



National University of Ireland, Galway
Ollscoil na hÉireann, Gaillimh

Research Matters

Cúrsaí Taighde in Ollscoil na hÉireann, Gaillimh

Developing Cardiac Muscle Tissue to treat Heart Disease

The National Centre for Biomedical Engineering Science (NCBES) brings together engineers, IT specialists, physicians and scientists in a shared, team-based and problem-centred approach to research.

One of the most exciting research programmes currently under way at the NCBES involves cardiac muscle tissue engineering. This offers the potential to improve the quality of life of thousands of people world-wide who suffer from heart disease.

The repair of cardiac muscle after a heart attack is limited due to the poor regeneration or repair potential of cardiomyocytes in the damaged tissue. Dr Valerie Barron, a Senior Researcher in the Biomechanics Group at the NCBES is currently working on a project to develop cardiac muscle tissue with the aid of a €170,000 SFI Research Frontiers Programme grant.

“The main aim of our research is to develop functional cardiac muscle tissue using a biomaterials approach for the repair or regeneration of damaged tissue,” explains Dr Barron. “This will represent a significant breakthrough in cardiac surgery and medicine, as there is currently no optimum functional cell therapy or tissue available for damaged cardiac tissue.”

A heart attack occurs when the blood supply to the heart muscle is severely reduced or stopped. If the blood supply is cut off for more than a few minutes, the muscle cells die or suffer permanent injury.

At present, many reliable clinical therapies address the issue of reduced blood flow to the heart, but there are few viable treatments available to address the problem of damaged cardiac muscle.

For long-term medical implants and devices to be



successful in patients, their design must take account of the physical and mechanical properties of both the implant and the tissues with which they interact. Characterisation of these properties will support advances in disease diagnosis, surgical planning, and prosthesis design.

As group leader of the cell biomechanics experimental research group, Dr Barron has developed a machine to replicate the biomechanical action of the heart. The machine, which recreates the environmental conditions of the heart, takes account of body temperature (37 degrees) and 100% humidity, which conditions and enhances arterial tissue growth.

“This method strengthens the cells and also allows for them to be tested in a human environment, reducing the ethical dilemmas posed by repeated animal testing,” says Dr Barron.

The machine has been mechanically validated and Dr Barron and her team have secured an Irish patent, which enables the University to licence the machine to companies, enabling it to be developed on a commercial scale.

Further research is being conducted to develop electrophysiological cardiac muscle tissue using a biomaterials approach in collaboration with Dr Mary Murphy at REMEDI. This approach would then stand a much better chance of integrating with the heart muscles and therefore lead to a greater chance of successful treatment.

This research is particularly important in Ireland where in 2003, diseases of the circulatory system accounted for 39% of all deaths, 24% of which were as a result of heart attack, stroke, and blood vessel diseases.

Photo: Dr Valerie Barron, NCBES.

RESEARCH MATTERS

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Renewable Energy Research focuses on Solar Power

As global supplies of fossil fuels continue to dwindle, the demand for alternative energy is growing at a tremendous rate. Solar and wind power are becoming viable options for countries worldwide whose governments have signed up to the Kyoto Protocol to promote renewable energy.

The Power Electronics Research Centre (PERC) at NUI Galway has been awarded €380,000 by Enterprise Ireland's Commercialisation Fund to develop an energy management system to optimise the generation and storage of solar power.

Germany and Denmark have already committed huge resources to research and development in this area. The grant from the technology development fund allows PERC to raise the profile of research in renewable energy in Ireland.

Maximum Power Point Tracking enables the maximum power to be drawn from the solar panel under varying atmospheric conditions. The solar panel is integrated with power conversion equipment and a micro controller to continuously track the maximum power available from the panel. The panel charges a battery which stores the power for later use.



Maximum Power Point Tracking is predominantly used in systems where the use of a large number of solar panels is not possible. It is used in solar powered vehicles and satellite communication circuits but can also be used in solar powered homes and businesses to optimise the power delivered to the storage batteries.

Maximum power point tracking principles can also be employed in wind-powered applications.

"Global warming and harmful greenhouse gases are major concerns in today's world", says

Professor Ger Hurley, Director of the Centre. "Power electronics is an enabling technology that allows us to tackle these issues through engineering research."

A solar power generator will be built in the Department of Electronic Engineering's facility at Nun's Island to demonstrate the technology and to raise public awareness of the issue.

The PERC was established in 1992 under the Programme of Advanced Technologies (PATs) and has generated more than €2.5m in research funding and income from technology transfer.

The Centre has established collaborative links with the Massachusetts Institute of Technology (automotive electronics), the Czech Technical University (magnetic sensors), Harbin University, China (battery technology) and the City University of Hong Kong (sensors and solar).

This Enterprise Ireland research award builds on these collaborations and aims to raise the profile of research in renewable energy in Ireland.

Professor Ger Hurley, Director of the Power Electronics Research Centre and PhD student Sarah Armstrong

Laser Processing Centre awarded significant funding

Research at the National Centre for Laser Applications (NCLA) has been recognised with the recent award of €700,000 from the Enterprise Ireland Commercialisation Fund. The funding will support two projects focused on the development of new techniques in laser processing.

The first project, *Development of a Process for Zero-Particulate Laser Machining of Medical Devices* led by Tony Flaherty, is based on the use of hybrid laser machining techniques to rapidly drill clean, high-precision holes in polymer materials. The industrial focus of the work is on the development of efficient processing routes

for next-generation catheter devices.

The second project: *Beam Delivery System for Advanced Laser Micro-machining* is led by Sebastian Favre and focuses on the development of real-time adaptive beam delivery techniques for application in the manufacture of novel micro-electro-mechanical structures (MEMS).

From the Editor

Welcome to this edition of Research Matters. It has been a busy year so far for researchers at NUI Galway, with over €6.2 million in research grants being awarded across the campus and in all disciplines. The research reputation of the University continues to grow and it is great to see international students coming to the campus to experience the dynamic and creative research environment here, through the UREKA programme.

The breath and depth of research now being actively pursued by NUI Galway researchers is reflected in these pages, from human health and well-being to the well-being of our planet. In this edition we focus on the Centre for Irish Studies, whose objective is to mine the rich seam of cultural, social and political endeavour among Irish people at home and abroad. The Centre is led by Dr. Louis De Paor, a poet of repute in his own right, who has a real commitment to teaching and learning in this area.

Our thanks to all staff who have contributed to this edition of Research Matters. We are always keen to hear about your research programmes. Through this and other outlets, the broader community can learn about some of the fascinating projects underway in NUI Galway and the University's research profile can continue to be enhanced.

Máire Mhic Uidhir,
Editor

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

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Focus on

The Centre for Irish Studies



Dr Louis de Paor, Director, Centre for Irish Studies with postgraduate student, Ms Nessa Cronin



From left to right: Saurabh Kumar, Indian Ambassador, Professor Tadhg Foley, NUI Galway, Suleleha Kumar, at the fourth Galway Conference on Colonialism

The Centre for Irish Studies was established in Autumn 2000 and is dedicated to research and advanced teaching on the cultural, social and political endeavours of Irish people, on the island of Ireland and beyond. The Centre's premises were subsequently refurbished through a private endowment and an extensive programme of teaching and research is now accommodated at Martha Fox House, Distillery Road.

TAUGHT PROGRAMMES

In the current academic session, more than 400 students have registered on taught courses in Irish Studies, including 158 students on the Centre's online programme, the first of its kind worldwide, and the first online programme offered by NUI Galway. Taught programmes at the Centre include

- MA in Irish Studies
- Diploma in Irish Studies
- Online Diploma/Certificate in Irish Studies
- Summer School in Irish Studies
- Customised programmes in Irish Studies

IRISH INTELLECTUAL HISTORY

In keeping with the University's policy of identifying prioritised research areas, the Centre for Irish Studies, in close collaboration with identified and confirmed partners, both national and international, has embarked on an ambitious research programme in Irish Intellectual History which will investigate the production, distribution and reception of ideas by Irish people on the island of Ireland and elsewhere.

Outcomes of the programme to date include:

- the publication of a new series of research essays from some of the foremost scholars in the world of Irish Studies, including Joep Leerssen's *Hidden Ireland, Public Sphere* (2002), Luke Gibbons' *Gaelic Gothic* (2004), and Breandán Ó Buachalla's *The Crown of Ireland* (2005).
- 'Translating the Brehon Laws: Gaelic Antiquity as Ideological Project', a post-doctoral research project co-supervised by Prof. Joep Leerssen, Director of the Huizinga Institute. This project

represents a first and seminal Irish contribution to Prof. Leerssen's pan-European study of National Thought and Cultural Learning, the most ambitious contemporary European research project in the humanities and social sciences with more than 30 countries and languages involved.

- the publication of Heather Laird's *Subversive Law in Ireland 1879-1920: From 'Unwritten Law' to the Dáil Courts* (Four Courts Press 2005), described by David Lloyd as 'a magnificent and indispensable contribution' to Irish and post-colonial studies.
- a series of research seminars on Utopian thought in Irish culture and history, co-hosted with the Ralahine Centre for Utopian Studies at the University of Limerick.
- an annual public lecture series with contributions from some of the most eminent scholars in the various disciplines of Irish Studies, including Prof. Breandán Ó Buachalla, Dr Angela Bourke, Prof. Declan Kiberd, Dr Niamh O'Sullivan, Prof. Tony Crowley, Dr Micheál Ó Cearúil, Dr Piaras McÉinrí.
- a series of international interdisciplinary conferences, including the Twelfth Irish Australian Conference (June 2002); The Irish Hero (June 2004); India and Ireland: The Fourth Galway Conference on Colonialism (June 2004).
- the publication of *Remembered Nations, Imagined Republics: Proceedings of the Twelfth Irish Australian Conference* (September 2004), edited by Louis de Paor, Maureen O'Connor, and Bob Reece.

VISITING RESEARCHERS

The contribution of visiting researchers is a crucial element in the prosecution of the Centre's research agenda. Among the topics covered by recent visitors are:

- representations of Spain and the Basque Country in nineteenth-century Irish writing (Dr Asier Altuna)
- the social and cultural history of Irish television

(Prof Rob Savage),

- Gaeltacht perspectives on emigration (Prof. Kenneth Nilsen)
- challenges to Irish democracy since 1922 (Prof. Richard Finnegan, Prof. Mike Cronin)
- the new theory of subjectivity underpinning classical economics (Dr Gordon Bigelow)

Visiting researchers in the forthcoming academic session will include Eiichi Hishikawa (Kobe University), Félix Flores Varona, from Cuba, Chunyan Lu, (Hebei University, China), and Philip O'Leary (Boston College).

IACI FELLOWSHIP

In partnership with the Irish American Cultural Institute, and the Faculty of Arts, the Centre offers a Visiting Fellowship in Irish Studies each year to enable a distinguished scholar from the United States to further his/her research at NUI Galway. Recent recipients of the fellowship include Adrian Frazier, formerly of Union College and now Director of the MA in Writing at NUI Galway, Catherine Shannon (University of Massachusetts), Richard Finnegan (Stonehill College), Robert Savage (Boston College), and Kenneth Nilsen (St Francis Xavier University). The recipient of the IACI Fellowship for the next academic term is Professor Philip O'Leary of Boston College, who is currently working on the third volume of his monumental history of prose fiction in the Irish language.

POST-GRADUATE RESEARCH

There are five students currently registered on the PhD programme at the Centre and three engaged in the MLitt. In November 2004, Ms Nessa Cronin became the first student of the Centre for Irish Studies to be awarded a Government of Ireland Fellowship for her doctoral research on the cultural history of cartography in Ireland.

The Centre for Irish Studies is a bilingual workplace and welcomes researchers working through the medium of Irish.



Longterm Research in Kinsale Harbour to continue

A monitoring project that has produced novel research and provided excellent training to students at NUI Galway for the past 27 years is to continue with the signing of a research agreement between the Zoology Department, the Martin Ryan Institute and the pharmaceutical company Eli Lilly.

The project, which has been ongoing since 1978, focuses largely on invertebrate animal community structure and habitat quality in the sediments of Kinsale Harbour, Co Cork. The harbour, which lies on the River Bandon estuary, has proved to be a fascinating, highly dynamic system.

The renewal of the research agreement, worth €472,000, will continue the work started by the late Professor Brendan Keegan, which has generated a unique time series data that is of great value to all stakeholders in the area.

Co-ordinated by Dr Bob Kennedy, the programme will continue to provide an excellent model system for the study of all aspects of marine ecology.

The coming phase of the programme will focus on:

- continuing the benthic survey in the harbour and approaches
- consolidation and interrogation of the extensive time series, including GIS development
- investigation of species roles in ecosystem process (biogeochemistry) in soft sediments
- water quality model development for nutrients and hydrography
- monitoring of intertidal communities, particularly mussel settlement dynamics

Eli Lilly has actively encouraged the development of new techniques and technologies to improve and add value to the monitoring programme. The company has directly and indirectly funded 12 PhD students and numerous undergraduates in the course of the study. Eli Lilly has also established the Prof. Brendan Keegan Memorial Studentship in Benthic Ecology as a separate fund valued at €45,000 to support a PhD student to work on the Harbour Study programme.

Pictured: Professor Wallace Arthur, Dept of Zoology, MRI signs the agreement with Donal Johnson, Eli Lilly Ireland.



Review shows enthusiasm key to Telehealthcare development

A review of telehealthcare services in the Health Service Executive North West and Western Areas, by Dr Anne MacFarlane of the Department of General Practice, NUI Galway, has found that the enthusiasm of service providers in such schemes can drive their development in rural and island communities.

Telemedicine or telehealthcare refers to the application of information communication technologies to health care delivery. Telehealthcare is not new and has been associated with the potential to improve access to health services for people living in remote parts of the country for some time.

Telehealthcare may also enhance communication between health care providers and impact on cost-effectiveness of service delivery.

A tele-radiology service, for example, saves people living in Clifden a round trip of approximately 100 miles as x-rays are taken locally and transferred digitally to University College Hospital Galway.

The review, undertaken between August 2002 and September 2003, is believed to be the first systematic review of telehealthcare in Ireland.

Eleven services in counties Donegal, Galway and Sligo were identified during the review process where it was found that successful telehealthcare services that endure over time are typically spear-headed by one or two enthusiastic service providers.

The enthusiasm of these service providers appears to motivate others working with them to get involved, creating a multidisciplinary 'network' of clinicians, technicians and administrators. Professionals within this network are very willing to learn how to use new technology and are also willing to take on additional tasks and duties in their working day for example, in order to arrange appointments for telehealthcare services or assist patients and other clinicians who are using the technology.

Some of those involved in telehealthcare services also emphasised that video-conferencing allows professionals to communicate with each other for case conferences, such as a tele-cardiology service between Sligo General and St. James's hospital in Dublin. The potential for educational sessions for continuing professional development was also emphasised. This could have consequential benefits in terms of attracting and retaining staff in rural areas. Dr McFarlane's review concluded that resources should be provided to support the work of those involved in telehealthcare services to maintain their enthusiasm and sustain the services that have been developed. For new initiatives, it would be valuable to use consultation exercises to identify key people and places that are likely to foster the kind of enthusiasm required to develop telehealthcare.

Pictured: Dr Anne MacFarlane, Dept of General Practice, Professor Martin Cormican, Dept of Bacteriology and Mr Darach Glennon, HSE-Western Area.

Emotional Support can maintain a Healthy Heart



The relationship between stress and heart disease is the subject of a study carried out by Dr Brian Hughes at the Department of Psychology, who is investigating the link between blood pressure and social support. The study is funded by the Irish Heart Foundation.

Research has found that cardiovascular health is characterised by relative stability in blood pressure, whereas widely fluctuating blood pressure is associated with increased risk of heart disease.

It also suggests that people who have significant stress in their lives are more likely to experience wide fluctuations in blood pressure and are therefore more at risk of developing an unhealthy heart.

When a person suffers a heart attack or undergoes heart surgery, many cardiologists seek to offer their patients emotional as well as medical help. Family and friends are the main providers of this social support that is deemed an important factor in preventing heart disease, as it is known to reduce blood pressure responses during stressful situations.

However in some cases, social support has the opposite effect, with people finding that the help being given by the other person increases their stress levels, leading to a significant rise in blood pressure.

Dr Hughes' study examines the effect support from others can have on a person's stress levels.

The study involves evaluating blood pressure of a group of healthy young adults as they respond to varying degrees of stress in a cardiovascular psychophysiology laboratory. Some are offered social support to cope with stress, others are given an alternative interaction while the third group undergoes blood pressure evaluations alone.

The participants are also subjected to rigorous psychometric testing so that a range of personality traits can be incorporated into the analysis of the blood pressure data.

Blood pressure responses are measured before and after the provision of social support so as to allow for the incorporation of different 'normal' blood pressure responses to be compared with socially supported blood pressure responses in the same people. This has not been done in much of the previous research in cardiovascular psychosomatic medicine.

Dr Hughes said the link between blood pressure and stress has been studied for over 30 years.

"The ability of a friend or a companion to help a person keep their blood pressure from increasing has been studied for decades," he said.

"Recently, a television quiz show awarded prizes to contestants who could, with the assistance of a companion, answer questions without allowing their heart rate to rise above a certain level.

"The quiz, which was hosted by the hot tempered tennis legend John McEnroe, more or less mimicked the format of studies conducted by psychologists and cardiologists since the 1970s."

The Irish Heart Foundation places great emphasis on social support as an important way of improving cardiovascular health and preventing premature deaths from heart disease.

Dr Hughes' study is relevant to the work of the Irish Heart Foundation in raising further awareness and knowledge of risk factors for heart disease, in establishing important aspects of cardiac rehabilitation that can be used to enhance cardiac rehab courses and in providing information for the Foundation's education literature.

The study also contributes directly to the Foundation's research mission by exploring new and better ways for the prevention and treatment of heart disease.

Pictured: Dr Brian Hughes, Department of Psychology

Environmental management becomes focus for Irish companies

Environmental management has become a strategic business issue for Irish companies. The ability of firms to reduce environmental impacts in an economically competitive manner is the focus of a research project to be headed by Dr Rachel Hilliard, at the Department of Management, NUI Galway.

Funded by the Environmental Protection Agency under their environmental research programme, the €180,000 project will run for 12 to 18 months. Dr Hilliard will work with researchers from the Center for the Management of Environmental and

Social Responsibility at INSEAD, one of the world's leading business schools in Paris, and the Center for Economic and Environmental Development at Allegheny College, Pennsylvania.

A senior researcher, Dr Don Goldstein, is being funded as an EPA Fulbright Scholar to participate in the project, which will examine whether organizational capabilities affect firms' abilities to reduce environmental impacts in an economically competitive manner.

Dr Hilliard, who is based at the Center for Innovation and Structural Change (CISC), is hoping

to build on her previous research at DCU Business School where she examined the role of dynamic environmental capabilities in the uptake of cleaner technology in the Irish pharmaceutical industry.

The current project will look at other industries in Ireland and it is anticipated that its outcomes, as well as contributing to the academic understanding of this important area of innovative activity, will have application for policy-makers and practitioners.



Developing Biogas – A Sustainable and Renewable Energy

Economic growth can come at a cost to the environment, unless appropriate technologies are developed to prevent pollution. The historic absence of such technologies has left a legacy of serious problems internationally, including loss of land suitable for cultivation of food and risks to public health from contaminated water.

These issues represent a major economic burden on, and depleted quality of life for affected populations. Biotechnology can provide solutions by exploiting the ability of microorganisms like bacteria to safely remove pollutants from for example, industrial discharges.

A €640,000 research programme at the Environmental Change Institute (ECI), NUI Galway, will investigate new biotechnological approaches to solve major environmental problems. The Science Foundation Ireland funded Investigator Programme will be carried out by Dr Vincent O'Flaherty of the Department of Microbiology and will involve collaborators in German and Dutch research institutes.

Using state-of-the-art scientific tools, the research will help to develop new, cost-effective

environmental technologies, based on specialised microorganisms, which convert pollutants to a fuel similar to natural gas.

The biogas fuel can be used to generate electricity (often in combination with fuel cells) or power vehicles. It represents a sustainable, renewable energy-producing approach to dealing with the waste products of human activity.

Specialised treatment systems called bioreactors are used in which the microorganisms grow in dense slimy layers called biofilms under anaerobic, or oxygen-free conditions.

The NUI Galway research will focus on the applicability of anaerobic biofilm technology to new, and extremely important areas of environmental management, such as domestic sewage treatment and bioremediation of contaminated groundwater.

It will benefit the country in general by facilitating sustainable economic growth into the future by providing a knowledge base for new Irish biotechnology enterprises.

Pictured: Dr Vincent O'Flaherty, Department of Microbiology and the Environmental Change Institute

Manufacturing a Safer and more Economic Aircraft

A project to toughen epoxy systems for aircraft applications is being developed by engineers at the Composite Research Unit (CRU).

Driven by the need to reduce weight and manufacturing cost of aircraft and to increase safety, the project involves a number of universities and industrial partners worldwide.

Dr Conchúr Ó Brádaigh and Dr Adrian Murtagh are supervising the project at the Department of Mechanical Engineering where work is being conducted to replace some of the metal primary structures in aircraft with polymer composite parts. Composites used in aircraft manufacture today are mainly pre-impregnated composites or prepregs, but these are expensive to manufacture as they require high pressures and temperatures for processing.

To reduce manufacturing costs, the aerospace industry is looking towards more economic processes such as Resin Transfer Moulding (RTM), a process by which the reinforcing fibres are placed in a sealed mould and the resin or matrix material is injected into the mould under pressure. The advantages of RTM are a possible 30% reduction in costs of manufacture, good surface finish, excellent

reproducibility and an ability to make more complex 3-D parts.

Mark Ward of the Department of Mechanical Engineering recently won an award for his work on the project at the 8th Annual Sir Bernard Crossland Symposium and Postgraduate Research Workshop, held in Queen's University Belfast.

The CRU will carry out mechanical testing on toughened laminates, compare them to un-toughened laminates and characterise optimised woven fibres with in-situ soluble fibres.

The unit will also establish an RTM facility to manufacture carbon fibre reinforced epoxy laminates meeting aerospace standards using the new thermoplastic soluble fibres.

A Finite Element Analysis (FEA) model is also being developed to predict fractures in the toughened material. This will aid the local toughening around bolt holes.

The benefits of this research when completed will be tough high performance parts, improved damage tolerance, an alternative innovative material system for end-users and economic processing using resin transfer moulding.

NUI Galway leads research in Law of the Sea



The law of the sea is the focus of a research programme led by Dr Ronán Long, research director at the Marine Law and Ocean Policy Centre. A small interdisciplinary team of lawyers, scientists and economists based in the Martin Ryan Institute are working on the programme.

Funded by the HEA and the European Union, the research is currently focused on reviewing Ireland's maritime boundary legislation and on developing new approaches to marine resource management in the north Atlantic.

In 2003, Dr Long became the first recipient of the Michael Manahan Fellowship, which was established by the Marine Institute to support original research in marine science policy, socio-economics and law of the sea. The fellowship has

allowed Dr Long to develop marine legal research as an expert research area at NUI Galway and to consolidate links with international institutions. The fellowship has also afforded him some research space to prepare a book on the law and policy relating to the utilisation and management of marine resources in Ireland.

One of the objectives of the law of the sea research programme is to assist developing states to broaden their own research capacity. Dr Long is actively engaged with the United Nations and the Nippon Foundation Fellowship Programme, which supports the training of scientists and lawyers from developing countries at specialist international institutions such as the Martin Ryan Institute.

The programme aims to train mid-level

professionals from developing coastal states so that they obtain the necessary skills to assist their countries to formulate comprehensive ocean policy and to implement the legal regime set out by international law.

This programme is currently supporting a scientist from the Ministry for Foreign Affairs in Bangladesh to undertake a legal and scientific assessment of that country's baseline legislation. On completion of his training at NUI Galway, under Dr Long's supervision, the present research fellow will undertake an internship in the United Nations prior to his return to national service.

Pictured: Dr Ronán Long, research director at the Marine Law and Ocean Policy Centre.

Using DNA methods to source contamination in water supplies

Ireland's first ever study of the source of contamination of private water schemes is being carried out by the Environmental Microbiology Research Unit at NUI Galway.

The issue of contaminated water becomes national news every year when reports are published showing that some of the clearest, purest mountain streams across the country contain highly contaminated drinking water.

The Environmental Protection Agency has reported that the level of contamination of these schemes, which serve 50,000 households across the country, is unacceptably high.

However, the level of monitoring water quality and treating contaminated supplies remains limited.

PhD student Siobhán Dorai-Raj has spent the past 17 months identifying the source of faecal contamination in some of the most remote areas of Galway and Mayo.

Siobhán, who began her research in January 2004 with the aid of HEA funding, is using DNA based methods to identify which type of faecal coliforms are present in contaminated water supplies.

Previous tests have been unable to differentiate between human and animal contamination but the DNA model is considerably more sensitive.

Leaking septic tanks, domestic sewage and sludge land-spreading are the primary forms of human contamination while slurry and animal droppings account for most of the animal contamination.

Although similar studies have been carried out in America, where the contamination of water found in shellfish is currently being analysed, the research is the first of its kind in Ireland.

Siobhán has found that despite annual reports indicating levels of contamination to be unacceptable, very little is done to treat the water affected. The danger to human health is serious as the presence of ecoli, which confirms the presence of other diseases such as salmonella and listeria in water, can lead to severe gastroenteritis.

Siobhán's research has focused on Galway and Mayo which have the highest number of private group water schemes in the country.

As County Councils take water samples only twice annually, many of the Group Schemes have recently



begun to employ private firms to take samples of water for testing. While there are gradual levels of improvement in some areas, a lot more needs to be done to bring the level of drinking water in these private schemes up to standard.

Pictured: PhD student Siobhán Dorai-Raj at work in NUI Galway's Department of Microbiology

Monitoring Air Quality

The Air Quality Technology Centre (AQTC), at the Department of Experimental Physics, provides an independent and nationwide occupational hygiene and environmental air quality monitoring service to the private and public sector. The service enables clients to increase industrial production efficiency and compliance with the ever-increasing health, safety and environmental legislation needs.

The Centre contains an extensive range of equipment and facilities for aerosol generation, measurement and analysis and in recent years, has been involved in a number of projects with a range of Irish industries and Irish-based US Multinationals.

A recent project in the area of occupational hygiene involved a study of work-place chemical spill clean-up techniques in the chemical and pharmaceutical industries.

This project was a joint collaboration between the AQTC and an Eli Lilly Pharmaceutical manufacturing facility in Indiana USA and formed part of a MSc Occupational Health and Ergonomics research thesis by student, Tara Dennis.

The field survey work was conducted at an Eli Lilly Manufacturing facility in the US while laboratory

work was completed at NUI Galway.

The project recently received the Best AIHCE 2005 Exposure Assessment Strategies Poster Presentation award, at the American Industrial Hygiene conference and was also awarded Second Prize at the AIHCE 2005 Conference Poster Presentation.

The AQTC has previously been involved in environmental surveys such as measurement of PM10 particulate matter in Dublin city and mercury vapour level measurements in ambient air.

The Centre also contributes to education and technology transfer through development and delivery of short courses on health and safety at work, aspects of occupational hygiene and air pollution measurements as well as a major input into NUI Galway's undergraduate and postgraduate courses in Occupational Health and Hygiene.

The AQTC is also authorised by the British Occupational Hygiene Society (BOHS) to teach their various occupational hygiene modules.

Pictured from left are, Dr Marie Coggins, Lecturer in Occupational Hygiene, NUI Galway; Tara Dennis, MSc student, Occupational Health and Ergonomics; and Dr Brian Ward, Eli Lilly Containment Engineering Team, Indiana, USA.



NUI Galway welcomes top Irish and International Students

Undergraduate students from Russia, America, China, Japan, Poland, Germany, India and the UK will join Irish students at NUI Galway in the coming weeks as part of an SFI initiative to encourage outstanding undergraduate students to undertake postgraduate research in Ireland. It is expected that the UREKA (Undergraduate Research Experience & Knowledge Award) initiative will become a powerful tool to attract a pool of highly motivated undergraduates as potential PhD students.

Only five of the 22 applications from throughout Ireland were successful, with two being awarded to NUI Galway; one to Professor Terry Smith, NCBES Director and the other to Dr Aoife Boyd of the Department of Microbiology.

The National Centre for Biomedical Engineering Science, SURF BioNET (Summer Undergraduate Research Fellowships in a Biomedical Research Network) site provides 16 UREKA students with the opportunity to experience the dynamic and creative research climate at the NCBES.

This programme will introduce the research students to the importance and benefit of interdisciplinary research in biomedical science and engineering during a 12-week training and education programme. The projects, which involve the molecular and cellular basis of disease, medical

devices and tissue engineering as well as regenerative medicine, span the research clusters of the NCBES and include projects within the Regenerative Medicine Institute (REMEDI).

The Infectious Disease UREKA Programme will be hosted by the Departments of Microbiology and Bacteriology and will provide 10 undergraduate students with the opportunity to participate in research to understand the importance of microorganisms which cause disease. The project areas include antibiotic resistance, host-pathogen interactions, bacterial stress responses and virulence mechanisms.

A series of seminars and workshops are planned to further stimulate the students' interest in infectious disease research. The students will have the opportunity to experience life in the laboratory, to interact with researchers within the University and to enjoy being part of an active research environment. The SURF BioNET and the Infectious Disease UREKA programmes aim to stimulate undergraduate student interest in biomedical and microbiological research and allow students to explore career options and develop skills.

UREKA Supplement grants were also awarded to Professor Emer Colleran, Department of Microbiology, Dr Ciaran Morrison, NCBES, and Dr Alan Ryder NCBES.