Institute of Physics MDLAND BRANCH NEWSEETER

January 2005

Chair: Godfrey Thomas

Hon. Secretary: Alan Timmins

International Year of Physics

2005 is the International Year of Physics and the Midland Branch hopes and expects to be busier than usual.

Our lecture programme continues into Spring with XX lectures planned at X centres. These are lively and informative presentations for interested people who wish to extend their scientific knowledge. If you are a teacher or lecturer, do encourage your students from year 11 and upwards to attend. Mike Melling is re-starting the North Staffordshire Centre at Stoke-on-Trent; look out for notices of meetings if you live in that vicinity.

The Paperclip Physics Competition has attracted an entry of 24 teams from the Midlands, and should stimulate the enthusiasm of the participants – both young and old – in the early part of the year, as it has always done in the past. This is a special year for us, as the Competition was devised and first held in the Midlands ten years ago.

The annual, afternoon, careers-orientated meetings for students in years 11 and 12 have been extended to three venues – Leicester has been added to Wolverhampton and Nottingham. Students will hear how the four speakers from a wide range of occupations, usually including research, industry and medicine, use physics in their day-to-day activities. The feedback from teachers who bring parties is always complimentary – if you are a teacher, will your students benefit in 2005? The three dates in March will be found in the Calendar that accompanies this Newsletter.

The national Lecture for Schools – 'Our Planet – Our Future' – will focus on the challenges of sustainability and will be presented at seven different Midland locations between February and October. Will your son or daughter hear it? Why not suggest to their teachers that they take a group from their school?

Our branch visits often take you to places of interest to physicists that the general public cannot access. We have several planned for the coming months – look out for details and booking slips with your copy of Physics World each month.

The branch covers a huge area – its perimeter is delineated by postcodes DE, NG, LE, NN, CV, WR, HR, SY, CW, ST – and the distances to travel to a lecture or meeting can be large. If there is a nucleus of interested people in your area, well away from one of our Centres, and you can attract a viable audience to a lecture programme, do let us know.

The distance problem has struck our intention to form a Retired Members Group. Most of those who replied to the advert in the November Calendar indicated a wish to travel no more than 30 miles – but this gives no overlap. If you can consider 50 miles, then the project to start such a group becomes possible – do let Michael Talbot-Smith know (michael.talbotsmith@btinternet .com). He has received already some excellent suggestions from the respondents, and will be contacting them individually.

Teachers are now served by Network Coordinators. The West Midlands Network based in Birmingham is developing rapidly, and Lynne Long describes on page X some of its activities in the past year. Two more coordinators have been appointed in the branch area – Peter Ball in Nottingham and Mike Melling in the North Midlands, so activities dedicated to teachers will expand greatly in the coming months.

2005 is Einstein Year in the UK/British Isles, (right geographical area? Editor) and the Institute is mounting a major publicity drive to raise the profile of physics throughout the country – look out for Einstein Year activities (such as the Lab in a Lorry) in your part of the branch area.

As our contribution to Einstein Year, the Midland Branch committee hopes to build more links with the local press throughout the area, and (if we are successful) you should see more physics-related items in your local paper throughout the year.

On a second front, we hope to build stronger links with our industrial members. Dominic Walker, who has recently become out Industry Representative, would like to hear from such members, particularly if you have views on how we can serve you better. His e-mail address is given at the end of his personal profile, printed

elsewhere/above/below/on page X with the profiles of two other committee members, continuing the 'snapshots' that we started in the last Newsletter.

The Branch exists to keep members in touch with each other and with the Institute in London. This will only happen if you play your part. Are your contact details up-to-date? Do we have your latest e-mail address? You can check and change these easily on the Institute's website at www.iop.org. The Midland webpages at http://midland.iop.org will tell you what is happening in this area; and listings can be found both at whatson.iop.org and in 'Interactions'.

Do you want to be in touch with lively, enthusiastic physicists, who are willing to support you and share your wish to see physics thrive? If so, then keep in touch with the branch and participate in some of its many activities – it's up to you.

Combined Midland Branch Brimingham centre / We

Lynne Long reports on all the MBBC/WMTPC events **Songs from the stars**

The first MBBC/WMTPC lecture for 2004-5 was - Songs of the stars - the real music of spheres held at The University of Birmingham on the evening of Tuesday 6 October, given by Professor Don Kurtz from the University of Central Lancashire. Professor Kurtz came highly recommended as an excellent speaker and he certainly didn't disappoint anyone!

The lecture was attended by around 105 teachers and sixth form students who very much enjoyed the presentation. The size of the audience was perhaps a little lower than we would normally expect as we had another lecture by Dr David Malin on the following evening and some schools had chosen to attend this lecture instead.

Don began his lecture by talking about animal sounds which may be emitted at frequencies above or below the normal human hearing range, but which can be "adjusted" to give us an idea of what they would sound like to us. He then went on to outline the different modes in which stars can vibrate (all be it at very low frequencies), and how we can use Fourier Analysis techniques to measure the different frequencies involved and the different amplitudes of these frequencies. So each star emits a characteristic sound, in a similar way to how musical instruments emit a characteristic sound. The audience were treated to the sounds of rumbling Red Giants to the



The vibrating Sun

sounds of our own Sun. These measurements can enable scientists to accurately calculate the conditions deep inside stars - we can, for example, say that the core temperature of the Sun is 15.4 million degrees Kelvin rather than about 15 million degrees, such is the accuracy achieved. Don's lecture involved many

animations, video clips and sounds which really brought the subject alive for the audience. The basis of the topic was also very relevant to many of the core ideas in A Level - standing wave modes, harmonics, Doppler effect etc. The students and teachers left impressed and wanting to learn more about the Universe.

From big bang to little bangs

The second IOP/WMPTC lecture for 2004-5 was held at The University of Birmingham on the evening of Tuesday 19 October -From the BIG BANG to Little Bangs - A beginners Guide to making your own Universe - by Dr Peter lones from the Nuclear Research group at The University of Birmingham.

The lecture was attended by around 120 teachers and sixth form students who responded very well to the talk and showed an obvious interest in the subject covered.

Peter divided his talk into three main areas - Inside Looking Out - Our view of the Universe from the surface of the Earth. Outside Looking In – The Current Picture of fundamental Particles and Making your own Universe – Some background from the experiment currently in operation at the Relativistic Heavy Ion Collider in Brookhaven, Peter's own

research interest.

The audience were invited to imagine just how big the Universe is, as well as taken on a brief historical trip to how we, as humans, have viewed the Universe and matter in past times. The STAR experiment was well presented and included a video simulation of just what a nuclear collision looks like at the energies and temperatures achieved in the accelerator. This was much appreciated by the



The STAR detector and team

audience.

The talk alluded to many topics applicable on the A Level syllabus, as well as being entertaining. Teachers and

Going with the Flow - liquid crystals around us

The third IOP/WMPTC lecture for 2004-5 - Going with the Flow -How Liquid Crystals alter our Lives was held at the University of Birmingham on the evening of Tuesday 9 November 2004 by Professor Helen Gleeson from the School of Physics & Astronomy at The University of Manchester.

The lecture was attended by around 65 teachers and sixth form students who were treated to Helen's usual polished and enthusiastic performance.

Helen gave a brief

introduction to the three main types of liquid crystal, outlining the basic principles on which LCD displays work and emphasising just how many applications of this technology we now have in our everyday lives, as well as how important these materials are in the natural world around us.

The talk was illustrated by demonstrations of liquid crystal effects, with various materials passed around for the audience to appreciate "close up". The talk alluded to some

topics in A Level syllabi, such as the polarisation of light, as well as introducing some new ideas, but always at an understandable level for the audience. When asked at the end of the lecture if the topic involved any complex maths.

Helen confessed that it did, but the audience had been spared that aspect in the lecture! Students and teachers left feeling they had learnt a little more about a new and important technology as well as the thought that their own



Professor Helen Gleeson

brains were 70% liquid crystal and certainly wouldn't work if this state of matter didn't exist!

There are three more lectures already planned in the next few months, for more details of forthcoming events see page 6.

est Midland Physics Teacher Network of the Institute

Find and seek in the infra red

Wolverhampton Centre hosted a lecture entitled 'Find and Seek in the Infra-Red' on 11 November. Despite speaking to Wolverhampton's smallest audience to date, Peter Dennis gave a fantastic lecture on thermal imaging, including some excellent video clips and demonstrations. The lecture was pitched at an appropriate level so that it could be enjoyed by any GCSE or A level pupil, yet still provide new insights for the professional physicist whilst keeping the mathematical content to the absolute minimum.

Dr Dennis began his talk by referring to three alternative approaches to 'seeing in the dark': image intensifying which uses a photo multiplier to increase very low levels of light and which generally gives a grainy green image, pyrometers which have a poor resolution and slow response time and thermal imaging which uses the infra red radiation emitted by all objects.

Thermal imaging cameras, which have a nanosecond response time and produce clear images, were first developed at DERA (now QinetiQ) some twenty years ago, when cadmium mercury telluride was discovered.

This material has a very low energy requirement for releasing its bound electrons and this enables it to conduct electric current when exposed to infrared radiation. Thermal imaging cameras have to operate at liquid nitrogen temperatures but are able to detect differences in temperature of 0.02°C. Dr Dennis showed a thermal image of Worcester Cathedral that clearly differentiated the cement work between the blocks of stone, which he explained was due to the stone having a different emissivity to the cement. One of the most

compelling images was of a fighter aircraft on a low-level flight path, weaving in and out of the hills in a Welsh valley at midnight, using only a thermal imaging camera in its nose cone to provide a view for the pilot.

There are, apparently, moves to install such devices in cars and they would unquestionably improve safety when driving in fog or in dark conditions, but the cost may prove prohibitive. Dr Dennis concluded his talk with some fascinating

demonstrations using a thermal camera: the audience looked most peculiar with their dark noses and bright tongues, black polythene could be seen to be transparent to infra red whereas glass was opaque and the sensitivity of the camera was well illustrated by measuring the handprint left behind by a member of the audience after he had briefly touched the chair in front of him.



Infra red images: Thermal imaging cameras have to operate at liquid nitrogen temperatures but are able to detect differences in temperature of 0.02⁰C.

session ended a very good illustrated lecture, enjoyed by all. Emma Johnson and Clive Wormley

A good question and answer

Christmas Presentation

Every year, in the run-up to Christmas. there is a special lecture aimed at students in years 12 and 13 organised by the Midland Branch of the IoP in association with physics teachers in the West Midlands.

The Schools' Annual Christmas Presentation at Birmingham was hosted by the University of Birmingham Physics Department, the Large Lecture Theatre is generally full on these occasions – and it isn't only youngsters in the audience.

There is always a fair sprinkling of teachers and others, like me, who are well out of the teenage group!

This year, at the end of November, the subject was 'Towards the absolute zero: physics at very low temperatures' and was given by Dr Chris Muirhead of Birmingham University.

Chris started by steadily working down the temperature scale(s): room temperatures in degrees Celsius and ending up with fractions of a kelvin. Along the wav he used liquid nitrogen quite liberally to freeze rubber, a chrysanthemum, create a superconducting ring repelling magnet, shrink balloons and so on.

There was a pleasing number of the 'Don't try this at home' demonstrations – such as speaking after inhaling helium (not that many homes are likely to have helium in a cupboard!)

All this was done with very good demonstrations – such as electrical resistance dropping when the conductor is chilled. Not only that but Chris entertained as well as informed his audience.

There were many chuckles and he was clearly audible without having to resort to a radio microphone.

It was, in short, an excellent presentation, much enjoyed by everyone there. Michael Talbot-Smith

LYNNE LONG

I have been a member of the Midland branch committee since shortly after taking up the post of Schools Liaison Officer in the School of Physics & Astronomy at the University of Birmingham in March 2002. As Birmingham Centre Rep, I'm involved, together with a team of West Midland teachers, in putting together the evening lecture series for Y12 Physics students at the University Centre between October and March each year, as well as supporting other local events.

In 2003/4, the lectures have attracted audiences in the hundreds and have been very well received by students and teachers. On March 4th 2004, Birmingham hosted the regional final of the Paperclip competition – always an enjoyable and fun experience for all concerned!

During the last year I have also been co-ordinating the Physics Teachers' Network in the West Midlands area, and through this, and the schools liaison work, have been privileged to meet and work with some wonderful, enthusiastic teachers and lecturers in the area – not to mention the students themselves!

I graduated with a BSc in Physics from Liverpool University in 1976, gaining a PGCE in 1977. I began my teaching career at a comprehensive school in Walsall and then taught in Warwickshire schools and colleges, spending 18 years at Stratford Upon Avon College, in a variety of roles from Head of Physics to Head of Engineering and HND/C co-ordinator for Coventry University. I am married with two grown-up sons – one a mechanical engineer and one in the third year of an MPhys degree at the University of Bath – I must be having an influence somewhere!

I would be delighted to hear from any teachers out there with ideas about how the local teacher network or schools liaison activities could help and support you and/or your students (web: www.ph.bham.ac.uk/prospective/schools, tel: 0121 414 4656 or e-mail: l.long@bham.ac.uk)

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Physics takes-off with Rocketeers

On July 6th 2004, a "Rocket Day" was organised, kindly hosted by Swanshurst School in Birmingham, an event for Y7 students.

Forty-seven students from 7 different schools in Birmingham, Coventry and Wolverhampton took part.

The day was lead by Jeff McQuone with help from technical staff from The School of Physics & Astronomy at The University of Birmingham and teaching staff at schools.

A good day was had by all, some networking took place and maybe a little Physics was learnt too! All students received ROCKETEERS certificates.

Prizes were awarded for winning rockets and winning teams, including family tickets to the THINKTANK & IMAX theatre, kindly donated by Emmie Kell at THINKTANK.

The winning rocket was built and flown by Josh Tippler from Plantsbrook School, which was also part of the winning team.

We hope to run a similar event next year. If you would be interested in joining the teacher network or finding out more, please contact Lynne Long, local network co-ordinator e-mail l.long@bham.ac.uk



Y7 students at Swanshurst School in Birmingham testing their rockets.

Poster Competition

In June/July 2004, as part of the IOP Physics teacher networking initiative in the West Midlands, teams of Y9 pupils from local schools were once again invited to design posters on themes from the National Curriculum and enter them for a competition.

118 students from 15 local schools in Birmingham, Dudley, Wolverhampton & Warwickshire, submitted entries which were again judged by a team of three - a Physics researcher & lecturer from the School of Physics & Astronomy, a Physics teacher and a non- specialist.

The winning poster was designed by a team from Windsor High School with runners up from.Ninestiles Technology College and Windsor High School

Winning students received book tokens and CDas well as winners certificates. Winning schools received resource packs, with the overall winner also receiving book tokens for the school library.

All competition entrants received a certificate of entry and an IOP pencil and the judges were very impressed by the amount of work put into the posters. We hope to run a similar competition as an annual event from now onwards.

If you have any ideas or suggestions or would like details for your school next year, or would like to become part of the teacher network in the West Midlands, please contact **Lynne Long**, local IOP network coordinator by e-mail: l.long@bham.ac.uk



In June/July 2004, teams of Y9 pupils from local schools in the West Midlands design posters for a competition on themes from the National Curriculum as part of the IOP Physics teacher networking initiative.

est Midland Physics Teacher Network of the Institute

Physics 2005 - A century after Einstein

This is just a reminder that the Institute's major scientific conference during Einstein Year will be held at the University of Warwick, UK between 10-14 April 2005.

With 108 invited-only speakers spread over 27 symposia along 4 major themes this is truly a high-octane physics conference for physicists. Cutting-edge research will be presented by leading scientists from laboratories all over the world.

The 4 themes are: Relativity &

Cosmology; Physics in Biology; Light & Matter; Quantum Physics. With 55% of the speakers from outside the UK, this conference will have a genuinely international flavour.

Two of the 7 Plenary Lecturers are Nobel prize winners (Steven Chu and Tony Leggett) and The Einstein Lecture on the final evening – the only public part of the programme – is delivered by one of the world's foremost authorities on the life and works of Albert Einstein, John Stachel, Director of the Centre for Einstein Studies at Boston University, USA.

There will also be Poster Sessions, a Conference Dinner, daily press briefings, numerous receptions, a scientific exhibition and a book fair.

We sincerely hope to see you at **Physics 2005** next April – your presence and support are very important to us. Please forward this message to a friend or colleague who may not be in membership, but who may benefit from knowing about this unique event. To view the full programme and to register, visit the web site at

http://www.physics2005.iop.org . If you would like to receive a copy of the information on the website by surface mail or a copy of the Physics 2005 conference poster please email physics2005@iop.org with your request.

Our best wishes, **Physics 2005 Team**

Have your say

What can the Institute do for you? The Young Professionals Forum discusses issues concerning the Institute's younger or recentlygraduated members and we're interested of hearing the views of young physicists in the Midlands region.

Membership of the Institute young professionals and can be associated with achieving students was the Young

chartership, or just being part of a network of professional physicists.

Maybe you use your membership to get reduced conference fees or careers advice, or attend local events.

A recent Institute activity for young professionals and students was the Young Physicists Conference in Glasgow in November, which included teamwork and careersbased activities as well as a lecture competition, excellent talks by presenters including Simon Singh, and some great social activities.

If you have views on what the Institute could be doing for

young professionals, or if you would like to organise something for young professionals yourself (funding may be available) then contact Kate Adamson who is a a member of the Young Professionals Forum at QinetiQ Malvern, contact her via email: kate.adamson@physics.org.

CLIVE WORMLEY

Born and raised in rural Leicestershire, I studied for a physics degree at the University of Birmingham during the student protest years of the 1960's, although I was much too much of a conformist to join in.

I enjoyed student life, did well in my course and decided to stay at the University and research for a higher degree.

I became a schoolteacher in the early 1970's, firstly at Queen Mary's Grammar School in Walsall and subsequently at Saint Peter's School in Wolverhampton, where I stayed for thirty years.

I retired from teaching last summer and now don't know how I

found the time to go to work. I am happily married with two adult children, neither of whom decided to follow a physics career despite the 'wonderful insights' I regularly gave them through their childhood!

Clive is our Honorary Secretary, and can be contacted at c.wormley@physics.org



DOMINIC WALKER

Dominic studied Natural Sciences at Christ's College Cambridge, graduating with a Masters degree in Experimental and Theoretical Physics in 1997. He then took up a post in the radar imaging systems group of the MoD's Defence Evaluation and Research Agency. There he spent four years involved in a UK/US collaboration programme into the modelling and analysis of high resolution radar sea clutter. During this time Dominic was also an external postgraduate student at University College, London, and was awarded his PhD for work into sea clutter modeling in 2001. Also in 2001, Dominic took a position in QinetiQ's Sensor & Technology Solutions group, where he has worked on a variety of

projects aimed at solving commercial clients' problems using technology developed in QinetiQ for the MoD.

In 2004 Dominic became the Technical Sales Manager for QinetiQ Airport Radar, a group within QinetiQ which has developed a novel millimeterwave radar system for airport surveillance.

Dominic is our Industry Representative, and can be contacted at dwalker@ginetig.com



BRIEFLY...

Forthcoming events for schools and colleges in The School of Physics and Astronomy at The University of Birmingham

• Evening lecture programme 2004/5

• Summer School for AS Physics students, 13th-14th July 2005

• Spring Term Forum Days for AS Physics students, 16th March or 23rd March 2005

 Talks and demonstrations out in schools - dates and times to suit

• 20th Residential Physics Teachers' conference, September 10th-11th 2005

And lots of other activities in the pipeline...

For more information, including past programmes, feedback etc see www.ph.bham.ac.uk/ prospective/schools and click to follow the links!

Alternatively contact Lynne Long, Schools Liaison Officer in the School of Physics & Astronomy, Tel: 0121 414 4656, Fax: 0121 414 4577, or e-mail: l.long@bham.ac.uk

Institute Careers Service

A message from **Vishanti Lull,** Careers Adviser, Institute Careers Service.

I aim to start the year with a bang, so from January 2005, I will be touring the UK to provide one-to-one careers consultations for members of the Institute free of charge. I will be in the Midland Branch area on the 15 and 16 February; the location has yet to be confirmed.

Members of the Institute are entitled to use the careers service regardless of whether they are in employment, unemployed or on a career break, and there is no age restriction on use of the service. I can provide careers advice on a range of topics including: changing careers, redundancy, taking a career break, updating your CV, retirement, etc. I know that your schedules will be busy, so I will be flexible with the times of meetings. Appointments will be between 12pm and 9pm and a consultation should take around 45 minutes.

For further details, see http:// (do we have a website address??) or contact me at members.careers@iop.org

IOP/WMPTC FORTHCOMING EVENTS

After a series of successful events in 2004 the Midland Branch Brimingham centre / West Midland Physics Teacher Network of the Institute have planned a series of events for next year including:

Tuesday 8th February 2005

The Weird World of the Quantum: From Schrodinger's Cat to the Quantum Computer

Professor Andy Schofield, Theoretical Physics Group, The University of Birmingham Contact Lynne Long 0121 414 4656 or l.long@bham.ac.uk. Details are available at http://www.ph.bham.ac.uk/prosp ective/schools

Tuesday 1st March 2005

The Risky Side of Radiation Dr David Twiss, Medical Physics & Clinical Engineering Dept, New Cross Hospital, Wolverhampton. *Contact Lynne Long 0121 414* 4656 or l.long@bham.ac.uk. Details are available at http://www.ph.bham.ac.uk/prosp ective/schools The branch newsletters are published by Institute of Physics Publishing, Dirac House, Temple Back, Bristol BS1 6BE, UK.

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The deadline for contributions to the next issue of this newsletter is 30 June 2004

E-mail your materials to godfrey.thomas@physics.org