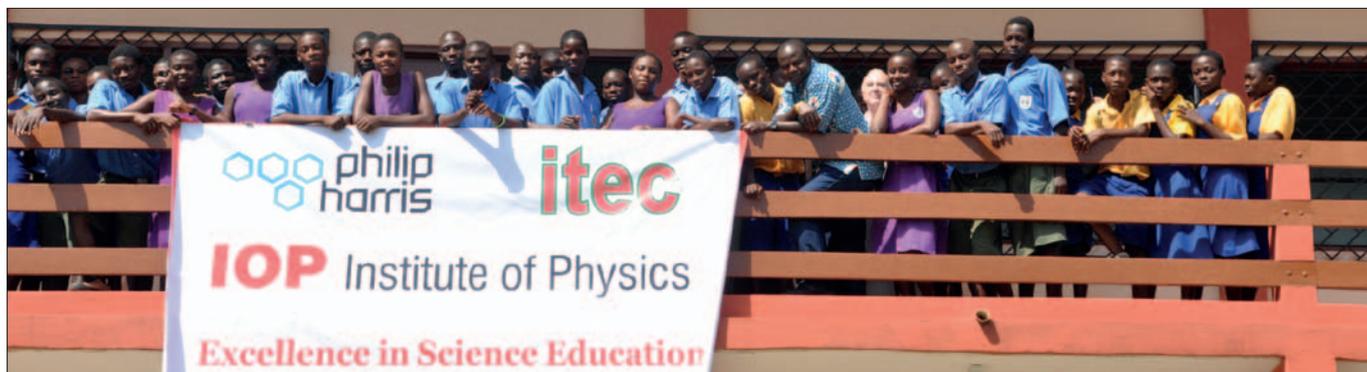


# Classroomphysics

The newsletter for affiliated schools

December 2012 Issue 23



Ernest Nantor

Participants on an IOP course held at the IOP Ada Centre in Ghana.

## International news

# Africa's physics-teaching challenges

Physics in Africa is generally rote learnt, with lots of writing on the board, copied definitions, reciting of scientific ideas and questions such as "are we together?" or "isn't it?" being commonly asked of the students (to which the answer is always "yes", regardless of understanding).

IOP for Africa aims to support local teachers move away from this style of teaching, by setting up education centres where teams of UK teachers volunteer their time and expertise to train African teachers. They identify local needs and develop training sessions with the schools on how to use basic equipment for practical demonstrations and experiments.

From working with one centre in Rwanda in 2004, the project has grown so that now 380 teachers and approximately 30 400 students have been trained across nine sub-Saharan countries. Teachers from the UK have played a crucial role in developing a practical model of support for African teachers. The Institute is determined to do more in 2013 and plans to expand this work as part of a wider campaign.

### Why is physics teaching suffering?

Joe Brock, IOP's international co-ordinator for Tanzania, explains: "In Tanzania biology is compulsory to Form 4 (O-level), but chemistry and physics are not. Many schools do not have a physics teacher and those that do may have only one teacher for up to 800 students. Some physics teachers are conducting lessons at the weekend to cope with the demand."

### What is it like to train teachers in Africa?

Gerry Blake, IOP's international co-ordinator for South Sudan, gives an insight: "The IOP for Africa team arrives in South Sudan for a week's training. Not so easy for one of the Sudanese teachers. His two-day journey has involved wading through a flooded river. In one week we train 17 teachers from five

out of the 10 states of this vast country, instructing them on how to use apparatus in their physics teaching. Our teaching includes sessions on Newton's laws, energy, electric circuits, optics and vibrations, and how to carry out investigations with students. At the end of the week each teacher takes a kit bag of apparatus back to their school."

### Is it worth it?

"Definitely," states Roger Green, IOP's international co-ordinator for Ghana: "The experience has been so stimulating that six years after retirement I have gone back to Islington Sixth Form College to a part-time job teaching A-level physics."

Joe Brock adds: "As a physics teacher with over 20 years of experience, I want to feel that I have made a difference. It is a difficult mission to change the way a nation teaches but being the IOP Tanzania co-ordinator has given me the opportunity to do just that."

**One Sudanese teacher of 25 years' experience handled apparatus for the first time in his life.**

**For more information:** if you would like to find out more and how you can get involved, visit [www.iop.org/africa](http://www.iop.org/africa).

The latest physics education news, resources and classroom ideas – from the IOP education team

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Editorial



Welcome to the 23rd issue of the newsletter for affiliated schools and colleges, especially to those new members who have joined as a result of our promotional campaign at the start of the school year. We hope that you find what we offer to be good value. In this mailing you will also have a copy of the *Explore* poster, with an associated teaching tip on p7. There are also two copies of a poster on the Higgs boson.

Our community website *talkphysics.org* has recently been upgraded and moved to a different platform, and we hope that regular users are already feeling the benefits. If you are among those who have not yet signed up, now is the time to give it a go! See the enclosed insert for more information.

The ASE Annual Conference 2013 is taking place on 3–5 January at the University of Reading. It is excellent value as CPD and a chance to meet other teachers and people from the world of science education. The accompanying exhibition is a great place to gather lots of resources and information from a whole variety of organisations. The Institute will be running a number of workshops over the three days, as well as having a stand (C3) in the exhibition. Our annual lecture named after the inspirational physics teacher, John L Lewis, who sadly died this year, will be given by our new chief executive, Professor Paul Hardaker, who has a background in meteorology.

If you have applied for a school grant, you should hear before Christmas if you have been successful. The deadline for applications for the summer term 2013 is 1 February. Go to [www.iop.org/schoolsgrants](http://www.iop.org/schoolsgrants) for information and the form you need to use.

We look forward to seeing as many of you as possible at the ASE Conference in Reading.

As ever, comments and suggestions are always welcome!

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Professional development

# Inspirational weekends away to update your physics

For those new to the Institute’s Physics Updates, these three-day professional-development courses bring you up to date on innovations in physics, both pure and applied, and curriculum developments. The workshop sessions allow teachers to try new equipment, learn new experimental techniques, try out novel investigations and share experiences and ideas.

Feedback from teachers who attended the last summer course held at the University of Birmingham was positive: “I thoroughly enjoyed the course and have come away with many ideas and resources that I will put into practice in my teaching. I have already done so with the three A-level classes I have taught since returning to school.” Another attendee was equally pleased: “I found this to be a fantastic experience full of innovative ideas for enhancing teaching and learning as well as updating my own subject knowledge from current researchers and of course being able to share good practice with fellow professionals. Thank you so much for putting together such as inspiring programme.”

New for 2013 is a special course centred on geophysics and seismology, organised by the British Geological Survey (based at the BGS headquarters in Nottingham, running from 31 May to 2 June). For further details of



this and other Physics Update courses, turn to the Teacher Events section on p6.

**For more information:** visit [www.iop.org/update](http://www.iop.org/update) – this will include regularly updated course details such as confirmed lectures, workshops and accommodation information, and access to the online booking form.

Teacher training

## Could you provide a school experience for a prospective teacher?

With the new academic year now well underway, budding physics teachers are starting to prepare for their initial teacher-training applications. An important part of this process is to secure school observational experience, which not only supports their applications but also confirms that teaching is the right career for them.

The Institute’s links with teachers and schools across the UK has enabled us to develop the School Experience Programme (SEP) to support potential physics teachers. With 580 registered schools nationwide, the programme involves matching a prospective teacher to a local school to gain the necessary school observational experience. For people who have struggled to arrange a school visit this programme has been a lifeline, helping them to enter the teaching profession.

We have had a fantastic take-up from



The School Experience Programme is calling for schools to help budding teachers.

many of our affiliated schools, however demand is growing and we are in need of more schools to assist – especially in inner cities where demand is highest.

**For more information:** if your department would be prepared to facilitate some observational experience, please register at [www.iop.org/sepschools](http://www.iop.org/sepschools). Your involvement could increase the numbers embarking on a new career in physics teaching, and may even put you in contact with a budding teacher for the future.

## Schools and colleges lecture tour

## Space lecture tour coming to a venue near you

Space tourism was once the stuff of science fiction, but programmes such as SpaceShipOne and Virgin Galactic have made it a reality. Privately funded flights into space and the flourishing space industry that makes them possible, mean that the dream of becoming an astronaut is closer than ever before.

This year's lecture tour, entitled "Defying gravity: make physics your launchpad", will explore how scientists and engineers have used physics to send astronauts and vessels into space. It will look at the science behind putting objects into orbit and the conditions that astronauts experience while in space, as well as explaining how more opportunities to work in the space industry are opening up.

Laura Thomas, a professional science communicator with extensive experience of schools' outreach, will deliver the lecture. She has an undergraduate degree in astrophysics from the University of Edinburgh and has worked for Queen Mary, University of London, for the last six years. Laura is a European Space Education Resource Office (ESERO) space ambassador who still dreams of becoming an astronaut.



An astronaut's view of the Earth from space.

The tour will be visiting 35 venues across England, Scotland and Wales. As in previous years, the talk will be an hour long and appropriate for 14–16 year olds. The talk has strong links with the following curriculum topics: forces and motion, materials and their uses, and how science works. The



The 2013 schools lecturer, Laura Thomas.

lecture is free but there are limited places available at each venue, so booking ahead is essential.

**For more information:** visit [www.iop.org/schoolslecture](http://www.iop.org/schoolslecture) to find out more, including details of dates and venues.

## Resources

## SPT support now covers the entire 11–16 physics curriculum

The Institute's Supporting Physics Teaching (SPT) initiative has been in development over the last few years and the final 14–16 topic has just been published. This means that there is now full coverage of the 11–16 physics curriculum to support teachers of physics in their pedagogic content knowledge.

## SPT 11–14 topics

- Electric circuits; electromagnetism; energy; Earth in space; forces; light; machines; motion; sound.

## SPT 14–16 topics

- Electricity and energy; force and motion (new topic); radiations and radiating.

For those new to SPT, the resources are designed to help teachers gain a better understanding of physics, to allow them to experience for themselves something of its fascination and to develop greater confidence in teaching it.

All of the topics have been reworked and are now available in three formats:

So 02 SPT: Sound topic	11: Working with sounds
A recap	
Sound consists of audible vibrations, which travel from a source to a detector. These can be of a whole range of frequencies and a whole range of amplitudes. We hear these as sounds of different pitches and different loudnesses. Sometimes one sound will be made up of many of these frequencies at once, each with their own amplitude. All of these contribute to the amplitude of the sound, as well as its characteristic quality.	
These vibrations travel at one quite constant speed, about 340 metres/second in air, whatever the frequency or amplitude. Sound travels through solids and liquids at higher speeds.	

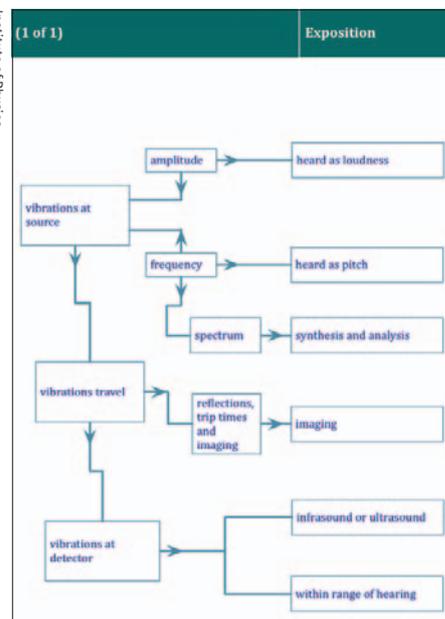
Above and right: a single "nugget" extracted from the physics narrative of the SPT sound topic.

1. As "full" PDF files (for download and offline study on desktops and laptops), suiting those who want to work in an environment with the best formatting, interactivity and layout, but requiring internet access.
2. As "light" PDF versions (for tablets/mobile devices), essentially adapted to give lower-demand graphics, and to minimise demand on the connectivity.
3. As webpages (accessed via the *TalkPhysics* website).

The reworking has improved consistency within the topics and clarifies approaches to teaching key topics – electric circuits, energy and forces.

## Will it help?

Comments from teachers who have used the resource provide an answer to this question:



**"I think the [SPT resource] will help me support not only non-specialist teachers, but also younger teachers in my department." (Teacher)**

**"I was very uncertain about electricity before and knew very little. I feel much more confident now." (Trainee teacher)**

**For more information:** the suite of SPT resources can be downloaded ("full" version recommended) from [www.talkphysics.org](http://www.talkphysics.org).

Student/teacher events

# Nationwide boost for Space Academy

After three years supporting STEM subjects in the East Midlands, the Space Academy has now expanded into a national scheme. A regional project manager and nine lead educators (seconded full-time teachers) will help deliver student masterclasses and teacher training across the UK.

New student initiatives such as the space-engineering course and higher apprenticeships have extended the role of the National Space Academy, which now organises a number of careers events throughout the year focused on the UK space industry, to showcase the companies, institutions and career pathways available to young people.

The Academy continues to deliver high-quality CPD for science teachers at the National Space Centre in Leicester and at both RAL Space and the International Space Innovation Centre (ISIC) in Oxfordshire, and can now also offer bespoke sessions in individual schools.

The new network of lead educators means that more regions than ever before are able



Stuart Hollis Photography

Gravity-well activity at a National Space Academy physics CPD session.

to access student masterclasses in the sciences, geography and mathematics. These sessions use space science and climate change as engaging “hooks” to support students in their curriculum studies in KS3–5 and can be delivered in school or

at an inspirational venue like the National Space Centre.

**For more information:** to find out more, visit the National Space Academy website at [www.nationalspaceacademy.org](http://www.nationalspaceacademy.org).

Awards

## Technician award time is fast approaching

In 2013 the Salters’ Institute will be entering the 10th year of the National Awards for Science Technicians. The aim of the awards is to publicly acknowledge the immense contribution that science technicians make to the well-being and success of schools and colleges and, in particular, to science departments. It is hoped that the awards will heighten awareness of the importance of science technicians to education in this country.

Headteachers and heads of science



John Spragg

The 2011 winners of the Salters’ National Awards for Science Technicians (left to right): Anne Mylchreest, Lorraine Collins, Susan Davis and Karen Gill.

from schools and colleges can nominate a technician who has a total of five or

more years experience (either full-time or part-time). If you know a technician who fits this criteria then you can nominate them for an award. The closing date for nominations is 1 March 2013. Nominations for the award can now be made online from 3 January 2013.

The Salters’ Institute will also be present at the 2013 ASE Conference in Reading, so please visit their stand (C59) where they will be pleased to provide information on all of their educational activities.

**For more information:** to find out about nominating a technician for the award, visit [www.saltersinstitute.co.uk](http://www.saltersinstitute.co.uk).

Student event

## Invention on show

The Big Bang Fair 2013 offers students four days of exciting and stimulating hands-on science at London ExCeL. School groups are invited on Thursday 14 and Friday 15 March, while family groups will be welcomed on 16 and 17 March. The fair is free for everyone to attend.

Students of all ages can explore everything from robots to wind turbines and from nuclear fusion to lifeboat technology, while also discovering the career opportunities that science, technology, engineering and maths offer. They will even have the opportunity to break their very own



National Science + Engineering

The ‘Sustainables’ from The Ursuline Academy Ilford are one of the teams presenting their project at The Big Bang Fair

world record with Guinness World Records: Science Live!, a new show exclusively launching at the fair.

At the heart of the Big Bang Fair is the UK

final of the National Science + Engineering Competition. Students from across the country who have won regional heats will be presenting their projects. The variety and invention of their ideas is truly inspiring, so bring your students along to see what they could do themselves. Once you have seen the competition, get your students involved by creating a project to exhibit at your regional Big Bang Fair Near Me in summer 2013. Your students could then be the ones showing their work to over 70 000 people at The Big Bang Fair 2014.

**For more information:** for tickets and information, visit [www.thebigbangfair.co.uk](http://www.thebigbangfair.co.uk).

## Policy

# It's different for girls says IOP report

You may have noticed the large amount of press coverage generated by the launch of the Institute's report *It's Different for Girls: The influence of schools* on 3 October. In 2011, physics was the fourth most popular subject for A-level among boys in English schools but for girls the subject languished in 19th place and only 20% of A-level physics students were girls; a situation that has remained unchanged for many years.

This new report takes a snapshot of the situation, looking at how the proportions of girls and boys going into physics A-level vary between different kinds of English school, using data from the National Pupil Database. We have used data on pupils doing A-levels in England in 2011 tracked back to the school where the pupils were taught for their GCSEs in 2009.

Some of the findings are startling: 49% of maintained co-ed schools sent no girls on to take A-level physics in 2011, but only 12% of these schools sent on no boys. In addition, girls were two and a half times more likely to go on to do A-level physics if they came from a girls' school rather than a co-ed school (for all types of maintained schools in England). The equivalent figure for boys is only one and a half times.

There are many factors that influence the differences in behaviour, such as access to specialist teachers, selection at age 11 and socioeconomic background. However, averaged over the large samples of schools, these influences should have the same effect for both boys and girls, but the differences in patterns of behaviour are not the same – they are nearly always more marked for girls. The variation in the experience of physics between school types is not gender-neutral: it's different for girls.

Therefore, we suggest that there are other, gender-specific cultural influences



coming into play. Teaching and learning are culturally embedded experiences and the way that the subject of physics appears to girls in the co-ed setting seems to be very different from that of the single-sex setting. It would appear that, in many schools, expectations of students are often gender stereotyped. The Institute is calling for this to be challenged by a school-wide approach to gender equity, with support from government.

We know that individual teachers have been working on encouraging more girls to

**Physics should be represented in schools to boys and girls alike as an exciting, relevant and deeply enriching subject.**



take physics beyond age-16 for some time, but for success to extend beyond individual teachers, the work needs to be part of a long-term programme involving the science department and wider school. We hope this report brings the issue to the attention of school leaders, policymakers and parents, and that it will stimulate change.

**Clare Thomson**, curriculum and diversity manager, pre-19

**For more information:** if you would like to encourage your senior leadership team to engage with the issues raised here, you can download the report and a briefing sheet for senior leaders from [www.iop.org/girlsinphysics](http://www.iop.org/girlsinphysics). Alternatively, if you would like hard copies of the report and the briefing sheet they can be obtained by e-mailing [education@iop.org](mailto:education@iop.org).

## Professional development New-teacher support

More than 630 PGCE physics students and NQTs have now registered for early-career mentoring through the Institute's Stimulating Physics Support (SPS) programme. With the next round of registration this looks set to rise to over 800 by the end of the autumn term. Our team of 26 SPS mentors also run local CPD events open to all early-career science teachers. These provide support in developing strategies for engaging physics teaching and offer teachers the opportunity to share and develop ideas on a local level. If you have an NQT in your department, you can alert them to these opportunities and



STIMULATING  
**PHYSICS**  
SUPPORT  
Inspiring Early Career Teachers

direct them to the website so they can find out about the support on offer.

**For more information:** if you or your NQT would like to find out more about mentoring

or the CPD events on offer, visit [www.iop.org/sps](http://www.iop.org/sps) to find your local SPS mentor and for details of meetings in your area. Alternatively you can contact Eliza Selley (e-mail [eliza.selley@iop.org](mailto:eliza.selley@iop.org)).

## EVENTS FOR TEACHERS

### ASE Annual Conference

University of Reading  
2–5 January 2013

The ASE Annual Conference is open to everyone with an interest in science education – ASE members and non-members. It attracts science educators from all phases of science education and features a selection of talks, workshops, seminars and booked courses. Entry to the exhibition marquee is free.

Details and booking: visit [www.ase.org.uk/conferences/annual-conference](http://www.ase.org.uk/conferences/annual-conference).

### Science Museum Teacher Zone

The Science Museum, London  
27 February 2013

Teacher Zone (open from 6.45 p.m. to 9.30 p.m.) is an exclusive area for teachers as part of the Science Museum's popular late-night events for adults, Lates with Mastercard. You will be able to enjoy bite-sized training and fun entertainment alongside drinks and nibbles. You can also join in the other great events on offer as the museum opens late with a lively programme of activities just for adults. Details: visit [www.sciencemuseum.org.uk/educators](http://www.sciencemuseum.org.uk/educators).

### Spring Physics Update

University of Sussex, Brighton  
22–24 March 2013

This ever-popular three-day course will be hosted by the physics department at the University of Sussex. The programme will feature a mixture of talks and practical workshops with ample opportunity to share and discuss classroom experiences with fellow physics teachers.

Details: visit [www.iop.org/update](http://www.iop.org/update).

### Practical SHAP residential CPD course for teachers and technicians

University of York  
26–27 March 2013

As in previous years, the main focus will be on practical and ICT activities in both AS and A2. Experienced SHAP technicians and teachers will be involved in the course.

Details and booking: contact Liz Swinbank (e-mail [elizabeth.swinbank@york.ac.uk](mailto:elizabeth.swinbank@york.ac.uk)).

### BGS Geophysics and Seismology Update

British Geological Survey, Keyworth, Nottingham

31 May–2 June 2013

The British Geological Survey (with support from the IOP and British Geophysical Association) will be holding a three-day teachers course based at their headquarters in Nottingham. The programme will include talks and practical workshops on the theme of seismology and geophysics.

Details: visit [www.iop.org/update](http://www.iop.org/update).

### Rugby Meeting

Rugby School, Warwickshire  
6 June 2013

Next year's 25th annual meeting for teachers of physics in schools and colleges will offer information, stimulation and communication. The programme will feature lectures given by leading research physicists and physics-education experts, hands-on workshops and an opportunity to browse the extensive exhibition area.

Details and booking: visit [www.iop.org/rugby](http://www.iop.org/rugby).

### Teacher Network for North Wales Conference

Bangor University  
11 June 2013

A conference for all who teach physics, with exciting talks and workshops. The guest speaker will be Professor Lyn Evans. Details and booking: contact Andrea Fesmer (e-mail [andrea.fesmer@talk21.com](mailto:andrea.fesmer@talk21.com)).

### A Day for Everyone Teaching Physics

Durham University  
20 June 2013

This free conference gives the opportunity to explore new resources for teaching physics in the classroom and to develop an understanding of the latest developments in physics. There will be sessions for those new to the subject as well as experienced teachers. Places must be pre-booked through the Science Learning Centre North East (failure to attend without prior notice will incur a £25 administration fee). Details and booking: visit [www.sciencelearningcentres.org.uk/northeast](http://www.sciencelearningcentres.org.uk/northeast) or contact Nicola Hall (e-mail [n.j.hall@durham.ac.uk](mailto:n.j.hall@durham.ac.uk) or tel 0191 370 6200).

### Summer Physics Update

University of Leicester  
12–14 July 2013

This ever-popular three-day course will be hosted by the physics department at the University of Leicester. The programme will feature a mixture of talks and practical workshops with the opportunity to share and discuss classroom experiences.

Details: visit [www.iop.org/update](http://www.iop.org/update).

## EVENTS FOR STUDENTS

### 2013 Schools and Colleges' Lecture — Defying Gravity: Make Physics Your Launchpad

This free lecture for 14–16 year olds, given by Laura Thomas, a professional science communicator with extensive experience of schools outreach, will explore how scientists and engineers have used physics to make the dream of space exploration a reality. Details: visit [www.iop.org/schoolslecture](http://www.iop.org/schoolslecture).

### Physics in Perspective: an enrichment course for sixth formers and college students

UCL and Royal Institution, London  
17–19 February 2013

This lecture series aimed at sixth-formers and college students offers – in a period of just three days – insights into the many different aspects of modern physics. The next event will take place in London and will include talks on planetary science, nuclear physics, particle accelerators, gravitational waves, engineering and oceanography. Details and booking: visit [www.iop.org/pip](http://www.iop.org/pip).

### The Big Bang Fair

ExCeL, London  
14–17 March 2013

Bookings are now open for The Big Bang Fair, the largest celebration of science and engineering for young people in the UK. Designed to inspire your students, it allows them to meet some of the country's leading scientists and engineers.

Details: visit [www.thebigbangfair.co.uk](http://www.thebigbangfair.co.uk).

### National Science & Engineering Week

15–24 March 2013

The theme for 2013 is “invention and discovery”. The week of events and activities aims to shine the spotlight on how the sciences, technology, engineering and maths relate to our everyday lives.

Details: visit [www.britishecienceassociation.org/national-science-engineering-week](http://www.britishecienceassociation.org/national-science-engineering-week).





# TalkPhysics toy bounces ideas around

To celebrate the relaunch of *talkphysics.org*, the IOP will distribute “jumping popper” toys at training events and conferences.

*TalkPhysics* is our community and resources website linking teachers of physics at all stages of their careers. It has been funded by the Stimulating Physics Network and has more than 6500 members. With regular contributions from teachers, the website has seen 100 posts per week and at least five new members posting every week. The site aims to bring together those who want to improve their teaching or help others to improve, such as teacher trainers. It is home to the IOP’s Supporting Physics Teaching (SPT) resources and provides a richer environment than the IOP’s existing e-mail discussion lists, allowing for the sharing of resource files and providing a searchable archive of all previous content. You can subscribe to e-mail notifications of new content. Since the relaunch, you can now tag and search more easily, link from e-mail notifications (even if you are not logged in), embed a wider range of multimedia in your posts, and preview before posting.

## How can I use the jumping popper toy in lessons?

To use the jumping popper toys, you turn them inside out, leave them upside down on a surface, and a short while later they restore themselves, “popping” back and jumping over one metre high. They are a cheap, fun, engaging toy with lots of interesting physics.

Can your students identify the forces acting on the popper at different times in the flight? (An opportunity to use the ideas from our SPT Forces resources, such as “Forces Spectacles II: the sequel”).

- How high will it jump? Is energy involved? How?
- Does it make any difference what type of surface it is sitting on?

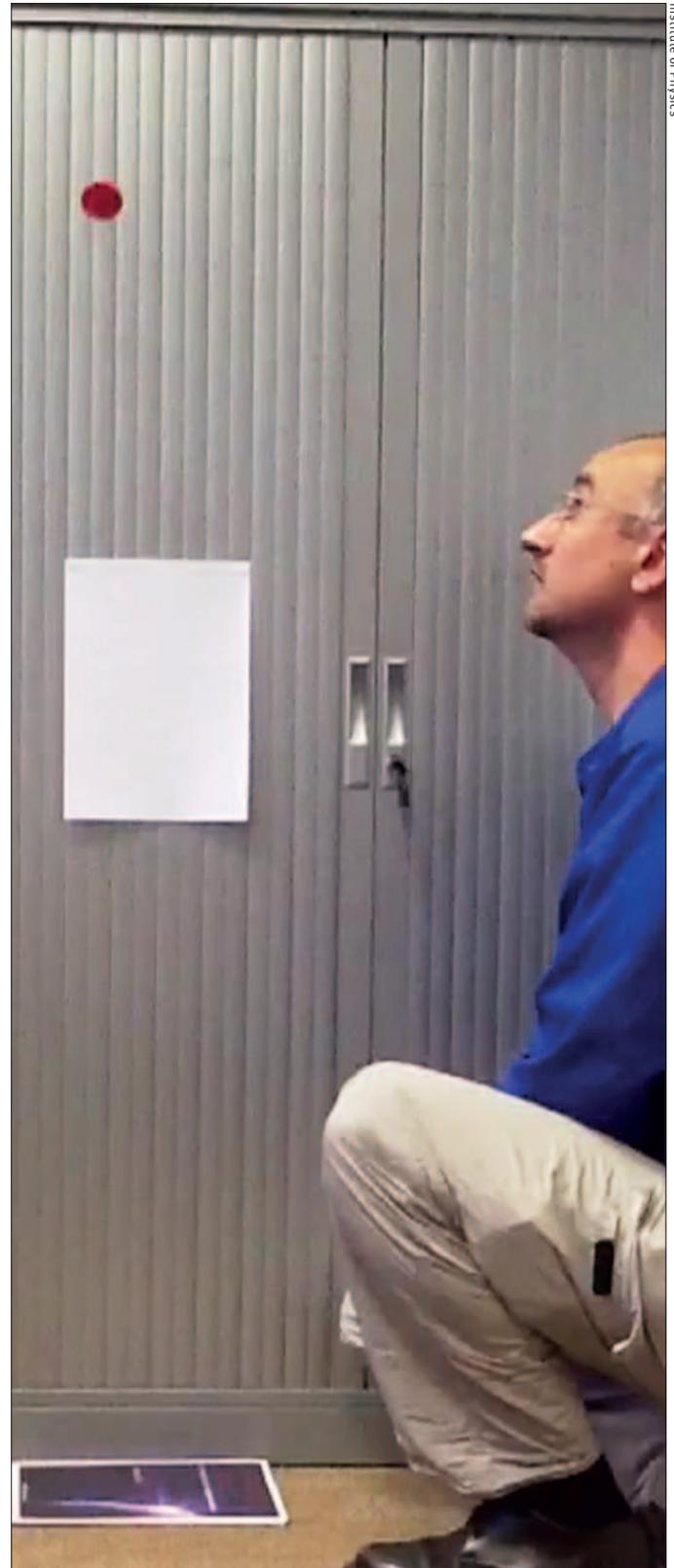
- How long does it take before the surprise “pop”?

Further ideas, including where to buy your popper and pointers to relevant articles in *Physics Education* are discussed on *TalkPhysics*, at [talkphysics.org/groups/158/forums/3627](http://talkphysics.org/groups/158/forums/3627).

To join this community, simply go to [talkphysics.org](http://talkphysics.org) and click on “register here”.

Thanks to Gerry Blake and Liz Hutchins for their suggestions.

**Jon Clarke**, Web 2.0 publisher



Institute of Physics

*Jon Clarke demonstrating the height that can be achieved by the jumping popper toy.*