

Programme of events 2009–2010

All meetings begin at 6.30 p.m. unless otherwise stated.

Tuesday 22 September, 7.00 p.m.

Solar sailing and its applications

Dr Malcolm MacDonald (Strathclyde University's Advanced Space Concepts Laboratory)

Sellafield Visitors Centre

Traditionally, burning fuel with an oxidiser has been used to propel spacecraft. More recently, ion propulsion has been tested. A quite different approach involves solar sails, which are the subject of this talk.

Wednesday 14 October

Travelling through time

Prof. Bob Lambourne

Lancaster

The future is the only place really worth visiting. But what are the chances of jumping the queue to get there, or of visiting the past? This talk discusses the mystery of time, the scientific objections to travelling through time and the extent to which established physics supports the possibility of time travel. Subjects covered will include the role of special and general relativity, the value of wormholes and the chrononautical significance of quantum physics. Don't miss this talk: it may be your only chance to hear it, unless...

pierce through the outer layers of a star and test the conditions within?" While he considered theory to be the proper answer to that question, there is now an observational answer: asteroseismology.

We can now see the internal rotation of the Sun halfway down to its core. We can probe the crystallised diamond core of a pulsating white dwarf star. We can resolve the 3D pulsation and atmospheric structure of the most peculiar stars in the sky. We can even see star pulsation and detect planets with exquisitely precise observations – observations comparable to those for the Sun only two decades ago.

Asteroseismology is closely related to planet-finding in terms of the high-precision demands of the observational techniques used.



Natural or artificial, a snowflake is one of nature's beauties.

Wednesday 9 December
Snowflakes

Dr Paul Connolly (University of Manchester)

Lancaster

The physics of water in its solid phase leads to the spectacular variety of forms that are seen in snowflakes. They begin as snow crystals, which develop when tiny supercooled cloud droplets (about 10 µm in diameter) freeze. Come to this talk to learn more about them.

Wednesday 13 January 2010

Large-area sputter coatings

John Ridealgh (Pilkington)

Preston

The EU has set the ambitious target of a 20% cut in CO₂ emissions by 2020. In response to this the UK

government has tightened building regulations to save energy. In the western world 40–50% of the energy used is accounted for by the heating, cooling and lighting of buildings. One of the ways that insulation (and therefore the energy use of buildings) can be improved is through the use of energy-efficient glazing. This is achieved by a combination of multiple glazing units and thin-film coatings. The coatings need to maintain high visible transmittance and low thermal conductance while optimising the solar energy gain for the required application.

Tuesday 9 February

IET Joint Meeting

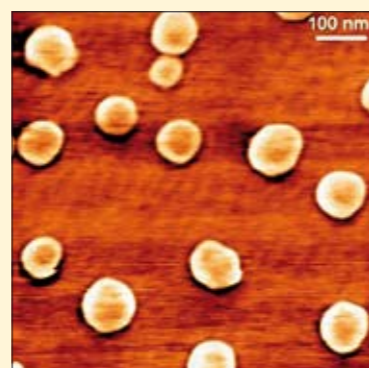
From Fleming to Penryn – celebrating over 100 years of electronics

Brian Mann MSc CEng FIET

Lancaster

In November 1904, Prof. Ambrose Fleming patented the device we know as the diode valve. This lecture celebrates that event, which is generally accepted as the beginning of electronics.

Significant inventions and personalities are highlighted. Up-to-date electronics are emphasised with reference to the very high performance and level of integration of the current Intel chips. Recent technological developments are discussed, including the move to the 300 mm silicon wafer, the "Penryn" processor and the move to 45 and 32 nm gate technology with new materials, such as hafnium.



Will quantum dots like these form the basis of a new generation of memories?

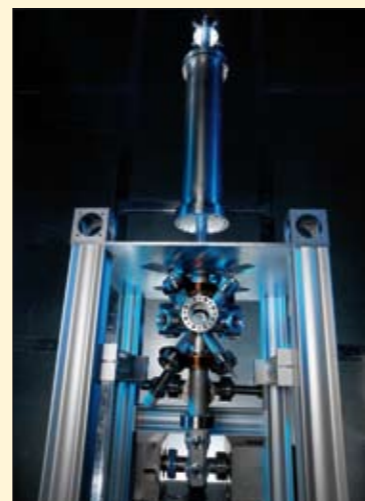
Wednesday 10 March

Quantum dot memory devices

Dr Manus Hayne (Lancaster University)

Preston

Extraordinary advances in computing power have been achieved simply by making transistors smaller and smaller. But as they approach the physical limits of scaling, Moore's law is in danger of grinding to a halt. One way around this is to replace Si and SiO₂ with materials that have intrinsically better performance. This talk will introduce a few examples, concentrating on the recently proposed concept of "quantum dot" memories using III-V compound semiconductors.



One of NPL's three active hydrogen maser atomic clocks. © Queen's Printer and Controller of HMSO, 1999.

Wednesday 21 April

Measurement of time

Dr Helen Margolis (National Physical Laboratory)

Lancaster

The past few years have seen enormous advances in the development of new types of atomic clock based on optical atomic transitions. Applications range from improved satellite navigation to the testing of fundamental physics. Such clocks operate at a much higher frequency than the current generation of microwave atomic clocks, so they divide time into smaller slices and therefore offer the prospect of significantly

better stability and accuracy. NPL is developing an optical clock based on an extremely narrow electron transition in a single trapped strontium ion.

Wednesday 12 May

AGM

Scanning microscopies

Dr Oleg Kolosov (Lancaster University)

Preston

Ultrasonic-force microscopy is a new technique to image materials at the nanometre scale. It can scrutinise soft biological tissue as well as single atomic sheets of graphene. Don't confuse this with Doctor Who's sonic screwdriver – this is cutting-edge science.

Wednesday 9 June

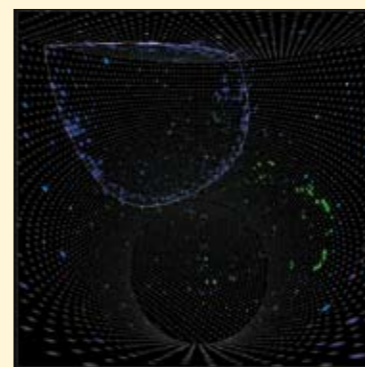
Mysterious neutrinos

Dr Laura Kormos (Lancaster University)

Lancaster

The T2K (Tokai to Kamioka) experiment is a collaboration of 400 physicists from 12 countries studying the behaviour of a particle called the neutrino.

What makes it so elusive? Unlike other fundamental particles, the neutrino only interacts via the weak force. In practice, this means that neutrinos almost never interact. Hence, they typically travel through enormous amounts of matter leaving no information behind. Despite that, physicists have engaged in the challenge of finding and measuring the unusual and surprisingly influential properties of this ghostly particle.



A muon-neutrino event in Super Kamiokande.

HOW TO FIND US

Lancaster University



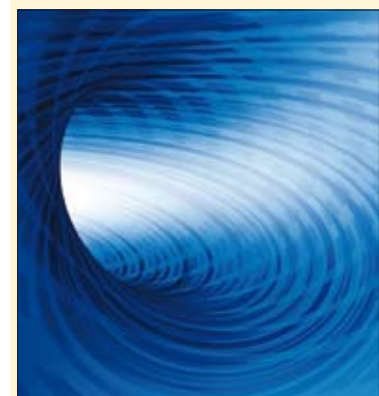
Lancaster meetings will be held at Lancaster University in the Cavendish Colloquium Room in the Faraday Lecture Theatre Complex, marked by a yellow square on the campus map above. Free parking is available everywhere on campus after 6.00 p.m.



University of Central Lancashire

Preston meetings will be held at the University of Central Lancashire in the Maudland Building, room MB49 (marked by a yellow square on the campus map above). Free parking is available behind the Maudland Building.

Please note that meeting times and venues are subject to late changes. E-mails will be sent to members containing the latest information, which can also be found at lancashire.iop.org.



Could a wormhole open up a short-cut through time and space?

Wednesday 18 November

Asteroseismology

Prof. Don Kurtz (UCLAN)

Preston

In 1926 Sir Arthur Eddington lamented, "What appliance can