

NEWSLETTER

June 2009

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The branch newsletters are published by IOP Publishing, Dirac House, Temple Back, Bristol BS1 6BE, UK.

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Printed by Warners (Midlands) plc, Bourne, Lincolnshire, UK.

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The North East pushes fuel-cell development

Dr Jon Helliwell of the Centre for Process Innovation (CPI) gave a lively talk on fuel cells to members of the Institute of Physics, the Institution of Engineering and Technology and the Institute of Measurement and Control.

Fuel cells are a flexible technology that can convert different fuels into electricity with greater efficiency than conventional generators.

The recent appearance of fuel-cell powered cars in the popular media has raised public awareness of the technology. However, this “new” technology first made its appearance in 1839. There are links to the North East where

significant advances in fuel cells had been made in the early part of the last century.

In his presentation, Dr Helliwell looked at the historical development of the fuel cell and detailed the different types of cell and how they worked. Of significant interest was the discussion on fuel-cell applications. It was interesting to see how California state was leading the way in fuel-cell powered transport.

The local work of the CPI in the development of fuel cells was highlighted, showing how there are now applications as varied as fuel-cell powered signs, the powering of local businesses and lighting local lighthouses.

Dr Helliwell’s talk concluded with a review of the commercialisation of the technology and the challenges that still remain to make fuel cells a significant tool in the low-carbon-energy toolbox.

Dr Helliwell brought with him a small Japanese toy car that was powered by a tiny fuel cell, illustrating how this maturing technology is no longer restricted to the laboratory, but is becoming a commercially viable solution.

Businesses in Teesside and the North East are suitably placed to be at the forefront of fuel-cell technology, with the CPI poised to be the hub to facilitate its development.

Durham University hosts a day for physics teachers

Science Learning Centre North East, the Institute of Physics and Durham University are working in conjunction to sponsor a day for physics teachers at Durham University on 24 June.

Keynote lecturer Dr Gordon Love will talk about “Light: skies, eyes and spies”, while Dr Ifan Hughes will show you cool things to do with lasers. As well as lectures, there will be an opportunity to “ask a physicist”, ICT resources, and workshops, with sessions for both experienced teachers and those new to the subject.

From the choices listed, you can attend either workshop A or two of the shorter workshops. You must make your selection

before completing your booking.

By the end of the day, participants will have explored new resources for teaching physics, developed an understanding of some recent advances in physics and had the opportunity to carry out practical physics activities.

A: The National Schools’ Observatory: talk and workshop
Dr Christopher Leigh, project manager, National Schools’ Observatory

Participants will hear about the observatory and how their school can access resources and viewing time. For more information, visit www.schoolsobservatory.org.uk.

B: Virtual Physics Laboratory

John Lunn, VPL
This is a collection of more than 200 physics simulations, and more. Participants will get a free licence to the materials.

C: Making 3D pictures in the classroom

Alison Alexander
Participants will view and make 3D pictures. They will need to bring a digital camera and a memory stick.

D: Shocked and stunned: the Van de Graaff generator

Gary Williams, editor of *Physics Education* and national coordinator of the Institute’s Physics Teacher Network.

Check out our website at northeast.iop.org

Newcastle University showcases cutting-edge climate research

Scientists from Newcastle University were singled out to take part in a national event showcasing some of the most cutting-edge research in the UK.

The MESSAGE (Mobile Environmental Sensing Systems Across Grid Environments) team – which includes experts from electrical, electronic and computer engineering, civil engineering and geosciences, and computing science – and the Climate Change Impact Research team took part in the Pioneers 2009 event in London.

Using a weather generator, the Climate Change team demonstrated how our climate

may alter over the next century. The team showed how these variations in the weather will impact on our lives and the need to develop strategies to deal with those changes.

The MESSAGE project develops wireless sensors that can be fitted to vehicles, infrastructure and mobile phones to produce real-time, second-by-second, metre-by-metre data on traffic pollution. The Newcastle team demonstrated how the sensors can be integrated together and the data consolidated into a constantly updated, interactive “pollution map”.



A real-time pollution map could be generated using data collected by sensors on mobile phones and vehicles, among other things.

Insulator becomes superconductor

Scientists at Durham University and the University of Liverpool have altered the structure of a poorly conducting material in such a way that it can now superconduct electricity.

This discovery could aid power transmission around the world, which would help to cut global energy loss.

The team produced a material from a football-shaped molecule, called carbon 60,

to demonstrate how a superconductor works at temperatures suitable for commercial use.

The research carried out by the team will allow scientists to search for materials with the right chemical and structural ingredients to develop superconductors that could help to reduce global energy losses in the future.

The scientists found that

pressing the powdered material caused the atoms within the material's structure to rearrange themselves. The material then changed from an insulator to a conductor.

It is believed that this work will lead to a better understanding of the processes that occur in superconducting materials and thus allow control of these properties to use in a multitude of devices.

Toddlers discover science at Newcastle's Centre for Life

Infant scientists recently tested their talents at a special day of activities. Babies and toddlers took part in a range of science-based activities at the Centre for Life, in Newcastle.

The children got the opportunity to look at giant snails and millipedes. There were musical workshops, a toddler disco and numerous touch, feel, look and see

science activities.

These events are designed to encourage scientific interest in small children from an early age.

The next preschool day at Life will be on 10 November.

Would you like to join the North East Branch committee?

Contact Alasdair Wilson for more details

(e-mail awilson.craw@blueyonder.co.uk) and/or attend the North East Branch AGM

Disused oil fields could act as CO₂ storage facility



Carbon dioxide could be captured and stored in North Sea oil fields.

Prof. Davies, head of the Durham University Carbon Capture and Storage Group has suggested that the North Sea's disused gas and oil fields could be used to store captured carbon dioxide (CO₂).

He says that the North Sea offers many world-class sites where CO₂ could be stored. The area's geology is ideal because it has stored fluids, oil and gas for tens of millions of years.

Davies believes that although CO₂ naturally leaks out to the surface, work should be undertaken to determine the relative risk of each of the sites to aid in CO₂ storage.

PETEC opens its doors

The week beginning 16 March marked the international launch of PETEC, the UK's national Printable Electronics Technology Centre. PETEC is the flagship company on the NETPark site in Sedgefield.

PETEC has significant expertise and state-of-the-art equipment in the field of printed electronics to deliver design, development and prototyping services and facilities to its customers. Printable electronics is a high-yield, low-cost manufacturing technology with a variety of applications.

Tom Taylor, director of PETEC, said: “The UK has a well established competence in research in printable electronics whereas PETEC's focus is in accelerating the commercialisation of these products through the production process and solving technology issues that companies face in developing new products.”

“PETEC offers experience, knowledge and the appropriate infrastructure to support customers in this emerging global market.”

The centre, a division of the Centre for Process Innovation (CPI), connects innovators in research with commercial activity using

proof-of-concept devices and pilot-scale manufacture. The centre helps clients identify the materials, industrial steps and investments required to bring products to market quickly.

PETEC's initial focus is in displays, where there is already commercial pressure to produce larger-area displays that are more efficient and cost less than what is currently available. With the emergence of new formats such as E-paper, OLED displays and LCD on flexible substrates, the potential for printable electronics to make an impact is vast.

Other near-term markets for PETEC's customers include solid-state lighting and organic photovoltaics. The centre is geared up to help companies address the various materials performance and processing challenges that these emerging markets pose.

Richard Kirk, CEO of PolyPhotonix, an OLED lighting company building its first production line at PETEC said: “PETEC has been pivotal to the creation of PolyPhotonix. Without access to the facilities, management expertise and experience, [production] would have been prohibitively expensive [to set up]. The ability to work quickly and effectively

is crucial in this fast-moving-technology environment.

PETEC is already attracting customers from the UK and internationally. Its aim is to secure the UK's manufacturing reputation in this field by training the next generation of PR engineers and providing a valuable contribution to the UK economy. PETEC's presence will consolidate national and international resources into efficient supply chains.

The launch event which took place at PETEC was chaired by Lord Alec Broers who received a peerage in 2004 in recognition of his contributions to engineering and higher education.

The event attracted global leaders across the field of printed electronics, including 60 members of the International Organic Electronics Association. A programme of keynote lectures by distinguished speakers from the UK, Korea, Japan and Europe took place throughout the day supported by demonstrations of prototype work from innovative companies. Lord Mandleson, business secretary, was present to officially open the facility.

Further information on PETEC can be found at www.ukpetec.com or by e-mailing pe-info@uk-cpi.com.

An evening spent on pulsars and extreme physics

The North East Branch is delighted to welcome Dame Jocelyn Bell Burnell back to Newcastle. She is an astrophysicist who, as a postgraduate student, discovered the first radio pulsars with her doctoral supervisor Antony Hewish, for which he won a Nobel prize. Dame Jocelyn Bell Burnell is visiting professor of astrophysics at the University of Oxford and a fellow of Mansfield College. She is also president of the Institute of Physics.

Pulsars were discovered 35 years ago. With an average density comparable to that of the nucleus, magnetic fields of around 10⁸T and speeds close to *c*, they have stretched our understanding of the behaviour of matter. They serve as extremely accurate clocks with which to carry out precision experiments in relativity.

11 June 7.00 p.m.
Pulsars and extreme physics

By Dame Jocelyn Bell Burnell (DBE, FRS, FRAS)
Northumbria University, Ellison Building, Room A003
(Preceded by the North East Branch AGM at 6.30 p.m. and followed by social evening and finger buffet to 9.00 p.m.)

A weatherman's view: Are this year's floods caused by global warming?

On 10 March at the Newcastle Discovery Museum, Peter Gibbs – familiar to many as a BBC weather forecaster – gave a comprehensive talk on the background to the art and science of weather forecasting. His lecture entitled “Were these floods caused by global warming or not?” formed part of National Science and Engineering Week and the newly revived Newcastle Science Festival.

Gibbs, an alumnus of Newcastle University, explained the development of forecasting techniques. Our understanding of the weather has grown over the years owing to more and more sophisticated and detailed observations of the many parameters

involved. These include terrestrial measurements of temperature, air pressure and velocity, humidity and precipitation together with their variation across the seas, land topography and up into the stratosphere and factors such as the carbon cycle and atmospheric chemistry.

Gibbs pointed out that despite the many weather satellites circling the globe there are still very sparse data coming from the major drivers of the weather, i.e. the oceans and the polar regions.

Gibbs described the manual methods of determining the weather of only a few decades ago and, owing to the rapid increase in computing power

over recent years, the faster and more accurate modelling that takes place now over space and time dimensions.

Supercomputers allow short-term forecasting within an hour or so with high reliability. This power also allows more variables to be included and more simulations to be run of a developing weather system over a useful timescale to assess the degree of variability of the outcomes over that time.

Answering the question of the title of the talk was a bit easier after all of the background.

Local weather events are caused by continual changes in the global weather and in the interaction of that influence with geographical factors, such

as coastline and hills, cities and pastureland. Increased instabilities in the global patterns of weather will as a consequence increase the likelihood of greater variation of local weather both in variety of conditions and the extremes reached. Global warming is an influence, but a particular flood is not necessarily strongly caused by it.

Sadly we did not have time to debate the merits of diverting all of the computing power of the LHC to the challenge of global weather forecasting.

Thank you to the staff of the museum and particularly to Graham Bradshaw, the curator who facilitated the event. We look forward next year's festival.

59TH ANNUAL GENERAL MEETING 2009

**Thursday 11 June 2009, 6.30 p.m.
Room A003, Ellison Building
Northumbria University**

Agenda

- 1 Apologies for absence
- 2 Minutes of AGM 2008
- 3 Matters arising
- 4 Chair's remarks
- 5 Honorary secretary's report
- 6 Honorary treasurer's report
- 7 Election of officers*
- 8 Election of committee**
- 9 Any other relevant business

* All of the officers' posts are up for election. Fellows or full members of the branch who are interested in putting themselves forward should contact the honorary secretary – Alasdair Wilson (e-mail awilson.craw@blueyonder.co.uk) – as soon as possible. A resumé, membership number and contact details of proposer and seconder will be required before the meeting.

** Any member may sit on the committee. New committee members are more than welcome. Nominations shall be proposed by no fewer than two branch members and be accompanied by the consent of the nominee. Please send nominations to the honorary secretary. Nominations will also be accepted from the floor from members in person.

The AGM will be followed by a lecture entitled “Pulsars and extreme physics” given by Dame Jocelyn Bell Burnell, president of the Institute of Physics. Everyone is welcome to join the social evening with buffet in the staff bar (8.00–9.00 p.m.).

**The deadline for your contributions to the
next issue of this newsletter is: Friday 31 July**

E-mail your materials to m.d.cooke@physics.org