schools and further education colleges will be available from December 2008.

Jean Scrase, director of CPD at Gatsby SEP

For more information: visit http://www.sep.org.uk/lss.asp or contact Jean Scrase (e-mail j.scrase@sep.org.uk).

Science and Engineering Ambassadors inspire students



The cadets celebrate their winning "Build a satellite" competition entry with Victoria Hodges (far right).

The Science and Engineering Ambassadors (SEAs) Programme is the Science, Technology, Engineering and Mathematics Network's flagship project. SEAs are individuals from a variety of STEM backgrounds, from across the UK, who offer their time, enthusiasm and expertise to help schools to inspire young people.

I joined Astrium Ltd in July 2006 after completing my undergraduate degree in physics with satellite technology at the University of Surrey. During my course I spent a year working in the space industry in Germany for a company called VEGA. I had always been interested in a career in the space industry, but it wasn't until university that I found out about Astrium. I chose to apply for a graduate position there because it is the UK's (and Europe's) leading satellite design and engineering company. Even though I am a physicist, I always wanted to work in industry rather than in academia, so Astrium has been the ideal place for me to use my experience in physics, and it proves valuable on a daily basis. I became an SEA in November 2006 and since then I have taken part in many activities, from "Build a satellite" workshops in schools to giving careers talks to sixth-form students.

As an SEA I developed a new school-visit programme and materials to be used for school visits to Astrium sites. This half-day programme is designed for students aged 11–18 and is subdivided into KS3-, KS4- and AS/A2-specific workshops. The aim is to enable students to understand how space technology is an integral part of their daily lives, and also how the physics and maths that they are learning at school is relevant to the space industry and the work that we do.

The new programme has now been running for almost a year and has received a warm reception from all of those who are involved. I have taken part in more than 10 on-site visits during the past nine months, including some from non-school groups, such as the Air Cadets and various holiday clubs (e.g. Gifted and Talented groups and the University of Leicester's Space School summer camps).

For me the most enjoyable part of being an SEA is having the opportunity to share my knowledge and enthusiasm with possible future scientists and engineers. It adds another dimension to my work as an engineer and benefits my own professional development, enabling me to improve my communication and presentation skills. I always feel energised and even more enthusiastic than usual about my job after involvement in an SEA event.

Victoria Hodges, SEA and graduate engineer with Astrium Ltd

For more information: To find out more about SEAs, visit http://www.stemnet.org.uk. If you are interested in organising a visit to Astrium Ltd (http://www.astrium.eads.net/company) for your students to learn more about space and satellite engineering, get in touch with our SEA coordinators in Stevenage (contact Sarah Forster: e-mail sarah.forster@astrium.eads.net) or Portsmouth (contact Samuel Juniper: e-mail samuel.juniper@astrium.eads.net).

Events

EVENTS FOR TEACHERS

East Midlands Teacher Network Day

Ockbrook School, Derby

20 September

This is an opportunity for anyone teaching or supporting physics classes to receive up-to-date information, share ideas and collect free resources. The keynote lecture entitled "Boomerangs, bouncing balls and other spinning things", given by the charismatic Dr Hugh Hunt, will appeal to everyone. You will be able to view Lab in a Lorry, which gives young people the chance to explore science through innovative hands-on experiments.

Details: contact Neal Gupta (e-mail neal@ngupta.wanadoo.co.uk) or Helen Pollard (e-mail hjp@oakham.rutland.sch.uk).

Frontiers of Physics 2008: Teachers of Physics Annual Conference

The School of Physics, University College Dublin

27 September, 9.30 a.m. – 4.00 p.m.

The day will consist of lectures, demonstrations and workshops for post-primary teachers of physics. Presentations will include:

- "The Antikythera mechanism", Prof. Mike Edmonds, Cardiff University
- "SciCast Physics", Alison Hackett, Institute of Physics in Ireland representative
- "Some of my favourites", Rory Geoghegan, Froebel College of Education
- "Moving forward: leaving certificate physics", Michael Halton, the National Council for Curriculum and Assessment
- "Leaving certificate physics papers 2008 review", David Keenahan, Institute of Physics in Ireland Teacher Network coordinator

Details: contact Teacher Network coordinator Paul Nugent (e-mail paulnugent@eircom.net) or visit www.iopireland.org.

North East Scotland Teacher Network Day on AH Physics

Robert Gordon's College, Aberdeen (10 minutes' walk from the railway station)

4 October, 10.00 a.m. – 3.00 p.m.

This includes workshop sessions on possible investigation topics and experiments, a talk from experienced SQA examiners, an equipment and apparatus exhibition, and a pack of printed and electronic resources to take away. There will be plenty of opportunities to chat and discuss ideas with other physics teachers and Teacher Network coordinators.

Details: contact Stuart Farmer (e-mail stuart.farmer@yahoo.co.uk).

North East Institute of Physics Teacher Network Meeting

Cramlington High School, Northumberland

8 October, 4.30 p.m.

This event entitled "What happens next?" will be led by David Featonby. The meeting will focus on sharing lesson ideas to stimulate and inspire physics students, with suggestions for practical use.

Details: contact David Featonby (e-mail featonby@onetel.com).

Welsh Physics Teachers Annual Conference

Christ College, Brecon, South Wales

8 October

This is a day of workshops, lectures and discussion for teachers, organised by the Institute of Physics in Wales.

Details and registration: visit www.iop.org/activity/education/Teacher_Support/Teachers_Network and click on "South Wales".

Creative Science Exploration

Science Museum, London

8 October or 19 November

Launchpad, the popular hands-on gallery, has been redeveloped and relaunched, and it is perfect for KS2 and KS3 physics. Find out how the Science Museum's inspiring approach to questioning, exploration and open-ended learning can be used to stimulate discussion and excitement about science in the gallery or the classroom. Learn innovative practicals from the range of online *Launchpad* resources and receive a goody bag full of resources and information.

Check out the free online resources at www.sciencemuseum.org.uk/educators and click on "Classroom and homework resources".

Details and booking: contact the education booking office (tel 0207 942 4777).

Physics Update: a Course for Practising Teachers of Physics

Department of Engineering, University of Cambridge

12–14 December

This is a stimulating mixture of lectures and workshops with accommodation at Trinity College, University of Cambridge (single rooms with en suite facilities). Further information and an application form will be sent out to schools in September.

Details: contact Leila Solomon (e-mail leila.solomon@iop.org, tel 020 7470 4821).

ASE Annual Conference

University of Reading

8–10 January 2009

Teachers will be able to meet the Institute's education department staff and enjoy three days of varied workshops and lectures, as well as a major exhibition of resources and apparatus. Highlights include the John Lewis lecture on "Climate change: a risky business", given by Geoff Jenkins, and sessions run by the Teacher Network.

Details: visit www.ase.org.uk.

EVENTS FOR STUDENTS

Institute of Physics 2008 Schools and Colleges' Lecture: Rock in 11 Dimensions – Where Physics and Guitars Collide!

This successful free lecture for 14–16-year-olds, given by Dr Mark Lewney, continues its tour of the UK.

Details: visit www.iop.org (click on "Events" under "Schools and colleges") or contact Clare Mills (e-mail clare.mills@iop.org).

Trust Physics!

Penrhyn Castle, Bangor, North Wales

24 September, 10.30 a.m. – 3.00 p.m.

This is a day of physics workshops run by the National Trust (NT) and the Institute. There are a limited number of places for pupils from years 5–7 still available. The workshops will be led by members of the science PGCE course from Bangor University and NT staff.

Details and booking: contact Andrea Fesmer (e-mail andrea.fesmer@talk21.com).

Physics in Perspective

University College London and the Royal Institution

15–17 February 2009

This is a three-day course for sixth-formers and college students, with the purpose of bringing to participants some of the excitement, relevance and fun of physics. It consists of a series of six lectures.

Details: contact Leila Solomon (e-mail leila.solomon@iop.org, tel 020 7470 4821).

The South West Branch of the Institute of Physics Festival of Physics

Redland Green School, Redland Court Road, Bristol BS6 7EF

21 March 2009, 10.00 a.m. – 4.00 p.m.

This annual festival will include talks and demonstrations accessible to students, and a free lunch for those who book in advance. Full details will be available at http://sw.iop.org. It will not be necessary to organise official school groups because the event will be on a Saturday. Students and/or teachers can come alone or with friends and family.

Gatsby reaches out to extend free practical resource series

Fantastic Plastic and *Composites: Designing Materials for the Future* are the latest booklets published by the Gatsby Science Enhancement Programme (SEP) in the Innovations in Practical Work series.

Fantastic Plastic considers the nature of polymers, how they are made and the relationship between their properties and applications. There are practical activities based on traditional polymers, such as polystyrene and rubber, as well as involving modern and smart polymers, such as polyox and hydrogel. Aimed mainly at KS4, the publication has been written by Averil Macdonald and is based on her highly popular lecture for schools (see http://www.scienceworks.org.uk/).

Composites: Designing Materials for the Future is aimed at teachers of KS3 and KS4 science. The use of composites is not new, but novel composites are being developed to meet modern demands. The booklet provides a range of activities, using everyday materials, to help students to understand the properties of composite materials and the development of particular combinations of properties and functions for specific tasks.

Both publications are free to download for all SEP Teacher Associates. To join free of charge and to start accessing SEP resources, visit http://www.sep.org.uk.

If you have any ideas for effective demonstrations in the physical sciences, SEP would be pleased to hear from you. These might be ideas for using new gadgets that are now commercially available, old classics that might be given a new lease of life or ideas for making simple demonstration equipment.

For more information: If you would like to share your experience with other teachers, visit http://www.sep.org.uk/demonstrations.

New conference inspires Welsh physics teachers

The first Institute of Physics Teacher Network for North Wales Conference was held at Bangor University on Tuesday 3 June. Approximately 60 students and teachers attended the event, and feedback included:

- "Good ideas for use in lessons."
- "A brilliant day."
- "Excellent resources to use within lessons."
- "As a non-physicist, the conference really inspired me to be more enthusiastic about the subject."
- "Excellent workshops."
- "Extremely useful."
- "An excellent speaker."
- "A thoroughly enjoyable day."

The day included a mixture of lectures and workshops to allow people to extend both their physics knowledge and their pedagogic skills. The conference will return in 2009.

For more information: contact Andrea Fesmer (e-mail andrea.fesmer@talk21.com).

Teacher Network research projects can enhance professional development

While the Institute continues to try to increase the level of expertise and numbers of those teaching physics through initiatives like the Physics Enhancement Project, the Science Additional Specialism Programme and the Teacher Network (see the Institute's education webpages for more details about these projects), there are still some experienced teachers who want to improve and take their teaching, and their students' learning, to even greater heights.

The Institute's Teacher Network delivers approximately 2700 days of CPD to teachers each year, but, up until now, this has tended to be in the form of workshops. In the future we hope to provide something more for experienced physics teachers by organising a variety of research projects that will focus on fairly concrete ideas, which may help in our teaching or may give information that would be of use in deciding a way forward for physics teaching generally.

The idea is that each project will be overseen by someone with a research background to make sure that the data collected are valid. The Teacher Network coordinators will help the teachers involved to collect the data and will also organise any meetings needed for discussion concerning tasks or results. Each project will run for several cycles, with each one lasting for an academic year. While the projects should generate useful information from the outset, after a number of years the evidence collected should be highly indicative of the effectiveness of a teaching approach, for example. It is hoped that this can be done with only a small amount of effort from each teacher, possibly seeking permission to administer tests at their school or using a specific intervention over a relatively short period of time. The extent of the Teacher Network should mean that the accumulation of a series of "light touches" leads to a rather heavyweight result.

Teachers enjoying David Featonby's workshop on the use of magnets in classroom physics activities.

As from September we intend to roll out a pilot project. The aim will be to see if running a science fiction film and book club in a school changes children's attitudes to science. This isn't intended to be indicative of typical projects but it seems a good idea to use it as a tool to look at the way that other projects could be made to work. Two of the areas that we will explore are how information is fed back and how those taking part communicate effectively, an obvious first step being to use *Wikipedia*.

Currently we're open to suggestions as to what those teaching physics would really like to know. We can't promise anything at this stage but if you're interested in this idea and you'd either like to take part, or you can think of an interesting research question, then get in touch with your local Teacher Network coordinator or contact Gary Williams (e-mail gary.williams@iop.org).

Gary Williams, Institute of Physics Teacher Network national coordinator

Background radiation: measuring your annual dose

The enclosed worksheet has been prepared as a classroom activity. It works best when done in groups or as a whole-class activity, with time allowed for discussion as points arise.

Some of the data have been simplified to assist with teaching points. In particular, in "4 Rocks and buildings", gamma radiation emitted by rocks and soil varies from place to place as well as by dwelling type. Some of the doses included in the worksheet are negligible compared with the variability in others. They are included so that pupils can have data from which they can deduce this fact and accurately assess which are the most significant for them. It may come as a surprise to them to find out what the most significant sources of background radiation are.

Visit http://www.defra.gov.uk/environment/statistics/radioact/radsource.htm for further detailed information about all of the sources of background radiation. The Health Protection Agency (HPA) website (http://www.hpa.org.uk/) has more general information about both ionising and non-ionising radiation. The National Radiological Protection Board (now HPA) "at-a-glance" leaflet *Radiation Doses: Maps and Magnitudes* is available from the website and can also be purchased as a slide set. Click on "Radiation" and then "Publications" to find these resources.

For further details about the millisievert (mSv), see a suitable textbook. This is the unit that radiation dose is measured in and is the energy absorbed per unit mass multiplied by a "quality factor", which estimates the sensitivity of cells to that type of radiation. (1 mJ/kg of alpha radiation has the same effect as 20 mJ/kg of beta radiation. Both are 20 mSv.)

The estimated total radiation dose should be in the range of 2.1–7.8 mSv per year, with the average annual dose for people in the UK being 2.5 mSv. However, commercial aircrews and workers in the nuclear industry receive approximately 4.5 mSv per year. The average annual dose from radon for a person in the UK is 1.3 mSv.

There can be a significant variation in the estimated dose if people have had medical treatment over the course of the last year, and this result can promote a useful discussion about the risks and benefits of such treatment. Of course, this needs to be sensitive to the possibilities of students or their close relatives having serious and life-threatening conditions.

Visit http://www.ehsni.gov.uk/pollution/radiation/radon.htm for more information about radon in Northern Ireland and http://www.rpii.ie/index.aspx for the Republic of Ireland. The information for the Republic of Ireland is not available in a form that is compatible with the data for the UK.

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