

## Merseyside Branch Newsletter Autumn 2002

Dear Member,

Welcome to the autumn newsletter of the Merseyside Branch of the IoP, introducing our programme of meetings and other activities for the next six months.

Full details of the talks that have been arranged are given on the two centre pages of the newsletter. These cover a very wide range of physics-based topics — from condensed matter physics and crystallography, through the impact that physics is making on the life and earth sciences, to fundamental particle physics.

Two talks will deal with topical issues: 2003 is the centenary of the Wright brothers' first powered flight and Professor Padfield will give us an overview of their engineering and aerodynamically achievement — this will include an opportunity to see (and possibly control) a demonstration of the Liverpool Flight Simulator set up to model the performance of the Wright brothers' aircraft. We shall also hear from Professor O'Neill on the controversial topic of whether the climate is changing and global warming is really occurring.

As in previous years, we shall have a joint meeting with the Manchester Branch, which will be held at Daresbury Laboratory. This will concentrate on the role of physics in industry and will feature a speaker from Siemens UK, who will deal with the latest developments in medical imaging.

In generating a programme that covers such a diverse range of topics, your committee has aimed to attract members and visitors from a wide background — you do not need to be a university academic to find interest and stimulation in the talks. We also believe that discussion and 'networking' amongst members and visitors has considerable value, so a number of the meetings (as identified in the programme) will be followed by a light buffet for all those attending, presenting an opportunity for further discussion with the speaker.

Details of the programme for schools and physics teachers organised by our Education Secretary, Dr Neil Heritage, are given on page 4. The Institute sees physics teaching as a priority area and last year's education events were well received by those who attended; we would strongly encourage all teachers involved in physics at the secondary school level to attend the education events. Furthermore, sixth form

science students should find most of the topics at our main meetings interesting and relevant. Accompanied pupils will be very welcome, though we would ask teachers to contact the Secretary or Chair in advance if appreciable numbers are expected, so that suitable preparations can be made.

The Newsletter also features a short report by Mike Moores, the Industrial Representative on the Branch Committee, who is heading a new initiative across three branch areas (Merseyside, Manchester and Lancashire and Cumbria) to strengthen links between the Institute and industry. It is expected that this will produce results during the coming year and we shall present further information at meetings and through newsletters as plans mature.

We hope that you find the Branch activities worthwhile and I look forward to meeting you at our future meetings.

Neil Marks  
Merseyside Branch Chair

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## Merseyside Branch 2002/3

**20 September** Mike Bode UoL  
11.15 am Large Lecture Theatre  
***Astronomy on Merseyside:  
Past Present and Future***



The Merseyside region has a rich astronomical heritage stretching back nearly 400 years. This talk will review that heritage, describe the current flourishing regional environment for astronomy and astrophysics, and then concentrate on the future, in particular on the JMU Liverpool Telescope (LT) project. The LT will be the world's largest robotic telescope when it begins operations later this year on the international observatory site of La Palma in the Canaries. As well as its use in research, there will be unrivalled opportunities for amateur astronomers, students and schools to request and access data from the telescope, the latter through the National Schools' Observatory project.

**10 October** Ronan McGrath UoL  
***Quasicrystal Surfaces: From  
Fibonacci to the Frying Pan***

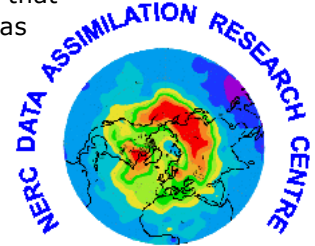
The existence of materials displaying 5- and 10-fold symmetries was once thought to be impossible by the rules of crystallography. Quasicrystals, are metallic alloys with just such 'impossible' symmetries. Their structure is related to the mathematics of Penrose tilings and the Fibonacci sequence, which also manifests itself in nature in other fascinating ways. The question of whether the unusual material properties of quasicrystals, such as their wear resistance, stem from the quasicrystalline nature of the surface or from other causes provides the motivation for surface studies.

**Tours of the Surface Science facilities can be arranged following the talk.**



**31 October** Alan O'Neill UoL  
***The Challenge of Climate Prediction***

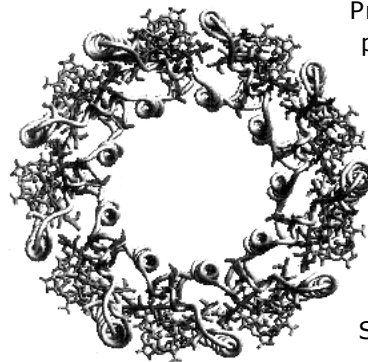
What is the evidence that the Earth's climate has changed, and why do we think it might change in the near future? These questions present major challenges for scientists. Indeed, some might find it surprising how many branches of physics, chemistry, biology and mathematics are involved in addressing them. The talk will review the evidence for climate change, highlighting some of the difficulties in interpreting the data. An outline will then be given of how computer models of the climate system are built, drawing attention to some of the difficulties and scientific uncertainties that are faced, including the fact that some features of the system are chaotic. The talk will close with some remarks on where the science of climate prediction is heading.



[darc.nerc.ac.uk](http://darc.nerc.ac.uk)

**14 January** John Helliwell UoL  
***Adventures in Space and Time –  
Physics and Protein Crystallography***

The analysis of the crystal structure of proteins is a multi-disciplinary subject.



Professor Helliwell's physics background has allowed him to become involved in protein crystal growth studies in the micro-gravity environment of space aboard the NASA Space Shuttle using the ESA Advanced

Protein Crystal Growth Facility, and then the Daresbury SRS and ESRF (sources of synchrotron radiation) to evaluate the perfection of the crystals.

**6 February** Don Tarling UoL  
***What is Wrong with Plate Tectonics?***

The concept of plate tectonics seems to be fundamentally acceptable to all, but the difficulty of physically defining a tectonic plate means that the terms *lithosphere* (the rigid upper rocks of the upper mantle and crust) and *asthenosphere* (the soft rocks of the mantle) have different meanings to different people. This is both confusing and dangerous. Their physical definition should be in terms of rigidity determined over timescales of tens of thousands of years. The early discovery of the asthenosphere suggests that some fundamental assumptions were neces-

sarily made. Some estimates of the thickness of the oceanic lithosphere were based on observations that are now being reassessed, raising the question of the driving force of plate tectonics, which in turn raises the question of the radioactive content of the mantle, and so on. While the concept of plate tectonics is sound, there are still fundamentally important questions about our understanding of the physical properties of the Earth that are yet to be resolved.

**27 February** Gareth Padfield UoL  
***The Birth of Flight Control – Flight Testing with the Wright Brothers***

Wilbur and Orville Wright solved the problems of flight control through a processes of research, analysis, design, building and testing. In the autumn of 1902 they broke all previous gliding records, achieved through their innovations in flight control that would shape all future aircraft. The Wright Brothers were the first aeronautical engineers and the first test pilots. The story of their invention is told through a description and assessment of the technical challenges faced by the Wrights, their unique approach to innovation and their dedication to their goals. The story is enhanced through the understanding gained from the development and testing of simulations of the Wright aircraft on the Liverpool Flight Simulator. **After the talk there will be a light buffet and opportunities to visit the flight simulator facilities.**



**20 March** Clare Stevens 6.30 pm DL  
***Fast CT – Multi-Slice Mania***

The past three to four years have seen a dramatic change in Computed Tomography (CT) technology and its clinical practice. In that time we have moved from single-slice spiral CT to multi-row systems acquiring 4 slices simultaneously during each rotation around the patient. Now there is another giant and equally significant leap from 4 slices to 16 slices. This talk will describe how these systems work and outline the clinical applications and benefits to both users and patients. Other issues will be covered such as: What effect does this have on radiation dose? How does the radiologist cope with the additional data generated? Finally we will look into the future of CT, an imaging modality which many experts claimed "would be superseded by Magnetic Resonance Imaging within ten years" ... that was more ten years ago! **The talk will be followed by a buffet.**

[www.siemensmedical.com](http://www.siemensmedical.com)

**10 April** John Fry UoL  
***Time Reversal in the Real World***

Are physical phenomena the same when the direction of time is reversed? Before we can answer this question we need to see how things behave in the real world of our universe, and to understand some of the peculiarities of

time itself and what is meant by time running backwards. An important observation is that a particle moving backwards in time behaves exactly the same as its antiparticle moving forwards in time. In our common-sense world right-handed and left-handed are just conventions, as is positive or negative electrical charge or current. We could agree to exchange the terms without altering our daily lives at all. In the real world, however, some phenomena, such as radioactive decay, violate the symmetry between left- and right-handedness and between positive and negative charge. This leads to the possibility of a difference in some physical phenomena when the direction of time is reversed, and this is what we find experimentally. The real world is very different from our common-sense world! **The talk will be followed by the AGM.**

**1 May** Sarnjeet Dhesi UoL  
***Atoms in a Spin***

Abstract not yet available

**22 May** Visit to  
 Pilkington Technology Centre 6.30 pm

The Pilkington Technology Centre lies at the heart of Pilkington's R&D, responsible for almost all of their global R&D effort. Some 300 scientists and engineers work on site, developing new uses for glass in buildings and in transport. There is also an exhibition centre on site, which showcases recent examples of Pilkington technology. These include Pilkington Activ (the world's first self-cleaning glass), advanced fire-resistant glazings, and products for the automotive market such as intruder-resistant side-windows and glazings with advanced heat-control properties. A short talk (~ 45 min) will highlight some of these areas, and also present a gentle introduction to the physics of windows prior to a tour (~ 45 min) of the facility. Numbers will be limited, so please contact the Secretary if you wish to attend the visit.



[www.pilkington.com](http://www.pilkington.com)

**Venues and Times for Talks**

UoL = University of Liverpool

[www.liv.ac.uk/UniversityPrecinct/precmap.html](http://www.liv.ac.uk/UniversityPrecinct/precmap.html)

Unless stated otherwise, talks are in the Surface Science Research Centre (building #47 on the precinct map). The Large Lecture Theatre is in the Department of Physics, Chadwick Laboratory (building #42).

DL = Daresbury Laboratory, near Warrington

[www.clrc.ac.uk/Activity/ACTIVITY=DLMaps](http://www.clrc.ac.uk/Activity/ACTIVITY=DLMaps)

Unless stated otherwise, talks start at 18:00 and refreshments are available from 17:30.

## Education Report 2001/2

### Highlights from a busy year

- The Paperclip Physics afternoon was enjoyed by both the competitors and organisers.
- The travelling Schools' and Colleges' Lecture "Music To Your Ears" given by Wendy Sadler, which was attended by about 400 pupils, was very well presented.
- The July 2002 Liverpool Physics Teachers' Conference, which focussed on software resources, was attended by over 40 teachers. Chris Butlin's demonstrations and the "Brains Trust" session were described as very useful and overall the day was flagged as "the most enjoyable conference yet" in feedback from teachers.
- During the year, we have been very pleased to welcome a small but steadily increasing number of enthusiastic sixth-formers to meetings. Many of the talks each year are pitched at a level which is accessible to A-Level students; please do come and bring your pupils.

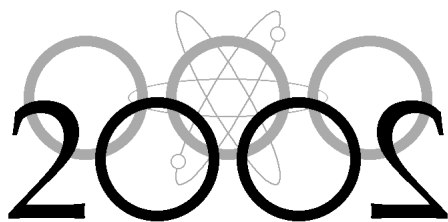
### Committee news

After many years as Education Secretary, I am delighted to hand the post into the capable hands of Neil Heritage, who is a Liverpool graduate teaching at King's School, Chester.

Ann Marks ([liviop@amarks.co.uk](mailto:liviop@amarks.co.uk))

## Education Events 2002/3

### 12 October 2002 Liverpool Physics Olympics



30 teams of A-Level students take part in a fun day of events with a physics slant, competing for prizes, medals and the LPO trophy. To enter a team contact Steve Barrett ([S.D.Barrett@liv.ac.uk](mailto:S.D.Barrett@liv.ac.uk)).

[www.ssci.liv.ac.uk/~POWW](http://www.ssci.liv.ac.uk/~POWW)

### February 2003 Paperclip Physics

The local heats of this national event will be run jointly by the Merseyside and Manchester Branches at Daresbury Laboratory. The event involves a group of sixth-formers explaining a simple principle of physics to a non-scientist using only objects that can be found in the home. The DL heat is always stimulating yet informal; a video of the more competitive final held in London is available for anyone who wishes to get an idea of what is expected.

## Spring 2003 IoP Schools' and Colleges' Lecture

The title and dates of the lecture series have not yet been finalised. Details will be posted on the Merseyside Branch web pages when they are available.

### 3 July 2003 Liverpool Physics Teachers' Conference

The annual day for physics teachers will once again be organised jointly by the IoP and UoL. If you have any suggestions for inclusion in the programme, please contact the Branch Secretary or Neil Heritage.

[www.liv.ac.uk/~iop/PTC2003](http://www.liv.ac.uk/~iop/PTC2003)

Neil Heritage  
([NeilHeritage@blueyonder.co.uk](mailto:NeilHeritage@blueyonder.co.uk))

## Industrial Representation News

### Industrial Initiative – Physics in Industry for the 21st Century

Innovation, Product Development  
and Wealth Creation

This initiative will build upon the IoP's long standing involvement in the promotion of strong links between the various physics-based sectors, including business, university and government-funded research organisations.

The aim of the initiative is to create a forum which can bring together individuals and organisations operating in the private and public sectors that can participate in the development and promotion of Physics-based activities for social development and wealth creation in the North of England. This will be addressed through a number of objectives:

- To create effective communication, discussion and collaboration between the industrial, medical, academic and educational sectors and infrastructure development agencies.
- To employ these communication channels to develop strategic planning initiatives which can influence future lines of research and product development in known growth market areas such as the aging population, environmental protection, energy conservation, *etc.*
- The planning, development and implementation of future initiatives which can help stimulate the entrepreneurial process and utilise the variety of expertise assembled in the above mentioned objectives.

Preliminary discussions with interested parties have already begun and a variety of organisations and agencies within the North West have demonstrated an interest in becoming involved. It is hoped that the interest generated by the preliminary actions will continue to gather momentum.

Mike Moores ([bmm@irs.u-net.com](mailto:bmm@irs.u-net.com))