



Lighting the way for physics education

Real-world physics engages students
Online resources foster future scientists
Astronomers celebrate a bright future

Keeping a sane head in a difficult environment



Teacher training has never been easy, whether you're a PGCE student or an NQT. What with all of the studying involved, getting to grips with your placement schools and learning how best to deal with the students and their various interesting, behavioural quirks, it's a tough but ultimately rewarding job.

Sadly, the government is attempting to slip in another quick-fix "solution", one which it hopes will stem the increasing lack of teachers and perhaps provide City bankers with an alternative to the stark reality of unemployment. The government's answer is the frankly unrealistic "be a teacher in six months" campaign, which for those of you in the real world may find both equally amusing and insulting.

Luckily, *peptalk* maintains its sane stance and realistic outlook, realising that teaching is a career in which you never really stop learning. Your skills and techniques are continually being honed and updated, and you will always be on the lookout for new ways to enliven the classroom and inspire your students. This issue brings you some more resources and articles that should prove useful to you in your endeavours.

Do you want to encourage your pupils to think about science as a viable career? If so, then Future Morph could be the answer. This online resource engages with science students and demonstrates the extensive range of career opportunities that are available as a result of studying science (p4).

Planet SciCast is calling for budding science film-makers. The competition gives pupils the chance to create films that demonstrate an aspect of science in an interesting way (p2).

We welcome back *peptalk* regular, Teachers TV. In this issue we highlight another of the channel's excellent physics teaching programmes, *Wannabe Biker*, which offers an engaging look at how science works in the real world (p3).

Feel free to contact me with any ideas, comments or suggestions and keep a lookout for the next issue of *peptalk* in June.

James Camp *peptalk* editor.

Do you know of any courses, conferences, workshops or talks that might be of interest to your physics-teaching colleagues?

E-mail james.camp@iop.org.



SciCast



SciCast

Aspiring science film-makers focus on physics concepts for SciCast.

Science competition is a fun way to teach physics

SciCast is Planet Science's competition for aspiring film-makers, which gives pupils the chance to create short films to illustrate an aspect of science in an interesting and engaging way. For *peptalk* readers, SciCast Physics is an especially fruitful subset of the endeavour and you have the reassurance that the movies have been through some sort of quality control and they happily negotiate school computer network firewalls.

For physics teachers, the competition website represents:

- a fantastic archive of demonstrations (easily within the 150s attention span that youngsters supposedly have);
- an opportunity for your students to try their hand at an entry, with prizes and possible internet stardom as bait.

In schools, the creative

arts and physics may not be the most natural of partners, but shooting a movie makes meaningful collaboration possible. Students learn about the value of teamwork, how to make a successful presentation, and the implications of using copyrighted material.

If you are planning to show films in the classroom, the site's search facility is a good place to start. Visit <http://www.planet-scicast.com> and watch them preferably on the same equipment that you'll use with the students.

A good teaching tip is to view the movies at the start of a lesson, which will encourage pupils to arrive on time.

The films are accompanied by "try these yourself" experiments to encourage further investigation of the science concepts.

Teachers get up to speed with real-world physics



teachers.tv is an unmatched resource bank that allows teachers to bring the real world into the classroom. *teachers.tv* programmes can be used in lessons to encourage learners to explore science topics in the world outside the classroom, and to reinforce how science impacts on students' lives.

Physics lessons backed up with *teachers.tv* videos can help to keep everyone focused. The programmes provide a concrete illustration of the themes that your students are exploring in class, and they allow for abstract ideas to be set in a real-life context.

Most of all, *teachers.tv* programmes allow you to demonstrate complex,



A real-world context helps to produce a more memorable lesson.

microscopic or large-scale phenomena that would be difficult to illustrate in class.

Programmes for physics classes
teachers.tv has more than 2500 programmes online, and you'll find all of its pupil programmes at www.teachers.tv/inclasstv. There are more than a hundred programmes that are ready to

use in the physics laboratory, which are grouped by subject from atomic structure, through forces and motion, to light.

Most programmes that are made to use in class come with additional resources, which range from full lesson plans, through ready-made discussion points, to places to look for additional information.

Clicking the "Resources" link allows you to open or download documents and files, or to click through to external sites for more information.

Real science for students

Wannabe Biker (www.teachers.tv/video/2304) is part of the *GCSEase: Real Science* series, a stimulating and thought-provoking set of pupil programmes offering insights into how science works in the real world and the science at the core of many human activities.

For example, the programme examines the science and materials used in motorbikes and looks at questions like:

- How do theme park rides give you an adrenalin rush but also manage to keep you safe?
- What are the forces at work in a speeding motorbike?
- How does the human body cope with the pressures of being on a jet plane?

Enhance your knowledge with PEP



Tim James, a Bath Spa PEP participant from the 2008 cohort.

What did you do before the PEP?

I'm from Bristol and I used to work as a travel consultant.

What drew you to teaching physics?

I have wanted to be a teacher for a while now. My degree course in maritime studies contained a lot of physics. I have never really used my degree though and I knew that I couldn't be a physics teacher without the right knowledge. I heard about the PEP so I decided that I would enrol on the course.

How are you finding the course?

It's a bit early to tell at the moment. It's pretty good though because the course structure gently introduces participants to basic-level topics first before building up to more intensive subjects. There doesn't seem to be anything too difficult as yet.



Javaad Alipoor, a Bradford PEP participant from the 2008 cohort.

What's your background?

After finishing my philosophy degree in 2007 I found out about the PEP and I thought that I would give it a go. The course provides a good introduction to teaching physics.

What attracted you to teaching?

My parents are both teachers so it's in the family. Physics is my main interest so it seemed like the perfect career path.

What do you make of the PEP?

I like many aspects of the course. I enjoy the relatively informal way that it is taught. There's some good banter in class and I think that this helps to create a relaxed learning environment. The PEP isn't too technical and it focuses on topics that we will be expected to teach up to physics A-level.

Physics students wow SciCast judges

Short physics films swept the board at the Planet SciCast awards ceremony on 30 March.

Of the 12 award categories, five were subject specific (best biology, chemistry, engineering, earth and environmental sciences, and physics films) while the other categories were open to entries from all of the science disciplines, including awards for most entertaining, best technical and artistic achievement and best presenter.

Two physics films attracted particular attention: a girl group's rap, entitled *The Geiger-Müller Groove*, won the most entertaining, best original score and best physics film; while an animation about the Large Hadron Collider (LHC)'s search for the God particle won awards for best technical and artistic achievement and best film from a secondary school.

The year-12 rap group from Sydenham High School won £600 worth of Amazon vouchers for the three award wins but, as the awards ceremony's compère, Kate Humble, presenter of *Springwatch*, said,

success at the awards ceremony highlights the girls' skill at communicating physics in a novel and entertaining way that will undoubtedly catch the eye of science show TV producers.

The girls from Sydenham High School disagree with the notion that physics is hard. Natania Dunher, who wrote the rap about alpha, beta and gamma particles, and the music for the film, said: "We really enjoyed learning about it and it's an easy topic to write about."

The girls say that it only took them two hours to film and about six hours to edit. Visit www.planet-scicast.com/view_clip.cfm?cit_id=2810.

Inspired by the media frenzy that surrounded the LHC's switch-on, two students from Hampton School's film club, Tom Sammut and Jamie Grace, made a technically superb film, hosted by an animated crazy professor, explaining the search for sub-atomic particles (www.planet-scicast.com/view_clip.cfm?cit_id=2871).

● Article first appeared on *iop.org* (April 2009).



The Future Morph online quiz matches students to science careers.



Future Morph's homepage opens a window on the world of science.

Online teaching content promotes science careers



The world of work is rapidly changing. Just think how much it has altered in the last 20 years with the rise of the internet and e-mail, for example. Science- and maths-related subjects equip young people with the skills and knowledge that will help them to adapt to whatever the future looks like.

The Future Morph site (www.futuremorph.org) has been created to help 11–19-year-olds to engage with science and maths at school and to appreciate the breadth of opportunities that are available from studying science, engineering or maths post-16. The site

shows just how valuable these subjects are for modern life and roles in all employment sectors. They're not a one-track path to life in a lab but instead they can help pupils to keep their options open.

Future Morph is partly funded by the Department for Children, Schools and Families and it has been produced by the Science Council as part of a wider Careers from Science project with involvement from the Association for Science Education, the Royal Society of Chemistry, the Institute of Physics and many others.

The site includes sections for teachers, careers advisers and parents. Content for teachers includes:

- resources for teaching KS3/S1-2 science with a world-of-work context, including videos and practical activities;
- where to find other careers-related resources;
- advice on engaging your students, how to find speakers, etc;
- listings of careers information and links to careers sites.

New content, including multimedia and interactive elements, is being used to pull together existing material with an ethos that is strongly audience driven. The video profile of a glass artist talking about how she uses science won an award even before the full site was launched, so be sure to take a look.

We want you to help us to keep in touch

As you may be aware, we at the Institute do our best to keep you informed of the latest teaching news and events, to offer our support and advice whenever needed and, of course, we like to ensure that you always receive your copy of *peptalk*. However, for this to happen, we need to ensure that we have your up-to-date contact information on our records.

So, if you've recently moved, changed your e-mail address or got yourself a new mobile phone, let us know so that we can update our records.

You can send me your latest information and I, the tireless workhorse that I am, will grapple with our records system and ensure that it is amended to reflect your correct details.

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Look out for the next issue of *peptalk* in June 2009

Website gives teachers the ability to share lesson ideas



The clamour for reducing “teaching to the test” in schools has finally reached a crescendo in the release of the *Cambridge Primary Review*, which is the largest such study of primary education in 40 years.

The report concludes that a focus on national tests has “squeezed out” other subjects, such as science, history, geography and music. Both time pressures on teachers and micromanagement from central government are preventing children from experiencing more engaging lessons.

Schools that blend basic skills into wider lessons and develop creative ways of doing so achieve the best results. Unsurprisingly, formulaic lessons are ineffectual.

Edward Upton, founder of *teachable.net*, said: “We believe that many classroom teachers know how to produce more creative lessons, but they are restricted by other demands on their time. Teachers are expected to do more and more, but the use of our online resources can really help them to deliver.”

“Teachers are expected to do more and more, but the use of our online resources can really help them to deliver.”

Members of *teachable.net* are already using the website to source high-quality, creative teaching materials and they are adapting them for use in their class. Hundreds of experienced teachers have uploaded interesting and interactive teaching resources for others to share, and they receive a contributor reward each time that their materials are used.

teachable.net is the UK's leading teacher-contributed, moderated resource website, with more than 20 000 pages of content to download. Currently the site has a special focus on science teaching but it will soon feature the largest collection of high-quality, editable, teacher-contributed files across all subject areas. *teachable.net*



A screenshot of a typical set of resources listed on the website.

is a community site, so it relies on the generous contributions of members and the efforts of other teachers to review and rate the files.

Users can browse and search for relevant resources by subject, topic, age group and ability level. All of the relevant resources are then displayed, clearly ranked by the “teachability” of the resource. The aim is to make it as quick as possible to find the best material. The files cost around £1.00 each, and half of that goes back to the contributing teacher as a reward.

teachable.net is the brainchild of Edward Upton and Ranjeet Guptara, who met at Magdalen College, Oxford. They were dismayed to see friends who had gone into teaching already burning out in their twenties, and they were determined to

find a way to reduce teachers' workloads. Leaving behind fast-track careers with the likes of Accenture and UBS, the team developed a website that saved preparation time for teachers by encouraging the sharing of superb-quality classroom materials.

Teachable Ltd is a social enterprise, which is funded by private capital but with a specific commitment to use funds to improve teachers' working lives, and to reinvest profits in teaching and training. It does not receive government grants or charitable handouts but instead exists by charging schools and end-users for the content that they use. The founders believe that this proven revenue-sharing model is the fairest and most efficient way to deliver educational material in the internet age.

Experts warn that global warming is set to burn a hole in our pockets

Climate-change concerns like melting icecaps, increased desertification, loss of coral reefs and the extinction of species (e.g. polar bears) can seem a distant concern in our everyday lives. Little attention, however, has been paid to the likelihood of increased bills, through tax and insurance charges, that will be incurred as the UK's climate changes.

Alistair Hunt, a researcher at the University of Bath, addressed scientists recently at the international Climate Change Congress held in Copenhagen to present research that shows that the cost of climate change is going to be felt much closer to home than many people expect. The talk was one of many described in the complete online abstract book of the congress, published in the IOP Conference Series: *Earth and Environmental Science*.

Working with the UK Climate Impacts Programme (UKCIP), Alistair has calculated the projected cost increases that would be incurred with an increased burden on National Health Service resources during hotter summers; the effect that hotter and drier summers will have on the rate of property subsidence; the maintenance costs of public lawns and the cost of maintaining climate damage-induced highways.

As Alistair said: "Through isolating particular consequences of extreme weather fluctuations, projected to become more frequent, such as the hotter summers of both 1995 and 2003, and assessing the effect that these weather fluctuations had on local resources, we are helping businesses, councils and individuals to prepare for the future."

The hot summers of 1995 and 2003 are used to inform a number of the case studies of likely trends associated with climate change, as experts



The wind of change: the UK could feel the pinch of global warming.

predict that the once-a-century temperatures, reached in 2003's summer, become regular English summer temperatures. Changes in temperature and rainfall averages also result in

climate-change costs.

The case studies look ahead 90 years and they predict that the cost of treating people with heat-related illnesses will increase anything between

five- and nine-fold for primary care trusts; the increased insurance costs associated with property subsidence during arid summers will increase anything between four- and 13-fold; and that both public lawn and road maintenance will see expensive hikes too.

Dr Johanna Schwarz, editor of *Earth and Environmental Science*, said: "Climate change is going to affect all of us and Alistair's presentation in Copenhagen was a timely reminder that it is not just tropical islanders or others in less moderate climate zones that need to adapt."

The case studies explore different adaptive measures, such as public health campaigns to provide advice about how to stay cool during hot summers, which could over the long term reduce the health costs, and they also look at weather patterns that could lead to savings, such as the need for less road-grit during warmer winters, but the studies still forecast financial increases that will bring the expense of climate change much closer to home.

Alistair said: "While the case studies might appear parochial and only reflect the concern of particular stakeholders, such as the National Trust or the Association of British Insurers, the hike in costs will be shared, and climate change will affect all of our wallets."

Roger Street, UKCIP technical director, said: "Understanding the costs of impacts and adaptation is an important aspect of defining and implementing a viable adaptation strategy and its evolving adaptation measures. It is essential that we continue to provide up-to-date and supportive guidance that meets the needs of users towards identifying the costs and benefits."

• Article first appeared on *iop.org* (March 2009).

Scientists celebrate the bright future of astronomy during 2009

To mark UNESCO's International Year of Astronomy (IYA2009), six leading astronomers from the UK, the US, Europe and Asia contributed to a recent issue of *Physics World* outlining the biggest challenges and opportunities facing international astronomers over the next couple of decades.

Many of those challenges are purely scientific, including the quest to clarify the true nature of dark matter and dark energy; the search for extraterrestrial life among the myriad of extrasolar planets that are set to be discovered; and finding the first stars that formed after the Big Bang.

Other challenges are political – including the need for mass international collaboration to fund and manage astronomical facilities, many of which are being so large and expensive that no single country can afford them. For example, the Atacama Large Millimeter Array, which is being built in Chile, involves astronomers from the UK, US and Japan.

The contributors included Catherine Cesarsky, president of the International Astronomical Union; Martin Rees, the UK's Astronomer Royal; Tim de Zeeuw, director general of the European Southern Observatory; John Huchra, president of the American Astronomical Society; Andrew Fabian, president of the Royal Astronomical Society; and Seok Jae Park, president of the Korea Astronomy and Space Science Institute.

All of the contributors expressed optimism about the future of global astronomy, reflecting on the advances that new facilities promise, including the Planck Satellite making detailed observation of fossil radiation, due to take off in May 2009; NASA's planned joint dark-energy mission; 2013's launch of the James Webb Space Telescope



Blue-skies thinking: international collaboration is key to future-proofing developments in astronomy.

to help answer questions about the universe's very first stars; and the European Southern Observatory's European Extremely Large Telescope, which, if built, could be the "world's biggest eye on the sky".

As Tim de Zeeuw said: "Technological developments now make it possible to observe planets orbiting other stars, to peer deeper than ever into the universe, to use particles and gravitational waves to study celestial sources, and

to carry out in situ exploration of objects in our solar system. This promises tremendous progress towards answering key astronomical questions."

But as Seok Jae Park commented: "The greatest challenge for astronomy is international collaboration, because building big and expensive telescopes can no longer be accomplished by a single country. It is my hope that IYA2009 will enable astronomers from around the world to create a new tradition

of co-operation in astronomy."

Catherine Cesarsky underlined her wish during IYA2009 to communicate the joys and benefits of astronomy: "It is the sense of discovery and awe that astronomers wish to share with our fellow citizens all over the world. We thus hope to stimulate a long-term increase in student enrolment in science and technology, and an appreciation for lifelong learning."

• Article first appeared in *Physics World* (March 2009).



President Obama sets out his goal to eliminate all nuclear weapons.

US pledges to end nuclear arms threat

President Barack Obama has made his intention of eliminating all nuclear weapons a tenet of his administration's foreign policy. Prof. Sidney Drell, a US theoretical physicist and arms-control expert, explained in a recent issue of *Physics World* what Obama needs to do to make that honourable intention a reality.

Prof. Drell, a professor emeritus at the SLAC National Accelerator Center, a senior fellow at Stanford University's Hoover Institution and an adviser on technical national security and arms control for the US Government, has recently co-authored a report, entitled *Nuclear Weapons in 21st-Century US National Security*, in collaboration with the American Association for the Advancement of Science, the American Physical Society and the Center for Strategic and International Studies.

In his article for *Physics World*, he explained how and why there is need now, more than ever, to introduce globally ratified systems to control the spread of nuclear arms.

Prof. Drell explained: "The world is teetering on the edge of a new and more perilous nuclear era, facing a growing danger that nuclear weapons – the most devastating instrument of

annihilation ever invented – may fall into the hands of 'rogue states' or terrorist organisations that do not shrink from mass murder on an unprecedented scale."

His article made two recommendations to Obama and his team. The first was to "revisit Reykjavik" – Reykjavik hosted a summit in 1986 where former US President Ronald Reagan and then Soviet Premier Mikhail Gorbachev agreed to begin reducing the size of their respected countries' nuclear arsenals. As the US and Russia still possess more than 90% of the world's nuclear warheads, it is imperative that they take the lead, Drell said.

His second recommendation was that the Obama administration should adopt a process for bringing the Comprehensive Test Ban Treaty (CTBT) into effect. "The new administration should initiate a timely bipartisan, congressional review of the value of the CTBT for US security," he said.

Drell concluded: "With these two steps outlined above, President Obama has a historic opportunity to start down a practical path towards achieving his stated goal of 'eliminating all nuclear weapons'."

● Article first appeared in *Physics World* (February 2009).

INSTITUTIONS RUNNING PEP COURSES

INTERESTED IN A PEP COURSE?

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If you have any teaching wisdom that you'd like to pass on to your colleagues, why don't you write an article for peptalk?

Get in touch with the editor to discuss your ideas.

E-mail james.camp@iop.org.

PEP conferences



MAKE A NOTE IN YOUR DIARY:

Oxford Physics Teachers Conference

22 (evening PEP reunion meal only) and 23 June 2009

Open to Bath, Sussex and London PEP participants (2006, 2007 and 2008 cohorts)

Liverpool Physics Teachers Conference

1 (evening PEP reunion meal only) and 2 July 2009

Open to Keele, Loughborough, Cumbria and Bradford PEP participants (2006, 2007 and 2008 cohorts)

The Institute's Teacher Network, along with the universities of Oxford and Liverpool physics departments, are organising a full-day meeting for physics teachers. Workshops will be aimed at all levels of expertise.

This is a great opportunity for past PEP participants and tutors to meet and to swap stories. This free event is especially tailored towards those who are in their PGCE or NQT years and spaces are limited.

We will be contacting you shortly with full event details.

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