

Ivybridge Community College, Devon, PL21 0JA

0915-0945	Registration, welcome refreshments and exhibitor stands					Dining Hall
0945-1035	Keynote Presentation: Tones, Tines and Tings – David Cotton					Performance Hall
1035-1100	Refreshment break and exhibitor stands					Dining Hall
1100-1210 Workshops 1 Level 3 Laboratories	Workshop 1A Electromagnetic Spear make'n'take <i>Richard Grimmer</i>	Workshop 1B Transverse and Longitudinal Waves <i>Dorian Pascoe & Jo Kent</i>	Workshop 1C Using Smartphones in Practical Physics Lessons <i>Alessio Bernardelli</i>	Workshop 1D "What good is that?" – an LDR circuit make'n'take <i>Lin Harwood & Phil Bunney</i>	Workshop 1E Teaching Electromagnetism at KS3 and 4 <i>Trevor Plant</i>	
1210-1310	Lunch and exhibitor stands					Dining Hall
1310-1420 Workshops 2 Level 3 Laboratories	Workshop 2A REPEAT Electromagnetic Spear make'n'take <i>Richard Grimmer</i>	Workshop 2B Balancing Better – Improving Gender Balance <i>Jo Kent & Lorien Joyce</i>	Workshop 2C Mystery Boxes – analogues, observations and problem solving <i>Joe Rowing</i>	Workshop 2D REPEAT "What good is that?" – an LDR circuit make'n'take <i>Lin Harwood & Phil Bunney</i>	Workshop 2E Exo- climatology - What and how we know about planets around other stars <i>Dr Nathan Mayne</i>	Workshop 2F REPEAT Using Smartphones in Practical Physics Lessons <i>Alessio Bernardelli</i>
1420-1425	Changeover/comfort break					
1425-1535 Workshops 3 Level 3 Laboratories	Workshop 3A Often Found at the Repairs Bench <i>Nick Paskin & Samantha Ball</i>	Workshop 3B REPEAT Transverse and Longitudinal Waves <i>Dorian Pascoe</i>	Workshop 3C Physics in the Workplace <i>Maddy Lees, Zoe Roughley & Sally Walters</i>	Workshop 3D How does an Electrical Circuit Work? <i>Malcolm Simpson</i>	Workshop 3E Using Online Video Resources <i>Lewis Matheson</i>	
1535-1545	Evaluation, goody bags & depart					Level 3 Laboratories

Keynote Presentation – 09:50 - 10:35

Tones, Tines and Tings – ideas, demonstrations and stories to enrich the teaching of sound



David Cotton teaches physics in Preston and is the IOP Physics Network Coordinator for Lancashire

The sound world of speech and song in which most of us live and communicate is rich and complex. How can we better engage our students in exploring the basic physics on which all this depends?

Dave will enthuse us with ideas and demonstrations that focus on aspects of sound waves in the curriculum and beyond. These ideas tell a story based on the development and usage of oscillation and vibration in music and communication. E.g. how to turn a tuning fork and a magnet into a model guitar pick up! - and many more ideas using lab equipment and some musical instruments.

This presentation has been developed in memory of Anthony Waterhouse, supported by the Fellowship scheme offered annually through the Institute of Physics.

Ivybridge Community College, Devon, PL21 0JA

Session One: 11:00 - 12:10 Choose ONE of the options 1A to 1E

1A An Electromagnetic Spear (make'n'take) *NOTE: Repeated in Session 2A*

The Electromagnetic Spear is a physical model of the electric and magnetic fields in an EM wave. It is over a metre long, with the different fields represented by different coloured lobes. The spear helps to visualise the electric and magnetic field components along an EM wave, and associated effects such as polarisation, reflection, phase differences and coherence. It can also be hung from the ceiling or on a wall to make a permanent display. You will make a sturdy model from wood and corriflute (corrugated plastic sheet), provided free, to take away with you, with the instructions to make more and ideas for its use in class. KS4-5

Richard Grimmer has taught physics full time for over 20 years and been an IOP Physics Network Coordinator for 12 years. He has co-authored a KS3 Science textbook and is currently contributing to an A Level textbook.

1B Transverse & Longitudinal Waves *NOTE: Repeated in Session 3B*

This workshop covers ideas about transverse and longitudinal waves including: how to effectively demonstrate both types of waves; free simulations to help illustrate tricky ideas and how to use them effectively; fun practical activities and demonstrations using standard laboratory equipment and everyday items - and much more! Aimed at teachers of Key Stage 3, 4 & 5 and interested technicians.

Dorian Pascoe teaches physics at Totnes Progressive School, Devon, and is an IOP Physics Coach and a Lead Educator for the National Space Academy. Joanna Kent is an IOP Coach supporting school-based Physics Coaches and the IOP's Improving Gender Balance programme. Please note that Jo will be accompanied by her assistance dog.

1C Using Smartphones in Practical Physics Lessons

In this workshop, we will explore useful and engaging ways to use smartphones in physics. Examples of practical activities will be given and there will be plenty of hand-on activities to model how to make the most of your students' devices both at GCSE and A-level. The focus will be on all three key stages, particularly KS4-5). **Please bring your own fully charged device to this workshop.** KS3, 4 & 5 **Note: Repeated in session 2F**

Alessio Bernardelli is an IOP Coach supporting school-based Physics Coaches in the South West, a member of the IOP Professional Practice Group and an Editor of TalkPhysics.org. He is a Chartered Science Teacher and has recently obtained an MSc in Teacher Education at Oxford University.

1D "What good is that?" – an LDR circuit that shows it's useful (make'n'take) *NOTE: Repeated in Session 2D*

Build, try out and then take away a compact model to show how an LDR can be used in practice in the real world. Clarify how you can explain to students what's going on and why. Some soldering is involved – you will be taught how if you've not done this before. The take-away components required will be provided free, and all the equipment needed alongside the model will be there on the day, along with information about ordering further components. Suitable for KS4 teachers and technicians.

Lin Harwood and Phil Bunney are both IOP Physics Network Coordinators with long experience of teaching physics and supporting teachers of physics.

1E Teaching Electromagnetism at KS3 and 4

We will look at some simple but effective demonstrations and experiments for teaching this tricky topic. Starting from a very easy demonstration of the motor effect, we will look at motors, speakers and some surprising examples of this effect. We will also look at how the proportionalities in $F = BIL$ can be established. We'll then see how the generator effect fits in with all this. All welcome, but most suitable for chemistry and biology specialists, and technicians. KS3-4

Trevor Plant has taught physics for over 28 years, and nearly 10 years working with IOP developing the physics knowledge and pedagogy of teachers. He is the IOP Regional Education Manager (South).

Ivybridge Community College, Devon, PL21 0JA

Session Two: 13:10 – 14:20 Choose ONE of the options 2A to 2F**2A An Electromagnetic Spear (make'n'take)**

This workshop is a repeat of 1A – details as above.

2B Balancing Better - how can schools work towards ongoing improvements in the take-up and success of girls in physics?

The first part of this workshop will provide an overview of the IOP's suggested priorities for school initiatives, following the research done within its Improving Gender Balance programme in trial schools over recent years. The second part will describe the different things that have so far been done, and what's been achieved, at her school in Devon. The school has linked its gender balance developments in physics with its whole school approach to teaching and learning, in collaboration with the IOP's initiative.

*Joanna Kent is an IOP Coach supporting school-based Physics Coaches and the IOP's Improving Gender Balance programme. Lorien Joyce teaches in the Social Sciences (Head of RE/Philosophy and Ethics) at Kingsbridge Community College, and leads on gender balance work across the school, liaising closely with the physics teaching team. **Please note that Jo will be accompanied by her assistance dog.***

2C Mystery Boxes – analogues, observations and problem solving

Mystery boxes highlight the creativity of thought that is needed to solve real world physics problems. In the first part of the workshop we will look at how large and small scale physicists are unable to 'open the box' and find a definitive confirmation of their ideas and theories. Instead, we can use evidence from testing, experimentation and research to generate innovative theories. These ideas or theories must be open to future revision, or rejection, as our understanding of the world changes with further developments. In the second part we will look at some other ways to apply the model for problem solving, developing knowledge of fields, forces and electricity. This session includes ideas for use from KS2 upwards. The main activities can be used with all ages, and the latter part of the session will segue into presenting a variation suited for ages 11-18. KS2-5

Joe Rowing, IOP School based Physics Coach, Exeter Maths School.

2D "What good is that?" – an LDR circuit that shows it's useful (make'n'take)

This workshop is a repeat of 1D – details as above.

2E Exo-climatology – what we know and how we know it, about planets around other stars

Since the detection of the first planets outside our solar system in the early 90's, we have now identified over 3,000 such exoplanets. The methods of detecting these planets also provide us with information about their possible nature, and further observations can be made allowing us to probe the atmospheres of these distant worlds. Combining such observations with theoretical models adapted from those used to predict our own weather and changing climate, is helping us unravel several puzzles and providing the first steps towards identifying exoplanets which might host life. Explanations of the many links between this work and the principles of school level physics will be included. For a 'taster' of the material on which this session will elaborate, see from 6:30-9:00 within this TEDx presentation: <https://www.youtube.com/watch?v=YYx-laOXiug> . KS4-5

Dr Nathan Mayne is a Senior Lecturer in Astrophysics in the School of Physics at the University of Exeter.

2F Using Smartphones in Practical Physics Lessons

This workshop is a repeat of 1C – details as above.

Ivybridge Community College, Devon, PL21 0JA

Session Three: 14:25 – 15:35 Choose ONE of the options 3A to 3E

3A Often Found at the Repairs Bench

A workshop for technicians who support 11-16/18 physics classes. We'll take a look at some of the items commonly in need of repair and exchange ideas of what can be done about them. **You are welcome to bring along an item or two of equipment with problematic repair issues, if you wish.** Also if and as time allows, issues and solutions with organisation, storage and how physics equipment is arranged in the laboratories.

Nick Paskin and Samantha Ball are technicians who support physics teaching at Ivybridge Community College.

3B Transverse & Longitudinal Waves

This workshop is a repeat of 1B – details as above.

3C Physics in the Workplace - with role models

How well off are you for 'out there' examples of how the physics principles you're teaching about are used? Are you able to cite positive role models to whose work your students - girls as well as boys - can relate? So that if physics-at-work appeals to them, learners can pick up ideas for a range of jobs they can choose to go for, as they plot their paths through education and training. These presenters will tell you about what they do, how they got there, and give you examples of curriculum physics in action that you can use back in the classroom. KS3-5

Madeleine (Maddy) Lees is Dosimetry Manager at Babcock International in Plymouth. She is a Health Physicist with a higher degree in Radiological Protection, with current operational responsibility for the procedures and measurement checks to ensure radiation safety across the Devonport Royal Dockyard and associated sites.

Zoe Roughley is the Graduate Controls Engineer at PCMC Plymouth (Paper Converting Machine Company) where machines for factory use are designed and built, e.g. wet wipe and napkin machines. She has worked on both electrical and pneumatic aspects and programming control systems. She will give examples of how school physics principles are applied e.g. to determining motor sizes, circuit design and using photoelectric sensors.

Sally Walters is a Civil Engineer working within the Water Sector, who has designed wastewater treatment works, pumping stations and sewerage pipelines amongst others. Her role utilizes fundamental physics and mathematical principles in the design of such structures, from understanding the forces imposed on them and how the structure will react to loads, to the concept of energy and its transmission and dissipation – especially in hydraulic design.

3D How does an Electrical Circuit Work? What really goes on inside the wires?

Electrons that move; metal ions that don't; currents that flow; voltages that don't, but which are 'PDs' and which are 'EMFs'?; resistance ... and how is the energy really transferred, when students ask about this? Most textbooks don't say, or don't provide a convincing explanation. In this workshop, we'll start from the basics: electric charges that push and pull on each other. From there we'll build up a coherent account of it and then look at a couple of helpful demonstrations. For anyone who teaches circuits who, whatever their specialism, doesn't yet 'get' the inside story of what's going on. KS3-4

Malcolm Simpson teaches at Exeter Maths School and has experience of explaining circuits to all levels of ability, achievement and experience.

3E Using Online Video Resources in your Teaching

In this session we look at how you can use various online video resources to help your physics teaching: for flipped learning, in lessons and for students to use independently.

Lewis Matheson is Director of GCSE and A Level Physics Online Ltd and YouTube video creator. He is also a Senior Teacher Fellow for the Ogden Trust and an IOP Physics Coach.

This event is organised and run by the Institute of Physics and is generously hosted and supported by Ivybridge Community College in Devon

Contact education-south@iop.org for any booking queries or see www.bit.ly/SWPhysicsDayJul19 to book