



**IOP** Institute of Physics



# SPEED 2015

**Stimulating Physics East of England Day**

Saturday 3rd October 2015

at

Netherhall School, Queen Edith's Way, Cambridge, CB1 8NN

- 09:40**      **COFFEE AND REGISTRATION**
- 10:00      Welcome
- 10:10      Allan McRobie – Synchronised fireflies and balancing broomsticks - or why bridges wobble!
- 11:15      Session 1 (90 mins - workshop A, B, C or D)
- 12:45**      **LUNCH**
- 13:45      Session 2 (60 mins - workshop E, F, G or H)
- 14:50      Session 3 (45 mins - workshop I, J, K or L)
- 15:40      Plenary and raffle (tea and coffee available)
- 16:00**      **CLOSE**

Yes, it's true – all this training and lunch is provided completely free\* to you, funded by



STIMULATING  
**PHYSICS**  
NETWORK



**IOP** Institute of Physics

\*This event is funded for

- teachers of science/physics currently working in English schools/colleges
- trainee teachers of science/physics
- technicians supporting science/physics in English schools/colleges

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## Allan McRobie – Synchronised fireflies and balancing broomsticks (or why bridges wobble!)

Supporting a stationary traffic jam in the sky is easy: it just needs cables, towers and one line of calculation. Things become much trickier when the wind blows. When the bridge's live load moves, it become even more interesting: the physics, biology and psychology of people all come in to play. Bridges are wholesome, they provide connections but if the designers get it wrong, the consequences are terrible.

Allan McRobie is a lecturer in structural engineering at the University of Cambridge. As well as bridge design, Allan's career has included irrigation engineering and nuclear waste disposal.

## SPEED2015 – for Teachers and Technicians of Physics

As we did last year, we have arranged a technicians' strand at SPEED.

### Technicians

It is recommended that you apply for the technician strand; these workshops have been tailor-made for technicians, there will be some choice of activity within the workshops. There are 20 technician places this year.

#### Technician Workshops

11:15 – 12:45	Make and Take – electrical devices, choose a device to make and take away with you (LEDs for showing photon energy [KS4], or measuring Planck constant [KS5]; resistors [KS4/5] or capacitors [KS5]).
13:45 – 14:45	Pound shop practicals – a circus of very cheap practical demonstrations and experiments, with guidance on making your own sets.
14:50 – 15:35	Electrical Circuits – setting up circuits, testing equipment and fault finding. A range of circuits covering KS3 to KS5.

Throughout the day: 'show and tell' or 'bring and ask' – a chance to show something you've made/customised etc and a chance to ask if you're not sure what something is, or if it works. We may be able to offer guidance, show you how to repair it (or even repair it on the day!).

[Book for technicians:](http://www.myphysics.org.uk/SPEED2015technicians.htm)

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## Teachers

Please read about all the sessions. You need to choose

- one long activity in session 1 (A, B, C or D) AND
- one medium length activity in session 2 (E, F, G, or H) AND
- one short activity in session 3 (I, J, K or L)

<b>Session 1</b> <b>90 mins</b> choose one of these		Overview
<b>A</b>	Cloud Chambers KS4 – KS5 Make and Take Robert Birke	<p>This is a ‘make and take’ workshop within which participants construct and use a simple cloud chamber made from a plastic vivarium and a few other components (all provided).</p> <p>Dry ice will be provided to test the chamber and alpha particle trails emitted from a harmless source (a welding rod) observed.</p> <p>In addition, time permitting, some background physics will be discussed (lightly) covering radioactivity and the structure of the nucleus.</p> <p>Some other fun &amp; informative uses of dry ice will be demonstrated.</p> <p>Robert Birke is a Teaching and Learning Coach (TLC) for North-East London &amp; Essex. He is an Early Career teacher mentor within the IOP Stimulating Physics Network. He is also a coach on the Capital Physics Project which is supporting Post-16 physics teaching &amp; learning in London Schools.</p>
<b>B</b>	Space, Gravity and Exoplanets KS3 – KS4 Workshop Gerry Blake	<p>In this session we will start with what we see in the sky, move on to explain what we see, discuss some common misconceptions, consider the influence of gravity and try out some great exoplanet activities.</p> <p>How do you organise a Space Party? You Planet!</p> <p>Gerry Blake is a Teaching and Learning Coach.</p>
<b>C</b>	Dragsters KS2 – KS5 Make and Take Dennis Waugh	<p>If you teach Forces at KS2, KS3, KS4 &amp;/or KS5, Dragsters will brighten up your lessons &amp; provide your pupils/students with some really exciting, hands-on, WOW stuff...&amp; you get to keep the hardware you’ll make, so you’ll be able to use it year on year!</p> <p>Use the Dragsters as fun ways to address the curriculum requirements.</p> <p><i>*See also session K – Teaching with Dragsters and Rocket Launchers</i></p> <p>Dennis Waugh is Physics Network Coordinator for Bedfordshire.</p>
<b>D</b>	Isaac Physics KS5 Workshop Lisa Jardine- Wright Heather Peck	<p>Isaac Physics aims to improve the problem solving skills of Physics A level students. In this session, you will see how you can use Isaac Physics materials in your teaching. You’ll also learn how to set (FREE) online homework assignments for your students and see their marks before you get into the next lesson!</p> <p>Lisa Jardine-Wright is Co-director of Isaac Physics.</p> <p>Heather Peck is a Hub Events Manager for Isaac Physics.</p>

<b>Session 2</b> <b>60 mins</b> choose one of these		Overview
<b>E</b>	Improving Gender Balance KS3 – KS4 Workshop Esther Bennett Eleanor Wylie	<p>“Improving Gender Balance” aims to increase the number of girls taking A Level Physics. We are looking at a number of approaches, and this workshop will involve Strand B and C.</p> <p>Strand B involves working specifically with teachers of physics to develop a more engaging and inclusive approach to physics throughout KS3 and KS4. It also increases students’ and teachers’ awareness of the vast range of careers that a Physics A Level can lead to. Come along for some ideas to try in with your classes.</p> <p>Strand C looks at a whole school perspective, so come and investigate how unconscious bias and teacher language can affect student attainment and potential. We will give you some tips on how to maximise the student potential by subtly and directly changing how you deliver.</p> <p>Esther Bennett is a Project Officer for Strand C of the IOP’s Improving Gender Balance project.</p> <p>Eleanor Wylie is a Project Officer for Strand B of the IOP’s Improving Gender Balance project.</p>
<b>F</b>	Energy Calculations KS2 – KS4 Workshop Robert Birke and Stephanie Grant	<p>There will be a recap on the new approach to energy involving ‘stores &amp; pathways’ which has appeared in the latest version of the National Curriculum.</p> <p>We will then explore how we use energy ideas to solve problems – from the (almost) trivial (what is the efficiency of a toy?) to the most significant (how can we provide enough power to sustain the world?).</p> <p>Energy is all about doing calculations, so some simple mathematics will be practised, some at least in the context of experimental explorations.</p> <p>Robert Birke is a Teaching and Learning Coach (TLC) for North-East London &amp; Essex. He is an Early Career teacher mentor within the IOP Stimulating Physics Network. He is also a coach on the Capital Physics Project which is supporting Post-16 physics teaching &amp; learning in London Schools.</p> <p>Stephanie Grant is a Physics Teacher and Ogden Trust Teacher Fellow at Norwich School.</p>
<b>G</b>	Machines KS3 Workshop Phil Badley	<p>The term ‘Simple Machines’ has a particular meaning for physicists. This session involves looking at the physics of levers, inclined planes and pulleys and includes ideas for straightforward data collecting and investigations.</p> <p>Phil Badley is the TLC for Cambridgeshire and surrounding areas. He is also the SPN team leader for the London and South East region.</p>
<b>H</b>	EM Spectrum KS3 – KS5 Workshop Angela Forrest	<p>A hands-on workshop introducing ideas for teaching the electromagnetic spectrum, from radio waves to x-rays. These ideas include practical activities, demonstrations, and computer resources to help you make the topic more relevant and interactive for pupils.</p> <p>Angela Forrest is Physics Network Coordinator for South Suffolk and North Essex.</p>

<b>Session 3</b> <b>45 mins</b> choose one of these		Overview
I	Inexpensive Ideas for Science Clubs KS2 – KS5 Workshop Gerry Blake	Make & take a bristlebot, a UV torch and tap into the 100+ Marvin and Milo ideas. You'll never again be short of ideas, you'll never again need endless time to prepare and you'll never again be breaking the bank to run a stimulating science club.  Gerry Blake is a Teaching and Learning Coach.
J	What Happens Next? KS3 – KS5 Workshop Angela Forrest	We know about the laws of physics but sometimes it can be difficult to apply them to new situations.  Come along and see whether you can answer the question 'What happens next?' in some puzzling scenarios.  Angela Forrest is Physics Network Coordinator for South Suffolk and North Essex.
K	Teaching with Dragsters and Rocket Launchers KS2 – KS5 Workshop Stephen Long Dennis Waugh	You may already have a dragster or rocket launcher kit. You may have made one this morning (in session C). In this session you'll find out how to incorporate its use into your schemes of work for a range of topics and ages.  Stephen Long is a Teaching and Learning Coach working in South East Essex, and parts of Hertfordshire. Stephen is also an Early Career Mentor.  Dennis Waugh is Physics Network Coordinator for Bedfordshire.
L	What Messages does Physics Education Research have to share? KS4 – KS5 Workshop James de Winter	A whirlwind tour through some of the key messages that have emerged from the physics education research (PER) community over the last 30 years or so. The aim of this session is to use this work to make direct and concrete suggestions for what we as physics teachers might want to consider, challenge or change about what we do in the classroom in light of the research that has been done. I've read all the papers so you don't have to.  James de Winter is PGCE Physics Tutor at the Faculty of Education in Cambridge and Physics Curriculum Lead for the Science Learning Centre Consortium, Central, London and South East England.

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