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North Eastern Branch of the Institute of Physics

The newsletter for Physics and Physicists in the North East

The Airy Plaque unveiled – at long last!

"Did Airy help... unveil his plaque?"

By Dr. Ben Rudden

Ask the average Physicist to say what immediately comes to mind at the mention of the word "Airy", and there is a high probability that the response would be "Airy's Disc" or "The Harton Colliery Experiment – to measure the density of the Earth". Apart from the obvious local connection of the latter however, there are few who would add that arguably the most eminent ever Astronomer Royal, was also a "son of the North East".

However, at a joint lecture with the Newcastle Literary and Philosophical Society on April 4th 1997, about Nineteenth Century North Eastern Astronomers, Alan Chapman, the renowned Historian of Science, in describing the famous mine experiment, revealed that Sir George Biddell Airy had been born in Alnwick on July 27th 1801.

This had prompted the thought that, in addition to the Parson's plaque which the branch had already unveiled in the Discovery Museum and the planned plaque to Sir Harold Jefferies for the Armstrong Building at Newcastle University, the possibility of eventually erecting a plaque to Airy in the region should also be explored, and the most obvious candidate for a site would be Airy's house in Alnwick.

In 2000 therefore, there started a three-year search for the exact birthplace of arguably the most illustrious holder of the office of Astronomer Royal. The date of birth was relatively easy to discover from baptismal records, but finding the house where Airy had lived for the first four years of his life proved more difficult.

However, the branch was lucky to have the assistance of Ian Smith, the then manager of the Bailiffgate Museum. Using various local sources and press cuttings from 1901, marking the centenary of Airy's birth, he was able to confirm that the house adjoined "Grosvenor Terrace on the Clayport Bank". Unfortunately, these houses had been demolished in the sixties and replaced by council houses, but since the Institute allows for plaques to be erected on or near the site, it was decided that the large Gable Wall of the last house in Grosvenor Terrace, overlooking the site of the Airy home, would be ideal for the purpose.

Discussions then began with Alnwick Local Authority, which proved quite protracted and at times frustrating. They did however, eventually confirm the name of the owner of 5, Grosvenor Terrace who, reluctant at first, eventually gave his permission. The Institute standard details of the plaque – dimensions, material and wording were submitted to the Planning Department and after much prompting, approval was given and arrangements were made for the ceremony.

The unveiling was performed on October 20th 2003 by Councillor Ken Gray, Mayor of Alnwick. The main guest was Dr Rob Warren, Curator of the Instrument Collection at the Royal Observatory and Simon Prendeville represented the Institute.

Unfortunately after a long period of fine weather, the heavens opened and the ceremony had to be curtailed and continued in the Museum, where a small display about Airy's life and works had been arranged. Councillor Grey said that he had been delighted to be asked to do the honours to celebrate the life of a remarkable man and renowned scientist, concluding, "It is a very prestigious thing to have such an important person come from your home town".

After the many years of detective work, delays and set-backs, there was evidence that Airy himself was in full agreement and indeed somewhat impatient. At the crucial moment in the unveiling ceremony, the curtain covering the plaque had opened itself or was it just a hefty gust of wind?

The Physics of Flying Frogs

Professor Andre Geim, University of Manchester

"If frogs can fly there is no reason why John Major cannot be Prime Minister". So ran the headline of an issue of the Sun, when news and pictures of an experiment carried out in 1996 by Andre Geim of the University of Nijmegen and Peter Main at the University of Nottingham were first published, which described the levitation of live animals for the first time in history.

In introducing the first lecture of the NE Branch Programme, Professor Geim referred to the Ig Noble Prize for Physics which he and Sir Michael Berry had jointly won in 2001. The main criterion for the award of the prize was that the work should make people laugh and think. His work on the flying frog was like a fairy-tale for non-too-serious scientists about something which was trivial but seemed non- trivial and vice versa and he hoped that the story of that famous little frog levitating inside a big magnet would be partly informative, partly educative, partly quite serious physics but, above all, would have a fair portion of fun.

"To make a human fly you just need finance from NASA to the tune of $1M and a 1GW power station!"

Historically, it had always been fascinating to watch an object freely hovering in mid-air and, not surprisingly, the notion of levitation has found its way into myths, science fiction and even into politics. Physics had indeed provided several ways to levitate things. A helicopter could be considered as a levitation device that used a stream of air to keep it floating, but if levitation were to be without generating noise or using fuel then electromagnetic fields could provide the means. In all such schemes however, a source of energy (an engine or a battery at least) was always required to keep the object afloat. Remove the source of energy and the levitation inevitably stopped.

The only way to achieve REAL levitation, which would last for ever with no energy input was to use diamagnetism, a weak magnetism possessed by virtually all materials, about a billion times weaker than the fields produced by "real" magnets such as iron. Electrons in such materials rearranged their orbits slightly so that they produce a weak external field and as a result, would repel or be repelled by strong magnetic fields. Although the majority of ordinary materials, such as wood or plastic, seemed to be non-magnetic, they too exhibited very weak diamagnetism and could be levitated using magnetic fields of about 10 Tesla. For several decades, this levitation possibility had seemed impossible - even for experts in high magnetic fields - until the live frog experiments in 1996

At this stage the "serious" physics section of the lecture was introduced, namely the apparent violation of Earnshaw's rule, including a brief glimpse at the relevant equations! Diamagnetic objects are repelled by magnetic fields which if sufficiently strong can balance gravity, and objects levitated in this way can be held in stable equilibrium, apparently violating Earnshaw's theorem. In fact the theorem does not apply to induced magnetism, and it is possible for the total energy (gravitational + magnetic) to possess a minimum and to derive general stability conditions, which predict that stable zones will always exist on the axis of a field with rotational symmetry and include an inflection point of the magnitude of the field. For the field inside a solenoid, the zone can be calculated in detail; and if the solenoid is long, the zone is centred on the top end and its vertical extent is about half the radius of the solenoid. It is in this region that the diamagnetic object – for example, a frog- can be suspended. Water is diamagnetic - it expels a weak magnetic field - which means that frogs and other living creatures (grasshoppers, fish and hamsters) will float in mid-air when placed in a very strong magnetic field in the zone. Professor Geim then showed various interesting demonstrations including a video of the flying frog and the levitron. This is a commercial toy which exploits the effect. A spinning top can levitate delicately above a base with a careful arrangement of magnets so long as its rotation speed and height remain within certain limits. This solution is particularly clever because it only uses permanent magnets and ceramic materials are used to prevent induced currents which dissipate the rotational energy. (Continued in Page 4)

Our universe: Past, present and future.

Professor Malcolm Longair, University of Cambridge

It was recently reported in the journal "Science" that evidence that the Universe was being pushed apart by a "mysterious force" called dark energy was the "breakthrough of the year". It was timely therefore that Professor Malcolm Longair had been scheduled to deliver a talk to the Branch on November 27th in which he reviewed the developments in theory and practice of cosmology, which provided the proof of what astronomers had suspected for some time.

The sequence followed in the lecture would cover the following topics: The Contents of the Universe; Classical Cosmology; the fundamentals of Astrophysical Cosmology; the origin of the Galaxies and the large-scale structure; and the parameters governing the Universe and its future. He would show lots of pictures, but advised the audience to forget these and concentrate on the words because, "although they would be at the non-technical level, there was a lot to get through".

A Joint Meeting with the Newcastle Astronomical Society

The Universe was vast, 600,000 astronomical units, and although populated by a dominant feature - millions of galaxies- it was still fairly empty. Galaxies exhibited a variety of forms. Elliptical galaxies were globules, with a bright nucleus and contained a population of old stars, usually with little apparent gas or dust, and few newly formed stars. They came in a vast range of sizes, from giant to dwarf. In contrast, spiral galaxies were flattened disc systems containing some old stars and also large populations of young stars, much gas and dust and molecular clouds that are the birthplace of stars. Generally a halo of faint older stars surrounded the disc, sometimes with a smaller central bulge, emitting two jets of energetic matter in opposite directions. However, about 1% of galaxies had no overall spiral form, the so-called irregulars, or "weirdoes" as the speaker named them, and he illustrated the formation of such structures which arose from galactic collisions, with a dramatic animated PowerPoint sequence.

Galaxies had been observed for many years but it was really only during the last ten that the accuracy of cosmological measurements had increased to about 10% allowing the hitherto hidden structure to be studied. Galaxies combined to form clusters, which were about 50 times larger than the average galaxy, and mysterious structures such as huge voids and walls had been detected within their structures. In 1989 Explorer had detected an inexplicable background microwave radiation of 1mm wavelength, a remnant of the "Big Bang", which interestingly had been anticipated by Sakharov with whom Professor Longair had collaborated in the '60s. It had been proposed that in order to satisfy the Conservation of Energy Principle, the energy difference between the measured and predicted mass of the universe could be accounted for by the concept of "dark" energy. However, most cosmologists were sceptical.

Professor Longair concluded his lecture by presenting very recent data from the Wilkinson Microwave Anisotropy Probe (WMAP), the Hubble telescope and the Sloan Digital Sky Survey and explained how these went a long way to dispelling any doubts. The WMAP satellite had made a detailed survey of the cosmic background radiation. Analysis of these results showed that the universe consisted of only 4% ordinary visible matter. The rest was made up of 23% hidden dark matter – the nature of which was still unknown, but predominantly was dominated (73%) by dark energy. The results also allowed the expansion rate of the universe to be found and thereby confirmed Hubble's Law first established in 1928. Its age, according to the new data, was 13.7 billion years.

The recent and ongoing observations were providing high precision estimates of the large-scale properties of the Universe and also allowing the past evolution and the ultimate fate of the Universe to be predicted. Within a decade, the James Webb 7mm Telescope would be operative and this would even allow the study of the formation of the elements. Few of the large audience disputed Professor Longair's conclusion that everything was now fitting together, and that indeed we were living in exciting times. It had been an entertaining and impressively illustrated lecture, in which it had certainly been worth looking at the pictures after all!

Instrumentation and Science in Medicine

Professor Phil Byrne, Northumbria University

Phil Byrne, Visiting Professor in the School of Engineering and Technology at Northumbria University, gave a vivid insight into the importance of devices based on simple science and engineering principles in clinical medicine.

He discussed a range of instruments and devices designed and developed in the Regional Medical Physics Department in Newcastle.

Among the examples discussed was a Laser Doppler Scanner which determines whether skin is alive or dead with a 97% success rate. This is now a commercial instrument with world-wide sales. Pilot studies of its use in diagnosing skin cancers are now underway.

Another device measures blood oxygen transport. Based on the wavelength dependence of light absorbance, a key feature is its wide dynamic range. He went on to dispel the view that the laser is a sterile surgical tool and to demonstrate how fit young men could develop asthma after exposure to welding fumes.

The Physics of Flying Frogs

Continued from page 2:

The amusing video image of the frog hovering in mid-air had circulated widely and captured many people's fancy. The researchers had received letters from all over the world including some inquiring after the frog's well being.

Prof. Geim while explaining how to make a frog fly!

Reassuringly, according to one of the human observers, the frog had emerged from the flight unharmed and "happily joined his fellow frogs in a biology department." What about levitating a human?

Could everything be scaled up for a human? Yes, that would be possible. The only drawback was the fact that it would require finance from NASA to the tune of $1M and a 1GW power station!

The lecture had been given to many audiences and had proved particularly interesting for young people. After one such lecture, Andre had received a letter from Fairfax, Alaska which ran:

"Dear Andre Geim,

I was very interested in how you got the frog to float. Could you please send me some information about your experiments. I am 9 years old and want to be a scientist when I grow up.

Jennifer Miles"

This was a very entertaining lecture and it lived up to the speaker's proposed aims at the outset – to be informative and to demonstrate that physics can be a lot of fun. More importantly it has also made a significant contribution to raising public awareness of science throughout Europe and North America.

Editorial

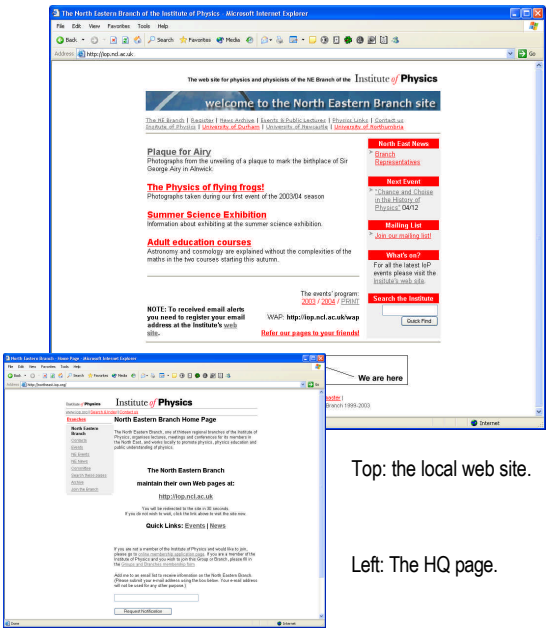
Happy New Year!

I hope you all enjoyed the holidays and that you are keen as always for more physics-related news from around the region.

For the last two issues we used the printing facilities at the Institute, which resulted in much better printing quality. Well, there is not really a comparison between black and white and colour printing, is there? This move allowed us to use colour in greater extent. As a matter of fact our current issue is not only employing a new colour scheme, but a completely new layout as well!

On many occasions I invited the Branch's members to contribute, but there was almost no response. I am more than confident that there many stories to be told about Physics and physicists in the region but I need your help! If you would like to share your experiences please email me. I will be delighted to receive your story.

May I take this opportunity to point out that from now on members wishing to access our web site should point their browsers at: http://northeast.iop.org. This URL will always point to the current location where the Branch's site is hosted. If any changes are required in the future, they will be transparent to the users. The current URL will also remain operational.



Top: the local web site.

Left: The HQ page.

As our newsletter is published every 3 months, if you would like to post an announcement in between, do not hesitate to contact me and I will post it at the web site.

Your comments are as always more than appreciated.

Dr. Savvas Papagiannidis
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UK students have a hit performance at international festival!

Sixteen students from Landau Forte College Derby performed their production 'Mut' to over 300 physics teachers and top physicists from over 22 different countries at Physics on Stage 3, a European festival in Noordwijk, The Netherlands, on Thursday 13th November.

Tony Coffey, the drama teacher behind the award-winning performance group explains: "Through drama, music and physical theatre we aim to explore the nature of sound. From the moment early humans responded to sound for its own sake, we follow the adventures of 'Mut' - short for Mutant - on a journey through time and space. We also consider the role of music to human culture and our aesthetic response to sound."

They were selected by the international organisers of the festival, the EIROforum group of European physics laboratories, having been strongly recommended by the UK steering committee.

Kerry Parker, UK co-ordinator for Physics on Stage 3 said: "We are very proud that the students from Landau Forte are here. They have shown our colleagues across Europe that we are not just great physics teachers: we can produce wonderful scientifically-inspired performances too. We have some amazing inspirational teachers in the UK, Tony Coffey is one of them. He has released the artistic potential and energy of a group of 'ordinary' Derby teenagers. It is amazing."

"I was really excited to be chosen to come and I get a real buzz from performing live like this," said Claire Vasey (16), one of the performers.

Simon Smith (17) said "This is the first time in the Netherlands for all of us. This performance is really special, being for physics teachers - it's a great experience. I've learned a few things from the physics fair too."

"I was more nervous about this performance than I have been about any other - we were invited to come, and we're here representing our country," said Lewis Church (15).

Bologna process threatens UK physics degrees

Lack of government leadership in acknowledging the effects of the Bologna Declaration could damage British physics degrees.

Chairing a joint meeting of the Institute of Physics and the Royal Society of Chemistry held at the Institute on the 20th of October, Professor Peter Main, the Institute's director of science and education said, "The Bologna process is a significant perturbation on higher education in the physical sciences and poses major problems with the funding and structure of degree programmes.

There are also major opportunities, but universities can only take advantage of them if the government clarifies its position with respect to Bologna. We are well behind our European neighbours in this respect and there is a need for urgent action from the DfES, HEFCE and the QAA".

"The Bologna process is a significant perturbation on higher education in the physical sciences."

The Bologna Declaration, signed by higher education ministers from 29 European countries in 1999, seeks to create a common framework for degrees based on the use of credits. This threatens the existence of UK 4-year first-degree qualifications in subjects such as physics (MPhys) and might remove the possibility of direct progression from BSc degrees to PhD programmes. This could lead to a 8-year cycle of study (3+2+3), which has implications not just in terms of the restructuring of degree frameworks, but of increased student debt, uncertainties of funding of studentships for Masters programmes and quality assurance.

The Institute of Physics has issued a wake-up call to the UK physics community with the publication of the discussion paper, The Bologna Process and UK Physics Degrees, by Professor Gareth Jones from Imperial College London, which was launched at the meeting.

The discussion paper highlights the threats and opportunities of the Bologna Declaration to UK physics degrees and provides a platform for the UK physics community to respond to the challenges because the integrated Masters degree is essential to their profession and because most of the rest of Europe take a further year to reach Masters level.

The Institute has already tried to persuade government to consider the implications of the Bologna Declaration - there was no mention of the Declaration in the DfES White Paper, The future of higher education, published earlier this year. In a joint letter from the Institute and the Royal Society of Chemistry to the DfES, concern was expressed that the Bologna Process seems to be gathering momentum in continental Europe, but is largely being ignored in the UK. Professor Peter Main, director, education and science at the Institute, said, "The DfES in its response, stated that the higher education White Paper chose to focus only on domestic issues, which is wholly unconvincing given that the implications of the Bologna Process are far reaching, and could have a huge impact on domestic higher education policy."

Physics first to offer cash to students affected by rising student debts

Physics will become the first subject to offer cash to entice undergraduates into degrees as fears grow over rising student debt. A new scheme announced last night at the Institute of Physics Awards Dinner aims to give means-tested bursaries of around £1000 per year to every undergraduate studying physics in the UK, making a total contribution of £3-4000 during the course of an average degree.

A Mori poll published this week showed that average student debt has grown by 43 percent since 2000. The Institute of Physics will be one of the first organisations to put its money where its mouth is and offer cash bursaries to support students during their time at university. The Mori poll also found that students from poorer families are graduating with debts 15 percent higher than those from wealthier backgrounds. The IoP bursary scheme will be directed at students who might otherwise be put off studying physics by top-up fees and the extra financial commitment a four-year degree demands.

"The Institute of Physics will be one of the first organisations to put its money where its mouth is."

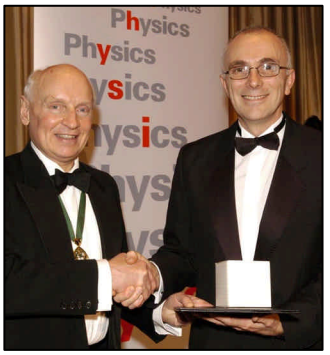
David Wallace, President of the Institute of Physics, said: "If you are an A level student considering going to university, it's important that you look at the financial commitment demanded by different subjects. Physics will become a very attractive subject - £1000 goes a long way and will help with maintenance costs whilst at university. It's a grant not a loan and students who need it will get it every year of their degree. Students also need to think about their potential earning power in later life and physics graduates on average have much higher salaries than graduates from other disciplines."

He continued: "The number of UK physics graduates has remained constant over the last twenty years, although the number of graduates in all subjects has risen by over 50 percent. Physics is vital to the future of the UK economy and the Institute hopes that by offering serious cash, it can help reverse this trend as well as ensure that the brightest students are able to study what they are good at, not just what they can afford."

Samuel George, a third-year undergraduate in physics and astrophysics at the University of Birmingham said: "The IoP bursary scheme would be a huge help. Although students from poorer families get help with their tuition fees and maintenance, they still have to work long hours during the holidays and in part-time jobs during term time to try and supplement their income. I've seen that students often find it difficult to keep up with coursework or do as well in exams as they could because they're spending so much time trying to earn money to support themselves."

The IoP Undergraduate Bursary Scheme should be operational from the academic year 2006/7 and will rely upon the government's system for means-testing for top-up fees in order to identify students most in need of a bursary. It will be restricted to accredited degree programmes and will apply to BSc and MSci degrees.

Teaching award given to local physics teacher



Professor David Wallace, President of the Institute of Physics, presents Tom Mather, head of physics at St Gabriel's RC High School in Bury, with a Teachers' Award at a ceremony on 22 January.


Dr Lidija Siller

Scientists create golden business opportunity

Scientists have created a new material which could save the electronics industry millions of pounds each year and which may also be more effective.

Several attempts have been made over the last twenty years to make gold nitride but now a researcher at the University of Newcastle upon Tyne has solved the puzzle.

Gold is used extensively in the electronics industry, as a conductor of electricity in products such as computers, mobile phones and smart cards. This is because it is relatively stable when exposed to the atmosphere. However, gold is also one of the most expensive metals on the market, and is therefore combined with other, cheaper substances such as nickel, iron and colbalt salt before it is used in order to improve hardness.

Newcastle University's Dr Lidija Siller, who has created the gold nitride, believes it could be harder and more durable than current gold alloys - which could mean a much thinner gold plating layer could be applied to products, thus reducing manufacturing costs. Further tests need to be carried out, however, to fully assess its potential.

"New material could save the electronics industry millions of pounds each year!"

Dr Siller, of the School of Chemical Engineering and Advanced Materials, who is working with the Institute of Nanoscale Science and Technology, used a technique called ion implantation to create the material. She placed the gold in an experimental chamber under ultra-high vacuum, cleaned it with argon and then heated up the gold crystal. This was then irradiated with nitrogen ions using a spattering gun. As it is invisible to the naked eye she then checked whether gold nitride had been formed by looking at it using X-ray techniques.

Dr Siller, who began her experiments with gold nitride in 2001, said: "I am starting to investigate its properties and to see how it performs in terms of conductivity and durabililty. Early indications suggest that it will certainly be cheaper to manufacture, as nitrogen makes up 80 per cent of the atmosphere around us. It is harmless and does not provide a pollution risk unlike some of the metals which are usually mixed with gold, such as arsenic, lead or colbalt." Previous attempts to make gold nitride failed because they were based on scientists' misunderstanding of the kinetic reaction between gold and nitrogen, Dr Siller said.

The University has filed a patent for the gold nitride process whilst Dr Siller is attempting to make further modifications to the substance to test whether it will have widespread use in industry.

TV Clip: http://stream.ncl.ac.uk:8080/ramgen/Content/media_clips/gold.rm

Head of teaching and learning to take the helm at Coventry

Professor Madeleine Atkins, Pro-Vice-Chancellor at Newcastle University, has been appointed Vice-Chancellor of Coventry University in the West Midlands. She will succeed Dr Michael Goldstein on 1st September 2004, becoming the first woman to take the helm of the institution in its 160-year history. Professor Atkins, 51, has worked at Newcastle University since the 1980s, gaining extensive experience in a variety of teaching and management roles. Her current responsibilities include learning and teaching strategy; European and international strategy; student recruitment, and human resources.

During this period, Professor Atkins has maintained a strong research profile, specialising in higher education management with a specific focus on the use of new technologies to support learning. She enjoys a national profile, being a member currently of the Higher Education Funding Council for England's Quality Assurance and Teaching Committee, its Employability Advisory Group, and the UK e-Universities Committee for Academic Quality.

Professor Atkins is delighted to have been appointed to the post. She said: "Coventry University has an excellent reputation and a distinguished record for its achievements. It is a privilege to have been appointed as its next Vice-Chancellor and I very much look forward to joining the University and to building further its relationships with the City of Coventry and the region."

Academic transfers between Durham and Newcastle

Two of the North's leading universities are preparing plans to exchange two subject areas to reinforce their respective strengths.

Under the proposal the University of Durham is looking to transfer Linguistics to the University of Newcastle. At the same time, Newcastle plans to move its Religious Studies group to join Durham's Department of Theology.
The proposal was backed by both universities' Senates (academic 'parliament') on 2nd December, and will be considered by their Councils later this month.

Arrangements for existing students in both subjects to complete their degrees in their current university are being discussed, along with other aspects of the change.

All the departments involved in the move have achieved a leading Grade 5 rating for international-class research in the most recent national assessment. Newcastle has the larger Linguistics group while Durham's Theology is the bigger of the two.

Between them the universities are already attracting a significant proportion of the available undergraduate applicants for these subjects, so they have decided that it makes sense to consolidate their respective strengths.

"Our plans ensure that both subject areas are retained as an educational resource in this region."

Durham's Vice-Chancellor Sir Kenneth Calman said: "There is definite strength in numbers for academic departments in the changing financial climate for universities and our plans ensure that both subject areas are retained as an educational resource in this region."

Professor Christopher Edwards, Vice-Chancellor of the University of Newcastle upon Tyne said: "This exchange of subjects will strengthen significantly religious studies at Durham and linguistics at Newcastle and hence strengthen the competitive position of both these subjects nationally."

The universities are preparing a bid to the Higher Education Funding Council for England for financial support for the moves from its Strategic Development Fund.

Physics Professor is new Master of Grey College

A leading expert in the technology that offers a potentially less hazardous alternative to X-rays has joined Durham University in a dual role. Professor Martyn Chamberlain has been appointed as Master of Grey College and also to a Chair in the Department of Physics.

At Grey he takes charge of one of the University's 15 residential colleges, and in Physics he brings the benefit of extensive research in one of the last unexplored regions of the electromagnetic spectrum.

His main interest is the area of Terahertz technology, which offers many possibilities in imaging, and could be a useful addition to X-rays for medical use. This is because a wide variety of common materials, such as living tissue, plastics, clothing, cardboard and semiconductors are semi-transparent at Terahertz frequencies. Terahertz radiation is sensitive to the chemical make-up of materials, in a way that is not possible with X-rays.

Moreover, the use of Terahertz is less hazardous than X-rays. Terahertz technology could also have security and screening applications, for example screening sealed envelopes, testing for the presence of drugs and explosives secreted on the person, and in the assessment of cosmetics. Sir Kenneth Calman, Vice-Chancellor of the University, said: "We are fortunate to welcome Professor Chamberlain to Grey College and to our world-class research community. This is an excellent appointment."

Durham Spin-out

Farfield Photonics Ltd, an early stage start-up looking for finance, was selected to present their technology to possible interested investors at an international venture capital summit in early December. Farfield Photonics is a spin-out company from the University, the ideas originating in the laboratories of Dr Graham Cross (Physics). Another spin-out from Graham's research, Farfield Sensors, is also doing very well, recently winning a category in the National Measurement Awards. For more information visit: www.farfield-photonics.com and www.farfield-sensors.co.uk.

Nanotechnology offers benefits, but risks must be assessed says experts' workshop.

Scientists and engineers believe nanotechnology can be used to benefit human health.

However, some nanotechnology experts at the workshop, organised as part of the joint Royal Society and Royal Academy of Engineering study on nanotechnology, believed that more assessments need to be made of the potential risks to human health posed by nanotubes and other nanoparticles, which may have the potential to be hazardous in unpredictable ways. Further studies should be carried out of the behaviour of nanoparticles in the environment.

Many participants at the workshop also thought that the construction of self-replicating 'nanorobots', which feature in some science fiction accounts of nanotechnology, is likely to be physically impossible.

The report also warns that participants felt "hyped up reports from some scientists or writers have only served to confuse the public's perception of nanotechnology". They wanted a public debate based on "a realistic projection of the potential impacts, both positive and negative, of nanotechnology."

Professor Ann Dowling, who is chairing the working group for the study on nanotechnology, said: "This report outlines some of the ways in which nanoscience and nanotechnology may develop, and the potential applications. We are publishing the report so that the science and engineering community in the UK and abroad, and indeed everybody with an interest in this area, can comment and let the working group know their views. The working group wants to make sure that they gain the most informed view possible of future developments in nanotechnology."

The report is based on a workshop involving 42 scientists and engineers drawn from a wide spectrum of disciplines in universities and industry. The participants discussed likely developments over the next 20 years in nanoengineering and measurement, nanomaterials, electronics and optoelectronics, and bionanotechnology. They also considered health, safety, environmental and social issues that might arise in these fields.

The report notes a wide range of current applications of nanotechnology and nanoscience outside medicine, ranging from the creation of 'nanomuscles' to make dolls that could react to sound by moving their eyes, to television screens that require less power and produce less heat.

Nanotechnology could also be potentially beneficial for the environment, according to the report, through the use of nanomaterials, for example, to create fuel cells and photovoltaic cells, or to remove heavy metals, cyanide and other substances that damage the environment. Overall nanotechnology could be used to develop industrial processes that make more efficient use of resources and generate less waste.

"The successful application of nanotechnology in the UK may be held up by the lack of a national strategy."

The report highlights some concerns that current regulations do not take into account the size of particles, which at the scale of the nanometre, or one-millionth of a millimetre, can have a significant effect on their properties. Although nanoparticles are already present in the air from a range of natural and man-made sources, further research is required into their safety.

The report indicates that some participants were critical of major corporations for "becoming less open to engaging the public, and indeed their own peers, in discussion about their nanotechnology research programs". Workshop participants wanted more effort to be made in involving the public in debates about the commercial research and development of nanotechnology. There were also fears that the successful application of nanotechnology in the UK is being held up by the lack of a national strategy to guide its progress.

For more news from the Royal Society:

- Royal Society attacks 'desperation tactics' to outlaw therapeutic cloning
- Iraqi scientists meet at Royal Society to set up new national science academy
- Royal Society calls for radical shake-up of university research funding

Visit: http://www.royalsoc.ac.uk/news/

Institute of Physics asks: "is the geek dead?"

Is a physicist the geek in the Yakult advert or something more unexpected? IoP set out to find out whether the stereotype of a physics "boffin" still exists.

A random selection of shoppers on Oxford Street in London were asked to pick out the physicist from a photograph of a line-up of possible suspects. Most people assumed that this was easy. However, 98 percent of those asked got it wrong.

The majority of people asked by the survey picked a white male of around 60 years old, wearing glasses and with a white beard. While this might have been the image of an average physicist fifty years ago, the reality is now very different. Since 1960 the number of young women entering physics has doubled and the average age of a physicist is now 31.

During 2003 the IoP completed a much larger survey of its members to find out what they thought about physics, about the IoP and what they thought of themselves. This survey revealed that members themselves hold this national stereotype; believing that the average member was male, around 60 who would wear a tweed jacket and that if physicists threw a party there would be sweet white wine, classical music, a selection of cheese and definitely no dancing. The 2003 members survey is the basis of a drive by the Institute to improve its services and activities. One of its key findings is that members want a higher profile for physics in the UK, believing that making physics and physicists more visible to the public, would help dispel some of these myths.

Try to pick out the physicist from the photograph of possible suspects:

http://physics.iop.org/IOP/Press/PR7303.html

Dr. Petra Boynton, a social psychologist at University College London, said: "The stereotype of a physicist has lasted a long time partly because the media help promote the image of white men in glasses sitting by a blackboard full of equations. This isn't necessarily the fault of journalists, they use stereotypes because people are comfortable with them. When they deviate from them, the public tend to complain."

She continued: "These stereotypes are really damaging to society. Very good school children might be put off doing physics because they don't see images of people like them on television, or in magazines, doing physics or science in general."

Dr. Julia King, Chief Executive of the Institute of Physics said: "One of the most surprising things in our members survey was that the members themselves believe the geek stereotype even though they themselves aren't like this! The IoP not only wants to persuade the media to change the images they promote but also to get physicists themselves to recognise and promote the diverse nature of our own community!"

Top female physicist delivers the Holweck lecture in London

Dr Catherine Brechignac, director of research at the Centre Nationale de Recherche Scientifique (CNRS), France, gave the Holweck Prize lecture on Friday 21st November 2003 as the first female winner of this prestigious prize, awarded annually jointly by the Institute of Physics and the Société Francaise de Physique (French Physical Society).

Catherine Brechignac was awarded the Holweck Prize for her contributions to the study of free clusters of atoms and clusters of atoms deposited on surfaces. A cluster of atoms is a group of between a few and a few tens of thousands of atoms grouped together; the study of which has opened new fields of research. Catherine Brechignac concentrated on two particular themes in her lecture, "Matter at the nanometre scale: the cluster approach". Firstly, she spoke of the unique behaviour of metallic clusters, which have some surprising properties. For instance, whereas the gold we are used to on the large scale is completely unreactive, gold clusters are chemically reactive. Secondly, she spoke about the 'self assembly' of nanochains, as the future of nanotechnology depends crucially on being able to build uniform structures. In self-assembly, objects are simultaneously formed and organised, producing uniform structures.

Professor David Wallace, President of the Institute of Physics, presented Catherine Brechignac with the award. He said: "I thoroughly enjoyed Catherine's lecture and was delighted that she was awarded the Holweck Medal and Prize. She has done pioneering work on the motion of electrons in nanoscale clusters, which is at the frontier between atomic and condensed matter physics. The Institute and the Société Francaise de Physique are proud to recognise the achievements of such an eminent physicist."

Physics teacher sets fire to dustbins in lessons!

Bristol-based teacher Lucien McLellan (41) who teaches at Downend School did just that, and has been awarded the 'Best Demonstration' prize at the international festival Physics on Stage 3, in Noordwijk, The Netherlands which ran between 8 – 15th November 2003. Beating 300 other teachers to win this award, Lucien performed 'The Fire Show', a shocking demonstration where he set fire to a waste paper bin full of methane gas. This amazing demonstration was followed by a clear explanation, so the braver members of the audience, who were mainly physics teachers, could safely try it in their classes too!

Out of the 32 teacher delegates at Physics on Stage 3, three live within an easy cycle from each other in Bristol. They are no ordinary teachers: Angus Gregson (Sir Bernard Lovell School) enjoys demonstrating forces using fireworks, Dave Richardson (Gordano School) makes delicious ice cream using liquid nitrogen and, as well as his tricks with dustbins, Lucien McLellan (Downend School) can't resist exploding bubbles filled with methane!

These inspirational teachers built on each other's ideas at the festival. Although Dave and Lucien didn't know each other before they met in Holland, they are now planning physics shows, aimed especially at young lads who traditionally are bored with science.

"It is very refreshing when Europeans notice people from the UK being fun, vibrant and creative, and that is exactly what happened. We started with 32 enthusiastic and inspirational physics teachers and we ended with an incredible synergy that far exceeded the sum of the parts," said Kerry Parker, UK co-ordinator for the team.

Teachers present 'Food for Life - Physics of Food' at international festival

Food is vital for life, and it's also vital for teaching physics. The presentation 'Food for Life - Physics of Food', was given by a British team at the European festival Physics on Stage 3 on Wednesday 12th November, in Noordwijk, The Netherlands. Physics on Stage 3 was a festival which gave physicists, teachers and science communicators a unique opportunity to showcase the most exciting, fun and innovative ideas happening across Europe. It was held between 8 – 15th November 2003 during European Science Week.

Elizabeth Swinbank (University of York Science Education Group), Alison Alexander (King Edward VI Community College, Totnes), Angus Gregson (Sir Bernard Lovell School, Bristol), Ian Harding (Croham Hurst School, Croydon) and Bernard Taylor (St Johns School and Community College, Marlborough) impressed the audience of 300 physics teachers from across Europe with a fantastic presentation about the many uses of food in teaching physics, with activities and demonstrations involving food and the audience. They broke biscuits and measured the frequency of sound they made as a way of finding out how crisp they were, and shone polarised light through a sugar solution to measure how strong the solution was.

Helped by some of the 32 other UK delegates, the team gave out sweets for the audience to compare their mechanical properties. "We compared the textures of sweets, looked at the viscosity of honey and even the electrical resistivity of burned toast. The demonstration of radioactive decay which involved eating M&Ms went down particularly well with the audience!" said Elizabeth Swinbank of the University of York Science Education Group.

All these activities are based on tests used in the food industry. They help students acquire experimental skills and develop a precise technical vocabulary - and sometimes the results can be eaten! They were developed in the UK for use with physics students aged 16-19, but many can easily be adapted for younger pupils.

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