Institute of Physics in Ireland
PHYSICS IN IRELAND
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# Meeting in Limerick remembers the life and work of John Bernal

*Prof. Alan Mackay, Dr Martin Bernal, Prof. John Finney, Prof. Helena Sheehan and Dr. Andrew Brown in front of the plaque commemorating John Desmond Bernal, FRS, in the Heritage Centre in Nenagh.*

*Martin Bernal (right), son of J D, and some of the other speakers and guests are told of J D's schooldays by Nancy Murphy, Ormond Histoical Society, in front of the Nun's Pension School (a former jail, Nenagh).*

More than 70 people attended a meeting on 1 June held at Limerick Institute of Technology to commemorate the life and work of the late John Desmond Bernal (1901–1971).

Prof. Alan Mackay (Birkbeck College, University of London) opened the meeting with a presentation dealing with Bernal and his times, focusing largely on his scientific legacy to society. He highlighted Bernal's ability to connect knowledge from disparate and seemingly unconnected areas into a unified network of understanding, which would then be brought to bear on new scientific problems. New theories and knowledge meshed into this network in Bernal's comprehension of the whole.

Mackay also provided some unique insights into Bernal's relationship with Bukherin and scientific developments in the Soviet Union. He showed a very sobering picture of Bukherin, taken as he was being marched off to his execution as part of the Stalinist purges.

Other speakers dealing with aspects of Bernal's work included Prof. Martin Caffrey (University of Limerick) and Prof. John Finney (University College London), who was the last PhD student of Bernal's working on the structure of water.

Prof. Helena Sheehan (Dublin City University) focused her presentation on Bernal's philosophy of science, and she robustly stated the case for socialism and how it played an integral part in his world view. She was critical of apologists who credit Bernal with scientific genius but imply that he was somewhat misguided politically. A very engaging debate followed this presentation.

A public lecture, attended by many of Bernal's family, was given by Dr Andrew Brown, Bernal's biographer. He talked about the human side of the man and painted a picture of a warm, entertaining and generous person who was fascinated by, as well as clearly fascinating to, women. Bernal's son, Dr Martin Bernal, closed the meeting with some personal reminiscences of his childhood experiences with his father.

The following morning, speakers and guests were treated to coffee by Mrs Nancy Riggs-Miller, a relative of Bernal's, and were taken on a "Bernal tour" by Mrs Nancy Murphy of Ormond Historical Society of Nenagh. This took in a visit to the former women's infirmary and county jail, where the Sisters of Mercy ran a pension (paying) school, attended by JD and his younger brother. The group also visited the site of the plaque that has been erected in Bernal's memory in the heritage centre, Nenagh. Ms Henrietta Swan also provided refreshments and a tour of Brookwatson, Bernal's home just outside Nenagh.

The meeting was organized by the Munster Group of the Institute of Physics in Ireland. The organizers would like to acknowledge the very kind support for this meeting from the Institute of Physics – History of Physics Group, the Institute of Chemistry in Ireland, Limerick Institute of Technology and the University of Limerick.

**Vincent Casey** and **Leah Wallace**, University of Limerick

# Heads of physics in Ireland are

On 16 May the Institute of Physics in Ireland hosted a meeting of the Heads of Third Level Physics Departments in the Royal Irish Academy. Despite the rail strike, there was a good attendance of 14. The group was addressed by Prof. Ian Halliday, chief executive officer of the Scottish Universities Physics Alliance (SUPA; see www.supa.ac.uk) and by Mr Tom Boland, chief executive of the Higher Education Authority (see www.hea.ie). Both speakers provoked a lively and enlightening discussion.

**Scotland: model of co-operation?**

Prof. Ian Halliday gave a remarkably frank and fresh presentation, bringing a very interesting perspective to the meeting. A distinguished particle physicist, he has considerable experience in coordinating science at international level. Prior to his appointment to SUPA he was CEO of the UK Particle Physics and Astrophysics Research Council (PPARC). He is currently president of the European Science Foundation.

SUPA is a partnership between the six Scottish physics departments of Heriot Watt University and the universities of Edinburgh, Glasgow, Paisley, St Andrews and Strathclyde. The initial impetus for the body arose from two of the universities' vice-chancellors just over three years ago. With a five-year budget of more than £14 million, the scheme was described by Halliday as a single front door for potential new researchers, sponsors and industrial collaboration.

SUPA is organized around five research themes:

- astro-space physics;
- condensed matter and materials;
- nuclear and plasma physics;
- particle physics;
- photonics.

Central to its plans and activities is a coordinated approach to research, in terms of sharing facilities, providing graduate training and offering academic appointments.

Currently there is just one SUPA graduate school in particle physics with more than 162 student applications, but by October there will be courses in each of the five themes. SUPA intends to have six months of intensive courses for PhD students, mainly delivered through distance learning.

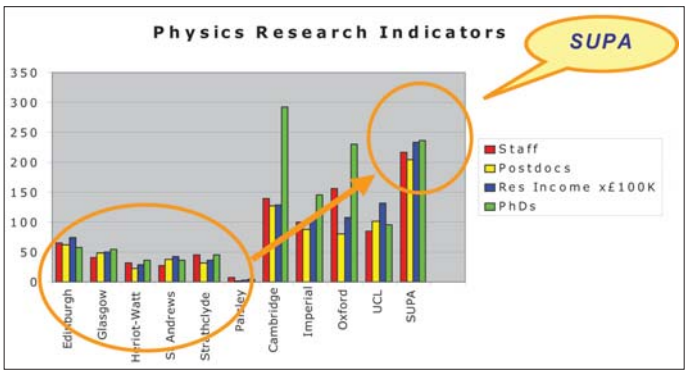
Noting the current high level of interest in so-called fourth-level Ireland, Prof. Halliday highlighted some recent changes in the PPARC funding rules for PhDs. For those UK departments providing significant additional training for PhD students there will be four-year funding. However, in the case of the more traditional training, the normal three-year funding will be given.

Later, Danny Heffernan from NUI Maynooth expressed concern about the timescale of PhDs with training, speculating that perhaps what was needed was a separation of the taught section from the research side.

Halliday emphasized that research facilities are already being shared. In this regard he acknowledged that the relatively close positions of the various university sites was a distinct advantage – a point certainly not lost on those victims of the day's transport chaos.

Of SUPA's budget the majority is reserved for academic appointments. These posts are at all levels but Halliday noted that there was a particular emphasis on high-profile SUPA advanced fellowships, which are aimed at young people of outstanding promise.

Responding to a query from James Lunney of Trinity, he compared SUPA'S approach with that of WEST CHEM and EAST CHEM – two similar bodies that act as a focus for collaboration in chemistry in Scotland. The latter has opted for making a number of high-profile academic appointments. Halliday expressed some concern that such a policy of "dropping" researchers into departments might lead to difficulties in creating a good working dynamic. His strong opinion was that it was better to grow research groups organically, and he cited his experience while head of physics at Swansea University in support of this.




*Comparison of Scottish universities with other universities in the UK.*

One of the most compelling sets of statistics from Halliday compared physics research indicators in 2002 of the component SUPA departments with those of Cambridge, Imperial College, Oxford and UCL. In this light the combined resources of SUPA clearly become a major factor in terms of its staff, student numbers and research income.

Throughout his presentation, Halliday touched on a number of areas that led to lively debate. In answer to a query from Tom Boland of the HEA as to whether it was SUPA's aim to have a single physics department for Scotland, he was very clear that the model was not to shut down two or three smaller departments. He emphasized that each of the component departments has strengths in particular areas but that the whole was greater than the sum of its parts. He noted that, in particular, Paisley, which has special expertise in piezoelectronics, had recently obtained a large industrial grant, and he speculated that it was unlikely that this would have happened prior to the establishment of SUPA.

**The working dynamic**

In a discussion prompted by Luke Drury from DIAS and Martin Henry of DCU on a possible conflict of loyalties between a researcher's home institute and SUPA, Halliday noted that SUPA was working hard to create an atmosphere where researchers would feel that their allegiance belonged to their particular research group. This, he said, would be most important in trying to attract the highest rank of researchers, because their drive was to be in contact with other high-calibre individuals. In this context he pointed out that CERN was one of the few European structures that genuinely surpasses the USA, not just because of the money that it receives but because of the dynamic created by the top people working together.

Throughout his talk Halliday repeatedly emphasized that what he wanted to achieve was a situation where researchers in Scotland would feel able to take the risk to tackle the most difficult of problems in physics. SUPA helps individual small research units to collaborate to create the critical mass whereby researchers feel empowered in their research. He stressed the need to plan for world success, not just to maintain the status quo but also a bit extra. His talk was inspiring but, as he says, it remains to be seen whether SUPA's future will be driven by research aims and agenda or by local politics.

**HE has never had it so good**

That's the view of Tom Boland, chief executive of the Higher Education Authority, with more than 60% of school-leavers going on to third level and an unprecedented increase in support for research.

# told about physics in Scotland

Speaking after Halliday, Boland gave an overview of current and upcoming funding mechanisms for the universities and institutes of technology. Much of what is planned is based on an analysis of international models and feedback from the HEA's consultation paper of 2004, which forms the basis of a model that supports meaningful autonomy for the sector but also provides incentives for various areas of innovation.

The impetus for change to the current model, which has been in place since 1996, arose from government concerns over the lack of transparency and international benchmarking, as well as the need to introduce direct links between institutional strategies and national priorities.

**New funding model**

Boland noted that this year a change has already been introduced into the core grant system. This block grant is given to the institutions to allocate as they wish in relation to teaching and research needs. However, in common with the system in England, from this year it will be allocated on the basis of a set of priorities, with funding linked to student numbers and types.

As an example, there is now a direct funding link to weighted student numbers in specific areas, with lab-based subjects having a weighting of 1.7 compared with non-lab-based subjects. Other changes to come in the core grant include changes to the system of attracting students from non-traditional backgrounds, again through a weighting attached to the student numbers from such areas. Boland stressed that the HEA is monitoring the effects of these changes on the funding system so that unintended behaviour does not arise.

An element of performance enhancement has been introduced into the core grant, with 5% being sliced off the total grant, which will be allocated to the institution on the basis of its research income and the number of Masters and PhDs awarded, thereby signalling that the HEA regards research performance as highly important. Consideration is being given to increasing this portion further from 5% to a higher level over time.

Boland also discussed strategic outcomes funding at length. The HEA is currently proposing that 10% of the grant should be withheld or reserved until an institution reaches certain performance targets. This would be judged by a panel of experts, who would examine, among other elements, the institution's strategy statement. The panel would expect to see a high level of collaboration both within the institution and with other bodies. In addition the statement should look at national priorities and demonstrate how a university should contribute to these. In answer to a later question from Prof. Martin Henry, co-chair of the Institute of Physics in Ireland, he clarified that an institution might be expected to have three or four such national priorities in their plan. A key target for the review panels will be to look at international best practice and compare Irish performance against this.

Boland reported that there was a positive view from the universities' management on these changes. It is likely that the institutions will become progressively more exposed to this reservation system, the intention being to use the funding system to encourage better planning. He highlighted that it is existing money that is being used in this regard.

**Strategic Innovation Fund**

In relation to new funding, Boland discussed the €300 million Strategic Innovation Fund, which was announced by the Minister for Education and Science, Mary Hanafin, last year. Available over five years, this will encourage institutions to develop better ways of carrying out existing activities. Her priorities are management training, teaching and learning reform, quality improvements, and incentives for intra-university collaboration and graduate training (i.e. fourth-level Ireland).

He emphasized that collaboration is the key to funding from the resource. It is likely that the first call for proposals will be issued in early June. He also pointed out that any institution that suffers a reservation of its core grant will not even be allowed to apply for money from this fund. In answer to a query from Prof. Martin Henry, Boland said that although the fund is not exclusively about fourth level, it will be skewed towards the research side and towards universities rather than the ITs.

**PRTLI 4**

In relation to the next phase of the Programme for Research in third-level Institutions (PRTLI 4), there will likely be €4 million available in grants, which will come from the new research plan that is being considered by Cabinet at present. A first call for proposals should come shortly and there will be a number of calls over the lifetime of PRTLI 4. Again there will be a strong emphasis on collaboration and co-operation, with the government determined to see value for money and Irish research benchmarked at international level.

In lively discussions following Boland's presentation, the question of Irish membership of CERN was raised by Cormac O'Raifeartaigh of Waterford IT. It was pointed out that national collaboration is not the only way to achieve world-class status; international collaboration is another. Halliday noted that the UK's membership fee of some £75 million a year is considered money well spent in terms of the country's research outcomes.

In discussions about graduate schools, Boland said that the HEA will not be prescriptive but would expect to see an enormous level of collaboration between the institutions, saying that the IRCSET will provide the seed funding for the fourth level while PRTLI4 will provide actual costs. He emphasized that the quality of the proposed increase in PhDs is very important. While there are no plans for a UK-style Research Assessment Exercise, there would have to be some focus on assessing performance and outcomes. Halliday interjected at this point with strong support for the current model of the RAE, saying that it has led to better science management.

Echoing the former Government chief scientist's thoughts at the last heads' meeting in May 2005, Boland said that the HEA is most concerned to achieve accurate numbers of those working in research and also undergraduate numbers. Halliday noted from his experience at Swansea University that departments there were paid according to the number of students who sit exams rather than the numbers who signed up for the course.

In a wind-up to the meeting there was discussion about the ongoing problem of undergraduates numbers in physics. John Costello of DCU noted that Scotland, while having a similar population base to Ireland, produces many more physics graduates. Danny Heffernan pointed out that school science numbers can be increased through a programme of significant and sustained campaigns, while Vincent Toal of DIT speculated that perhaps too much attention was paid at second level to non-science subjects. As John Costello noted, as welcome as the proposed increase in the numbers of postgraduate places is, it's hard to know from where such students be sourced if nothing changes at undergraduate level.

**Follow up**

This was the second meeting of its kind, drawing together all of the physics departments in Ireland. The Institute was delighted with its success and intends to follow up on the issues raised.

**Dr Sheila Gilheany**, policy officer, Institute of Physics in Ireland

# Superstrings: fiddler and physicist

**This article, written by Andrew Peggie, first appeared in issue 6 (August 2006) of *New Routes*, the British Council's biannual music magazine. It is reproduced here with the kind permission of both the author and the publisher. Andrew Peggie is a composer, musical director and former artistic associate with the London Philharmonic Orchestra. He has written extensively about music and education.**

An eminent scientist and an acclaimed young violinist have joined forces to create a unique performance that uses music to unravel the complex world of particle physics.

Jack Liebeck is a young, charismatic solo violinist from the UK, already a veteran of many concert halls across the world and much in demand as a classical music soloist and chamber music player. Just the sort of artist one would expect to feature in *New Routes*. And someone to whom the tag "Superstrings" might well apply.

But if you're expecting to read another catalogue of musical achievements and successes, be prepared for a slightly different story. Liebeck's association with *Superstrings* in fact takes him to another world – both metaphorically and literally. For he is one half of a double act that aims to bring the esoteric world of subatomic particle physics to a broader public through the neat (and not entirely spurious) device of combining science lecture with music recital.

The punning title also refers to the latest constructs that theoretical physicists have proposed as a way of explaining the interactions of a range of exotic subatomic particles as they (the physicists, that is) strive to investigate how gravity actually works and whether general relativity and quantum mechanics can ever be reconciled.

Can music really be an ingredient? There are certainly historical precedents. The ancient Greeks considered the study of music, arithmetic and astronomy as essential to the quest for the meaning of truth and beauty. Pythagoras and Ptolemy were accomplished practitioners and theoreticians in both music and the physical sciences. The medieval philosopher Boethius defined his fields of reference as "musica mundane" (the harmonic systems of the physical world), "musica humana" (the harmony of the human body and soul) and musica "instrumentalis" (the stuff we like listening to).

His point was that they are all related. Then, in the early 17th century, Johannes Kepler coined his famous phrase "the harmony of the spheres" in a (not unsuccessful) attempt to relate the orbits of the stars and planets to the harmonic laws governing vibrating strings. Waves – whether sound or electromagnetic – appear to follow the same principles.

### Unusual partnership

All of this might have been at the back of the mind of the other half of the *Superstrings* duo. Brian Foster is Oxford University's professor of experimental physics and European director of the global design effort for the International Linear Collider – the next major project proposed in particle physics.

He is also involved in a new project at CERN in Switzerland, the Large Hadron Collider – particle physics' giant state-of-the-art tool for investigating extremely small and short-lived subatomic particles, which is due to be completed next year.

Two years ago he began thinking about what to do for the World Year of Physics in 2005, instigated to commemorate the centenary of the publication of Albert Einstein's famous papers on relativity, which revolutionized scientific thought about the way the universe works. But Einstein was also an accomplished musician who declared: "Life without playing music is inconceivable to me" and was known to give public recitals on the violin.

Foster recounts a post-concert discussion with his friend Jack Liebeck (remember him?) one evening in 2004. "We'd been to a concert together and vaguely discussed doing a lecture. The World Year of Physics was coming up and it had occurred to me that it's a very good angle to try to break up the very dense, unavoidably quite difficult ideas that you have to convey, with some sort of relaxation – possibly with music.

But what I was short of was something to hang the concept on. Then when Jack reminded me about Einstein playing the violin, things started to become clear. The idea of *Superstrings* was born."

Despite working at the frontiers of the most abstruse of sciences (where it's hard to know where science ends and metaphysics begins), Foster is passionate about sharing these concepts with a wider public.

And it turns out that Liebeck is equally enthusiastic about all kinds of technical and scientific investigation. In spite of his inevitable focus on music at the highest level, he found time to build his own computer while

*Jack Liebeck (right) and Brian Foster will be performing* Superstrings *at the Genoa Science Festival (Italy) on 30 October, in the RDS (Dublin) on 14 November, in Limerick on 15 November (as a schools lecture at the University of Limerick followed by an evening recital at Daghda Space in John's Square) and at Marlborough College (Marlborough, UK) on 5 December. See the Institute of Physics in Ireland Lecture Programme for further details of events in Ireland. Online resources relating to* Superstrings *can be found at www.jackliebeck.com/superstrings.htm and at superstring theory at www.superstringtheory.com.*

# perform together

still at school. So Liebeck became a model for the interested and curious member of the general public whom Foster was looking to connect with.

**Super sponsorship**

*Superstrings* became a reality, thanks to sponsorship from the Particle Physics and Astronomy Research Council (PPARC) and the Council for the Central Laboratory of the Research Councils (CCLRC) – both bodies keen to use the World Year of Physics to promote interest in the field. So Foster and Liebeck set about devising a 75 minute show with music, explanation and a PowerPoint presentation – a sort of short history of particle physics, from Einstein all the way to what might just be discovered tomorrow. PPARC also proved to be helpful in setting up possible dates in schools, public venues and university campuses.

"We advertised it as being suitable for 16-year-olds and above; people with a basic knowledge of physics from school," said Foster. "Even so, we had to give a resumé of the very basic ideas that Einstein had. So the whole of the first part deals with his ideas, a bit about his early life and where his ideas have got us to. The next part looks at where we are now. Then there are the superstrings."

But if you imagined that this was a standard scientific lecture with added violin playing, you would be wide of the mark. Foster freely acknowledges that Liebeck has had a fundamental influence both on the way he approaches lecturing in general and also in the way he presents his subject matter.

"He's completely changed the way I give lectures," said Foster. "He keeps telling me it's not a lecture; it's a performance, and you've got to perform. He knows what an audience will understand, and he has good ideas about how to convey the concepts. He actually thought of a lot of the demonstrations. So it's very much a joint thing."

Some of these demonstrations involve flour, sieves and various shapes of pasta – cosmic cookery, if you like. The lecture begins with music – Bach's solo violin music played by Liebeck (and some of Einstein's favourite pieces), accompanying a sequence of images from Einstein's early life and career.

Music punctuates each subsequent section, again referring to what Einstein might have played. Then we plunge into the world of quarks, leptons, gluons and the elusive Higgs boson. Liebeck's violin is also pressed into service in demonstrating some of the properties of waves.

Liebeck and Foster have already delivered around 60 presentations, both in the UK and in the USA, courtesy of the World Year of Physics. So successful has *Superstrings* proved that PPARC has agreed to underwrite another 30 performances over the next two years or so. Independently, the British Council has supported performances in China and is supporting forthcoming trips to Ireland and Italy.

Is this the end of the story? Foster is sure that it isn't. The concept could well develop into other areas. "I'm surprised that it works as well as it does," he confided, "but you need to be sure that the connections are there, otherwise it could be a bit false."

Certainly the notion of a mixture of informative lecture and linked music is so appealing that it's a wonder that no one has done it before. But maybe that's partly because Foster plays an unexpected role in the enterprise. What we don't discover until the end is that he too is an accomplished violinist. In a clever *coup de thòâtre*, he picks up his own instrument and plays a Boccherini duet alongside Liebeck in a final flourish that presumably drops the jaws of any scientific colleagues who might be present and must surely have Ptolemy, Pythagoras and Einstein muttering approval from another dimension.

**Andrew Peggie**, London Philharmonic Orchestra

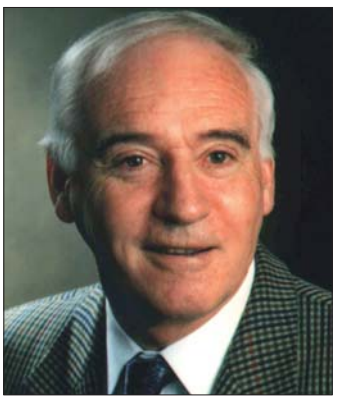
# Symposium honours O'Raifeartaigh

On 22–24 June an international symposium celebrated the work of the late physicist Lochlainn O'Raifeartaigh (1933–2000) in Budapest, Hungary.

The O'Raifeartaigh Symposium on Symmetry Methods in Quantum Field Theory was presented by the KFKI Central Research Institute for Physics in Budapest, in association with the Dublin Institute for Advanced Studies and the Hamilton Mathematics Institute of Trinity College Dublin. The conference programme (see www.kfki.hu/~lor2006) featured presentations by physicists from Europe, the United States, Russia, India, Israel and Japan.

Throughout his long career at the Dublin Institute for Advanced Studies, Prof. Lochlainn O'Raifeartaigh was recognized as a leading international figure in the field of particle physics, notably in the application of mathematical symmetry methods to the description of the elementary particles and their interactions. He published more than 200 research papers during the course of his career, several of which became seminal works in the field. His monograph *The Group Structure of Gauge Theories* (Cambridge University Press) is a standard textbook in graduate courses in theoretical physics.

O'Raifeartaigh first established an international reputation with the celebrated O'Raifeartaigh Theorem (1965). This was an important result in the search for a unified description of the elementary particles and led to offers of positions in prominent universities around the globe. However, he decided to remain in Ireland, building an internationally respected group in theoretical particle physics at the Dublin Institute for Advanced Studies.



*Lochlainn O'Raifeartaigh.*

In the 1970s O'Raifeartaigh achieved a second well known result with a landmark contribution to the theory of supersymmetry, a radical new theory in elementary particle physics. The O'Raifeartaigh Model of Supersymmetry Breaking (1975) provided a mechanism for the spontaneous breaking of supersymmetry, an important result that established him as one of the leading architects of the new theory. This, and subsequent work, led to the award of a prestigious international science prize, the Eugene Wigner Medal for "pioneering contributions to elementary particle physics". The theory of supersymmetry has found widespread application in physics, from string theory to cosmology. In 2007 a new particle accelerator at CERN, the European Centre for Particle Physics in Geneva, will be used to search for evidence of the supersymmetric particles predicted by the theory.

**Cormac O'Raifeartaigh**, Waterford Institute of Technology

**The deadline for your contributions to the March 2007 issue of this newsletter is:**

**31 January 2007**

**Please e-mail your materials to Peter.vanderBurgt@nuim.ie**

# IEEE Historic Milestone honours Nicholas Callan

At a ceremony on 5 September at the National University of Ireland, Maynooth, Revd Nicholas Callan's pioneering contributions to electrical science and technology were recognized with the dedication of an IEEE Historic Milestone to him and the unveiling of a plaque with the following text:

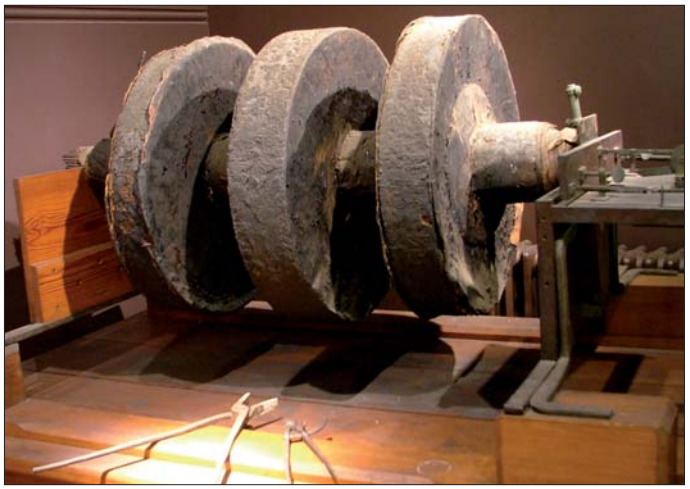
"Reverend Nicholas Callan (1799–1864), professor of Natural Philosophy at Saint Patrick's College Maynooth, contributed significantly to the understanding of electrical induction and the development of the induction coil. He did this through a series of experiments that made the inductive transient phenomena visibly clear. The apparatus used in these experiments was replicated in other laboratories."

The plaque was unveiled in the foyer of the Electronic Engineering and Biosciences Building at NUI Maynooth by Prof. Michael Lightner (president of IEEE) in the presence of Mary Hanafin (TD, Minister for Education and Science) and many representatives from NUI Maynooth and other organizations.

After a welcome by Dr Frank Devitt (head, Department of Electronic Engineering, NUI Maynooth), speeches were given by Prof. John Hughes (president, NUI Maynooth), Prof. Michael Lightner, Mary Hanafin and Prof. Jim Slevin (president, Royal Irish Academy). Callan's work has also been recognized by the Institute of Physics with the unveiling of a Blue Plaque on 17 April 1998 in Maynooth.

Nicholas Joseph Callan was born on 22 December 1799 in Darver, Ireland. He started his studies for the priesthood at Navan Seminary and continued at St Patrick's College Maynooth, where he studied natural and experimental philosophy under Dr Cornelius Denvir. After his ordination as priest in 1823, Callan pursued his doctorate in divinity in Rome, where he became acquainted with Galvani and Volta's work in the study of electricity, and recognized the potential to put it to practical and commercial use with powerful batteries.

*Left to right: Prof. Jim Slevin (president, Royal Irish Academy), Dr Niall Mckeith (curator, National Science Museum, and Department of Experimental Physics, NUI Maynooth), Prof. Michael Lightner (president, IEEE), Mary Hanafin (TD, Minister for Education and Science), Prof. John Hughes (president, NUI Maynooth), Dr Frank Devitt (head, Department of Electronic Engineering, NUI Maynooth), Monsignor Dermot Farrell (president, St Patrick's College, Maynooth) and Dr Seán McLoone (vice-chairman, UKRI Section of IEEE, and Department of Electronic Engineering, NUI Maynooth).*



*Callan's giant induction coil (1837)on display in the National Science Museum, Maynooth. This consists of three secondary coils connected in series on an iron core. Each coil contains approximately 10 miles of very fine wire insulated with a mixture of beeswax and gutta-percha. In 1837 this apparatus produced sparks that were 15 inches long.*

In 1826 Callan returned to Maynooth as the new chair of natural philosophy, where he also began working with electricity in his basement laboratory at the college. Influenced by the work of his friend William Sturgeon, the inventor of the first electromagnet, and the work of Michael Faraday and Joseph Henry on the induction coil, Callan began to investigate the idea of the induction coil in 1834. He developed his first induction coil in 1836.

In addition to this achievement, Callan built the first successful mechanical current breaker, which he called a "repeater." He was the first to establish the link between rate of change of current and electromagnetic induction, and he discovered the principle of the self-exciting dynamo. Callan also built the most powerful batteries and electromagnets of his time, including a giant battery of 577 cells, and he patented a method for protecting iron from rust – an early form of galvanization.

Callan died in Maynooth on 10 January 1864. Many pieces of his apparatus, including his giant induction coil built in 1837, are on display at the National Science Museum in Maynooth (see http://www.nuim.ie/museum/).

IEEE Milestones in Electrical Engineering and Computing is a programme set up by the IEEE to honour significant historic achievements in electrical, electronic and computer engineering (see http://www.ieee.org/web/aboutus/history_center/about/milestones.html). There are now more than 70 IEEE Milestones around the world, and that for Nicholas Callan is the third in the Republic of Ireland. The others are the Shannon Scheme for the Electrification of the Irish Free State at Ardnacrusha, dedicated on 29 July 2002, and the County Kerry Transatlantic Cable Stations, dedicated in July 2000.

Executed by Siemens and operated by the Electricity Supply Board, the Shannon Scheme was officially opened on 22 July 1929. It successfully harnessed the Shannon River and served as a model for large-scale electrification projects worldwide. It had an immediate impact on the social, economic and industrial development of Ireland and continued to supply significant power beyond the end of the 20th century. By the international standards of 1929, the Shannon Scheme was one of the largest civil and electrical engineering projects of its type.

After several unsuccessful attempts in the 1850s to lay a telegraph cable between Ireland and Newfoundland, the Great Eastern successfully landed at Heart's Content, Newfoundland, on 27 July 1866, having left Valentia Island on 13 July. It was also able to recover a cable laid unsuccessfully in 1865, resulting in two working Atlantic cables, and establishing a permanent electrical communications link across the Atlantic Ocean. Later, additional cables were laid from Valentia and new stations opened at Ballinskelligs (1874) and Waterville (1884), making County Kerry a major focal point for global communications.

**Peter van der Burgt**, NUI Maynooth

# First Ireland firm gets IOP accreditation for graduate training programme

Thales Air Defence Ltd (TADL) has become the first company in Ireland to have its graduate training scheme formally approved for Institute accreditation status. This means that its trainees are provided with a structured route to gaining chartered status (i.e. the CPhys award of the Institute).

In recognition of this the accreditation certificate was presented to TADL at the company prize night held on 1 March in the Stormont Hotel in Belfast. On the same evening TADL also received accreditation status for the graduate training programme from the Institution of Mechanical Engineers, the Institution of Engineering and Technology and the Royal Aeronautical Society.

In recent years the Institute has strengthened the standard for Chartered Physicist and made it a valuable tool for all employers (whether major multinationals on a recruitment cycle, SMEs or start-ups). Chartered Physicists agree to be bound by a code of conduct that reflects best practice. The code requires members not only to show a high level of professionalism but also to advance their competence through continuing professional development.


*IOP representative Alison Hackett presents the IOP accreditation certificate to Thales Air Defence Ltd's HR director, Mary Bryce, and technical director, Hill Wilson, at the company prize night on 1 March .*

In addition the Institute offers Chartered Engineer (CEng) and Chartered Scientist (CSci) to its multidisciplinary members as an additional members service and benefit. The title Chartered Physicist is exclusive to the Institute of Physics. Chartered Engineer is maintained by the Engineering Council UK and Chartered Scientist by the Science Council.

Chartered status stands for the highest standards of professionalism, up-to-date expertise, quality and safety, and for the capacity to undertake independent practice and exercise leadership. As well as competence, the title denotes commitment to keep pace with advancing knowledge, and with the increasing expectations and requirements for which any profession must take responsibility.

For further information, visit http://www.iop.org/Our_Activities/ and select "Supporting Universities and Academics" followed by "How to Get Chartered Status".

**Alison Hacket**, IOP representative

# IOPI policy submissions

Over the summer the Institute of Physics in Ireland has prepared and submitted papers to government on various aspects of policy relating to physics.

In a submission to the Advisory Council for Science, Technology and Innovation's Review of Health Research, the Institute noted that basic research is fundamental to many of the most innovative branches of health research (e.g. the use of nanotechnology in the development of diagnostic tools and biosensors, imaging techniques and the use of radiation in treatment).

Given that it is frequently not possible to know the exact direction that a research path will take or to predict the new products/techniques that will emerge from it, the IOPI emphasized that basic research in physics should be strongly supported throughout the third-level sector in order to lay the ground for future innovation.

The IOPI is particularly pleased to note that this view was accepted in the recent government paper "Strategy for science, technology and innovation". Such a position, though, leads to a requirement that the skills base in physics is strongly supported.

In a wider-ranging Institute submission to the Expert Group on Future Skills Needs, this need was emphasized, with support for physics being sought at second and third level. In particular there was the oft-repeated call for the full implementation of the 2002 report of the Taskforce on Physical Sciences in relation to school science technician positions and also for the development of the IOPI's teachers' network coordinators.

In relation to the third level, while welcoming the recently announced enhanced funding for research, concerns were expressed about the funding of teaching labs. A number of strategies were proposed to enhance the standing of physics as a third-level option, including the provision of financial incentives to students and calls to examine, on a pilot basis, creative schemes to attract high-ability students, perhaps by raising entry requirements.

Enhancing the profile of physics at both national and international level was addressed in response to the Higher Education Authority's consultation exercise on research infrastructure. In particular the Institute called for Irish membership of CERN and the European Southern Observatory.

Both of these facilities share a number of common features. They are universally acknowledged as being world leaders in their fields, bringing together the highest calibre of scientists and pooling knowledge across many areas of science and technology, requiring the most cutting-edge technology in such areas as detectors, high-speed micro- and optoelectronics, high-performance computing, high-speed networking, large-volume data storage, and mechanical and electrical engineering – all areas with tremendous potential for technology transfer and industrial spin-offs. In addition they explore fundamental areas of physics, which have exceptional appeal to young people and to the broader public, and as such act as outstanding tools to attract students into science.

For more details, see the policy section of the IOPI website or contact Sheila Gilheany (e-mail: sheila.gilheany@iop.org).

# Fliers provide information on physics careers


*Under the title "A day in the life of a…" the Institute of Physics in Ireland has produced a series of 18 fliers, each of which describes a day in the life of someone who is pursuing a career that began from the springboard of a degree in physics. All of these profiles can be downloaded from the IOPI website (either as single A4 sheets or as a full set), or you can request hard copies from Alison Hackett (e-mail: alison.hackett @iop.org).*

# Neil Porter: an outstanding career in astrophysics

Neil Porter, an outstanding astrophysicist, died peacefully in Dublin on 15 March. He made a number of original and fundamental contributions to his field during a long career dedicated to research, teaching and scholarship.

Porter's interests were catholic in scope, ranging from peace studies (in which he got an MPhil), astroarcheology and cosmic-ray physics to the history of physicists who suffered persecution, a topic on which he published the book *Physicists in Conflict* and also obtained an MA. He was truly a renaissance man with wide interests and talents: a brilliant raconteur, an actor, a singer, in his youth a long-distance runner, and a gentle man of deep faith.

Born in Urmston, Manchester, on 4 September 1930, Porter was educated at St Bedes College and then the University of Manchester. In September of that year he was appointed a research scholar in the School of Cosmic Physics of the Dublin Institute of Advanced Studies.

Between 1954 and 1958 he was a research fellow at the Atomic Energy Research Establishment at Harwell, UK, working with the cosmic radiation research group. He returned to Dublin in 1958 as a lecturer at University College Dublin, and he was then appointed professor of electron physics there in 1963.

It is as a scientist of outstanding curiosity, inventiveness and flair that Porter will be most widely remembered. During the early years at Harwell he collaborated with J V Jelley on the development of new types of Cerenkov radiation detectors for measuring cosmic-ray showers. During this time he published a very original paper proposing that the magnetic monopole might be an important constituent of cosmic radiation.

In 1961 he visited MIT for two months, working with Bruno Rossi's group and, together with Dave Hill, he accomplished the remarkable technical achievement of using image intensifiers to photograph the feeble and transient Cerenkov light given off by energetic charged particles from cosmic-ray showers in the atmosphere. A collaboration with Frank D'Arcy resulted in the successful detection of the passage of cosmic mu-mesons in the human eye by virtue of emitted Cerenkov radiation.

Neil was a key figure in the application of radio technology to detecting cosmic-ray showers. A paper by G A Askaryan in 1962 stimulated interest in the detection of the feeble coherent radio emission from extensive air showers through the deployment of cheap radio receivers. Pulses were first detected from showers in 1964 through the collaborative efforts of scientists from Harwell, Dublin and Jodrell Bank.

However, perhaps Porter's most important contribution to science has been his role in the development of the imaging atmospheric Cerenkov technique. A seminal paper written with J V Jelley in 1964 described the future course that this technique would take. In particular the paper outlined the concept of recording the images of the Cherenkov light from the gamma-ray-initiated electromagnetic cascades and using the information contained therein to discriminate them from the much more numerous background hadron showers.

The paper also advocated the use of stereoscopic imaging systems to reduce background further. It was 20 years before the concept saw practical realization. Porter was to be a coauthor of the Whipple paper announcing the first credible detection of a TeV gamma-ray source (the Crab Nebula).

Porter was always mindful of alternative approaches to the detection of new and exciting phenomena. When Stephen Hawking suggested that primordial black holes might evaporate with the emission of a burst of gamma rays, Porter immediately saw that a simple ground-based atmospheric Cherenkov experiment using separated detectors would be a sensitive way to detect such bursts. Although no bursts were detected in a series of elegant experiments, the limits were more sensitive than those obtained using other techniques (including those from the EGRET telescope on the Compton Observatory a decade later). It was one of Porter's most satisfying achievements in his research career that these results were referenced in Hawking's famous A *Brief History of Time*. In the French edition Porter is referred to as the *savant irlandais* – surely a fitting epitaph.

Porter was an inspirational teacher who influenced generations of students in physics with his engaging style of lecturing. Generations of Irish undergraduates and postgraduates in experimental physics owe an important component of their education to him. He also contributed significantly to the Irish Branch of the Institute of Physics, being committee member (1981–1984 and 1993–1995), co-chair (1989–1991) and chair (1991–1993).

With his passing we have lost our mentor, colleague and good friend. We learned a lot from Neil Porter, the least of which was physics.

**David J Fegan**, University College Dublin and **Trevor C Weekes**, Smithsonian Astrophysical Observatory

# Elastic band secures prize for a young innovator

Stephanie Paul from Loretto College in Coleraine has won this year's Seagate Young Innovators IOPI Prize. She received the award for her project entitled "The physics of twisting elastic".

In a highly original investigation, Stephanie studied the wrapping round itself of a stretched rubber band. She did this using a cardboard tube and two small brass rods. She attached the rubber band to the rods, which were placed at the top and bottom of the tube, and by turning the top rod through successive half-turns relative to the bottom rod, she marked the path of the rubber band stretched across the inside surface of the tube.

She used mathematical formulae to work out how the extension and tension change as the number of half-turns increases. Then, by putting these equations into a spreadsheet, she was able to plot the overall tension against the number of half-turns.

Stephanie also looked at the structures that are formed when an elastic band is twisted. She found that two different behaviours occur as a result of the increase and decrease in tension and torque.


*Left to right: IOP Teacher Network Coordinators Paul Nugent and Vida Given, Stephanie Paul, winner of the 2006 Seagate Young Innovators IOPI Prize, and her teacher Brian McKenna.*

# Inaugural meeting of the Irish Branch

**17 May 2004 marked the 40th anniversary of the formation of the Irish Branch of the Institute of Physics and the Physical Society, now known as the Institute of Physics in Ireland. The first general meeting was held in University College Dublin on 17 May 1964. At the Inaugural meeting, held in University College Dublin on 3 November 1964, Prof. Blackett of Imperial College London (at the time the scientific adviser to Harold Wilson's government) spoke about "Government organisation of science and technology". In an article entitled "More money urged for industrial research", the Irish press reported on this event on 4 November 1964. The article was provided by Mr David Murnaghan (founding committee member 1964–1966, secretary 1966–1968) and is reproduced here with kind permission from the Irish Press Archives.**

## More money urged for industrial research

A leading British scientist, speaking in Dublin last night, called on his Government to pour more money into industrial research projects, saying that applied research and development was clearly best done in industry itself "where they know the problems involved." He is Nobel Prize winner Professor P. M. S. Blackett, F.R.S., who a week ago was appointed deputy chairman of the Advisory Council on Technology in the new British Ministry of Technology. Professor Blackett was addressing the inaugural meeting of the newly created Irish Branch of the Institute of Physics and the Physical Society, which will promote all matters relating to the science of physics and its applications. The meeting, held in the physics theatre, U.C.D., was attended by the President, Mr. de Valera, the Minister for Education, Dr. Hillary, and distinguished scientists from the universities, the Institute for Advanced Studies, and industry. The subject of Professor Blackett's inaugural address was "Government organisation of science and technology", and he said he was convinced that the present financial crisis in Britain was only temporary.

*The President pictured with Professor John Synge, Dublin Institute for Advanced Studies (left) and Professor P. M. S. Blackett, Imperial College of Science and Technology, London, at last night's inaugural meeting.*

**Must be changed**

However, he said, there was "not nearly enough" government finance of research in civil industry in England. Out of a total government spending of about £400 million on research and development, only about £1 million went to finance research in industry. This had to be changed, he declared.

The future of their economy depended on this application of science and technology in industry—particularly the export industry. Their economic growth rate over the last ten years had been very disappointing. The financial crisis had been due almost directly to the failure of their exporters—due again partly to rising costs, and to a lesser extent, to the matter of investment capital. It was hoped that the difficulties created by the crisis for other countries would be only temporary. Professor Blackett said it was relative weakness in technology, which led to this bad export performance. He described the system of grants for research in British universities, and said the government would continue to spend something like £40 million on this.

**US example**

One of the deficiencies felt most had been lack of machinery in the government for discussing all these intricate problems of research, finance and advancement. In America, research in industry was financed on an enormous scale through huge defence contracts. Something had to be done in England to raise the level of industry in that respect, he said. The establishment of a Ministry of Technology was important to the economy as so many of the things they wanted to do depended on it. Professor Blackett said that in the field of pure science Britain's tradition was being maintained, though perhaps dwarfed by such giants as Russia and America. The most immediate difficulties were financial, although they in Britain devoted about the same fraction of their national income to science as a whole, as did the U.S., which was six times bigger.

**Fine tradition**

Professor F. E. Hackett, F.Inst.P., chairman of the Irish Branch, Institute of Physics and the Physical Society, welcomed Prof. Blackett, and thanked him for his outstanding inaugural address.

He said that Ireland had a fine tradition of achievement in physics. The Irish Branch had an obligation to carry further the discussion of the topics raised by Prof. Blackett. The Irish Branch was established in March this year. The secretary is Mr. C. P. O'Toole, A.Inst.P.

## Why not contribute to our historical archives?

Putting together the anniversary issue (September 2004) of the newsletter highlighted the need to complete and maintain our archives. We have detailed records of the minutes from AGMs and committee meetings, and correspondence from the early years of the branch, and we are now collecting and archiving material from other years. In particular, we're looking for issues of series 3 and 4 of the newsletter. The archives, which include the original notebooks that contain the minutes of the AGMs of 1964–1982, are kept at University College Dublin.

If you have any historical materials, please contact Peter van der Burgt (tel: 01 708 3782; e-mail: peter.vanderburgt@nuim.ie) or Alison Hackett (tel: 01 716 2216; e-mail: alison.hackett@iop.org).

# Teachers meeting offers fresh ideas

*Paul Nugent (Teacher Network coordinator, St Dominic's High School, Dublin) demonstrates the Camera Obscura from the* Science on Stage 1 *booklet (see http://ireland.iop.org/sos/sos1book.html) at the Physics Teachers Conference held at Queens University Belfast on 28 June.*

The annual Physics Teachers Conference held at Queens University Belfast on 28 June was attended by a large number of teachers, all in buoyant mood, having almost reached the end of another busy term.

The day kicked off with an exciting array of experiments by an enthusiastic Dr Keith Gibbs, author of the successful book *Resourceful Physics* and accompanying website (http://resourcefulphysics.org/). This was Keith's first visit to Northern Ireland and he gave freely of his time to demonstrate experiments to a large number of Year-11 pupils who attended the Horizons in Physics event held during the same week.

Teachers and pupils alike could not fail to be enthused by his variety of interesting experiments. Anyone wishing to obtain copies of his new CD of resources produced by Institute of Physics Publishing can do so by ordering directly or contacting Vida Given (e-mail: v.given@btinternet.com).

This was followed by an enlightening talk entitled "The science of science fiction in TV and film", with many accompanying pictures, by Prof. Francis Keenan from the School of Mathematics and Physics at Queens University.

After an excellent lunch, kindly provided by Queens University in the Great Hall, the workshop session by the Irish Science on Stage team was well received by all. Hopefully many of the novel ideas presented by the enthusiastic Eilish McLoughlin, Damienne Letmon and Paul Nugent will reach the labs and open evenings of physics departments around the province.

**Vida Given**, Teacher Network coordinator

# Careers advisor will visit Dublin

The Institute's careers advisor Vishanti Lall will be at the Buswells Hotel, Molesworth Street, Dublin 2, on 20 and 21 November, offering one-to-one careers advice to members.

She will be able to provide advice on a range of topics, including starting out on the career path, changing career midstream, surviving redundancy, taking a career break and preparing for retirement. Vishanti can also help with CV writing, application forms and interview techniques.

If you would like to attend a guidance session on either date, visit http://members.iop.org/careersguidance.html to book an appointment with Vishanti.

# Belfast student gets A-level award

*The 2005 A-Level Award was won by Mary Ellen Lynall from Methodist College, Belfast. She obtained the highest marks in physics in the CCEA 2005 GCE physics examination. The prize was presented to her on 24 April by Prof. Bob McCullough (Department of Pure and Applied Physics) at Queens University Belfast.*

# Website helps teachers to turn kids on to physics

Ever considered visiting primary schools to excite children's interest in physics? Sessions should be fun, explain the basic concepts clearly, support the curriculum and offer support for the teachers. To do this successfully takes careful preparation, requiring far more time than busy people have free.

A team from Sheffield University, under Prof. Gillian Gehring's leadership, has developed a website of suitable material, hosted by the Institute. Other team members are Prof David Mowbray, Dr Susan Cartwright, Dr Richard de Grijs and Dr David Lidzey. For details, go to www.iop.org, select "Engaging the public" from the centre column, and then select "Physicists and Primary Schools Project" from the top left.

The site will soon have 10 presentations covering different areas of the curriculum. Each session has fun activities and games that engage the whole class plus novel demonstrations. These are clearly described with details of the apparatus used and safety notes. Possible misconceptions are explained. A well illustrated, downloadable PowerPoint presentation is provided for each.

If you would like further information, contact Ann Marks (e-mail: pips@amarks.co.uk).

# Nano Nano! one-day event in Dublin

Nano Nano! is not a revisiting of Mork and Mindy from the 1970s but rather an up-to-the-minute meeting of physicists and engineers at the interface of nanotechnology.

Engineers Ireland and the Institute of Physics in Ireland are jointly organizing a one-day event on Tuesday 14 November at the Engineers Ireland headquarters at 22 Clyde Road, Ballsbridge, Dublin 4. The meeting will showcase cutting-edge research throughout Ireland, highlighting innovation in such areas as bioelectronic sensing, electronic device fabrication and solar energy cells, as well as demonstrating both current and potential industrial links. Participants include Mike Devane from Lucent Technologies, Gareth Redmond of the Tyndall Institute and NanoComms Ltd, and Igor Shvets of Trinity College Dublin. There will be an entrance fee.

According to a recent report from Forfás, the total global demand for nanoscale materials, tools and devices was estimated at €6.2 billion in 2003 and is expected to reach €23.4 billion in 2008. Indeed, the nanotechnology market is believed to be growing more than twice as fast as either the biotechnology or global informatics markets. In this rapidly developing area, all players – academic, industrial and government – are finding it essential to keep up to speed, and this meeting reflects such demands. The organizers hope that the day's participants find many more connections, not just at the nano-level.

For more details, see www.engineersireland.ie or contact Sheila Gilheany (e-mail: Sheila.Gilheany@dcu.ie).

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The Institute of Physics, 76 Portland Place, London W1B 1NT, UK.
Tel: 020 7470 4800.
Fax: 020 7470 4848.