The newspaper of the physics community

January 2005

interactions

Institute *of* **Physics**

Einstein Year – the UK and Ireland's contribution to International Year of Physics – will be a huge public celebration of physics. In this special issue of *Interactions* you can read about some of the highlights of the next 12 months. More detailed information on everything about the year can be found at **www.einsteinyear.org**.

Einstein Year is just the start

Caitlin Watson hopes that attitudes towards physics will begin to change in 2005.

On 5 January the Institute enlisted the help of 18-year-old Ben Wallace to launch Einstein Year, the UK and Ireland's contribution to International Year of Physics 2005. A member of Team Extreme, one of the world's top BMX stunt teams, Wallace performed the first-ever Einstein Flip – a stunt created with the help of physicist Helen Czerski of Cambridge University that shows young people that physics can be cool.

"Cool" is not a word that most people associate with physics, and it's no secret that, lately, physics has been suffering from an image problem. All too many people regard it as dull, difficult and irrelevant. But Einstein Year is all about bypassing such negative perceptions and creating a whole new set of associations, especially in the minds of 11- to 14-year-olds, the main target audience for the year's activities. At this critical age, children make lifelong decisions about who they are and what they like. For many, Einstein Year will be their first experience of physics, so it's vital that it's an enjoyable and positive one.

Changing perceptions of physics is a huge challenge. For many, even the word "physics" is an instant turn-off. The name Einstein Year gets round that by focusing instead on an icon who is not just the world's most famous physicist but also one of the most recognized figures of the 20th century. Even those who turn away from physics tend to warm to the image of the quirky old man with the mad hair, the non-conformist pacifist who refused to wear socks. And, of course, 2005 is the centenary of Einstein's *annus mirabilis*, when he published his seminal papers on special relativity, the photoelectric effect and Brownian motion.

We're not just relying on Einstein's name and image to change attitudes to physics. Far from being dull, difficult and irrelevant, the events and activities during Einsein Year aim to be entertaining, accessible and interesting. For example, throughout 2005 groups of "physics buskers" will be turning up in public places and festivals to show off the exciting physics-based tricks in our specially created Physics To Go packs. And there's even an Einstein Year computer game, *Time Twins*, that's great fun to play but also communicates some of the ideas of special relativity.

Team Extreme

Team Extreme's Ben Wallace helps Einstein Year to get off the ground.

We hope to reach as many young people as possible during Einstein Year, and that everyone who takes part will learn a little physics. But Einstein Year won't take the place of physics teaching in the classroom. Instead, it's about exposing young people to some new experiences of physics – ones that they're unlikely to get at school.

"Changing perceptions of physics is a huge challenge. For many, even the word 'physics' is an instant turn-off."

The touring exhibition Move Over Einstein, for example, details the search for the Higgs boson and the mysteries of dark matter with hands-on exhibits that capture the excitement of these research areas. The exhibition will also feature information about some of the young researchers involved in this work. Aside from science museums and science centres, the exhibit will visit some less traditional spaces, such as city museums and even shopping centres, to reach those who might not otherwise be exposed to physics.

One of the biggest projects that will start during Einstein Year is Lab in a Lorry. Three of these custom-built mobile physics laboratories will be touring the country, each with experiments designed to inspire young people. Visitors will take part in real physics and meet real physicists, and for some their visit could even be the push that makes them consider taking physics further.

We've started the year as we mean to go on – engaging young people by highlighting the physics involved in activities that interest them. That's why the Institute was keen to team up with Ipswich Town Football Club to put on an Einstein birthday party – one of dozens around the country. The party will include tricks and games that are, first and foremost, great fun but are also based on physics. Children will discover, for example, that it is harder to score a goal with a completely smooth football than with one with a seam, but they'll also find out why.

Most activities are aimed at young people, but adults needn't feel left out. There will be plenty to engage all age groups during the year. We realise that young people don't live in a vacuum – they're influenced by older siblings, parents and teachers. If everyone around them says that physics is boring, they're likely to believe it. Throughout 2005 we'll be demonstrating to everyone how physics plays a part in so many aspects of our lives. There will be 10 themes during Einstein Year – including Physics in Music, Physics in Sport and Physics in the Future – that we hope will demonstrate just how relevant physics is to us all.

This year is a great opportunity to try out new ways of inspiring people with physics, and that effort won't end on 31 December 2005. Once the balloons have come down and the cleaners have left, we'll be taking a close look at what worked – and what didn't – to make sure that Einstein Year has a lasting impact. It's not too late to put on your own event. You, too, can be part of this effort to change attitudes, so that a whole new generation grows up believing that physics is interesting, exciting and, yes, even cool.

Caitlin Watson is the Institute's programme manager for Einstein Year.
www.einsteinyear.org

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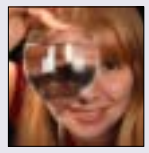


"Students get a real buzz using the telescope. It makes them feel like real astronomers."
Andrea Fesmer, p2

"To me, science is so vibrant and exciting. I can't understand this idea of it being boring."
Wendy Sadler, p3

Einstein's brain is talking point

By Michelle Cain

Einstein's brain will be starring in a lecture series based on the documentary *Riddles of the Dead: the Secret of Einstein's Brain*, which was first aired on National Geographic last December and is due to be screened on Channel 4 in the autumn. During Einstein Year, nuclear physicist Jim Al-Khalili and neuroscientist Mark Lythgoe, who made the documentary, will be taking a model of Einstein's brain around the country as part of a talk for branches, schools and science festivals.

"Was Einstein's brain unique?" ask Jim Al-Khalili and Mark Lythgoe.

Their lecture is a dialogue between the presenters, based on themes from the documentary, including plenty of material that didn't appear in the final cut. Al-Khalili will talk about Einstein's theories; Lythgoe will focus on what was special about Einstein's brain. The lecture series – supported by an Einstein Year grant – is aimed at a variety of audiences: children, non-scientists, physicists and neuroscientists. The duo plan to tailor their double-act to each type of audience.

"It will be a bit like a travelogue, but quite different from the documentary," said Al-Khalili. "We will talk about the fun side of filming and also about the science. The documentary was light on physics, but I will be able to go into more detail about Einstein's momentous discoveries, so it's not just a human interest story."

The two presenters will recount their adventures in the search for Einstein's brain, from driving a Cadillac across the Mojave Desert in California to locating it in a New Jersey hospital.

After the autopsy, Einstein's brain was preserved for scientific research and is currently kept by Princeton University in two jars in a secret location. "It will not be making any more television appearances after this documentary," said Al-Khalili. However, detailed photographs were taken during Einstein's autopsy in 1955, and these were used to recreate an accurate 3-D model of his brain. Al-Khalili and Lythgoe will use this model to examine whether Einstein's brain was unique in any way. Although his brain was of normal size, there are certain interesting features that Lythgoe will highlight in his talk.

They will also discuss a more theoretical question: Could others have come up with the theory of relativity or was Einstein's genius unique?

www.einteinyear.org/events

Students search for asteroids

By Sarah Connolly

In March 2005, as part of Einstein Year activities during National Science Week, groups of students across the UK will be searching the skies for asteroids using the Liverpool Telescope in La Palma, Canary Islands – the world's largest robotic telescope.

Students aged 11 to 16 will take part in Go Observing workshops, a joint venture between the National Schools Observatory, the Astrophysics Research Institute at Liverpool John Moores University (LJMU) and City Learning Centres throughout England.

The workshops were pioneered by members of the Merseyside Branch of the Institute, including Andrea Fesmer, a local physics teacher, and Andy Newsam, an astronomer at LMJU who has developed the LTImage software that allows images to be ordered from the telescope via the Internet.

Schools in Widnes and Runcorn have been attending pilot workshops in local City Learning Centres (CLCs) since June 2004. "They get a real buzz from using a multimillion pound telescope – it makes them feel like real astronomers," said Fesmer. "Searching for asteroids just seemed like an ideal project for Einstein Year."

The workshops will last for an hour, during which time students will be taught how to use the software to search for asteroids; they will also have the opportunity to ask questions of an astronomer. Each school will then have access to the telescope for one month to carry on their search.

It is hoped that, through the CLCs, students from less privileged areas will be able to take part, making this a national project. Each workshop can accommodate up to 30 students and Fesmer anticipates that at least half of the CLCs will take part – about 1800 students in total.

In Scotland, Wales and Ireland the Institute's Teacher Network Coordinators will be organising training workshops for local schoolteachers. Institute Affiliated Schools will receive six months' access to the telescope.

"I really encourage members to get involved in the Go Observing workshops in their local area," said Fesmer. "We've had a great reaction from both gifted students and disaffected groups. For many it's the first time they've been exposed to a real live physicist and it helps them see that physics is more exciting than they ever thought."

www.schoolsobservatory.org.uk/einstein

Free resources are packed full of ideas

Einstein's birthday – 14 March – happens to fall in National Science Week this year, and dozens of groups will be holding physics-based parties to celebrate. This couldn't be easier, thanks to a helpful pack from the Institute that does most of the work for you.

The Einstein Birthday Party Pack contains 10 party-friendly experiments to keep children entertained and inspire them with physics. They can play "Bubble Tennis" and learn about surface tension or do their first "Fizzics Experiment" (blowing up a balloon using a small amount of fizzy drink) and learn about the expansion of gases. The pack also contains several problem-solving activities, such as "Rocket Science", which challenges them to build and race a "rocket" constructed from little more than a balloon and a piece of string.

If children's parties aren't your thing, there's the Physics To Go pack, which contains everything you've ever wanted to know about putting on a public event demonstrating physics. It contains 20 easy-to-perform tricks designed for any audience and just about any public venue – on the street, in a motorway service station or even at your local supermarket. The tricks include "Balloon Kebabs", which involves sticking a sharp skewer through a balloon. Children especially will be amazed that the balloon doesn't burst. There are also plenty of tricks to keep their parents entertained, such as "Lager Lamp", which makes use of a pint of lager and some peanuts to demonstrate buoyancy.

In addition the pack includes various sample quizzes, such as a pub quiz, along with tips on creating eye-catching posters and advice about how to publicise your event to your local community.

The packs are available to download at www.einsteinyear.org/get_involved.

Rambert Dance Company, *Constant Speed* by Mark Baldwin. Photo: Anthony Crickmay

A new dance work inspired by Einstein's physics has been commissioned by Institute of Physics Publishing. The Rambert Dance Company's *Constant Speed* will première at Sadler's Wells, London, on 24 May. Created by the Rambert's artistic director, Mark Baldwin, *Constant Speed* takes its inspiration from the phenomenon of Brownian motion and Einstein's theory of special relativity. The work will form part of the Rambert's touring and education repertoire. Visit www.rambert.org.uk for more information.

Touring exhibition is cutting edge

One of the challenges of Einstein Year will be to share the excitement of modern research in physics with young audiences. That's the aim of the brand-new touring exhibition, Move Over Einstein, which will showcase six areas of cutting-edge research.

The exhibition, aimed at 11- to 14-year-olds, will present contemporary research using hands-on, interactive exhibits. "Hands-on exhibits have been done before, and cutting-edge research has been presented before, but this is the first time that the two have been combined in this way," said Caitlin Watson, programme manager for Einstein Year.

Each exhibit will highlight the young EPSRC and PPARC researchers who are involved in the work, while emphasising the importance of teamwork in modern scientific research. The topics presented at the exhibition will include the search for dark matter; building a super-nose; the search for other planets; nanobot drug transporters; the search for the Higgs boson; and quantum cryptography.

The exhibition will tour the UK and Northern Ireland, visiting eight venues in all, which will include the Science Museum, the Royal Museum of Scotland and some non-traditional venues, such as the Lakeside Shopping Centre in Thurrock. "We want the exhibition to reach as many people as possible, so we're taking it to places that are not normally associated with science, like shopping centres," said Watson. School groups will also be encouraged to attend and teachers will be provided with materials to take back to the classroom.

profile: Wendy Sadler

The sound of science

Ayala Ochert meets one of the team driving Lab in a Lorry.

Will Webster

Through a glass, lightly: Wendy Sadler shows how to make science simple.

Standing up on stage in front of hundreds of people and presenting television programmes aren't obvious choices for someone who describes herself as "quite shy". "But when I'm talking about things I really believe in, I don't feel shy," says Wendy Sadler.

What she believes in – wholeheartedly and passionately – is science and technology . "Technology just amazes me!" says Sadler, who admits to being a bit of a "gadget fiend". Her latest toy is an infrared thermometer that allows you to measure someone's temperature from a distance – just the sort of device that she incorporates into her science shows for children or family audiences.

For six years Sadler was public programmes manager for Techniquest Science Centre in Cardiff, where she developed innovative science shows using various innovative formats, such as game shows and detective stories. "It's all about looking for ways to make the audience become part of the show," she explained. In 2002 she left Techniquest to set up her own science communication start-up company, Science Made Simple, a venture that won her recognition in the science and technology category of the 2004 Welsh Woman of the Year awards.

Sadler grew up in Wolverhampton to a musical family. She loved physics and music and decided on a joint honours degree at Cardiff University. "I liked the mixture of the logical and the creative," she said. However, as a student she felt annoyed at having to justify her choice of physics to other students. "To me, science is so vibrant and exciting that I can't understand this idea of it being musty and boring. I want other people to understand why it's interesting," she explained. And that's exactly what she has devoted her career to.

After graduating, Sadler spent a year touring the science centres of Australia, developing shows for them. Although she'd had a little experience working as an "explainer" at Techniquest, she'd never developed shows before. But her enthusiasm and energy gave others the confidence to let her prove herself. When she returned to Cardiff, aged just 23, she was offered the new post of public programmes manager.

Modesty leads her to claim that she was just "in the right place at the right moment", but in reality Sadler has always created her own opportunities. Before she left for Australia she wrote to BBC Radio Wales to tell them about her trip and landed a regular slot reporting on science in Australia. Since then she has done four series of HTV's science programme *What on Earth*, and she was also a presenter on *Tomorrow's World Livelab*. In 2002 she was a finalist in the BBC talent competition *Science on Screen*.

Becoming the Institute's Schools Lecturer in 2002 also turned out to be a big break. Her talk, "Music to your ears: the story of sound, synths and CDs", toured the UK and beyond, generating enough work to make her start-up a possibility. In 2003 she gave the talk in South Africa and also trained local people to become presenters of science. "It just transformed their confidence. We hear that one guy is still doing outreach work in the township schools," she said proudly, remembering herself what it was like to be that shy girl getting up on stage for the first time.

Her list of clients is impressive and includes the Royal Institution, the Glasgow Science Centre and the National Space Centre. She's also writing her third series of children's science books for Heinemann. Her latest project brings her back to the Institute as one of the project scientists for Lab in a Lorry, which will launch during Einstein Year. The Institute and the Schlumberger Foundation are joining forces to produce three interactive mobile physics laboratories that will tour the country, visiting schools, festivals, shopping centres, and sporting and other community events.

"It's all about looking for ways to make the audience become part of the show."

"I've had a lot of experience with touring hands-on exhibits, but this is something else. It gives people more flexibility to make their own decisions; it's more open-ended," said Sadler. She'll train the volunteer scientists, who will act as guides in the lorries. Unlike a traditional physics practical, there is no set beginning or end. Visitors decide for themselves what to do, with help from the guides, who can answer questions and offer advice. "It gives a taste of what real physics is like," she said.

The experiment that most excites Sadler is one that uses sound to break a wine glass. The equipment is more sophisticated than is found in most school laboratories, but she believes that it's the volunteers who will make the real difference. "We've got to make sure that there are exciting things to do, but it's the volunteers who will really bring it to life."

www.labinalorry.org.uk

OBSERVATIONS

Karen Bultitude shares her experience of putting on the Institute's annual Schools Lecture "Our planet – our future", which explores how physics and engineering help us to understand the impact of human life on the planet.

10 November

Preparation begins today in earnest. I'm off to a local school with my co-presenter, Laura Grant, to chat to students about our ideas for the show. We're keen to incorporate some innovative techniques, such as getting the audience to vote for the topic they want to hear about. The idea is to transfer ownership of the show to the audience to maximise their interest and engagement. We've got a list of potential topics and demonstrations but we really want to know what the students think. They won't get much out of a show that they think is dull.

17 November

Wow! What great feedback. Cloud Seeding is a definite "in" – every single year group was impressed by the idea and none had heard of it before. They also really liked Hydrogen Technology and Nuclear Fusion – in fact, there was a definite trend towards anything futuristic. But they were very down on Energy Efficiency and Personal Choices. One group in particular complained heavily that their teachers and parents are already telling them to turn lights off all the time. They were adamant that if we included those issues in our talk they wouldn't listen.

18 November

We've finalised the six topics for the show. All we have to do now is research the demonstrations for each one and combine them all into a coherent lecture. We've decided to simplify the "choose-your-own-lecture" format so that the audience chooses between pairs of (fairly similar) topics. That way the overall message for each show should remain consistent.

26 November

The show is starting to take shape. Laura and I have been working on sourcing good visual demonstrations that we can perform live on stage. Our favourite so far is a flame tornado – a pillar of flame that we'll use to explain vortex formation in hurricanes and tornadoes.

3 December

Phew! It's been a tiring few days, sourcing all of the equipment for the demos while doing our usual full-time jobs. We've been getting some very strange looks as we've brought the equipment in. Our kit includes helium-quality balloons, a cook's blowtorch, reams of fluorescent paper and a lazy Susan. I just hope it will all fit in Laura's car...

10 December

Just finished our first full rehearsal, which ran into quite a few problems – the kit we ordered not turning up, demos not working exactly as planned and the script taking longer to write than we originally thought. We've had some help from a script adviser, which has made the "story" more exciting and logical. At one point on stage Laura and I have to (pretend to) argue about which topic the audience should choose, which is great fun, but I'm a bit worried. It's just a couple of days until our first pilot lecture. Are we going to be ready?

15 December

We had our first pilot performance yesterday. The students enjoyed the electronic voting and the "choose-your-own-lecture" format, and we felt that we had a great rapport with the audience. We've also learned which parts didn't work so well, and last night we undertook a rapid redesign ready for our second pilot performance today. We've still got some work to do, but the lecture is shaping up well and I think it promises to be a highly enjoyable show that will inspire students around the country with a fascination for physics and the contribution that it can make to our planet and our future.

Visit http://teachingphysics.iop.org for full details of times and venues for the 2005 Schools and Colleges Lecture. If you would like to contribute to **OBSERVATIONS**, please send an e-mail with your idea to interactions@iop.org.

Selected highlights of Einstein Year celebrations throughout the UK and Ireland. To find out what's happen

JANUARY

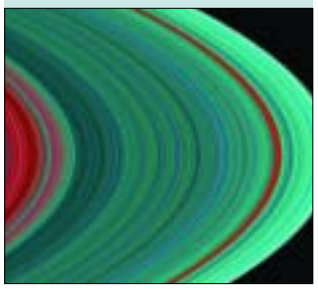
UniVerse
The BA
10 January
Poetry competition inspired by physics. For all ages.
www.the-ba.net/universe

Was Albert Einstein the Original Doctor Who?
ESAT BT Young Scientist and Technology Exhibition 2005, Royal Dublin Society
13–15 January
Play exploring special relativity, starring Dr Who and Einstein.
www.esatys.com

Physics Across the World
Science Across the World
January
International physics poster competition for school students.
www.scienceacross.org

SPACE

Cassini/Huygens Probe: Titan Landing
PPARC
14 January
Launch of Physics in Space theme as Huygens probe lands on Titan.
www.uk2planets.org.uk



Albert Tripos
INTECH Science Centre, Winchester
27 January
Three lectures putting Einstein's theories into a modern context.
www.intech-uk.com

FEBRUARY

WEATHER

Metlink 2005
Royal Meteorological Society
February
Launch of Physics in Weather theme. Make, exchange and analyse weather observations with the help of meteorological professionals.
www.metlink.org

Move over Einstein
Discovery Museum, Newcastle
26 February
First stop in nationwide tour of this interactive exhibition exploring cutting-edge physics.

The Weather Project
The Met Office
February
Weather experiments for the classroom or home.
www.met-office.gov.uk/education

Who Do You Think You Are, Einstein?
Wrexham Science Festival
Deadline: 28 February
Einstein short-film competition. Winning entries will be shown at the festival.
www.wrexhamsf.com

ADD YOUR OWN EVENT

Visit www.einsteinyear.org/events

MARCH

Family Day at Bletchley Park
Oxford Branch of the BA, Bletchley Park, Milton Keynes
5 March
Dr Chris Davies leads a fun-packed day of space-related events during Bletchley Park's Einstein Week.
Contact: Catherine Gater 01235 778 420

Einstein, the Photon and Fundamental Interactions
University of Liverpool
9 March
Public lecture organised by the Merseyside Branch of the Institute of Physics.
Contact: Ann Marks LivIOP@amarks.co.uk

Einstein: the Man who Invented Universes
University of Bath
10 March
Public lecture organised by the South-West Branch of the Institute of Physics.
http://swestern.iop.org/Events.htm

The Science of Sound
Summerfield Primary School, Leeds
11–20 March
A presentation on the science of sound, including samba, rock and didgerydoo.
Contact: Jon Farley 0113 205 7520

It's all Relative!
Oakwell Hall Country Park, Batley, West Yorkshire
13 March
Family activity day with real moon rocks, a planetarium and a chance to meet Einstein.
Contact: Joanne Catlow 01484 223 803

Café Scientifique
Royal Exeter Hotel, Bournemouth
15 March
Talk on Einstein's discovery of the equivalence of energy and matter, followed by a 126th birthday party.
Contact: Judith Wardlaw 01305 213 594

MARCH CONT.

Paperclip Physics Competition: Grand Final
Thinktank Science Museum, Birmingham
16 March
School students are challenged to explain physics using everyday household objects.
http://paperclip.iop.org

Pub Science
The Plough Inn, Ripple, Deal, Kent
16 March
Pub quiz with demos, illustrations and questions about the science around us.
Contact: John Adams 01304 366 944

Einstein's Sporty Birthday Party
The Institute of Physics and Ipswich Town Football Club
17 March
Huge party for 11–14 year olds to celebrate Einstein's birthday.
Contact: joseph.hines@iop.org

Science Madness at Heworth Grange
Heworth Grange Comprehensive School, Tyne & Wear
19 March
Fun-packed day including a show on energy, "make and take" activities and an Einstein competition.
Contact: Shaunagh Lavery 0191 4212 244

Einstein's Birthday Bash
Killhope Lead Mining Museum, Bishop Auckland, Durham
19–20 March
Physics fun and games.
Contact: Tina Raynor 01388 537 855

APRIL

THE ARTS

Einstein on the Big Screen
Watershed Media Centre, Bristol
2–3 April
Physics in the Arts theme kicks off with weekend of Einstein and film.
Contact: maddy@watershed.co.uk

Lab In a Lorry
Various venues
From April
Mobile science laboratory with hands-on experiments.
www.labinalorry.org.uk

ORGANISE AN EINSTEIN BIRTHDAY PARTY

Download a party pack from www.einsteinyear.org/get_involved

The Einstein Lecture
University of Warwick
13 April
Public lecture during IOP 2005 conference, with Prof. John Stachel.
www.physics2005.iop.org

The Origin of the Universe
H H Wills Laboratory, Bristol University
19 April
Public lecture organised by the South-West Branch of the Institute of Physics.
http://swestern.iop.org/Events.htm

MAY

Visions of Science
Deadline: 7 May
Science photo competition featuring a special Einstein award for best physics-inspired work.
www.visions-of-science.co.uk

TIME

50th Anniversary of the Invention of the Atomic Clock
National Physical Laboratory
May
Launch of the year's Physics in Time theme.
www.npl.co.uk

Dear Professor Einstein
London and South-East Branch of the Institute of Physics, venue TBA
11 May
Actors narrate excerpts from Einstein's letters, followed by a discussion with the director.
Contact: D.G.Dawes@open.ac.uk

Constant Speed
Rambert Dance Company, Sadler's Wells Theatre
Premiere: 24 May
Modern dance inspired by Einstein's physics.
www.rambert.org.uk

EINSTEIN YEAR GRANTS AVAILABLE

Visit www.einsteinyear.org/get_involved/funding for more information

ing in your area, to add your event or to find out more about the year's activities, visit **www.einsteinyear.org**.

JUNE

PICK UP A 'PHYSICS TO GO' PACK

Physics busking tricks for all ages. See www.einsteinyear.org/get_involved

MUSIC

Heavenly Music
Royal Greenwich Observatory
June
Physics in Music theme begins with workshops using sounds from space to compose music.
www.rog.nmm.ac.uk

Einstein's Brain
Cheltenham Festival of Science
8–12 June
Jim Al-Khalili and Mark Lythgoe recount their trip across America in search of Einstein's brain.
www.cheltenhamfestivals.co.uk

Lab in a Lorry
Cheltenham Festival of Science
8–12 June
Mobile science laboratory with hands-on physics experiments.
www.cheltenhamfestivals.co.uk

Fun with Physics
SETPOINT, Shrewsbury, Shropshire
25–26 June
Take part in practical experiments, investigating the physics of flight and ping-pong.
Contact: Nigel Moore 01952 681 010

Rambert Dance Company, *Constant Speed* by Mark Baldwin. Photo: Anthony Crickmay

JULY

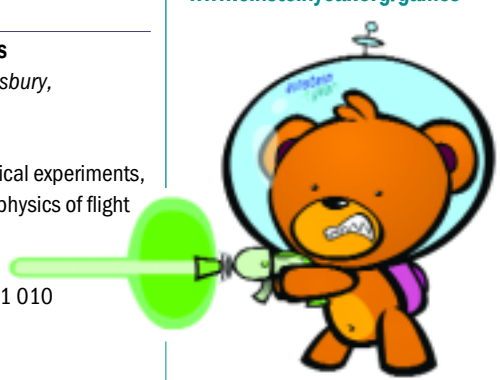
Schools Lecture: Our Planet – Our Future
Royal Institution, London
7 July
How physics can help us to understand the impact of human life on our planet.
http://teachingphysics.iop.org

Einstein Made Simple
Cardiff University
Throughout 2005
Entertaining show bringing Einstein's research to life.
www.sciencemadesimple.co.uk

Einstein Comes to Radstock
Radstock Museum, Bristol
Throughout 2005
Physics-based talks and activities for all of the family.
Contact: Colin Axon 01225 383 248

DOWNLOAD THE 'TIME TWINS' GAME

Visit www.einsteinyear.org/games



AUGUST

An Evening with Albert Einstein
Various venues
Throughout 2005
One-man show about Einstein's life and work by actor Gary Barber.
Contact: Gary Barber 01227 264 738

Chocolate, Mirrors and the Speed of Light
Particle Theory Group of the Institute of Physics, various venues in the South West
Throughout 2005
Talk and demonstrations on how our understanding of light has evolved.
Contact: Martin Lavelle 01752 232 729

Einstein@home
World Year of Physics 2005
Throughout 2005
Lend a hand in the search for gravitational waves with this screensaver.
www.physics2005.org

SPORT

Physics and Sport
Various venues
Live event demonstrating the physics of sport launches this Einstein Year theme.
Contact: caitlin.watson@iop.org

SEPTEMBER

BE A GUIDE FOR LAB IN A LORRY

Get information on volunteering from www.labinalorry.org.uk

MYSTERY

The Physics of Magic
The Magic Circle, London
3–4 September
Magicians and scientists team up to demonstrate the magic of physics.
Contact: drsharon@pavilion.co.uk

BA Festival of Science 2005
The BA, Dublin
5–9 September
Annual festival of the British Association for the Advancement of Science.
www.the-ba.net

Visions of Science
Venue TBA
20 September
Science photo competition awards ceremony featuring Einstein Year award for best physics-inspired work.
www.visions-of-science.co.uk

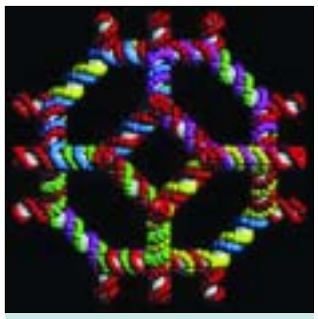
sciZmic Science Go For It! Challenge Pack
sciZmic
September
Launch of challenge pack with ideas to help Girl Guides to work towards their Go For It! award.
www.scizmic.net

Nick Robinson

OCTOBER

Recreating the Georgia Wonder
Venue TBA
October
Psychologist Richard Wiseman recreates the strange world of Lulu Hurst, who stunned 19th-century audiences with feats of strength based on physics.
Contact: r.wiseman@herts.ac.uk

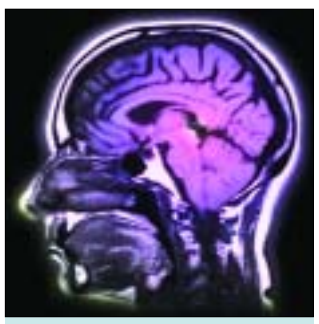
Schools Lecture: Our Planet – Our Future
Sheffield University and Newcastle University
6 & 11 October
How physics can help us to understand the impact of human life on the planet.
http://teachingphysics.iop.org



THE FUTURE

Future Physics
Institute of Physics
October
Series of debates about future technologies launches the Physics in the Future theme.
Contact: joseph.hines@iop.org

NOVEMBER & DECEMBER



MEDICINE

Medical Physics
Medical Research Council/ Institute of Physics
November
Exploring the life-saving physics behind medical imaging.
Contact: sam.rae@iop.org

Meet Uncle Albert
Yorkshire Branch of the Institute of Physics, Leeds
November
Writer Russell Stannard plays Uncle Albert, best-loved character of his popular children's books.
Contact: pbritton@fish.co.uk

The Story of Physics
Bath Royal Literary and Scientific Institution
24 November
Seven lectures on the contributions made by famous physicists.
Contact: Victor Suchar 01225 337 026

ENERGY

Debates with a Difference: Energy
sciZmic, venue TBA
December
Young people debate the issues surrounding nuclear energy.
www.scizmic.net

HIGHLIGHTS

Optics – 300 years after Newton

Exactly 300 years after Newton published his revolutionary *Opticks*, the Optical Group and the Quantum Electronics and Photonics Group of the Institute held a special meeting at the Royal Society – Opticks 04 – to celebrate Newton's legacy and to explore new technologies in the field.

Simon Schaffer of the University of Cambridge, and presenter of BBC Four's new series *Light Fantastic*, gave a historical overview of Newton's career. He emphasised the importance of the proximity of the Royal Society and the thriving London-based industry of instrument makers. Leaps in technology by instrument makers allowed Royal Society scientists to make vital discoveries, which in turn fuelled developments in that industry, he said.

Wilson Sibbett of the University of St Andrews discussed the possibilities of new lasers that generate pulses of light of just a few femtoseconds. Applications include lightning-free golf courses, imaging technology for looking through solid biological tissue, and a method of defusing rocket-propelled grenades from a distance. John Pendry of Imperial College presented his new research developing a new range of materials with negative refractive indices. These could one day allow exceptional amounts of data to be encoded onto DVDs.

'Electronic eye' to help the blind

Scientists in Japan have developed a system that could make pedestrian crossings much safer for blind people. The technique was developed by Tadyoshi Shioyama of the Kyoto Institute of Technology in Japan and was published in the Institute journal *Measurement Science and Technology*. It uses an image from a single camera (which could be mounted in the middle of a pair of specially designed glasses) and relays three pieces of crucial information through a small speaker: where there is a crossing, how wide it is and the colour of the traffic-lights. Reports of the work appeared in newspapers around the world, including the *New York Times*, *New Scientist* and the *Guardian*.

Shining a light on LEDs

Institute of Physics Publishing has launched a new title, *LEDs Magazine*. Produced in association with Cabot Media Ltd, it will cover the rapidly growing LED industry and serve as a link between semiconductor manufacturers and end users in markets such as lighting, displays and the automotive industry. The publication comprises a website and a regular e-mail newsletter.

"LEDs provide amazing colour-changing effects and have been used in high-profile projects to illuminate buildings, bridges, TV studios and rock concerts," said editor Tim Whitaker. "As performance levels increase and prices fall, the challenge over the next several years is for LEDs to penetrate general illumination markets, such as home and office lighting." The website includes case-studies, technical articles, background information, business and product news, an events calendar and a buyer's guide.
ledsmagazine.com

The *Independent Physicist*

In association with the Institute, the *Independent* published a careers supplement on 28 October 2004 in the education section of the newspaper. The "Physicist" featured a comment by the editor-in-chief of *Good Housekeeping* magazine, Lindsay Nicholson (an astrophysics graduate), and case-studies of physics students and professional graduates. The aim of the supplement was to highlight how useful a physics degree can be in all walks of life – whether you want to edit a magazine or work in academia, industry or the City. The Institute plans to distribute copies of the supplement to school physics departments in early 2005.

David King addresses Institute

On 29 November the Institute's Business Partners welcomed Sir David King, the government's chief scientific adviser, to a Key Insight Business Briefing on the subject of science and innovation. According to Sir Gareth Roberts, the meeting's chair, King was the "architect" of the government's recent 10-year investment framework for science and innovation.

Drawing on his recent *Nature* paper, "The scientific impact of nations", King pointed out that there is a very high correlation between a country's science output and its wealth. The UK has been "very good at scratching its cognitive itch," said King, and as a result has the second largest volume of science citations in the world. Basic science research in the UK is also extremely good value for money, with 60% more citations per pound spent on research than in Germany, he says. However, he also noted a shift in recent years away from the physical sciences and engineering and towards the biomedical sciences.

The government plans to spend an additional £1 billion on the science base over the next 10 years, but King says that the government also wants business to increase its investment in R&D, from 1.9% of GDP to 2.5%. It is looking at ways to stimulate interest in R&D in the City and to get science "higher on its radar screen".

Physicists must also become more like entrepreneurs, believes King, something that the government is trying to encourage through its Science Enterprise Centres. "We have to instil [among students] the idea that wealth creation is a good idea and that they ought to have it in the back of their minds when studying physics," he said. The government is looking at ways to "pull through" investment, for example by using government procurement to give UK-based technology firms a boost.

Industry panellist Andrew Mackintosh of Oxford Instruments spoke of some of the difficulties that face science-based industries in this country. Chief among them, he says, is the conservative attitude of UK investors. But the government could also help science-based industry by decreasing the burden of regulation, he said.

● On 2 December Chancellor Gordon Brown announced a series of measures in his prebudget report designed to stimulate science-based industry. These include removing the tax barriers to the formation of university start-ups and the creation of an industry-led science forum to help to raise the level of business R&D towards its 2.5% target.

SUPPORTING PHYSICS TEACHING

Robin Chanda

Claire Curtis-Thomas MP (second from right) and Institute president Sir John Enderby (far right) join in a demonstration of current flow within a circuit – one of the classroom activities included in the forthcoming "Supporting Physics Teaching" (SPT) CD-rom resources. The Institute's SPT project provides assistance for non-specialist teachers to teach physics to 11- to 14-year-olds and was launched at a reception at the House of Commons hosted by Curtis-Thomas. The set of five CD-roms – *Forces and their Effects*, *Energy and Energy Resources*, *Light and Sound*, *Electricity and Magnetism*, and *The Earth and Beyond* – will be officially launched in the spring. The education minister, Dr Kim Howells, spoke at the launch, praising the project as an example of a successful partnership in education.

Schools search in vain for physicists

A survey conducted by the Institute has found that 3 out of 10 schools looking for a physics teacher are unable to recruit one.

Trawling through job adverts in the *Times Educational Supplement* during a six-month period, the researchers identified 140 that mentioned physics – either alone or in combination with another science. When schools were later contacted, only 95 of them said that they had been able to fill the post with a specialist physics teacher.

It's well known that there's a shortage of physics teachers, and two-thirds of 11- to 14-year-olds are taught physics by non-specialists. But Chris Shepherd, the Institute's teacher support manager, still feels that these results were surprising. "These are the schools that were confident enough to mention physics in their advert. It's a national scandal that even these confident schools were unable to fill the posts."

Schools are having to find creative ways round the recruitment problem. Some department heads have stepped aside to enable the school to hire a new physics teacher at a higher salary. Others have hired from abroad.

The Institute is tackling the problem from all sides – through it's involvement in the Physics Enhancement Project, which trains non-physics graduates to become physics teachers, and through its Supporting Physics Teaching CDs, which are designed to help non-specialist teachers to enliven their physics teaching.

But a lack of good-quality data on who teaches what subjects in schools makes this harder, says Shepherd. Earlier this year the Institute helped to persuade the Department for Education and Science to start collecting more detailed information about teachers.

Young physicists get together

The Young Physicists' Conference makes a big bang in Glasgow, reports *Michelle Cain*.

"Every scientist is a communicator," proclaimed Ravi Kapur, kicking off the Institute's Young Physicists' Conference and highlighting a theme that would run throughout the weekend. Held at the University of Glasgow on 19–21 November, this year's conference drew a record number of physics undergraduates, postgraduates and young professionals.

In his talk, the film-maker, journalist and physics graduate Kapur told delegates that explaining ideas to others – concisely – is a crucial part of a scientist's everyday work. "The greatest asset any scientist has is their passion and vision for their subject," he added. He also observed that a large proportion of documentary makers are also physics graduates, perhaps because both have a "constant need to quench the thirst of their curiosity".

The annual conference brings together physicists in the early stages of their careers to network, share experiences and gain valuable training for their future careers. "It's worth putting the effort in to come...there's not much chance to meet up with other young people in physics," said Eoin Kerrane from Trinity College, Dublin.

Graham Clark

Delegates devise a useful gadget – a washing line that automatically brings the clothes inside when it rains.

The event included a lecture competition, giving students the chance to try their hand at frontline science communication. Nine gave short presentations on physics topics, with the winners showing an outstanding ability to explain a difficult, technical subject in an interesting way.

There were two workshops during the weekend. The first, entitled Wonder Widget, challenged the young physicists to work as a team, designing and building a prototype for a "widget" – an extremely useful gadget – using household materials like foil and cardboard boxes. "I was amazed at the range of ideas and the humour in the presentations," said Sara Shinton, a UK GRAD course director, who ran the workshop. "The participants were living proof that physicists are innovative and can communicate."

In the second workshop, delegates practised their interview skills. During the conference they were also given the opportunity to have a one-to-one session with the Institute's careers adviser, Vishanti Lall.

Writer and broadcaster Simon Singh concluded the conference with a talk about his new book, *Big Bang*. He traced the history of the Big Bang theory from the 1930s, when the steady-state theory of the universe prevailed. Back then the idea of "a day without a yesterday" seemed to create more problems than it solved. He described how scientists later favoured ethe Big Bang or steady-state theories depending on their political, philosophical or religious beliefs.

To illustrate how easy it can be to read too much into one's data, Singh played Led Zeppelin's "Stairway to heaven" backwards. When the word "satan" appeared on the screen, everyone was able to hear it in the record – but not before. He explained that the human brain searches for patterns, fills in the gaps and sees what it wants to see – an important lesson for physicists of all ages.

Physics professors press government

On 26 November the heads of 35 physics departments met at the Institute for the year's second Standing Conference of Physics Professors. They were addressed by Sir Alan Wilson, the new director-general for higher education, who expressed the government's desire to support subjects of strategic national importance.

The heads expressed concern that, despite a doubling in the science budget, high-quality grant applications are still being rejected. They asked Randal Richards of the Engineering and Physical Sciences Research Council to do more to reverse this trend.

The conference ended on a positive note with the department heads welcoming the Institute's proposed Undergraduate Bursary Scheme, which aims to offer a means-tested bursary of around £1000 per year to selected undergraduates studying physics from 2006.

Newcastle physics suffers blow

In early December Newcastle University closed its doors to new physics students. The announcement came in the wake of the high-profile closure of Exeter University's chemistry department, which led Sir Harry Kroto to return his honorary degree from that university in protest.

Newcastle said that it would be shifting research and teaching towards more applied areas of physics, such as nanotechnology, but would no longer teach pure physics. However, the 30 students enrolled on this year's course will be able to complete their degrees.

The problem of closing science departments has been receiving national attention – one-third of physics departments in the UK have closed over the last decade and chemistry departments have also suffered badly. The Institute has been highlighting the problem and its causes. It believes that the funding model of the Higher Education Funding Council for England (HEFCE) and the distribution of funds through the Research Assessment Exercise (RAE) are partly to blame for closures.

This year HEFCE changed the way in which it allocates money to science and arts departments, giving the sciences proportionally less and the arts proportionally more than in previous years. At the same time, the bulk of research funding goes to departments rated 5 or 5* in the RAE. In 2001, Newcastle received a 4 rating. The low popularity of physical science courses has compounded the problem for many 4-rated physics and chemistry departments.

Paradoxically, earlier in the same week the Chancellor, Gordon Brown, named Newcastle as a "science city for the North" as part of the government's plan to boost the UK's "scientific genius and world-class universities". "It's hard to see how Newcastle can be a city of science without a physics department," said Peter Main, director of science and education at the Institute. "What we need from the government is some joined-up thinking about science. On the one hand they say they want to emphasise science, but here we see that HEFCE has promoted the arts over the sciences by some considerable margin. The Institute has been pressing HEFCE to change the funding model."

There are signs that the government has been taking notice of the problem. In November, education secretary Charles Clarke said that he was asking HEFCE to look at ways of protecting subjects of "strategic national importance", including the sciences.

● In December the University of Keele decided to restructure its physics department. Physics and astrophysics will no longer be offered as single honours degrees and research will be limited to astrophysics.

IN BRIEF

● **On 27 November president Sir John Enderby** unveiled an Institute of Physics commemorative plaque to celebrate the life and work of Sir John Ambrose Fleming, who invented the radio valve 100 years ago. Commissioned by the South-West Branch of the Institute, the plaque was mounted on a wall of the Norman Lockyer Observatory, Sidmouth.

At a special event to celebrate the unveiling there was a live radio link-up with Newfoundland in commemoration of the first successful transatlantic radio transmission, made by Fleming in 1901. A team of students from Torquay Boys Grammar School also performed their show, *Dazzling Diodes*, which won them a place in the grand final of the 2004 Paperclip Physics Competition.

● **Institute of Physics Publishing** has launched a new service, Vector, allowing electronic access to the full text of more than 170 of its titles. All books published since 2000 have been digitised, along with selected bestsellers. New books will be added as they are published. http://vector.iop.org

● **The Joint Information Systems Committee (JISC)**, the technology acquisition arm of the Higher Education Funding Council for England, has bought a licence for the IOP Journals Historical Archive (1874–1998). The licence will provide permanent access to the archive for UK universities and fphysics-based research councils, so every state-funded scientist in the UK should now be able to access the Institute's journal archive.

NEWSMAKERS

Vince Smith, the Institute's branches representative on Council, received an MBE for services to physics at Buckingham Palace on 24 November.

Peter David Drummond, director of the Centre for Quantum-Atom Optics at the University of Queensland, has been awarded the Institute's 2005 Harrie Massey medal and prize for his contributions to physics in Australia.

Prof. Eberhard Bodenschatz of Cornell University, New York, has been appointed the new editor-in-chief of the *New Journal of Physics*. In November the six-year-old journal published its 500th article. Prof. Jan-Michael Rost of the Max Planck Institute for the Physics of Complex Systems in Dresden has been appointed editor-in-chief of the *Journal of Physics B: Atomic Molecular and Optical Physics*.

interactions

Editor Ayala Ochert, **Production** Kate Boothby, **Art Director** Andrew Giaquinto
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Nobody's fool

I thought you might like this story for Einstein Year. When Albert Einstein was on the speaker's circuit, he often found himself longing to get back to his laboratory work. One night, while on his way to yet another rubber-chicken dinner, he mentioned to his chauffeur (a man who somewhat resembled Einstein in looks and manner) that he was tired of speechmaking.

"I have an idea, boss," his chauffeur said. "I've heard you give this speech so many times. I'll bet I could give it for you." Einstein laughed loudly and said: "Why not? Let's do it!"

When they arrived at the dinner, Einstein donned the chauffeur's cap and jacket and sat at the back of the room. The chauffeur gave a beautiful rendition of Einstein's speech and even answered a few questions expertly.

Then a pompous professor asked an extremely esoteric question about antimatter formation, digressing here and there to let everyone in the audience know that he was nobody's fool. Without missing a beat, the chauffeur replied: "Sir, the answer to that question is so simple that I will let my chauffeur, who is sitting at the back, answer it for me."

Paul Heyda
Cuffley, Hertfordshire

The good news...

I read with interest articles in November's *Interactions* concerning the number of pupils taking physics A-level. The Royal Grammar School in High Wycombe is justifiably proud that "almost one-third of sixth-formers are studying physics A-level". This is to be contrasted with the more pessimistic observation by Sir John Enderby that "the number of students taking A-level physics continues to fall".

At Loretto School in Edinburgh, where I am director of studies for physics, 35% to 45% of A-level students take physics. This number is consistent from year to year, and physics is one of our most popular A-levels. We have always considered pupil interest in physics to be the norm, but the growing number of reports on the decline in numbers taking A-level physics nationally makes us realise we must be unusual. The subject can be made stimulating and relevant to young people (despite some appalling examination-board syllabuses) provided the correct teaching strategies are implemented. I am not convinced that "bribes by bursary" are necessary but they are welcome.

Martin Baker
Dalkeith, Scotland

...the bad news

I've only just picked up September's *Interactions*. On p8 you ask where to aim a laser cannon to hit the sun dead-centre at sunrise. The problem is that, at this time of day, the light from the Sun is refracted by around 0.55° (about one diameter) as it passes through the atmosphere. The laser cannon light will presumably be bent by the same amount as it leaves the atmosphere, so you can aim at the centre of the Sun to hit it. However, as the goal was "dead-centre", you have to worry about the wavelengths of the sunlight and laser so that you can correct for dispersion effects. In fact, the "blue" and "green" images of the Sun are higher in the sky than the "red" image, so the effect really isn't trivial. This is the reason for the famous "green flash" that is sometimes seen at sunset.

Tim Jolly
Bristol

Write to interactions@iop.org or the address above. Letters may be edited for space.

notices

NEW BUSINESS PARTNERS

Sharp Laboratories of Europe Ltd, PANalytical Research.

NEW MEMBERS

Guy Buesnel, Benny Hallam, Joseph Melville-Roberts, Juan Roman.

NEW FELLOWS

Peter Beton, Frederick Currell, Stephen Lee, Glen McHale, Roger New, John Nye, Michael Conlhaola, John Pugh, Mervyn Rose, Judith Steven-Setchell, Clive Tadhunter, Peter Thomas, Anne Tropper, Jakob Van Den Berg.

IN MEMORIAM

Martin Black, Peter Hambling, Peter Head, Rudolf Kingslake, Arnold Lynch, Heinz Maier-Leibnitz, Stanley Murrell, Rendel Pease, James Ring, A Roberts, Gordon Robin, Hyman Rose, James Rush, Jan Sosna, David Sparrow, David Tedford, Donald Watkins, Derek Wells, Peter Wootton.

MEMBER NEWS

- Congratulations to Hubert Gauss, who turns 100 on 3 January.
- John Singleton of Oxford University has been elected a fellow of the American Physical Society.

INSTITUTE DIARY

For full details of events in the physics community, visit **whatson.iop.org**.

Dry Etching: Advances and Trends
Ion and Plasma Surfaces Interactions Group, Institute of Physics, London, UK
26 January 2005
http://conferences.iop.org/DRY

Waste Minimisation and Resource Efficiency: the Role of Physics
Environmental Physics Group, Institute of Physics, London, UK
23 March 2005
http://conferences.iop.org/WMR

Modelling, Simulation and Design of Dielectrics
Dielectrics Group, Homerton College, Cambridge, UK
6–8 April 2005
http://conferences.iop.org/MSD

Physics, a Century after Einstein
Institute of Physics, University of Warwick, UK
10–14 April 2005
www.physics2005.iop.org

4th CCM International Conference on Pressure Metrology
National Physical Laboratory, Institute of Physics, London, UK
19–22 April 2005
http://conferences.iop.org/ICPM/index.htm

Drug Delivery and Diffusion Through Polymers
Polymer Physics Group, Institute of Physics, London, UK
21 June 2005
http://conferences.iop.org/DDD

15th Interdisciplinary Surface Science Conference
Thin Films and Surfaces Group, Institute of Physics, London, UK
27 June 2005
Phil Davies: daviespr@cf.ac.uk

EMAG-NANO 2005
Electron Microscopy and Analysis Group, University of Leeds, UK
31 August – 2 September 2005
http://conferences.iop.org/EMNA

Sensors and their Applications XIII
Instrument Science and Technology Group, University of Greenwich at Medway, Kent, UK
6–8 September 2005
http://conferences.iop.org/Sensors

ICOLAD
Instrument Science and Technology Group, City University, London, UK
12–14 September 2005
http://conferences.iop.org/ICOLAD

A Gentle Introduction to Biological Modelling
Computational Physics Group Institute of Physics, London, UK
15 September 2005
http://conferences.iop.org/GIM

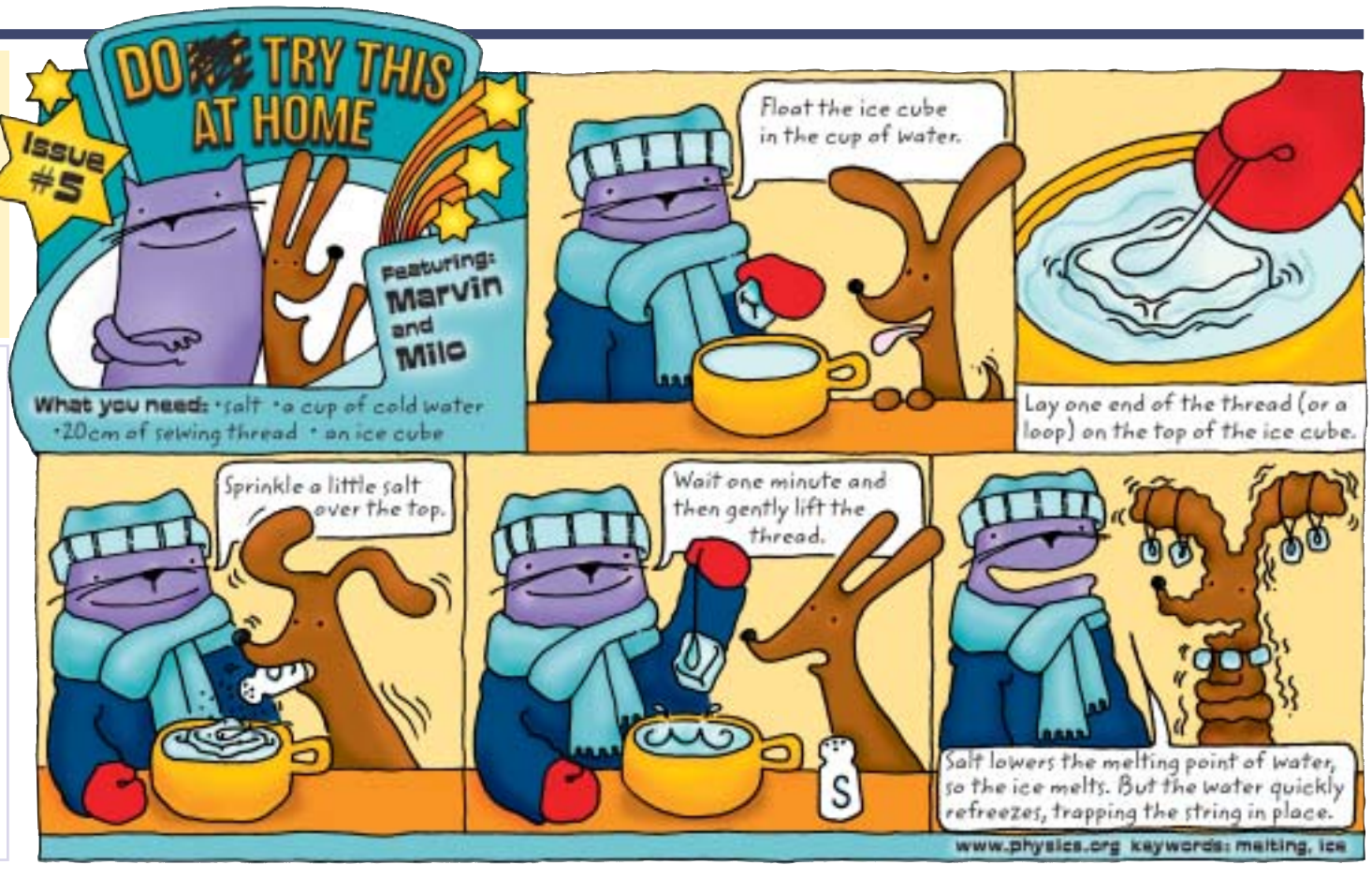
Novel Applications of Surface Modification
Applied Physics and Technology Division, Chester College, UK
19–21 September 2005
http://conferences.iop.org/APTD

particles

It's a hold up

The compressed air in a car tyre exerts equal pressure in all directions. So the resultant force on the wheel is zero. What, therefore, provides a force to hold the car up off the road?

Many thanks to Peter Kenny of Lichfield, Staffordshire, for sending this in. If you have an interesting physics puzzle that you'd like to share, please send it to interactions@iop.org. If yours gets published, we'll send you a bottle of champagne or £30 worth of your choice of Institute of Physics merchandise.



Are you on a career break?

The Institute of Physics Benevolent Fund is able to provide financial support to members at times of financial difficulty or hardship. The Benevolent Fund Committee has been considering how best to offer support to members at the various stages in their lives. One area where it may be able to offer support is to members currently on a career break who wish to improve or re-establish links to their field, with the ultimate aim of easing the transition back to a science-based/technical career.

Applications to the fund are therefore encouraged from those on career breaks for financial assistance towards, for example, the cost of a home PC, retraining course or any other suitable mechanism to help to maintain technical currency or restart their career. Applicants should outline briefly how they would use the mechanism to maintain links to physics, and must clarify why they would be unable to cover the costs themselves or from other sources, such as an employer. (The purpose of grants from the fund is to address issues of hardship.) This information should be addressed to: The Secretary, The Institute of Physics Benevolent Fund, 76 Portland Place, London W1B 1NT.