

## Welsh Physics Teachers Conference Brecon 2021

A Blended Approach

#BreconConf2021

Friday 8<sup>th</sup> to Friday 15<sup>th</sup> October 2021

**For all teachers of Physics...**

join the Welsh Physics Teachers Conference Brecon 2021, this year between 8<sup>th</sup> - 15<sup>th</sup> October 2021.

A fabulous free week of presentations and workshops for teachers, technicians and PGCE students with opportunities to network with colleagues.

We will offer workshops shows and presentations between 1.30pm and 3pm each afternoon and 4pm until 8pm each evening Monday - Friday, as well as a quiz, a trek and workshops at an Alpaca Farm in the Brecon Beacons on Saturday morning (10:30am - 3.30pm), an opportunity to discuss the relationship between Physics and faith, networking opportunities with colleagues from Ireland and New Zealand - and a virtual tour of Penderyn Whisky Distillery in the heart of the Brecon Beacons.

Please join us for a full week of workshops and inspiring lectures, which include: 'Materials in Action' (Dr Diane Aston, IOM3); 'The Digital Century' (Professor Neil Stansfield, National Physical Laboratory); 'From cat skin to submarines - soft materials that are a bit of a stretch' (Professor Helen F Gleeson, Leeds University) and 'From Deep Space to Deep Impact: bringing the solar system down to Earth' (Professor Paul Roche, Cardiff University).

Workshops will include: 'Keeping up the Momentum'; 'Physics, weather and forecasting'; 'Tones, Tines and Tings' and 'What alpacas and other animals can teach us about Physics'.

Technicians are welcome to attend all the events and we will also be hosting a technicians event: 'The Physics Prep Room' on Thursday 14<sup>th</sup> October.

**FREE registration via Eventbrite is at**  
[welshphysicsteachersconference2021.eventbrite.co.uk](https://welshphysicsteachersconference2021.eventbrite.co.uk)

**Please encourage colleagues from other schools and organisations to attend.**  
**Booking is essential so please respond no later than 6<sup>th</sup> October to avoid**  
**disappointment. For further details please contact [cerian.angharad@iop.org](mailto:cerian.angharad@iop.org)**



## Session timetable

ID	Time	Title	Presenter
<b>Saturday 9 October</b>			
	10.30-15.30	Workshops / Trek with alpacas at the Alpaca Farm	
S1		What alpacas and other animals can teach us about Physics	Dr Lawrence Cattermole and Cerian Angharad
S2		Projectiles; rockets and spitting alpacas	Gary Williams and Tony Reeves
<b>Sunday 10 October</b>			
Su1	14.00	Physics and Faith	Stephanie Bevan
Su2	15.00	Physics and Faith round table discussion (invitation only)	
<b>Monday 11 October</b>			
M1	13.30-15.00	An introduction to teaching Forces and Energy	Dr Lawrence Cattermole
M2	16.00	Spaced Learning in Physics	Alessio Bernardelli
M3	17.00	Keeping up the Momentum	Graham Perrin
M4	18.00	From Deep Space to Deep Impact: bringing the Solar System down to Earth	Professor Paul Roche, Cardiff University
M5	19.00	From cat skin to submarines – soft materials that are a bit of a stretch	Professor Helen F Gleeson, Leeds University
<b>Tuesday 12 October</b>			
T1	13.30	Careers in Physics – looking beyond the box	Cerian Angharad
T2	16.00	Teaching Electricity and Electromagnetism cohesively	Dr Lawrence Cattermole
T3	17.00	Curriculum for Excellence	Stuart Farmer
T4	18.00	Physics for all	David Keenahan
T5	19.00	The Magic of Physics	Sue Carvell
<b>Wednesday 13 October</b>			
W1	13.30	IOP Whole School Inclusion Project in Wales	Samantha Borley
W2	16.00	GCSE and GCE Physics Update WJEC	Helen Francis, WJEC
W3	17.00	Light and Space	Lewis Matheson, A level Physics Online
W4	18.00	Physics, weather and forecasting	Alison Alexander and Ruth Wiltsher
W5	19.00	Physics Down Under	Gary Williams and David Housden

ID	Time	Title	Presenter
<b>Thursday 14 October</b>			
Th1	13.30	Prep Room Physics	Cerian Angharad
Th2	16.00	Physics in Archaeology	Anthony Clowser and Keith Jones
Th3	17.00	The Digital Century	Professor Neil Stansfield, National Physical Laboratory
Th4	18.00	Materials in Action	Dr Diane Aston, IOM3
Th5	19.00	IOP Physics Hub Ireland	David Keenahan
<b>Friday 15 October</b>			
F1	13.30	An introduction to teaching Electricity and Waves	Dr Lawrence Cattermole
F2	16.00	Teaching Motion	Gary Williams
F3	17.00	Ireland's greatest Physicists	Paul Nugent
F4	18.00	Tones, Tines and Tings: ideas, demonstrations and stories for teaching Sound.	David Cotton
F5	19.00	A virtual tour of Penderyn Distillery and virtual whisky tasting	

## Session descriptions

### Saturday 9 October

#### Workshops and trek with alpacas / Alpaca Farm

The first day of the Welsh Physics Teacher Conference will be located in the heart of the Brecon Beacons. Join us for a series of workshops focused on the Physics of Alpacas. As you trek together around the Brecon Beacons National Park, you will learn some interesting facts about these enchanting and curious animals. The fantastic scenery provides the perfect backdrop for learning and networking. We will strive to provide you and colleagues with a therapeutic and amusing experience.

#### **S1: What Alpacas and other animals can teach us about Physics / Dr Lawrence Cattermole and Cerian Angharad**

This session will explore various ways in which animals can help to engage us with ideas in school physics. Different activities and resources will be shown and, as we will be located on an Alpaca farm, they will feature heavily. We will look at aspects of forces and motion, energy and thermal physics, sound, light and electromagnetic waves and even some electricity. Have you ever wondered what is the terminal velocity of an alpaca? (No alpacas will be harmed before, during or after this session.)



#### **S2: Projectiles; rockets and spitting alpacas / Gary Williams and Tony Reeves**

In this workshop we will build a 'rocket' launcher that uses paper projectiles that are easy to make and alter, allowing students to carry out projectile motion experiments across all age ranges from 11-19. (A decent manual air pump is required). We'll also look at other examples of projectile motion, including water jets, cherry stone spitting, chameleon tongues... and spitting alpacas.



## Sunday 10 October

### **Su1: Physics and Faith / Stephanie Bevan**

Join Steph Bevan and friends to discuss the relationship between Physics and faith. We will explore some of the historical and growing misconceptions between Physics and religion and consider ways that those in Physics careers and religious communities could work more closely together to benefit all. Suitable for all.

### **Su2: Physics and Faith round table discussion (invitation only)**

What is the need for a positive interaction between Physics and faith? Can the IOP work closer with faith groups towards a common goal?

## Monday 11 October

### **M1: An Introduction to teaching Forces and Waves / Dr Lawrence Cattermole**

We will use simple demonstrations, activities and explanations that can be used flexibly and across the Key Stages to help develop understanding based on consistent ideas. The teaching of Forces and Energy will be looked at both separately and where they can usefully be related with resources provided. This session is suitable for trainee teachers embarking on a PGCE, NQTs and those teaching Physics outside their subject specialism, although all teachers are welcome to attend.

### **M2: Spaced Learning Physics / Alessio Bernardelli / KS3-KS5**

In this workshop we will explore current research into neuroscience to consider how long-term memories can be formed and the timeframes needed by our brain to encode new information in complex cognitive constructs. We will review the evidence from neuroscience studies and research carried out in the classroom to apply these principles. Finally, we will consider how this approach could be used to enhance students' learning in Physics. This session is suitable for all teachers and trainee teachers.

### **M3: Keeping up the Momentum / Graham Perrin / KS4-KS5**

Momentum is a difficult concept to get across. Can it be made more accessible by considering the history of physics? Should it be taught before Newton's Laws? In this session, we'll be exploring the origins of the concept of momentum and discussing ways of teaching it. This session is suitable for all teachers and trainee teachers.

### **M4: From Deep Space to Deep Impact: bringing the Solar System down to Earth / Professor Paul Roche, Cardiff University / KS3-KS4**

The Faulkes Telescope Project (based at Cardiff and Swansea universities) provides free access to a global network of research-grade 2m, 1m and 0.4m telescopes. Part of its focus is on studying asteroids and comets, the building blocks of our solar system, but also the bringers of death and destruction for the dinosaurs. This talk will cover the educational opportunities available, from discovering new asteroids and measuring their rotation rates, to observing the wide variety of icy comets that periodically (and sometimes randomly) appear in the skies. Classroom activities, including desktop simulations of asteroid rotation and an online impact calculator, will be covered under the Down2Earth programme. Bring the 3 'D's of STEM education (Death, Destruction and Dinosaurs) into your classroom! This session is suitable for all teachers and trainee teachers.

Faulkes Telescope Project



Prosiect Telesgôp Faulkes

### **M5: From cat skin to submarines - soft materials that are a bit of a stretch / Professor Helen F Gleeson, Leeds University**

Liquid crystals are a type of soft matter best known for their use in liquid crystal displays (LCDs) and much of the research in the area over the past 30 years or so has been focused on achieving what was once science fiction - TVs that hang on the wall and mobile telephones that communicate both visually and audially. However, LCD technology is now mature and for some time now new, exciting properties of liquid crystals that might lead to rather futuristic applications have been emerging. This talk shows how some of the unique properties of liquid crystals can be used for other applications, including electrically switchable focus contact lenses.

## Tuesday 12 October

### **T1: Careers in Physics – looking beyond the box / Cerian Angharad / KS3-KS4**

Join Cerian Angharad who will be sharing resources and platforms on Careers in Physics and discussing how this can be integrated into classroom teaching. STEM Ambassadors with Physics-related careers or work where Physics is an applied skill will offer a short 20 minute session showcasing how Physics impacts on their working life, and how attainment in Physics broadens career opportunities.

### **T2: Teaching Electricity and Magnetism cohesively / Dr Lawrence Cattermole / KS3-KS4**

This session will look at ways of teaching Electricity and Electromagnetism cohesively across the Key Stages, to help develop understanding based on consistent ideas. We will use demonstrations, activities and explanations that can be used flexibly, and in doing so we will compare and contrast static electricity and magnetism, static electricity and electrical circuits, simple circuits and mains electricity, and electricity generation and its use. This session is suitable for all teachers.

### **T3: Curriculum for Excellence / Stuart Farmer**

Since its introduction in 2010, Scotland's 'Curriculum for Excellence', while successful in some areas, has also been dogged by problems, unintended consequences, and a series of changes to the National Qualification courses such as Higher and Advanced Higher Physics – resulting in significant workload for teachers. The pandemic brought further tensions and highlighted structural problems, particularly with assessment. Following sustained pressure from professional bodies and opposition parties, the Scottish Government commissioned the OECD to conduct an independent review of the Scottish school curriculum. Its report was published in June 2021 and all 12 of its recommendations were immediately accepted by the Scottish Government. These include the replacement of the Scottish Qualifications Authority and the break up of Education Scotland, the national support and inspection agency, as well as many other changes. This session will provide some background and will highlight lessons learned from the implementation of what many see as a forerunner of a Curriculum for Wales. Suitable for all.

### **T4: Physics for all / David Keenahan**

IOP strive to make physics communities more welcoming and supportive for people from all backgrounds. Our schools are more inclusive than in the past, but can teachers of physics be more accommodating and understanding of physics students with special educational needs? This workshop will explore how we might adapt our teaching to support students who have dyslexia, ADHD, autism, dyspraxia and similar learning disabilities. Suitable for all.

### **T5: The Magic of Physics / Sue Carvell / KS3-KS4**

Susan Carvell – aka Scientific Sue – is joining us once again to share many of her Science Magic Tricks which she uses in her live and virtual shows and workshops. They are designed to have the WOW factor tool aimed to hook young minds and capture their curiosity and imagination – as these are the two key elements required for our budding scientists and engineers to become the inventors of tomorrow. This session is suitable for all teachers and trainee teachers.



## Wednesday 13 October

### **W1: IOP Whole School Inclusion Project / Samantha Borley**

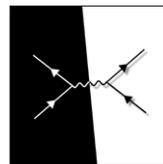
The Whole School Inclusion Project in Wales aims to significantly increase the number of students from under-represented groups progressing to physics-based routes after the age of 16. In this workshop we will help teachers to identify the barriers that may be limiting their pupils' aspirations and will show how these barriers can be addressed in the classroom and across the whole school. Suitable for all.

### **W2: GCSE and GCE Physics update WJEC / Helen Francis, WJEC / KS3-KS5**

The examinations board will provide an update on GCSE examinations and discuss Science and GCE Physics. This session is suitable for all teachers and trainee teachers.

### **W3: Light and Space / Lewis Matheson, A level Physics Online / KS3 – A Level**

In this session Lewis will show some ideas you can use in the classroom when teaching about colour, ray diagrams and how we observe the moons, planets and stars. Suitable for anyone teaching about light and space from KS3 to A Level.



### **W4: Physics, weather and forecasting / Alison Alexander and Ruth Wiltsher / KS3-KS5**

Physics plays a major part in meteorology. In this workshop we will look at some relevant physics-based concepts and measurements. Join in and explore physics related to temperature, pressure, air movement, radiation and many more concepts relevant to weather forecasting. We will be asking you to try out some simple activities. You will need to have ready some miscellaneous items easily found at home. A list will be sent to participants who sign up. This session is suitable for all teachers and trainee teachers.

### **W5: Physics Down Under / Gary Williams and David Housden**

Join colleagues in New Zealand to share resources and find out how the teaching of Physics has evolved over 11, 000 miles away. An opportunity to network and share experiences. Suitable for all.

## **Thursday 14 October**

### **Th1: Prep Room Physics / Cerian Angharad**

An opportunity for technicians to talk to colleagues online and share resources and ideas. This session will be supported by suppliers and their technical teams. Please encourage your technicians to engage. An opportunity to network with other schools across Wales and beyond. Suitable for all technicians.

### **Th2: Physics in Archaeology / Anthony Clowser and Keith Jones**

Join Anthony and Keith as they use Physics knowledge and skills to travel back in time to tell the story of how the people of Wales lived in the past. We will be discussing Geophysics, radioactive dating and other techniques used by archaeologists to find out about the past. The techniques discussed will be linked to the stories of sites across Wales in time and location, and to topics in the Science curriculum for Wales AoLE. Suitable for all.

### **Th3: The Digital Century / Professor Neil Stansfield, National Physical Laboratory**

It has been said that the nineteenth century was the century of chemistry, the twentieth century the century of physics. The twenty first century is the century of digital. In 2020 over two thirds of the earth's population had internet access – 96% in the UK. The number of active smartphones in the world grew to nearly 3.5 billion. 30 billion devices were wirelessly connected to the internet to form an 'internet of things. Welcome to the digital age, where digital technologies are the engine of the economy and of society, and data is the fuel. But can we be confident in the technologies that are the bedrock of this digital world? So join us to talk about the digital world and discuss how we can harness science and engineering to provide trust and confidence in this rapidly changing world.

### **Th4: Materials in Action / Dr Diane Aston, Head of Education and Professional Development at IOM3 / KS3-KS5**

Materials play a central role in our lives, but to a great extent we take them very much for granted. How often do you consider the engineering and science that has gone into producing all the things around you? In this presentation we will explore how the use of these biocompatible materials have helped change and improve the technology that we rely on by looking at how they are used in computers, aircraft, sports equipment and medical devices. The use of biocompatible materials inside our body has allowed us to improve the quality of life of millions of people and we are now able to successfully replace joints, lenses and even blood vessels. Join us on a journey of discovery. This session is suitable for all teachers and trainee teachers.

### **Th5: Physics in Ireland / David Keenahan**

Each Thursday during term teachers of Physics in Ireland meet online at IOP Ireland Physics Hub. These events give teachers an opportunity to share ideas and support each other. Each Hub event offers a blend of short presentations from guest contributors and offers opportunities to discuss and ask questions. This special edition of Physics Hub welcomes delegates from the Welsh Physics Teachers Conference. Suitable for all.

## Friday 15 October

### F1: An introduction to teaching Electricity and Waves / Dr Lawrence Cattermole

We will use simple demonstrations, activities and explanations that can be used flexibly and across the Key Stages to help develop understanding based on consistent ideas. The teaching of Electricity and Waves will be looked at separately, as well as where there is meaning that can helpfully be applied to both, with resources provided. This session is suitable for trainee teachers embarking on a PGCE, NQTs and those teaching physics outside their subject specialism, although all teachers are welcome to attend.

### F2: Teaching Motion / Gary Williams

This workshop will look at how the projectile launcher made in a previous workshop can be turned into a 'Dragster' launcher and the teaching opportunities that this presents. It will help if you already have a launcher but details of how to build one will be available. We will discuss how this and similar ideas, including ways to make timing gates, can form the basis of a topic for teaching across the Science Curriculum for Wales AoLE. Suitable for all.

### F3: Ireland's greatest Physicists / Paul Nugent / KS3-KS5

Ireland is a small island nation on the edge of Europe. It is well accepted that Ireland 'punches above her weight' in terms of producing many excellent writers, musicians and sports people. Irish scientists have contributed to some of science's greatest achievements: splitting the nucleus, putting men on the moon, discovering pulsars, putting cars on the road and many more. Join us in this session as we discover the lives and work of these scientists who helped to change the world. Disclaimer: we will only have time to discuss some of the many. Suitable for all.

### F4: Tones, Tines and Tings: Ideas, demonstrations and stories for teaching Sound / David Cotton

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? Enjoy 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 use of oscillation and vibration in music and communication, for example, how to turn a tuning fork and a magnet into a model guitar pick up! This session is suitable for all teachers and trainee teachers.

### F5: Virtual tour of Penderyn Whisky Distillery

This leading Welsh whisky distillery is located in the historic village of Penderyn on the southern tip of the Brecon Beacons because of the site's own supply of fresh natural spring water.



The Penderyn Distillery also has a unique copper single-pot still designed by Dr David Faraday, a relative of the great 19<sup>th</sup>-century scientist Michael Faraday. Penderyn produces its own malted barley spirit which, when matured, is recognised worldwide as one of the finest single malt whiskies. The majority of the spirit goes into casks for ageing.

The virtual tour will provide an unique opportunity to see the distillery, ask questions and sample a variety of popular Penderyn bottlings.

This event has limited spaces and delegates who attend at least 5 sessions during the Conference will be given priority booking. Suitable for all.