



College of Engineering, Mathematical & Physical Sciences

College Bulletin

UCD develops novel engineered wetland system

Alum sludge, a by-product of drinking water treatment plants that use aluminium salts as coagulant, has been successfully re-used as substrate in a novel engineered wetland system for enhanced wastewater treatment. The new system represents one of the significant outcomes of a multi-dimensional research project being carried out at the Centre for Water Resources Research (CWRR) at UCD. The project, which began in 2004, is aimed at developing beneficial re-use alternatives for the alum sludge, as opposed to the current practice of disposing it into landfills.

Ireland produces about 18,000 tonnes of dewatered alum sludge annually from its public drinking water treatment plants. The sludge is landfilled at a cost of about €130/tonne.

The new system employs passive aeration strategy by using the tidal flow concept, rhythmically filling and draining the wetland matrices with the wastewater. The abundant aluminium ions in the alum sludge remove phosphorus from the wastewater through ligand exchange, while the enhanced oxygen transfer efficiency of the tidal flow operation greatly improves the microbial degradation of organics. Results from the pilot-scale demonstration of the engineered wetland system at the UCD Farms, Lyons Estate, Newcastle, Co. Dublin, have shown that the system is



Participants at a one-day seminar held to demonstrate the the system. From left: Xiaohong Zhao, UCD; Giara Daly, Dept of Agriculture; Yuansheng Hu, UCD; Lordwin Jeyakumar, UCD; Michael Hegarty, UCD Farms; Dr Edward Jordan, Farm manager, UCD Farms; Dr Akintunde Babatunde, UCD, Research Project Manager; Melina A. Dneboska, UCD; Ned Fleming, Dublin City Council; Thomas Kiniron, Dublin City Council; and, Dr Yaqian Zhao, UCD, Lead Project Principal Investigator.

capable of enhanced and simultaneous removal of phosphorus and organic matter, particularly from high strength animal farm effluents.

A one-day demonstration seminar held at the project site on July 3, 2009, attracted a number of relevant stakeholders, including the EPA, the Department of Agriculture, Fisheries and Food, and Dublin City Council. The EPA, Enterprise Ireland and the

Department of Agriculture, Fisheries and Food have funded different aspects of the overall development of the system. Ballymore Water Treatment Plant and UCD Farm are particularly appreciated for their assistance in the research.

For more detailed information and enquiries, please contact Dr Yaqian Zhao, Email: yaqian.zhao@ucd.ie.

Biomedical engineering seminar

Prof Ray Ogden, Professor of Mathematics at the University of Glasgow and SFI Walton Fellow in the School of Electrical, Electronic & Mechanical Engineering, gave a research seminar on Thursday October 8, 2009. Prof Ogden's main research interests are in nonlinear elasticity theory and its

applications (particularly applications to modelling the material properties of rubberlike solids), thermoelasticity theory, elastic wave propagation, pseudo-elasticity theory (with application to damage mechanics), and biomechanics (with application to modelling the mechanical

properties of soft biological tissue). His seminar, entitled 'The structure and mechanical properties of soft biological tissue, with particular reference to the cardiovascular system', is part of a series of biomedical engineering seminars that take place every Thursday between 1.00 and 2.00pm.

IMechE awards at Engineering Graduate Association Awards Ceremony

Prizes and awards from the Institution of Mechanical Engineers (IMechE) were presented to four BE (Mechanical) degree students at the recent Annual Engineering Graduates Association Awards Ceremony. The Institution's Frederic Barnes Waldron Best Student Prize was awarded to Ronan Lonergan, who graduated first in his BE (Mechanical) class this year. Citing Ronan's excellent academic performance, his final year project supervisor, Dr Ken Stanton, commended his achievement, saying that: "Ronan is a graduate that University College Dublin can be particularly proud of and he is a very worthy recipient of the IMechE Frederic Barnes Waldron Prize". Ronan has been accepted to graduate entry at Massachusetts Institute of Technology (MIT) in the United States.

The IMechE also conferred the Institution's Best Project Prize on Eamonn Lannoye for his final year project entitled, 'Modelling the future development of electricity generation portfolios in the EU'. The objective of the project was to examine the potential for accurately predicting the future development of electricity generation portfolios in the EU. In tackling this ambitious project, Eamonn had to locate, absorb, and distil a very large quantity and range of data and other material. Commending Eamonn on his achievement, his final year project supervisor, Dr William Smith, said: "This was an ambitious, expansive, and complex project; Eamonn tackled it with intelligence, academic rigour, perceptiveness, and plenty of hard work. He did an outstanding job, and I was very pleased to support most strongly his nomination for the Institution Project Prize".



Declan Lyons, Enterprise Ireland, presents David Ferns with his IMechE Best Project Certificate 2009.



Declan Lyons, Enterprise Ireland, presents Eamonn Keane with his IMechE Best Student Certificate 2009.



Eamonn Lannoye receives his Institution Best Project Prize, presented on behalf of the IMechE by Declan Lyons, Enterprise Ireland.



Ronan Lonergan receives his Frederic Barnes Waldron Best Student Prize, presented on behalf of the IMechE by Declan Lyons, Enterprise Ireland.

Best Student and Best Project Certificates were also awarded to Eamonn Keane and David Ferns, respectively. Eamonn was awarded a Best Student Certificate for his consistently excellent academic performance

over the four years of his BE (Mechanical) degree and David was awarded a Best Project Certificate in recognition of his final year project to develop an energy harnessing system for a transatlantic auto-piloted yacht.

BE (Mechanical) student wins coveted award

Patrick Murphy, who graduated from the BE (Mechanical) degree programme in July 2009, has won the Orthofix Prize for Best Medical Engineering Project at the 21st Annual Medical Engineering Student Project Competition organised by the Engineering in Medicine and Health Division of the Institution of Mechanical Engineers (IMechE) in London.

Patrick's project, which was conducted under the supervision of Dr Denis Dowling of the UCD School of Electrical, Electronic and Mechanical Engineering, was entitled 'Evaluating ellipsometry as a method of detecting protein adhesion'. The project looked at how ellipsometry, which is an optical measurement technique, can be used

to quantify the level of protein adhesion on surfaces. Patrick successfully constructed an apparatus that enabled protein adhesion measurements to be carried out while a protein (bovine serum albumin) was passed over silicon wafer surfaces. In addition to the Best Project prize, Patrick was also a runner-up for the Best Presentation award at the event.

BiancaMed raises €6 million

BiancaMed, a leading medical technology company and spin-out from UCD's School of Electrical, Electronic and Mechanical Engineering, has announced that it has received an additional €6 million in funding. This second round funding was led by pan-European venture capital firm Seventure Partners. Three of BiancaMed's existing investors – ePlanet Ventures, Enterprise Ireland and ResMed – also participated in this round. BiancaMed has developed and is marketing SleepMinder™, an accurate, contactless and convenient device for the measurement of sleep and breathing in the home.

This new capital will allow BiancaMed to expand its core team, and accelerate the launch of several innovative consumer products. It will also enable the company to continue the development of clinical products targeting unmet needs in areas such as sleep apnoea screening and disease management. BiancaMed co-founder and CEO Conor Hanley said: "With this new financing we will be able to accelerate the commercial development of our proprietary non-contact, sleep monitoring technology. It is a strong validation of our firm's technology and strategy that we have secured investment from a new, value-add investor such as Seventure, and the continued support of our existing investors. We look forward to working with our investors, and BiancaMed will undoubtedly benefit from the



Dr Conor Hanley, co-founder and CEO, BiancaMed.

wealth of healthcare experience that non-executive board members bring to the table". BiancaMed is headquartered in NovaUCD, the Innovation and Technology Transfer Centre at University College Dublin. The technology at the core of BiancaMed's SleepMinder™ was initially developed at UCD's School of Electrical, Electronic and Mechanical Engineering by Dr Conor Heneghan, Chief Scientific Officer, and Dr Philip de Chazal, Chief Technology Officer.

Donald Fitzmaurice, BiancaMed's Chairman and a partner with ePlanet, commented: "We have been strong supporters of BiancaMed since our initial investment in the company in 2005, and we have been impressed with the progress the team has been able to make from a technology and business perspective in the past three years. The company is at an

exciting point in its commercial development".

Mark Payne, Director of ResMed's Sleep Business Unit in Europe, said: "This step towards full commercialisation of BiancaMed's unique contactless technologies will provide hope to many patients and clinicians searching for easier access to novel, accurate, and innovative SDB screening solutions".

Seventure General Partner Isabelle de Cremoux said: "BiancaMed is a unique company with a breakthrough technology in the massive \$20 billion global sleep market. BiancaMed is Seventure's first investment outside continental Europe and we look forward to working with members of this entrepreneurial executive team".

Iain Wilcock of Seventure will join BiancaMed's Board of Directors.

UCD connection to 2009 CAV Award winners

The 2009 CAV (computer-aided verification) Award was presented on June 29 at the 21st annual CAV conference in Grenoble, France.

The annual award, which recognises a specific fundamental contribution or series of outstanding contributions to the CAV field, was given to: Conor F. Madigan, Kateeva, Inc.; Sharad Malik, Princeton University; Joao P. Marques-Silva, University College Dublin; Matthew W. Moskewicz, University of California, Berkeley; Karem A. Sakallah,

University of Michigan; Lintao Zhang, Microsoft Research; and, Ying Zhao, Wuxi Capital Group. The award includes a \$10,000 prize and was presented with the citation: "For fundamental contributions to the development of high-performance Boolean satisfiability solvers".

The conference is the premier international event for reporting research on CAV, a sub-discipline of computer science concerned with ensuring that software and hardware systems

operate correctly and reliably.

The recipients of this year's award worked in two teams, at the University of Michigan and at Princeton University, where they created powerful programs for checking whether a logic formula has a consistent solution. Teams from around the world compete to produce new satisfiability solvers, or 'SAT solvers', that can solve the most difficult problems, and to find new ways to apply these solvers to a variety of practical problems.

Student wins machinery prize

Patrick McGettrick, an ALCE PhD student of Arturo Gonzalez, recently won the Len Gelman student prize for his paper, 'Theoretical investigation of the use of a moving vehicle to identify bridge dynamic

parameters', at the Sixth International Conference on Condition Monitoring and Machinery Failure Prevention Technologies (or CM2009/MFPT2009), which ran from June 23-25, and was

organised by the British Institute of Non-Destructive Testing (BINDT) in close cooperation and partnership with the US Society for Machinery Failure Prevention Technology (MFPT).

Teaching and Academic Development Awards 2008/09 for the College of Engineering, Mathematical and Physical Sciences

College Teaching and Learning Awards

Two individuals in the College of EMPS were awarded UCD College Teaching Awards in 2008/09: Professor Michael Gilchrist and Mr Brian Mulkeen. These awards recognise and celebrate excellence in teaching.

UCD Module Innovation Support Grants

These grants support module innovation activities aligned with the key strategic objectives set out in the Education Strategy 2009-13: student engagement; and, integration of research and teaching. Two submissions from EMPS were awarded grants:

- Dr Gabrielle Kelly, School of Mathematical Sciences, was awarded €4,000 for the redesign of a statistics module expanding an active learning component; and,
- Dr Ian Mercer, School of Physics, Professor Bill Watson, School of Medicine and Medical Science, Dr Pat Felle, School of Medicine and Medical Science, and Dr Geraldine O'Neill, Centre for Teaching and Academic Development, were awarded €2,500 to further develop a Stage 1 physics module for medical students,

developed using a problem-based learning approach.

UCD Fellowships in Teaching and Academic Development

Eight Fellows in Teaching and Academic Development have been appointed for 2009-11, three from the College of EMPS:

- Dr Aoife Ahern, School of Architecture, Landscape & Civil Engineering;
- Mr John Dunnion, School of Computer Science & Informatics; and,
- Dr Patrick Purcell, School of Architecture, Landscape & Civil Engineering.

Two new thematic areas of focus for the Fellowships have been identified: teaching for transitions; and, development of elective provision. Two senior Fellows have been appointed, including Dr Patricia Kieran, School of Chemical and Bioprocess Engineering.

National Academy for Integration of Research, Teaching and Learning (NAIRTL)

Two grants from the NAIRTL Grants Initiative

2009 were awarded to members of the College of EMPS:

- Dr Patricia Kieran and Dr Dermot Malone of the School of Chemical & Bioprocess Engineering, and Dr Geraldine O'Neill, Centre for Teaching and Academic Development, obtained a grant for development and evaluation of peer-assisted learning in the undergraduate chemical engineering curriculum; and,
- Professor Michael Gilchrist, Vice Principal for Research and Innovation and School of Electrical, Electronic and Mechanical Engineering, was awarded a large grant for implementing innovative methods for teaching foundation level engineering mechanics to large cohorts of undergraduate students, through research-led assignments for small groups with postgraduate students.

NAIRTL National Awards for Excellence in Teaching 2009

Dr Amanda Gibney was awarded an NAIRTL National Award for Excellence in Teaching 2009.

IRCSET Fellowships

Six INSPIRE IRCSET-MarieCurie International Mobility Fellowships in Science, Engineering and Technology were awarded to EMPS by the Irish Research Council for Science, Engineering and Technology (IRCSET), with co-funding from the EU FP7 Marie Curie Programme.

The IRCSET INSPIRE programme is a co-funded scheme that encourages international mobility among Irish-based experienced researchers.

Congratulations to the 2009 recipients:

1. PI: Dr Greg O'Hare,
Post-doc: Dr Conor Muldoon.
Title: Pervasive agents and the sensor web
2. PI: Dr Patrick Orr,
Post-doc: Dr Maria McNamara.
Title: Controls on the preservation of colour in the fossil record
3. PI: Prof John Walsh,
Post-doc: Dr Eoghan Holohan

Title: InSAR and 3D-DEM analysis of active calderas

4. PI: Prof Lorraine Hanlon,
Post-doc: Dr Suzanne Foley
Title: Multi-wavelength observations of gamma ray bursts with Fermi and GROND
5. PI: Prof Adrian Ottewill,
Post-doc: Samuel Dolan
Title: Black holes, gravitational waves and the self force
6. PI: Dr Thomas Unger,
Post-doc: Dr James O'Shea
Title: Isotropy of quadratic forms and algebras with involution

The College was also awarded five IRCSET Empower Fellowships. The aim of this scheme is to provide early stage researchers with the opportunity to avail of a period of research at an Irish host institution with a research team that has achieved international recognition for its work.

Empower Fellowship Recipients:

1. PI: Dr Simon Dobson,
Post-doc: Dr Juan Ye
Title: A formal semantic information model for pervasive computing
2. PI: Dr Conrad Childs,
Post-doc: Dr Nicholas Thompson
Title: 3D discrete element method (DEM) modelling of kinematic evolution of submarine landslides
3. PI: Mr Paul Kenny,
Post-doc: Dr Agota Szucs.
Title: Energy conscious retrofit of Irish building stock promoting healthy indoor environment
4. PI: Prof Mohamed Al'Rubeai,
Post-doc: Dr Praveen Kaul
Title: Mutational approach to cell lines exhibiting enhanced productivity and antiapoptotic characteristics
5. PI: Dr Chris Brown,
Post-doc: Dr Kristin Jonsdottir
Title: Seismic tremor from volcanoes, glaciers, subduction zones and landslides: comparison and modelling.