

December 2017

Kent • Tuesday 5 December 7.30pm • Professor John Zarnecki

Spacecraft I Have Known and Loved

During a 35-year career in research, John Zarnecki has been involved in some iconic missions. These have ranged from sounding rockets (which give just a few minutes exposure to the space environment) through to Earth-orbiting missions (such as the Hubble Space Telescope) to deep-space missions, and missions of exploration such as Giotto to Comet Halley and Cassini–Huygens to the Saturnian system. He will give an account of these and other missions.

Herts • Wednesday 6 December 7pm • Dr Martin Kellett

Discovering Britain's Past from the Air

The view from the air can reveal amazing things that just aren't visible when standing on the Earth. Archaeologists use this fact to discover features of our historical landscape. Features such as neolithic monuments, Roman camps and medieval field systems can reveal themselves through parch marks, soil marks and crop shadows. Martin Kellett will describe the methods and the magic of aerial archaeology and show some of the amazing finds in our archaeological landscape.

Kent • Tuesday 12 December 7.30pm • Professor John Todd

Rutherford and Rosetta – Two Explorers of the Unknown

It is hard to imagine what our level of scientific understanding would be like without Rutherford's pioneering discovery that, in radioactive decay, elements are transformed into different chemical species, this phenomenon being explained by the nuclear atom. Such concepts were so original that Rutherford and collaborators were taking the first steps in exploring what was completely unknown territory. An analogy is, perhaps, the Rosetta mission to characterise a comet, where the numerous investigating teams were faced with unexpected observations that only became apparent as the experiment progressed.

Milton Keynes • Tuesday 12 December 7.30pm • Professor W Hensinger

Constructing a Practical Quantum Computer

Many problems are so complicated that even the fastest supercomputer would take millions of years to provide an answer. Optimising financial transactions, machine learning, creating new medicines, understanding protein folding and breaking codes are just some of the problems where a quantum computer could change everything. Winfried Hensinger and his team have managed to remove one of the biggest barriers traditionally faced to building a large-scale quantum computer – having to precisely align billions of lasers to carry out quantum-gate operations. His group recently unveiled the first blueprint on how to build a large-scale quantum computer. Hensinger will explain challenges and opportunities in developing practical quantum computers.

London • Wednesday 13 December 6.30pm • Tony Mann

Puzzles in Maths and Physics

The talk will explore the role that paradoxes play in physics and mathematics, using a wide range of puzzles, illusions and paradoxes.

Information

Our lectures are free to all and last about one hour with 15 minutes afterwards for questions. School parties are welcome but numbers need to be registered beforehand with the relevant venue organiser (see below). Venues are wheelchair accessible. Details herein are subject to alteration so check branch webpages. Views expressed are not necessarily those of the IOP. Follow us on:

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Lecture venue information

Berkshire

See branch calendar for details of lectures. Lectures held at 7.30pm, William Penny Theatre, Recreational Society, West Gate, Aldermaston RG7 4PR. The theatre entrance can be found on the A340 Basingstoke to Newbury road, just before the Heath End Roundabout at Tadley. Do not use the main gate entrance; the correct gate is signposted as the West Gate or AWE Staff + Deliveries (picture of a lorry). Email iop.lectures@awe.co.uk for further information.

Herts

Lectures usually held at 7pm in the Lindop Building, University of Hertfordshire, College Lane, Hatfield AL10 9AB. To book a place or for further information on this season's events, contact Diane Crann (d.crann@herts.ac.uk, tel 07770 444614).

Kent

Unless stated otherwise, lectures are held at 7.30pm, Rutherford Lecture Theatre 1, University of Kent, Canterbury CT2 7NZ. Further information can be obtained from Dr Cyril Isenberg (c.isenberg@kent.ac.uk, tel 01227 823768).

London

Lectures held at 6.30pm, Franklin Theatre, Institute of Physics, 80 Portland Place, London W1B 1NT. Refreshments are served from 6pm. Register online to attend. For those with no internet access, contact Olivia Keenan (olivia.keenan@iop.org, tel. 02074 704 918).

Milton Keynes

Lectures held at 7.30pm, Berrill Lecture Theatre, Open University, Walton Hall, Milton Keynes MK7 6AA. No need to register. For further information, contact Ray Mackintosh (raymond.mackintosh@open.ac.uk).

Oxford

Lectures held at 6.45pm, Martin Wood Lecture Theatre, Clarendon Laboratory, University of Oxford, Parks Road, Oxford OX1 3PU. Refreshments are served from 6.30pm. Register online to attend lectures.

London & South East Branch

Public Events – Autumn 2017



IOP London and South East Lecture Programme

October 2017

Herts • Wednesday 4 October 7pm • Professor Alan Davies

How do Physics and Mathematics Explain Biology?

In 1917 the Scottish polymath D'Arcy Wentworth Thompson published *On Growth and Form* – a masterpiece of the application of physics and mathematics to biology. One hundred years later it is still in print. It started the discipline of mathematical biology, which is currently an extremely important and fertile area of scientific research. We shall explain, among other things, why size is important, why shells have the shape that they do and the mechanical efficiency of animal skeletons.

London • Wednesday 4 October 6.30pm • Dr Toby Waine

Role of Drones and Satellites in Land Use and Precision Agriculture

Dr Waine will explore how science and technology is revolutionising agricultural engineering with a particular focus on remote sensing from space and drones. From measuring illicit opium production in Afghanistan to undertaking national assessments of vegetation in semi-arid climates, innovative use of remote sensing supports operational methods for vegetation monitoring and providing robust, statistically based area estimates of land cover and net primary production.

Kent • Tuesday 10 October 7.30pm • Professor Dame Julia Higgins

Seeing is Believing

Understanding the behaviour of polymeric materials (plastics and rubbers) with the help of neutron scattering.

Milton Keynes • Tuesday 10 October 7.30pm • Professor Julia Yeomans

Nature's Engines: Powering Life

Active materials, bacteria, molecular motors and self-propelled colloids continuously transform chemical energy from the environment to mechanical work. Dense active matter, from layers of cells to flocks of birds, self-assembles into intricate patterns. Nature's engines are complex and efficient, and we would like to exploit her ideas to make nanomachines.

London • Wednesday 18 October 6.30pm • Mr Stephen Pattison

Will the Coming Tech Revolution be a Force for Good?

A new age of technology is fast approaching. But there are many concerns: will cyber criminals ransack our bank account? Will robots take our jobs? Will hostile intelligence agencies undermine our politics and flood us with fake news? Stephen Pattison will consider these issues in the context both of what cutting-edge technology can do to help mitigate some of the risks, and what will require a wider policy debate about the ethics of some of the possibilities the technology will create. His starting point is that the new technology can deliver huge benefits for us: but for those benefits to be realised we need to have confidence in it. If the internet of things doesn't empower people, it will fail.

Kent • Tuesday 24 October 7.30pm • Rupert Berryman

Wind Farms

The talk will initially describe the construction of an early onshore wind farm using 600 kW wind turbines, with 40 m diameter rotors, and the subsequent development of offshore wind farms using 8 MW wind turbines, with 164 m diameter rotors.

November 2017

Oxford • Wednesday 1 November 7.30pm • Professor James Hough

Ripples from the Dark Side of the Universe

Gravitational waves – a prediction of Einstein's general relativity – are still among the most elusive signals from far out in the universe. Over the past decade the laser interferometric detectors LIGO (at Hanford and Livingston, USA), Virgo (Cascina, Italy) and GEO 600 (Ruthe, Germany) operated at design or close to design sensitivity. However, in keeping with source strength predictions and, as expected, no gravitational-wave signals were observed. Now these detectors have been upgraded and observation with the Advanced LIGO detectors has begun again. In 2016 the first detection of gravitational waves was announced, emitted from black-hole binary systems. This is particularly exciting as the existence of the black-hole system was a surprise to the astronomy community!

London • Wednesday 1 November 6.30pm • Ian Phillips

They're Just Not Making Atoms Any Smaller

In the 60 years since the first integrated circuits with three transistors, they have developed to the billion+ circuits that power all aspects of our lives today. But these transistors are now approaching the size of atoms. Will this be the end for the continued growth of sophistication in our products that we have come to expect?

Herts • Wednesday 1 November 7pm • Dr Stuart Clark

The search for Earth's Twin Planet

Is there life on other worlds? Astronomers finally have the technology to begin answering this perennial question. During the last 20 years, they have been finding thousands of planets around other stars. Some are strangely familiar, others exotically different. Could any of them support life? Stuart Clark will explain this fascinating study for a public audience.

Kent • Tuesday 7 November 7.30pm • Dr Simon Singh

From the Big Bang to Homer's Last Theorem

Science writer Simon Singh will take us on a whistle-stop tour through the bestselling books that he has written over the last two decades. Fermat's Last Theorem looks at one of the biggest mathematical puzzles of the millennium. The Code Book shares the secrets of cryptology; Big Bang explores the history of cosmology; Trick or Treatment asks some hard questions about the alternative medicine; and Simon's latest book, *The Simpsons and Their Mathematical Secrets*, enters the world of the world's most popular TV show.

Milton Keynes • Tuesday 14 November 7.30pm • Dr Sebastian Wood

Nanometrology and Printed Electronics – Using measurement to lay new foundations for electronics

For the last 50 years, progress in electronics has meant making components smaller and factories bigger, but there are fundamental limits on what can be achieved using traditional semiconductors. Printable electronics offers a completely new paradigm, using organic semiconductors that can be printed onto any surface to make flexible, robust and lightweight electronics using simple techniques. Scaling up this technology from a laboratory to a factory is difficult and relies on having accurate ways to measure the properties of organic semiconductors, which we have been developing at the National Physical Laboratory (NPL). Sebastian Wood will explain how the latest developments in nanometre-scale measurement are laying the foundations for this transformative new technology.

London • Wednesday 15 November 6.30pm • Professor Lewis Dartnell

Astrobiology – The Hunt for Alien Life

Astrobiology is a brand new field of science, encompassing research into the origins and limits of life on our own planet, and where life might exist beyond the Earth. But what actually is life and how did it emerge on our own world? What are the most extreme conditions terrestrial life can tolerate? And what would an alien actually look like – how realistic are the life forms envisaged by science-fiction novels and films over the years? Join Lewis Dartnell on a tour of the other planets and moons in our solar system that may harbour life, and even further afield to alien worlds orbiting distant stars, to explore one of the greatest questions asked: are we alone?

London and South East Branch Dinner • Wednesday 15 November 8pm

This year's branch dinner will follow Lewis Dartnell's talk (see above) and be held at a restaurant close to the IOP. Further details will be posted on the branch website ASAP.

Kent • Tuesday 28 November 7.30pm • Professor Nigel Mason

Astrobiology: Exploring the Origins of Life

How did life begin on Earth? Could life exist or have existed on other planets and moons in our solar system? Is our solar system unique? Or are there many such habitable systems in the universe? These are the questions that the new science of astrobiology aims to explore. In this talk Nigel Mason will describe how this field is developing and discuss some of the exciting results that are emerging.

London • Wednesday 29 November 6.30pm

3 Minute Wonder – London and South East Branch Heat

“Educational, inspiring and entertaining all at once.” It's back! The IOP's national 3 Minute Wonder (3MW) science-communication competition returns. 3MW challenges researchers to explain their work in just three minutes, each participant pitching their research to a panel of established science communicators and an interested but nonspecialist audience...that means YOU! The winner will compete again in the grand final against the victors from all the other regional heats in 2018!

iop.org/activity/3-minute-wonder/page_60438.html