Perhaps you’re looking for a way to excite primary school children about the science awaiting them at secondary school. Perhaps you want to improve links with your feeder primaries? If so, you might like to try a Science in Action Day (SAD for short!), run for the first time earlier this year in rural North Yorkshire at Norton College with a neighbouring school in Malton. Science coordinators chose those pupils they felt would benefit most (not necessarily the most able scientists) from both sets of feeder primary schools. Over a hundred pupils wanted to come (from roughly 20 feeder schools, most of them small village primaries) and the event – with only two staff and one technician to run the day – had to severely limit numbers.

The focus was ‘Rockets’. The NASA kids’ website (http://kids.msf.nasa.gov and then follow the links to the rocket pages!) provided a wealth of activities for the morning. The day began with a big screen presentation about the Shuttle and some of the principles involved in launching it into space. The 60 pupils who attended were then divided into two groups for hands-on activities. One group looked at the principles of momentum conservation, with activities ranging from building and racing balloon-powered rocket cars to making Hero’s engines from fizzy drinks cans. The second group looked at fuels, with activities such as making matchstick solid fuel rockets and launching a hydrogen-powered tin can rocket from floor to ceiling in the laboratory.

After a break, the first group of pupils went off to build their own drinking straw-launched rockets and the other group went off to the IT suite to investigate the optimal launch parameters for a water rocket. The race was on to see who could launch their virtual rocket to the greatest height (see http://www.ag.ohio-state.edu/~rockets/).

Finally real rockets were launched: water rockets – one commercial and one home-made – and a STOMP rocket, a larger scale version of the drinking straw rockets (both rockets are available from the Science Museum – see http://www.sciencemuseumstore.com/).

At the end of the day every pupil was presented with a certificate declaring them to be an expert in rocketry and they were returned, flushed and excited, to their waiting parents.

Simon Carson and Ian Martin

In a hurry…

The pace of publication in education may seem rapid as one reform follows another. But in the world of research things can happen even more quickly.

A group from Tokyo University discovered bulk superconductivity in magnesium diboride (MgB₂) at 39 K—the highest transition temperature so far achieved in a bulk non-copper oxide superconductor. What makes it especially remarkable is the fact that this material is cheap and readily available, unlike its predecessors. The group published their findings on 1 March in Nature.

Almost at the same time a few groups around the world have been racing to publish their results on this wonder material, some of the rivals being at the University of Wisconsin, USA, and Cambridge, UK.

On 1 March at 3:20 pm the Cambridge group submitted their article on MgB₂ to the journal Superconductor Science and Technology. On 2 March at 4:58 pm it was published online after having been refereed, edited, typeset and checked by the authors.
The Stirling meeting in Scotland has for many years attracted an audience of 250 physics teachers from all over Scotland. The 27th Stirling meeting will be on Thursday 31 May. The keynote speaker for the afternoon session will be Professor Murray Campbell with his musical instruments show.

The morning programme is focused as usual on the curriculum with some emphasis on the new advanced Higher course. As a taste of what happens at this excellent meeting here is a report of what happened last year.

Arthur Gibbons, who chaired the morning session, introduced Donald Vass HMI, to give a presentation on ‘Standards and Quality Inspections’. This was of enormous interest to an audience which comprised many heads of department, well aware that they, sooner or later, would themselves be the subjects of such an inspection. Inspections in schools will be more frequent than before, one per generation, i.e. every six years. Their purpose is threefold: to establish how effective the department is, how well pupils are performing in the department and how well the department is managed.

Adrian Watt spoke on ‘New Technologies in Physics Teaching’. In his view the distinguishing feature of school physics was experimental work. At its best, this was something that would turn pupils on to physics. Pupils, however, were now more likely to be exposed to high technology in IT departments (referred to as ‘typing and bookkeeping’) than through anything currently seen in the average physics lab. The new technology does two things: it harnesses the power of the modern computer to the actual experiment, and more significantly, it switches the emphasis away from the collection of the data to the analysis of the data.

In the afternoon Richard Morris from MIRA gave a talk on ‘The Physics of Car Crashes and Occupant Protection’. There are two branches of vehicle safety: active or primary safety, e.g. ABS braking, and passive or secondary safety, which is engaged in reducing the effects of accidents. Richard described, with the help of video clips produced at MIRA and a simulation, the three stages of a collision: vehicle/object, occupant/vehicle interior and internal organs/body wall. The heart is a floating mass; during a collision the ribcage compresses and the heart moves forwards and up. If the biomechanical limit for the heart of 60g for 3 ms is exceeded, then the aorta ruptures, pumping blood into the chest cavity instead of the brain. This leads to death. The subject of compatibility was described. This analyses how different people react to different types of ‘roadside furniture’. Collision objects like walls and parapets produce different acceleration profiles on impact. Variations in age and sex and mass of occupants also have significant effects. This means that ‘median’ crash test dummies are developed which only give reliable information for individuals with profiles close to the dummy. The MIRA microcell barrier, a recent development, is used to analyse frontal impacts. It comprises 480 50 mm² load cells with eight larger cells on the sides. A test plot was examined from such a device and the way in which the vehicle in the test absorbed energy was clearly visible. Small cars do not absorb energy in the frontal structure as well as large ones.

A major feature of the meeting are the IOP Awards for students who have the best exam performances. The education representative Michael McVey introduced the Prizewinners and Scottish Branch Chair Heather Reid made the presentations.

As chair, Heather thanked all those who had participated, and Jack Woolsey in particular for making the day possible.

Michael McVey
Education Representative, Scottish Branch

---

### Scottish Stirling Meeting

| There were four winners at Higher Grade |
|----------------------------------------|
| 1st place | Jennifer Smillie | Preston Lodge School Prestonpans |
| 2nd place | Dilraj Jagpal | Boclair Academy Glasgow |
|          | Claire MacLeod | Linlithgow Academy |
|          | Susannah Cooke | Wellington School Ayr |

| There was one winner at CSYS |
|-----------------------------|
| CSYS | Keith Sutherland | George Heriot’s School |

Profiling the effects of accidents.
Global warming forecasts rise in skin cancer

Depletion of the ozone layer may allow more ultraviolet radiation to arrive at the surface of the Earth, but many other factors control the incidence of skin cancer. Skin cancer is caused by prolonged exposure to UV over many years, and rises we are observing in skin cancer rates are also due to people spending more time in the sunshine, exposing skin to the sun, going on holiday to sunny places and using sunbeds (sunbed users double their risk of skin cancer).

Professor Brian Diffey of Newcastle General Hospital presented a very interesting paper at The Physical Environment and Health conference at Congress. Current lifestyle studies suggest that as the outdoor temperature rises in the UK people will spend more time outside in the sun; this suggests that more people will get skin cancer due to global warming, assuming that we don’t teach people to protect their skin. Other countries, which become heated to levels that make sunshine uncomfortable, may find more people seeking shade—in which case their skin cancer levels may decline. KP

Events

2001 SET week

Science, Engineering and Technology (SET) week is an annual event in the UK when many lectures and science events are held to produce a concentrated focus on the Public Understanding of Science. This year events were as diverse as the lecture given by Colin Wright on the ‘Physics of Juggling’ at Brighton to a call in a lecture in Leeds for active observation and tracking of asteroids that may end up hitting the Earth. Duncan Steel, author of Target Earth, spoke about the background which has led to the recent House of Lords report on the asteroid risk. He told the audience that 23 years’ warning was needed if we were to ‘gently’ move an asteroid out of a collision course with Earth. KP

E-mail Discussions

Learning in science

The e-mail group ‘learning-science-concepts’ is a discussion list for those interested in aspects of learners’ scientific conceptions, understanding the learning process and facilitating learning.

Learning-science-concepts is for more reflective discussions than other e-groups and includes all science disciplines. The discussion list is a forum for teachers, researchers and others who are interested in aspects of learning in science. Suitable postings include observations about learners’ conceptions; news of relevant publications; consideration of problematic aspects of learning science; information about teaching materials, curriculum or research projects.

You can join the list through the internet, by visiting the website: http://www.egroups.co.uk/group/learning-science-concepts.

You can choose to receive each e-mail message sent to the group separately, or to have them compiled into a daily digest. The list is moderated by Dr Keith Taber of Homerton College, University of Cambridge, who may be contacted at kst24@cam.ac.uk. Keith Taber

Student Activity

Paperclip Physics

This event for students raises awareness of physics, stimulates interests and gives a real insight into what the subject is about. It is also well known that the way to really show an understanding is to explain something to others. That is the success of Paperclip Physics. The idea is to explain a basic physics concept in five minutes using only everyday materials. The judging panel contains a physicist, a teacher and a non-physicist, at whom the explanation must be aimed. Qualifying rounds are held by branches around the UK and then finalists travel to London for the finals. This year’s winner was Brighton, Hove and Sussex Sixth Form College, who explained Momentum and Impulse. PB
One of the most difficult questions that students ask during a science lesson is ‘How do we know that?’ That is the question addressed by a new course for 16–19 year-old students in the UK. The answer is often, ‘I’m sorry I haven’t got time to go into that right now’ or ‘It’s not on the syllabus, just accept it as true’. This seems a great shame as science should really be all about understanding how and why things happen and not just learning ‘facts’ by rote.

Perspectives on Science is a proposed new AS-level that will give students and teachers a chance to look at how things were discovered: the philosophical and historical development of modern science. It is a course that will address the human face of science – the key thinkers, the great debates and the forgotten mistakes that have led to the science we know today.

Where are we?
Where is the Earth in the universe? How do we know the Earth rotates around the Sun? How do we know that a star is 10 trillion miles away? For answers we look at the work of scientists such as Copernicus, Brahe, Galileo, Kepler, Newton, Hubble, Hoyle, Penrose et al.

What are we?
Why do we think all animals evolved from a common ancestor? What is DNA? Who discovered it? What are atoms? Where do atoms come from? For answers we study the work done by Lamarck, Darwin, Mendel, Crick, Watson, Lavoisier, Rutherford and Seaborg, to name but a few.

When are we?
How long ago did dinosaurs walk on Earth? How old is the Earth? How old is the universe? What is time? For answers we look at the ideas of Wegener, Curie and Einstein etc.

The answers to all these are interrelated. With the Perspectives on Science course we aim to show how the work of one scientist influences others. The course will look at the work of scientists from all cultures, not just those who practise the ‘western scientific method’.

We wish to look at the great mistakes, for example phlogiston theory, Blondlot’s N rays and cold fusion. Why do we prefer the models we use? Are we likely to change our views on how things work in the future?

It is hoped that the course will be taught by scientists and historians. It is intended to appeal to science students wishing to widen their understanding of their subject and arts students looking for a new approach to science. At the moment, with support from the Royal Society, a small team of teachers, authors and educational researchers are designing trial materials for the course.

If you wish to receive further information about the course as it becomes available, or if you have any suggestions of suitable material which should be included please contact: Dr John Taylor at Rugby School, Rugby (JLT@rugby-school.warwks.sch.uk).

Mark Williams

Awards

Congratulations to winners of the Institute of Physics’ Public Awareness of Physics awards. Among this year’s recipients is a team from the physics department at the University of York.

Prof Jim Matthew with Sarah Thompson, Peter Main and Mat Hill have been performing a dialogue ‘Is Science Chaotic’ for over ten years, performing on over 50 occasions to a wide variety of audiences. The current performance features Sarah as a young experimentalist debating, arguing and joking with an older ‘sceptic’ (Jim Matthew) over the ability of science to make predictions.

What makes the presentation so successful and popular? Sarah’s view is that ‘Our audiences like the jokes, the arguing and the demonstrations: it’s different and it’s amusing.’ But there has to be some good science behind the show: ‘you can tell from the questions that people are disturbed by the range of science affected by chaos’ she adds.

Dr Sarah Thompson will be a lead speaker at the North of England Physics Teaching Education Conference (NEPTEC) on 19 June, talking about her work on magnetism. For further details contact Dr Phil Scott at: P.H.Scott@education.leeds.ac.uk
Physics at Congress

Physics and public health: Do electrical power lines cause cancer?

This is just one of many public health issues where science is forced into facing ethical decisions and, like it or not, physics teachers are involved. The days are gone when the great and good scientists could decide what was good for the public – nowadays the public is very influential in taking the decisions. Students expect to debate these issues in an informed way.

Two speakers at Congress gave interesting perspectives. Several studies have suggested that childhood leukaemia is twice as likely in children living close to power lines. Alan Preece (University of Bristol) reported epidemiological research which suggests that it is not caused by exposure to magnetic fields. In fact analysis of postcodes and cancer rates showed a slight excess of mouth and lung cancers downwind (with prevailing wind) of power lines. While this supports a hypothesis that relates coronal discharge around the power lines to increased damage caused by pollutants, the cause of the leukaemia remains a mystery.

John Swanson, of the National Grid, discussed the policies we should adopt for electrical power lines. He explained how some people take the view that we should not do anything new unless it can be shown to be absolutely safe, while others take the opposite extreme view, that we should not hold back from doing new things unless we can prove that they are damaging. Swanson’s opinion is that both views have problems: ‘We have to look at the evidence and make an estimate of the risk and, if the risk is significant, we should take precautionary measures. We have to weigh up benefits against the consequences of intervention (the costs in terms of risks, side-effects, and financial).’

What can be done? New power lines are kept as far away from homes as possible. Fields can be reduced by altering the phases of the lines which run parallel to each other. (The UK has done this for over 30 years, the USA is just beginning to.) Power lines can be buried but this would put up the cost of electricity. Yet, in the UK homes can be built under power lines. A ban would result in massive devaluing of these homes. Such costs are an important part of a realistic debate. Society must decide priorities – large studies to prove cause and effect are expensive. Most of the inexpensive precautions have already been taken. Would it be better researching other causes of childhood leukaemia, or even just using the money for treatment? KP

Higher Education

First-year course development

Two meetings at the recent Institute of Physics Congress at Brighton dealt with teaching undergraduates. The first was a policy seminar dealing with benchmarking, which in the afternoon had an open forum for discussion. The other was the Education Group Higher Education meeting, which had two session themes: one on Key Skills and the other the development of a resource to support the first-year curriculum.

Ashley Clarke argued that key skills are not only valued by employers but are also the skills needed for PhD students. Mick Brown called for universities to cooperate and produce a pool of resources for first-year undergraduate teaching. The time taken to produce such resources is unaffordable for one university in the face of research pressures, but together the time might be found.

Other speakers outlined innovative approaches to key skills and to undergraduate teaching, including how information technology can complement but not replace existing methods. Along with other consultation these meetings will feed the thoughts of the Undergraduate Physics Inquiry. PB
INTERSCHOOL COLLABORATION

Monitoring geomagnetic storms

We are currently experiencing a solar maximum so the opportunity to observe the effects of space weather is better now than at any time during the next 11 years. We have recently had some exceptional conditions, causing aurorae to be seen as far south as Cambridgeshire. Geomagnetic storms can damage power and communication systems as well as affecting the Earth’s electric and magnetic geospace environment so monitoring the ‘weather’ is important.

Space weather is often monitored by expensive satellites, but a simple device can be built from a pop bottle and a bar magnet which allows pupils to observe the effects of space weather for themselves. Launched in March 2001, the

A coronal mass ejection hitting Earth (an artist’s impression).

Schools Pop-Bottle Magnetometer Network (PopMagNet) encourages school children between the ages of 10 and 18 to participate in a project to monitor space weather and learn about their space environment in general.

Results can be posted to the web site for comparison between different schools. There is also a news and comment forum which can be used to ask questions or post news items. Children are being asked to participate with the web activities via their school. Data measurements began on 11 April and you can add your contribution until the end of July.

For more information and the instructions for how to build and use a pop-bottle magnetometer visit http://www.aurorawatch.york.ac.uk/popmagnet. The material can also be accessed through the Blue Peter website www.bbc.co.uk/bluепeter. PopMagNet is being run by the Magnetospheric Physics Group at the University of York and is funded by the Particle Physics and Astronomy Research Council (PPARC). Zoe Dent zoe@aurora.york.ac.uk

CURRICULUM DEVELOPMENT

UK course goes international

Throughout the development of Salters Horners Advanced Physics (SHAP) in the UK there has been considerable overseas interest in the way SHAP uses relevant contexts and applications to structure the course and to help students with their study of physics. The response of UK students has been very positive, with students better motivated and seeing more immediate relevance in their studies.

Physics educators in several countries, including Sweden, Belgium, Romania, the Czech republic, Italy and Spain, have expressed interest in adapting and translating the materials for their own students.

A team of Swedish teachers, led by Anders Karlsson of Allebergs gymnasiet, Falkoping, has already undertaken to translate the materials from English, and the SHAP publishers Heinemann have signed an agreement with Swedish publisher Bonnier.

In a related development, Allebergs gymnasiet is introducing a bilingual education programme. The Swedish curriculum will be taught wholly or partly in English, using English materials including the Salters Horners Advanced Physics and Salters Advanced Chemistry books. Teachers from the school have visited the UK to see the Salters courses in action and to set up exchange programmes. Perhaps some English-speaking schools will be inspired by their example and introduce the teaching of physics in a foreign language!

Liz Swinbank SHAP Project Director www.york.ac.uk/org/seg/salters/physics

PHYSICS IN SCIENCE YEAR

Website launched

Science Year begins in the UK in September 2001. Preparations are already in hand and the promotional advertising has already started with adverts on prime-time TV featuring a range of celebrities. Funded by the Department for Education and Employment and led jointly by the British Association and the Association for Science Education, the initiative aims to engage young people with science.

Packs of materials and a teachers’ guide are already available, and you can elect to receive a weekly electronic newsletter by visiting http://www.scienceyear.co.uk PB