



National University of Ireland, Galway
Ollscoil na hÉireann, Gaillimh

Research Matters

Cúrsaí Taighde in Ollscoil na hÉireann, Gaillimh

Engaging in comprehensive research on ageing population

Ireland's first dedicated research centre on economic and social ageing, the Irish Centre for Social Gerontology (ICSG), was launched recently by the Minister for Health and Children, Mary Harney TD. The €3 million centre will examine the economic and social aspects of Ireland's ageing population across multiple disciplines including: social gerontology, economics, sociology, psychology, law, nursing and medicine.

Director of the Centre, Professor Eamon O'Shea, welcomed the Government's support for the Centre as an important step which would facilitate comprehensive research in the area and identify problem areas for Ireland's elderly.

Speaking at the launch Prof. O'Shea said: "Ireland is on the cusp of major demographic changes and the ICSG will be a vital resource in assisting Ireland's policy makers to plan and make provision for Ireland's ageing population. The formulation and implementation of measures to improve and enhance the participation of older people in economic, social and civic life has not been heretofore properly addressed in research in Ireland."

Prof. O'Shea added, "Older people have too often been seen as drawing on public resources rather than as net contributors to society. The ICSG seeks to both inform and influence attitudes to, and expectations of, older people as well as exploring innovative ways, through technology for example, to ensure that older people play a full part in society at all levels. Each of us has a role to play in ensuring that we include older people in social and community initiatives."



The ICSG recently co-produced a research report funded by the National Council on Ageing and Older People on the quality of life for older people in long stay facilities. The Centre is currently completing a further report for the Council on the quality of life of older people living at home with a chronic illness or disability. The ICSG is also working on a number of other research projects in the following areas: volunteerism, technology, dementia, and the ethnogerontology of Irish-born immigrant populations.

The ICSG is funded through a combination of public and private funding, including important financial support from Atlantic Philanthropies, and will work closely with stakeholder groups including Age and Opportunity, Age Action Ireland, Senior Citizens Parliament and the Federation of Active Retirement

Associations to promote a holistic and positive view of ageing in Ireland. The ICSG aims to develop and promote social and economic aspects of ageing in Ireland with a view to supporting a holistic and positive view of ageing, which emphasises participation and empowerment for older people at all levels of society. The first centre of its kind in Ireland, the ICSG offers research expertise and practical support to public, private and voluntary agencies involved in the formulation and implementation of public policy for older people at international, national, regional and local levels. The ICSG offers Ireland's first Diploma in Social Gerontology.

Pictured: Prof O'Shea with Minister Mary Harney TD at the launch of the ICSG

RESEARCH MATTERS

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Message from the Vice President for Research



Athbhliain faoi mhaise do gach uile duine leis an gcéad eagrán de Cúrsaí Taighde, 2007. This edition reaches you at the busiest time of the Research calendar when we are putting together our application for PRTL 4 funding.

We are also dealing with several applications to Science Foundation Ireland (SFI) for major research funding opportunities, and negotiations with the Health Services Executive about the provision of a Galway Clinical Research facility shared between NUI Galway and University College Hospital. We are also considering possible applications for the Stokes Lectureships and Professorships which are soon to be opened for competition among universities by SFI.

The most pleasurable experience of my tenure to date as Vice President for Research has been to witness the concern of staff in the Research Office to inform scholars of research opportunities and assist them with research applications. It has been exhilarating to meet with several younger researchers from a wide range of disciplines who are bringing distinction to themselves and to this University through high quality research and publications, as well as prestigious research awards. Less encouraging has been the apparent disparities in the availability of research funding which means that disciplines identified for privileged support by some major funders are

visibly increasing and prospering within the University sector, relative to those not considered consequential by the funding bodies.

The new PRTL round, which is sponsored by the Higher Education Authority, will attempt to redress potential imbalances, by insisting that successful research applications be related to the teaching as well as to the research strategies of each institution, and that competition for such money is open to academics from all disciplines. It is inevitable that scholars in areas that have recently been augmented by massive subventions from Science Foundation Ireland will have a head start over all would-be competitors. However, as I write on the eve of the commencement of the internal competition for inclusion in the institutional PRTL bid, I hope that this unique fund will be employed throughout the university system to rectify some of the imbalances that have resulted from recent skewed funding schemes, and which we, as an academic community, are either too busy or too timid to discuss in the public domain.

Pictured: Professor Nicholas Canny, Vice-President for Research

Biocatalytic research to enhance medical devices

An international research project on bio-powered bio-electrochemical sensing systems which will bring together researchers from Ireland, the UK, Europe and the Middle East, is to be led by NUI Galway following a funding announcement of €2.8m by the European Commission.

The Specific Targeted Research Project (STREP) titled BIO-MEDNANO, will be led by Dr Dónal Leech, at the Department of Chemistry. It aims to develop biocatalytic fuel cells which will provide miniaturized, implantable power sources to drive many devices, including medical devices. Modern medicine increasingly demands the

monitoring and control of a range of medical conditions by sophisticated, miniaturised and integrated implantable devices. Current battery technology uses highly reactive lithium, making miniaturisation expensive and difficult, and thus biocatalytic fuel cells will be of significant importance in medical devices of the future.

Dr Leech explained the significance of the project, "Biocatalytic fuel cells represent a realistic opportunity for the provision of implantable power and there is enormous scope for the wider application of biosensors in the area of medical diagnostics, in environmental monitoring and in food quality.

"We are delighted to have secured this funding which will allow us to make important strides over the next number of years and we look forward to leading the way in research in this field."

The Biomolecular Electronics Research Laboratory, based at the Department of Chemistry, will conduct the research project, which is a collaboration between NUI Galway and research groups at the Hebrew University of Jerusalem, the University of Southampton, the University of Rome, Czech Republic company BVT Technologies, and Finnish organisations Abo Akademi and VTT Biotechnology.

Win-win scenarios for air quality and climate change

An integrated approach to tackling air quality and climate change could provide efficient solutions to both, according to a new report published by the Environmental Change Institute.

The report, edited by Dr Colin O'Dowd, Department of Experimental Physics and ECI, calls on European environmental researchers and policy makers to agree to an integrated

approach which could be cost-effective and mutually beneficial.

"The aim is to optimise cost-effectiveness and cost-benefit of abatement and mitigation strategies, which have win-win scenarios for air quality and climate change," said Dr O'Dowd.

The report is a strategic output document from the European funded ACCENT (Atmospheric Composition Change – A European Network)

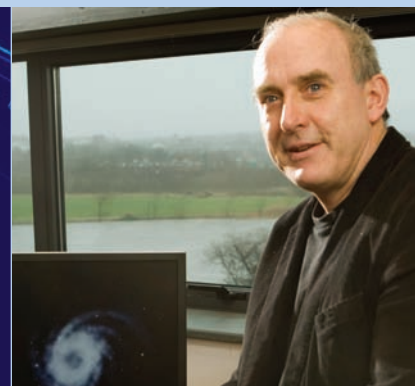
Network of Excellence. It brings together the views of leading researchers and policy contributors in Europe and the US and highlights the common research and policy issues relating to air quality and climate change for the future.

The report outlines strategies for harmonising research in support of policy development for the future in terms of common issues between air quality and climate change.

Research Matters is published by the Press & Information Office, in association with the Office of the Vice President for Research. Items for publication, views, comments, and suggestions are all welcome.

Please send these to: Michelle Ní Chróinín, Editor (Press & Information Officer). Email: michelle.nichroinin@nuigalway.ie

Focus on the Irish Centre for High-End Computing



The Irish Centre for High-End Computing (ICHEC) was created to meet the needs of a growing number of researchers whose work demands computing resources on a massive scale. Big computers have become inseparable from big science in areas as diverse as climate modelling to drug discovery and if countries are to compete as knowledge economies, they must provide superior computational facilities. The ICHEC provides Ireland's research community with such a facility. The centre is a distributed project administered from NUI Galway under the initial direction of the principal investigator, Dr Andy Shearer, Astrophysics and Scientific Computing Group, IT Department, with systems and support staff located in Dublin and Galway. The project is funded by grants totalling €5.2m from Science Foundation Ireland, with additional support from the Higher Education Authority through the PRTL1 3 programme Cosmogrid.

Launched in 2005, the ICHEC is now operating at full capacity, offering both a distributed memory system and a shared memory system for use by approved, non-commercial principal investigators all over Ireland. More than 100 projects have already been approved, including a number of initiatives led by researchers at NUI Galway. The ICHEC builds on Galway's expertise in high performance computing over more than a decade and has facilitated HPC projects in subjects ranging from bioinformatics to computational chemistry.

"In the future, much more science will be carried out 'in silica' before it is carried out experimentally, or in vivo," explains Dr Shearer. "In many cases, experiments can be simulated that can never be fully performed experimentally. High-performance computing is increasingly becoming an integral part of all science and engineering, from carrying out large-scale simulations to visualizing complex data sets."

The ICHEC's resources are being utilized by several research teams throughout the University. Dr Michael Hartnett is based at the Marine Modelling Centre at the Martin Ryan Institute (MRI). He says; "Ireland has a strong economic dependency on the sea, and projects that can give insight into high-impact events - such as storm surges or algae

blooms - offer a clear benefit to Ireland as a maritime nation. Our R&D project uses the ICHEC's computational resources to devise detailed ocean and estuary models which could help predict the timings and intensity of such phenomena."

A team led by Professor Peter E. McHugh, at the National Centre for Biomedical Engineering Science, is utilising the ICHEC's resources to perform large and highly non-linear simulations. "The expansion of vascular stents in bifurcated arteries is being addressed using finite element analysis, with a view to generating optimal stent designs and assessing the risk of damage to the arteries. Large simulations of the deformation of bone microstructures are also being performed, to quantify the deterioration of bone strength due to osteoporosis."

AIMS OF ICHEC

- Support world-class research programmes within Ireland
- Undertake collaborative research programmes in Ireland and the EU
- Provide access to high end computing facilities to students and researchers in Ireland
- Provide high performance computing training
- Increase the application of high end computing and Grid technologies
- Encourage and publicise activities conducive to establishing and sustaining a world-class high performance computing facility in Ireland
- Foster collaboration with similar in Europe and the rest of the world

Dr Aaron Golden, Bioinformatics, National Centre for Biomedical Engineering Science has developed novel pattern matching algorithms that have improved our understanding of how genes are expressed in normal and diseased cells. These are being used to identify new genes and ultimately entire genomes in DNA sequences extracted from ecological niches as diverse as the human gut and sea sponges. Such algorithms are computationally demanding, and significant use has been made of the ICHEC's shared memory machine, Hamilton.

The Astrophysics and Scientific Computing Group has been working on a number of HPC problems over the past ten years, ranging from enhancing medical X-rays to modelling pulsar

magnetospheres. The ICHEC facilities have allowed the group to expand and accelerate its project work, and the group has also been active in developing Grid computing in Ireland through the establishment of Grid-Ireland", according to Dr. Shearer.

Professor John Simmie, Combustion Chemistry Centre, explains the importance of the ICHEC to his work. "A fundamental understanding and a capacity for modelling both the underlying chemistry and combustion environments is vital in today's world of scarce natural resources. Simulation of combustion can involve highly complex mixtures, reactions, reactors and data. High-performance computing is an essential component in such work, complementing the unique set of laboratories dedicated to studying combustion in NUI Galway."

The purpose of the ICHEC goes beyond hardware, seeking to attract leading computational scientists to Ireland and build the country's reputation as a recognised centre for capability computing. Prior to the establishment of the ICHEC, HPC in Ireland was confined to a number of universities and institutes with limited resources. The ICHEC is proud to be a true collaborative effort among many third level institutions throughout the country, providing capacity and capabilities far in advance of what an individual establishment could offer.

On an international scale, the ICHEC has already propelled Ireland into the top three countries per capita in Europe for providing HPC research facilities. Ireland is now on track to offer HPC facilities in the realm of 15 Tflops/s by 2008.

"Irish researchers have the ideas and the ability to lead Europe in computational science," says Dr Shearer. "The ICHEC provides the advanced computational infrastructure that these researchers need today and it allows the hands-on training that is essential for upcoming computational scientists."

The partner institutions in the ICHEC are NUI, Galway, DCU, UCD, TCD, DIAS, Tyndall National Institute, UCC and NUI, Maynooth. The ICHEC facilities are open to all researchers in Ireland.

Pictured: Dr Andy Shearer, Principal Investigator at the ICHEC

Medieval text reveals Old Irish words

A unique Irish computistical textbook of the late seventh or early eighth century has recently been discovered in Switzerland. The manuscript was found in the library of the Benedictine monastery of Einsiedeln by Immo Warntjes (B.A. Göttingen), who is currently a Ph.D. student in the Department of History based at the Moore Institute.

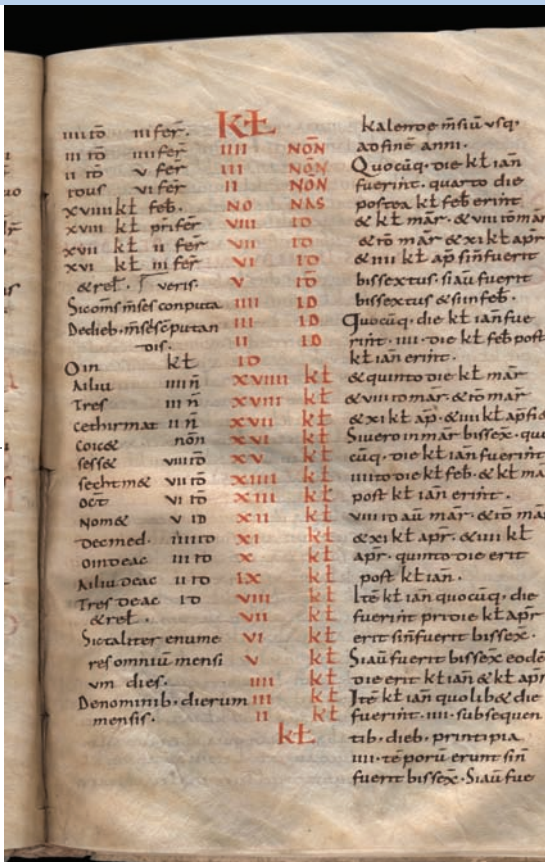
The new text, to be known as the *Computus Einsidlensis*, was uncovered as a result of the systematic search through early medieval manuscripts in Swiss libraries that is part of the Foundations of Irish Culture project, under the direction of Professor Dáibhí Ó Cróinín. The Irish laid the foundation of medieval computistics — the reckoning of time in general and the calculation of Easter in particular — which was the foremost science of the Middle Ages.

Since only two Irish computistical textbooks from this formative period were known up to now, the new discovery will contribute greatly to the

knowledge of Irish pioneering work in this area of medieval science. One of the fascinating features of the new *Computus* is the fact that it contains a considerable number of Old Irish words. Witnesses to the Irish language from this period are extremely rare, and therefore these Old Irish terms represent an important new contribution to the study of the history of the Irish language.

Meanwhile, the Moore Institute for Research in the Humanities and Social Studies at NUI Galway was officially opened in November.

The Institute provides scholars an opportunity to engage in research and innovative thinking to promote the better appreciation of human cultural and social achievements in past centuries, and the enrichment and improvement of our world today. It is called after the Moore family of Moore Hall in County Mayo whose members, in successive generations, sponsored such change in the west of Ireland over the course of four centuries.



Heritage goes global with e-archives

An exciting project is under way at the Department of English to create electronic archives and editions of historical and literary texts.

The Transfer of Expertise in Technologies of Editing 'TEXTE' project is led by Dr Sean Ryder, who alongside six postdoctoral European researchers will work with new technologies of imaging, text-encoding, electronic editing and hypermedia. By bringing traditional humanities disciplines such as literature and history into contact with advanced computer technology and software design, the project represents a major interdisciplinary initiative, and will enable the University to become a major international centre for this expanding field of research.

According to Dr Ryder, electronic editions and web-based archives of important historical and literary works make cultural heritage globally accessible. "New technologies can have a profound effect on the way we interact with literary works. A digital edition of the work of Thomas Moore's *Irish Melodies*, for example, can give the reader a rich experience by supplying not just the words of Moore's poetry, but also recorded performances of the songs, images of the original illustrations and manuscripts, facsimile musical scores, archived broadcasts and hyperlinks to a wide range of online historical information and critical opinion. By using hypermedia a vast body of information can be

instantly searched, retrieved and organised by anyone with access to the World Wide Web. The astonishing potential of such electronic texts for readers and scholars is only beginning to be realised."

The six TEXTE researchers will be hosted by the Moore Institute for Humanities and Social Studies between 2006 and 2010. They will give training workshops for staff and students to demonstrate current theories and techniques of digital editing and electronic text creation. The project will also fund staff and researchers at the University to attend workshops and observe projects underway at eight international centres of expertise, including the universities of London, Oxford, Birmingham, Leicester, Munich, Antwerp, Ghent and Virginia. The project will build upon the expertise and infrastructure created by previously-funded programmes at the Institute, including the PRTL 2 research agenda funded by the HEA, and the Thomas Moore Hypermedia Archive, funded by the Irish Research Council for the Humanities and Social Sciences.

TEXTE is one of only two Social Science/Humanities projects from across Europe to be funded in the 2005 round of Marie Curie Actions, receiving a grant of over €1m. It was selected from a total of 289 proposals drawn from the social sciences, physical sciences and engineering.

Developing sustainable eco-industries



A project to develop innovative environmental technologies for treating wastewater from small towns and villages is being carried out by a team of environmental researchers from the Department of Civil Engineering and the Environmental Change Institute. The research is a major initiative in developing sustainable environmental products and services for the domestic and export markets, as well as meeting the requirements of EU directives on water quality. "This project is a strategic step towards developing the knowledge, skills and products Ireland will need in order to command a strong stake-hold in the burgeoning environmental technology industry,

which is one of the fastest growing sectors in the EU, supplying €183 billion worth of goods and services a year," said Dr Michael Rodgers, Department of Civil Engineering, NUI Galway, who heads up the research.

Dr Rodgers will work alongside a team of engineers and scientists from Ireland, China, Denmark, Spain and Poland. The present value of the team's contracts on such national and international environmental research projects is in excess of €2.2 million.

The three-year research grant is co-funded by the Environmental Protection Agency (EPA) under the EU Environmental Technologies Action Plan (ETAP),

and the National Council for Forest Research and Development (COFORD) under the National Development Plan.

The team will design and develop technologies to clean wastewater for discharge to any surface or groundwater body. The research will provide the basis for a unique Irish water and waste facility for leading edge research, knowledge creation, graduate training, and the development and commercialisation of eco-innovative environmental technologies. There is also scope for education, public information and policy planning.

Pictured: Dr Michael Rodgers

Stem cell trials move spinal cord research forward

REMEDI scientists have begun preclinical testing on Neural Stem (NS) cells as part of ongoing research on the use of stem cells in treating spinal cord injuries. The trials are in collaboration with Stem Cell Sciences (SCS), the global biotechnology company which develops commercial stem cells. The initial study will examine the ability of the NS cells to provide functional improvements in models of spinal cord injury at REMEDI.

Stem Cell Sciences' NS cells are unique in that they can be grown in serum-free and feeder-free cell culture conditions. Potentially, this makes them very effective when used in a variety of cell-based therapeutics.

Professor Frank Barry, REMEDI's Scientific Director and a world-leading scientist in stem cell therapy, said: "For REMEDI to be able to evaluate a 'best in class' Neural Stem cell in conjunction with a world-leading company is a great opportunity for us, and underscores the efforts we are making in Ireland in finding novel therapeutic solutions for currently incurable conditions."

SCS's Chief Scientific Officer, Dr Tim Allsopp said "It's a really exciting opportunity for us to test our NS cells in preclinical models of spinal cord injury".

"We will examine how the cells remain viable, engraft and support natural repair processes. We are really pleased to be collaborating with NUI Galway's Regenerative Medicine Institute".

Initial study results are expected in the first quarter of 2007. If this study proves successful, Stem Cell Sciences and REMEDI plan to expand the collaboration with more extensive testing.

Dr Daniel O'Mahony, Director of Technology Transfer at NUI Galway said, "We are bringing together two technology leaders in their respective fields in the development of new treatments for spinal cord injury. This collaboration between REMEDI and SCS reinforces our commitment to industrial collaborations and to progressing technologies from the laboratory to the market place."

REMEDI is also engaged in researching the role of bone marrow stem cells in the treatment of childhood leukaemia. Funded by the Children's Leukaemia Research Project, the project is in collaboration with Dr Michael Carty, at the Department of Biochemistry. It involves an investigation of how stem cells are affected by chemicals that are commonly used in the treatment of leukaemia, and by radiation therapy which is used prior to bone marrow transplants. Childhood leukaemia is caused by the abnormal

growth of certain types of blood cells. Blood cells are derived from cells in the bone marrow, which includes a type of stem cell called the mesenchymal stem cell.

"Mesenchymal stem cells are thought to play a role in supporting the growth of blood-forming cells, as well as going on to form cells of tissues such as bone and cartilage," said Prof. Barry.

"Given their importance in the bone marrow environment it is important that we understand their behaviour during the treatment of leukaemia". Current treatments for leukaemia use drugs or radiation to destroy the cancer cells by damaging the genetic material or DNA of the cell.

However, the effect of these agents on the other cells present in the bone marrow is not clear. The research will look at the effects on MSCs of chemotoxic agents used in the treatment of leukaemia, focusing on key DNA damage responses in the cells.

"The research will be important in helping to understand what happens to these stem cells in patients being treated with chemotherapy or radiation therapy for childhood leukaemia," said Dr Carty.



Photonics experts lead Irish interests in EU strategy

Two scientists from NUI Galway have been chosen to represent Ireland's interests in a European initiative to develop a strategic research agenda for lasers and optics. Photonics 21 is a European initiative with the aim of bringing industry and academia together to establish R&D priorities to improve competitiveness and economic growth in Europe using light-based technologies. These technologies are used in communications, lighting, displays, lasers, sensors, machine vision, life sciences and many other applications.

Professor Chris Dainty of the Applied Optics Group chaired the Photonics 21 Working Group on Photonics Research, Education and Training, while Dr Gerard O'Connor of the National Centre for Laser Applications was a contributing member and secretary of the Industrial Production, Manufacturing and Quality Working Group. Both scientists were chosen to play a prominent role in the formation of the initiative due to the prominent roles that their respective research groups play in the pursuit of fundamental, applied and industrial research in laser and optical technologies.

The Photonics 21 Strategic Research Agenda contributes guidance from technology leaders directly to the European Commission, which is currently developing major funding plans for scientific research and industrial development. The Agenda will include a coordinated approach for R&D investment at European, national and regional levels.

Meanwhile, the University's Atlantic Laser and

Optics Forum (LightForum) recently held its first meeting where the expanding role of photonics in manufacturing was discussed. A number of invited international speakers addressed a range of topics related to photonics in industry and society in general. New initiatives designed to make the interaction between industry and the photonics research community simpler and more effective were also discussed. Tony Flaherty of the National Centre for Laser Applications, NUI Galway, explained, "Although we may not all realise it, photonics has long been a fundamental technology in areas of manufacturing such as telecommunications and information technology. More recently, photonics has become mainstream in areas such as medicine, where poor eyesight is being remedied by laser treatment, and in manufacturing, where laser processing is rapidly becoming the industry standard for many applications. As the use of photonics across industry expands and the Irish economy adapts to become a high-tech knowledge economy, the strength of our photonics research and expertise will be critical."

The Atlantic Laser and Optics Forum provides a framework in which scientists and professionals in industry and the University can explore and develop interactions of mutual interest.

The Forum is free to professionals in Irish industry and more information is available at <http://www.nuigalway.ie/lighthouse/news3.html>

Superbugs 'hope' for CF sufferers

Burn victims and cystic fibrosis sufferers could benefit from the latest research into hyper-resistant bacteria, often known as superbugs, at the Department of Microbiology. The three-year study, by postgraduate Paul McCay, under the supervision of Dr Ger Fleming, examined the cross-resistance of a particular strain of bacteria to both antibiotics and disinfectant.

The research focused on *Pseudomonas aeruginosa*, an opportunistic pathogen often associated with burn wound sepsis or sufferers of cystic fibrosis and is frequently connected with hospital acquired pneumonia. The University team developed a highly resistant strain of the bacteria and mixed it with the original strain, and a very low level of either antibiotic or disinfectant.

It was discovered that when low levels of antibiotic or disinfectant were present, the ordinary strain of the bacteria was significantly disadvantaged and the superbugs became dominant. The superbugs were also found to be more readily resistant to other types of antibiotic or disinfectant when they were subsequently introduced. Furthermore, superbugs with antibiotic resistance also had resistance to disinfectant, even though the disinfectant had never been present,

suggesting a strong link between the development of resistance to antibiotics and disinfectant.

Dr Fleming said: "This could have major implications for those administering antibiotics. Firstly, for burn victims and cystic fibrosis sufferers, infections can be long-term. While treatment with antibiotics is the obvious solution this approach is sometimes quite broad and if one antibiotic does not work, we switch to another. However, we may in fact be selecting for resistance and developing an even stronger pathogen. Secondly, disinfectant-tolerant bacteria are emerging more often and this may contribute to antibiotic cross resistance."

With funding from the Research Frontiers Programme, administered by SFI, and the Embark initiative, Paul McCay is one of only a few researchers in Ireland or Britain that utilises long-term selective chemostat cultures for investigations. Using a chemostat culture system, which mimics a natural environment, a highly resistant strain of the bacteria can be grown and, in theory, grow indefinitely. This better mimics how bacteria behave in the natural environment while allowing bacteria to mutate, evolve and "adapt" to selective agents such as antibiotics and disinfectants.

Fourth-level graduates to address pressing energy issues



Twenty new researchers are to be recruited to the Microbial Bioenergy Group at the Environmental Change Institute to conduct research into bio-fuel following a €2m award under the prestigious Charles Parsons Research Funding Awards scheme. The funding will enable the University to put highly skilled fourth level graduates to work at addressing some of the most pressing energy issues facing Ireland today.

The team will aim to produce improved bio-fuels from organic wastes such as domestic sewage. It will also research highly novel microbial and bio-fuel cells, which produce electricity through the action of naturally occurring bacteria.

The Microbial Bioenergy research group is jointly led by Dr Vincent O'Flaherty and Dr Dónal Leech, from the Departments of Microbiology and Chemistry, respectively.

The project coordinator, Dr O'Flaherty said, "The Charles Parsons Award will help NUI Galway to develop and deploy new energy technologies which are essential to deliver security of supply, sustainability and competitiveness to Ireland.

There is a particular and urgent need for research into producing viable alternative energy sources to tackle Ireland's reliance on fossil fuels."

Microbial fuel cells (MFC) produce electricity through the action of naturally occurring bacteria that drive power production by breaking down organic substrates in, for example, wastewater and then transporting electrons from their cell surface to the anode, the negative electrode of a fuel cell. The electrons flow from the anode through a wire to a cathode, the positive electrode of a fuel cell, where they generate electrical potential and combine with oxygen to form water. An added benefit of the approach is that as the bacteria generate electricity, pollutants are also removed, cleaning the wastewater. The power outputs reported thus far from MFC are usually small, but this is expected to change in the coming years as research continues. In addition, MFCs can be used to produce hydrogen directly from organic wastes for use as an alternative vehicle fuel.

"There is real potential for MFCs to accomplish both wastewater treatment and electricity

generation at a large-scale in the future, with sanitation and energy benefits for both developed and developing countries," added Dr O'Flaherty.

The Charles Parsons Research Funding Awards scheme was named after Irishman Charles Parsons (1854-1931) who, in 1884, invented the steam turbine, which made affordable electricity readily available for the first time. The competition was open to institutes and groups from all thirty-two counties and applicants were evaluated by an international panel of experts, as part of the highly competitive process in which only seven awards were made nationally to cutting-edge research groups.

Pictured: Minister for Communications, Marine and Natural Resources, Mr Noel Dempsey, TD; Dr Vincent O'Flaherty, NUI Galway's Microbial Bioenergy Group; and Professor Nicholas Canny, Vice President for Research, NUI Galway.

Flagship project integrates business with semantic technologies

Key next generation technologies for the internet, which will be the backbone of Ireland's knowledge economy, are being developed at the Digital Enterprise Research Institute (DERI). DERI is developing technologies enabling people, organisations and systems to better collaborate and interoperate through the use of semantics (tagging data to allow computers understand its meaning).

Data Information and Process Integration (DIP IST - 507483) is an Integrated Project, funded by the European Commission, which has involved 20 partners and tackles the integration of business services through a combination of Semantic Web and Web Service technologies.

The Semantic Web is an extension of the current Web which is readable by machines facilitating the

delegation of certain classes of task to intelligent computer agents. Web Services are computer programmes which by be invoked over the Internet using standard protocols and can act as proxies for business services.

By semantically describing Web Services, DIP provides a platform where many of the steps involved in application development are automated. Additionally, the DIP architecture enables the construction of brokers able to mediate between the goals of a client or consumer and the capabilities provided by online services.

DIP technologies were tested in three key areas: Telecommunications, eBanking and eGovernment. Deployment was extremely successful and led to a new €1m internal project, incorporation of DIP technologies within a corporate strategy plan and a

new government-funded project. The DIP framework now underpins a raft of new EU projects with a combined funding of over €70m. Following a review on its completion in December, the project was declared "a flagship project" and "a paragon of collaborative research."

Other projects involving the semantic web are being conducted at DERI where a team of over 80 researchers is based, the biggest of its kind in the world, working on many aspects of the digital society ranging from the public sector (e.g. health or governmental administration), to the personal domain (e.g. community portals which support novel ways for people to share information and interact), to industry-linked implementations.

Award success at home and away

Dr David Finn, a lecturer in the Department of Pharmacology & Therapeutics, has won a major award in the UK for his ongoing work in the areas of pain and anxiety. Dr Finn was awarded the prestigious 2006 Wyeth Pre-Clinical Award, by the British Association for Psychopharmacology, at a ceremony in Oxford. The award for outstanding research in preclinical psychopharmacology recognised Dr Finn's work over the past six years including his research during his PhD at the University of Bristol, his postdoctoral period at the University of Nottingham and his recent work here at NUI Galway.

Dr John Breslin was among the winners at the Irish Internet Association's Net Visionary Awards. A researcher and adjunct lecturer at DERI, John won the Online Trader award for his website adverts.ie/boards.ie. The site, which has over 5.5 million postings from about 90,000 members, is a forum for topics of Irish interest,

-ranging from arts and society to business and technology. This is John's second IIA award which is unique in that it is nominated and voted upon by members of the public.

Three students have been awarded Fulbright Awards which have taken them to universities across the United States for the academic year 2006-2007.

Jennifer Cruise is studying for a Masters in Mathematics at New York University; Brian O'Donnchadha, whose PhD is in Education, is spending the year with Campus Compact in San Francisco; while Garry Duffy is in the Georgia Tech/Emory Centre for the Engineering of Living Tissues in Atlanta, where he is researching his PhD in Medical Science. The University also welcomes two American Fulbrights, Professor Nichola Devereux at the Department of Physics and Hannah Zdansky, who is studying for a Masters in Irish Studies.



Pictured from left to right: Colum Lyon, Chairman of the IIA; John Breslin, DERI and Stephen McDonagh, sponsor Realex Payments

Software to identify hazardous substances

A suite of software products for accurate, rapid identification and quantification of materials, including illegal narcotics, explosives and medicines has been developed by a team of researchers at the Department of Information Technology and the Department of Chemistry.

The Hazard-IQ technology can be used in many different practical applications such as airport security screening, poison testing at accident and emergency departments, and on-the-spot forensics analysis. The intelligent software has been developed by Dr Michael Madden, Department of Information Technology, and Dr Alan Ryder, Department of Chemistry and the National Centre for Biomedical Engineering Science.

Hazard-IQ automatically learns to identify hazardous and illicit substances, by examining a wide variety of

samples that have been prepared in a lab. Hazard-IQ has been 'trained' to recognise different categories of drugs, poisons, and explosive and corrosive materials, and estimate their concentrations accurately. It can then recognise new samples within milliseconds.

Hazard-IQ identifies the components of mixtures and estimates their concentrations, by combining Raman Spectroscopy – which is a laser-based method for 'chemical fingerprinting' of materials – with Machine Learning, which is a family of analysis techniques that automatically improve with experience.

Drs Madden and Ryder developed the novel technologies and software with support from Enterprise Ireland as part of the Commercialisation Fund for Technology Development.

Ethics committee to support researchers

Ethical awareness and conduct has long been a key aspect of research at the University. The recent establishment of the Research Ethics Committee (REC) provides an aid and support to researchers in maintaining exemplary ethical standards in research across the institution.

The REC is committed to supporting rigorous and objective inquiry and supports academics in pursuing their research in an environment that affirms academic freedom. Researchers have a responsibility to society, to their profession, to the University and to the funders of their research, to accept full responsibility for the professionalism and integrity of all aspects of the conduct and publication of their research, and for the activities of any staff and students under their direction.

REC members are drawn from a wide cross section of University staff, both internal and external, including clinicians, scientists, engineers and social scientists, while lay members bring a wider perspective to the debate.

The REC has published Standard Operating Procedures and Guidelines for completing its application form. These have proved to be very useful documents for applicants who can also receive support and further information from the Research Office.

For further information see www.nuigalway.ie/ro/ethics.htm or contact the Research Office on (091) 492034