Herts • Wednesday 29 April • 7.00 p.m. • Dr Julia Gog Hidden Epidemics and Viruses: The Mathematics of Disease

One may think that applied maths is mainly used for solving problems in physics, but increasingly it is becoming an essential tool in biological sciences. Here, we will look at how mathematics has been applied to help understand and control infectious diseases, from the scale of a single virus particle through to a global influenza pandemic, and some mathematical challenges for the future.

May 2015



London • Wednesday 6 May • 6.30 p.m. • Prof. Mike Glazer Crystal World

Crystals have been objects of mystery for millennia yet many are unaware that much solid material around us is made from crystals. The importance of crystals lies in their beauty and practical applications in today's technology. This talk will follow historical developments that allowed scientists

to describe the nature of crystals and show how the science has advanced over the last 100 years; from resolution of the simplest structures to modelling molecular crystals such as proteins and viruses

Milton Keynes • Tuesday 12 May • 7.30 p.m. • Dr Mark Telling Magic Bullets and Plastic Sponges

In the heart of the Oxfordshire country side lies a neutron research laboratory that houses what *The Guardian* describes as, "one of the most extraordinary machines ever built" – a machine, however, that few even know exists! In this outreach presentation, Dr Telling invites the audience to peak behind the curtain and learn exactly what neutron research entails, how this tiny particle illuminates our atomic world and how he uses the method for his own biophysics-based research.

Berkshire • Monday 18 May • 7.30 p.m. • Garrod Musto Euclidean Crop Circle Theorems Each strate to a Horte Wednesday 25 March

For abstract see Herts, Wednesday 25 March

London • Wednesday 20 May • 6.30 p.m. • Prof. Alan Davies Faraday, Green and Maxwell

Michael Faraday and James Clerk Maxwell were the greatest British scientists of the early and late nineteenth century respectively. Faraday's innovative idea of the electromagnetic field of force was crucial for Maxwell to produce his eponymous equations and predict light as a wave. We shall explore the work of Faraday and Maxwell and its profound influence on the way we live. We shall also explain where the work of the lesser-known George Green fits in.

Herts • Wednesday 27 May • 7.00 p.m. • Prof. Carolin Crawford Small Bodies of the Solar System

2015 is a momentous year for the study of dwarf planets – the Dawn mission arrives at Ceres in the asteroid belt in February, and the New Horizons space probe will commence its flypast of Pluto and its moons in July. We shall discuss the smaller bodies of the Solar System.

June 2015

Milton Keynes • Tuesday 9 June • 7.30 p.m. • Prof. Didier Queloz Exoplanets and the Nature of Otherworlds

The discovery of exoplanets sparked a revolution in astronomy and captured our imagination. Today, about 1000 such objects have been found. We have learned that planets are common, and that their properties are much more diverse than originally predicted. Their nature remains mysterious. Our Solar System is just one solution of nature's problem of making planets. This talk will present the main results of exoplanet work, with the prospects for characterising the structure and atmosphere of exoplanets.

Information

All our lectures are free to all and last about one hour. There is usually 10–15 minutes afterwards for the audience to ask questions. School parties are most welcome but please register numbers beforehand with the relevant venue organiser (see below). All venues are wheelchair accessible. Details herein are subject to possible alteration – check branch webpages. Any views expressed in here are not necessarily those of the Institute of Physics.

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Lecture venue information and times

London

Lectures usually held at 6.30 p.m., Franklin Room, Institute of Physics HQ, 80 Portland Place, London W1B 1NT (unlss otherwise stated). Refreshments are served from 6.00 p.m. on the day of the lecture. **Please register online to attend lectures**. If you do not have access to e-mail, telephone/text Alex on 020 8845 2295.

Berkshire

Lectures held at 7.30 p.m. in the William Penney Theatre, Recreational Society, West Gate, AWE, Aldermaston, Reading 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). E-mail **iop.lectures@awe.co.uk** for further information.

Herts

Lectures usually held in the Lindop Building, University of Hertfordshire, College Lane, Hatfield AL10 9AB. For further information on this season's events, contact Diane Crann, e-mail **d.crann@herts.ac.uk**, tel 07770 444614.

Kent

Unless stated otherwise, lectures held at 7.30 p.m. in Darwin Lecture Theatre 1, University of Kent, Canterbury CT2 7NZ. Further information can be obtained from Dr Cyril Isenberg, e-mail **c.isenberg@kent.ac.uk**, tel 01227 823768.

Milton Keynes

Lectures held at 7.30 p.m. in the Berrill Lecture Theatre, Open University, Walton Hall, Milton Keynes MK7 6AA. For further information contact Prof. Ray Mackintosh, e-mail **raymond.mackintosh@open.ac.uk**.

IOP Institute of Physics

London & South East Branch

Public Events – Spring 2015



London and South East Lecture Programme

January 2015

London • Thursday 8 January • 10.00 a.m. - 5.00 p.m. • Secretary of State for Energy and Climate Change (and others) Electricity Production and Storage

The programme includes talks on energy production from fusion to the future of conventional power systems among others. Please note that the event takes place at Imperial College from 10.00 a.m. to 5.00 p.m. The event is free but you will need to register via the IOP London and South East Branch Calendar where you can also find further information.



London • Wednesday 21 January • 6.30 p.m. • Prof. Paul McMillan Vulcan's Forge and Hades' Kingdom: Chemistry and Biology Under Extreme Conditions

Most chemistry is based on experiments at near ambient conditions. However, most matter in the universe is under conditions of extremely high pressure. Prof. McMillan will explore the chemistry and biological survival in Vulcan's forge, and in Hades' kingdom.

Herts • Wednesday 28 January • 7.00 p.m. • Dr Hannah Fry Hidden Connections

In this talk, Dr Fry will take you on a whistle-stop tour of the hidden connections in our human world. Showing how the patterns uncovered in Facebook are helping us understand the human brain, how understanding the structure of the internet is helping to fight terrorism, and even how the maths of connections proves that sometimes it pays to gossip.

February 2015

Kent • Tuesday 3 February • 7.30 p.m. • Dr Frances Saunders The Challenge of Translating Research into Economic Impact

Everyone knows that the UK leads the world in research. Successive governments have looked at how to translate this extraordinary wealth into financial wealth by creating new business or making existing business more competitive. Dr Saunders hopes to stimulate debate about why translational research is important and how to make sure that great science does not just sit on the shelf, waiting for others to lift it off and gain benefits that should be ours.

London • Wednesday 4 February • 6.30 p.m. • Dr Susanne Schwenzer Curiosity at Gale Crater, Mars

The Mars Science Laboratory Rover Curiosity has been exploring Gale Crater on Mars since 6 August 2012. On its journey from Bradbury Landing to Mt Sharp it has found conglomerates and mudstones, clay minerals and sulfates. The talk will investigate what these findings mean for the habitability of the site.



Milton Keynes • Tuesday 10 February • 7.30 p.m. • Felix Flicker

From Smoke Rings to Cosmic Strings: The Physics of Knots

Knots, like those you'd tie in your shoelace, have wideranging applications in modern physics. You will be given an overview of the history of the subject, before considering examples from the purely theoretical (quantum computing) to the eminently practical (getting out of armlocks).

Kent • Tuesday 17 February • 7.30 p.m. • Prof. Mohamed Sobhy The Influence of Science, Technology and Photography on Art

Developments in science and technology have always influenced art. From mathematics, artists learned about perspective; chemical processing gave affordable colours, previously not seen. Newton and Goethe's work on vision helped artists understand colour. Turner and Mondrian applied Goethe's theories. Psychologists raised awareness of colour constancy and adaptation, while photography showed stages of movements not perceived by the eye, as seen in works by Duchamp and Picasso. Science and technology can itself be subjects of art, be it in the laboratory or workshop. Prof. Sobhy will explain these ideas through examples of artwork from medieval to present time.

London • Wednesday 18 February • 6.30 p.m. • Felix Flicker From Smoke Rings to Cosmic Strings: The Physics of Knots

For abstract see Milton Keynes, Tuesday 10 February

Herts • Wednesday 25 February • 7.00 p.m. • Colin Howard Some Lessons from Buncefield

The Buncefield Explosion, reportedly the largest peacetime explosion in Europe, has been the subject of a series of investigations, research studies, joint work by regulators and industry, civil and criminal court cases. This presentation explores some of the lessons and their wider future impact.

March 2015



Kent • Tuesday 3 March • 7.30 p.m. • Prof. Steve Bramwell Spin Ice, Monopoles and 'Magnetricity'

In the 18th century, Coulomb became famous for discovering the law of attraction between electrical charges. He later showed that north and south poles of magnets attract in the same way. If magnetic poles behave like electrical charges can they then form the magnetic equivalent of electricity – 'magnetricity'?

London • Wednesday 4 March • 6.30 p.m. • Ron Neale Computer Memory Revolution??? An Update

The growing dominance of silicon as the mainstream solid-state memory is being challenged. Will silicon remain the basis of memory developments or new atomic-sized devices where changes in phase or chemical structure, quantum effects, tunnelling and wave mechanics take over? Ron Neale, from a 50-year perspective as a researcher, developer, writer and outspoken critic in the area of memory devices, will explore the present state of play and likelihood of the revolution succeeding.

Milton Keynes • Tuesday 10 March • 7.30 p.m. • Prof. Peter Richmond Physics Outside Physics

Aristotle, Copernicus, Newton and many other scientists have made important contributions to economics and finance. Much of this work was forgotten during the industrial and quantum revolutions, but the application of physics to social and economic problems is presently undergoing a rebirth following new understanding of so-called complex systems. This talk will explore aspects of this recent work and show how physics is giving new insight into finance, economics and social science.

Kent • Tuesday 17 March • 7.30 p.m. • Dr Geoff Macdonald The Story of Radio Astronomy – A Personal View

Radio astronomy has yielded many outstanding discoveries in the past 50 years, from radio galaxies and quasars to pulsars and the cosmic microwave background radiation remaining from the Big Bang. There have also been spectacular advances in observing techniques. Dr Macdonald will describe radio astronomy's development from its relatively primitive origins to its present day sophistication.

London • Wednesday 18 March • 6.30 p.m. • Dr Caroline Shenton-Taylor Physicist, Explorer and Inventor: Dizzying Highs and Crushing Lows

This talk follows the life of a scientist who embraced adventure. From exploring strange magnetic phenomena to predicting the presence of an element, his career took him on a journey that reached both dizzying highs and crushing lows. Counting Einstein among his friends, the scientific discoveries and inventions he made played a role in shaping modern technology. So, to find out the identity of the scientist who made it as a science legend, in fact and fiction, join Dr Shenton-Taylor for an evening of exploration and invention – following the journey of one man and his curiosity for new perspectives.

Herts • Wednesday 25 March • 7.00 p.m. • Garrod Musto Euclidean Crop Circle Theorems

This talk seeks to explore the books of *Euclid's Elements* that focus on aspects of the geometry of circles, and how the phenomenon of crop circles can be explained using aspects of mathematics.



Berkshire • Monday 30 March • 7.30 p.m. • Martin Kellett Will it Fly? A Guided Tour of Aircraft Stability How do engineers know whether an aircraft will be s

How do engineers know whether an aircraft will be stable or not, even before it flies? Martin Kellett will explain this.

April 2015

London • Wednesday 1 April • 6.30 p.m. • Martin Kellett Will it Fly? A Guided Tour of Aircraft Stability For abstract see Berkshire, Monday 30 March

Milton Keynes • Tuesday 21 April • 7.30 p.m. • Dr Caroline Shenton-Taylor Physicist, Explorer and Inventor: Dizzying Highs and Crushing Lows For abstract see London, Wednesday 18 March

London • Wednesday 22 April • 6.30 p.m. • Dr Michaela Musilova Living in the Extremes: the Quest of an Astrobiologist

Where do we come from? What is our future on Earth and beyond? Are we alone in the universe? For the first time since these questions were posed thousands of years ago, they may now be answered. Astrobiology is a multidisciplinary science encompassing astronomy, biology, chemistry, geology and engineering. Dr Musilova will explain how these disciplines are used to understand the origin, evolution and the future of life in the universe through her experiences at NASA, as an analogue astronaut and surviving extreme expeditions.

All free, all welcome! Please join our Facebook group www.facebook.com/ioplse

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