

NUIG Engineering

A SPECIAL REPORT

Uniting theory, practice and execution

From undergraduate placements with local companies to cutting-edge research in conjunction with market leaders, NUIG's has impressive links with industry, writes Éimhír Mulqueen

NUI GALWAY HAS been nurturing its links with regional industry since the 1970s, when multinationals were first attracted to establishing bases in Ireland. Since then, Galway as a university city has built a reputation as an attractive location for foreign direct investment.

IDA regional manager Jim Murren says the presence of a university serves two key roles: "One is research and development and the other is the interaction between industry and academia. The availability of graduates with appropriate skills is a key part in all of that."

He adds that as multinational companies evolve, they often begin develop research and development sections, providing the opportunity for further synergies to develop between a university and a high-end corporation.

Prof Sean Leen, head of Mechanical and Biomedical Engineering at NUIG, points out that links with local industry are first formed at undergraduate level.

"One of the reasons why we have strong links – and there are lots of reasons – is we have a professional engineering placement for all our third-year students, both in the bio-medical and the medical industry, but also in the general mechanical engineering and general engineering industry."

"It sets them up to do postgraduate research where the application of it is part of their perspective. Because they have worked in a company, if they go on to do postgrad they are seeing something bigger hopefully than just academic aspects of the work. That is very important in terms of translating research into industry."

The way courses are structured is also reflecting the needs of industry. Dr Kathryn Cormican, of the Department of Mechanical and Biomedical Engineering, points to the need for graduates who to develop problem-solving and critical thinking techniques.

"Our college structure has changed and that has allowed us to change. We are moving away from very defined disciplines into more cross functional, collaborative aspects."

As director of the Masters of Applied Science in Enterprise Systems course, she oversees a programme that provides taught and research elements in process engineering. "For their research, we try our best to buddy



them up with a company, mainly in the medical-technology industry because they are our neighbours."

The locally based medtech companies, such as Medtronic, Boston Scientific, Creganna, Allergan Pharmaceuticals and CareFusion, as well as University College Hospital, have contributed to the programme in what Dr Cormican describes as "give and take" relationships. "They give us their case, which is an organisation in point that we can study. Then, hopefully, we try to give them feedback by giving them an understanding of the best practice in the case and some ideas of what they could do to improve it."

John MacNamara, director of R&D at Medtronic in Galway, says the level of science and engineering graduates coming through from NUIG helps fuel innovation while academic research drives the convergence of new biomedical technologies.

The biomedical engineering degree has been very beneficial in providing knowledgeable graduates for recruitment. A pipeline of Specialist PhDs in Finite Element Analysis, an area that has become very important to the medical device industry in the last five years, has allowed us to develop a core competency within Medtronic. Medtronic also runs an

Undergraduate Intern Programme," he says. David Tallon, R&D director at Stryker Instruments in Cork, emphasises the need for skilled graduates and points to NUIG's strong research focus in biomedical engineering and the clinical side of bioengineering.

"To develop deep engineering skills in R&D, we work with the universities to identify

A BOLD INVESTMENT in the future of medical technology research

NUI GALWAY has joined its strategic alliance partner the University of Limerick, Bank of Ireland and Enterprise Ireland in supporting the €10 million Bank of Ireland MedTech Accelerator Fund. This is Ireland's first Seed Fund to focus exclusively on the indigenous medical technology sector and is focused on

export-oriented high-potential start-up Life Sciences companies that operate in the medical device, diagnostics or medical/laboratory sectors. The fund is being managed by Kernal Capital, and both universities have invested €1 million each. The medical technology market is estimated to be worth almost €220bn

worldwide, and the west of Ireland in particular is noted globally as a centre of excellence in the creation of innovative research-based companies and indigenous medical device start-ups. This fund creates greater access to investment enabling early-stage companies to capitalise on the sector's potential.

An Taoiseach, Enda Kenny TD, with NUI Galway President Dr James J Browne and Dr Maeve Duffy of the University's Power Electronics Research Centre, who has been instrumental in developing the next generation of smart-phone technology

suitable candidates to pursue PhDs in areas of strategic importance for Stryker.

From a graduate point of view, we put a lot of effort into building relationships with the heads of departments in universities, particularly engineering and bio engineering. And the relationship with NUIG came out of that."

But in tandem with its biomedical research, an important component of NUIG's engineering discipline is tied up with the automotive industry. Lecturer in Electronic Engineering Dr Edward Jones, heads up the Connaught Automotive Research (CAR) Group with Dr Martin Glavin. They work closely with car components supplier Valeo Vision Systems (VVS).

"VVS have a full range of activity in their Tuam facility, ranging from R&D to manufacturing – and the R&D is highly advanced, using the latest techniques including image and signal processing," says Dr Jones.

Much of the research carried out by CAR, which was set up six years ago, is focused on the area of driver assistance using cameras, a technology that is becoming cheaper and more prevalent in vehicles.

Peter Reilly, Research & Development director at Valeo, says a key part of the business's success is the nurturing of locally based talent so that they become expert in Automotive Vision Technology, ensuring the long-term sustained success of the Tuam facility.

"One of the key strengths is the fact that graduates are highly specialised and trained in our technology area so when they join the team here they are adept in our particular technology." Valeo has a market-leading position because its products are innovative, he adds. "Our next generation vision system, currently in development, will deliver new features to enhance the driving experience and improve overall road safety for both the driver and other road users."

CAR has moved into looking at new systems for future vehicles, including pedestrian-detection systems. Even though Valeo has a strong R&D component in Tuam, which is currently being expanded, Dr Jones says university researchers can offer less market-focused research that may have applicability in a few years' time. "It may not be what the market needs right now or in six months' time, but it may be something that will be of interest two to three years down the road," adds Dr Jones.

Spinning out for success

A dynamic relationship between graduates and their alma mater has led to the development of many spin-out companies that proudly retain links with NUIG, writes Éimhír Mulqueen

THE OFFICE OF DR Neil Ferguson, director of our NUIG's Technology Transfer Office (TTO), is often a first port of call for all research contracts that go through the college. Formerly the Industrial Liaison Office, it was the first one of its kind to be established in Ireland in the early 1970s. "The Technology Transfer Office's core function is to identify intellectual property that is being developed within the university, to

protect that intellectual property – which would typically be filing European patents – and to commercialise the intellectual property. That is where we would interact with the region's industries," he explains. "That is a long process. Sometimes industry would come in and they would have the idea and we would help turn that into a working prototype and to validate it."

His office works closely with Enterprise Ireland, which is a seed capital funder, along with Science Foundation Ireland, for new ideas being developed into tangible, profit-making start-ups.

"We have very good visibility on what research is going on in the university and we are the first point of contact for companies looking to partner with various research projects. That can go from a simple Enterprise Ireland innovation voucher – a €5,000 voucher – to contract research and to collaborative research."

According to Enterprise

Ireland, the number of college spin-outs in Ireland is continuing to rise, yielding "an important pipeline of new high potential start-ups in recent years".

The west has proven to be a hot spot for such spin-outs. Over the past five years, the TTO has been a leading office in commercialisation of research. Dr Ferguson puts the success of the TTO and the university in developing spin-outs down to a can-do relationship between the university and industry. He underlines the removal of barriers and the streamlining of operations as part of a successful strategy.

"We try to streamline the operation as much as possible. We try to simplify everything as much as possible with standard agreements. For Enterprise Ireland's Innovation Partnership Fund, they would fund up to 80 per cent of the cost of the project, the company would put to 20 per cent, and they would get an option to licence the technology coming out."

The links between NUIG's College of Engineering and local start-ups run deep. In 1983, the university's first head of Mechanical Engineering, Prof Sean McNamara, set up a spin-off company, MCS Kenvy, one of Galway's indigenous company success stories, employing two postgraduates, John Conroy and Michael Lane. A world leading sub-sea engineering firm today, it specialised in the design of risers, the speciality pipes used to connect oil rigs with wells. MCS, acquired by the Wood Group in



Among the spin-out companies is a NUIG lecturer Dr Conchúr Ó Brádaigh's Eirecomposites, which manufactures blades for household wind turbines, supplies components to Bombardier Aerospace and carries out R&D for the European Space Agency

2008, is now the largest riser consultancy in the world, employing more than 200 people internationally.

"That company started out from within mechanical

In line with how engineering research has developed, many of the projects have led to spin-out companies which are multidisciplinary in nature. One such company is Vornia Biomaterials, which specialises in biomaterials solutions for medical device manufacturers. It was founded by Dr Wenxin Wang, lecturer in biomedical engineering at NUIG.

Meanwhile, Boards.ie, the online discussion site, was co-founded by Dr John Breslin (see profile, below), NUIG lecturer at the Department of Electronic Engineering, in 2000, when he was a student. As he puts it, it is not a spin-out company but evolved from his passion as a gamer, starting as a discussion board on the game Quake.

But his experience with Boards.ie led him to undertake research on online communities and semantic web sites for the college's Digital Enterprise Research Institute. "It is an example of a hobby and making use of it as a research project," he says.

Other NUIG success stories include FotoNation, founded in 1998 and now a world-leading independent provider of embedded imaging and communication solutions for the digital camera industry, with 30 R&D engineers based in Galway. Acquired by Tessa Inc three years ago, it counts the major camera companies as customers and has a portfolio of more than 200 patents, including in-camera red-eye removal technology – now also used extensively in mobile phones – wireless connectivity and face-recognition software.

"The company maintains a close relationship with NUI Galway and actively supports PhD research activity in digital imaging within the College of Engineering and Informatics," says company co-founder and NUIG lecturer Dr Peter Corcoran.

A year after FotoNation was founded, BSM was set up by NUIG graduates. An international management and technology consulting company for the life sciences and consumer products industries, it has areas of expertise in lean and operational excellence and ERP [enterprise resource planning] life-cycle management.

More recently, Dr Conchúr Ó Brádaigh, a NUIG lecturer in Mechanical Engineering, co-founded Eirecomposites from a merger of four smaller companies, one of which began life as a composites research unit in the university. Now with a €5 million turnover, it manufactures composite blades for household wind turbines, supplies components to Bombardier Aerospace, and carries out R&D projects for the European Space Agency.

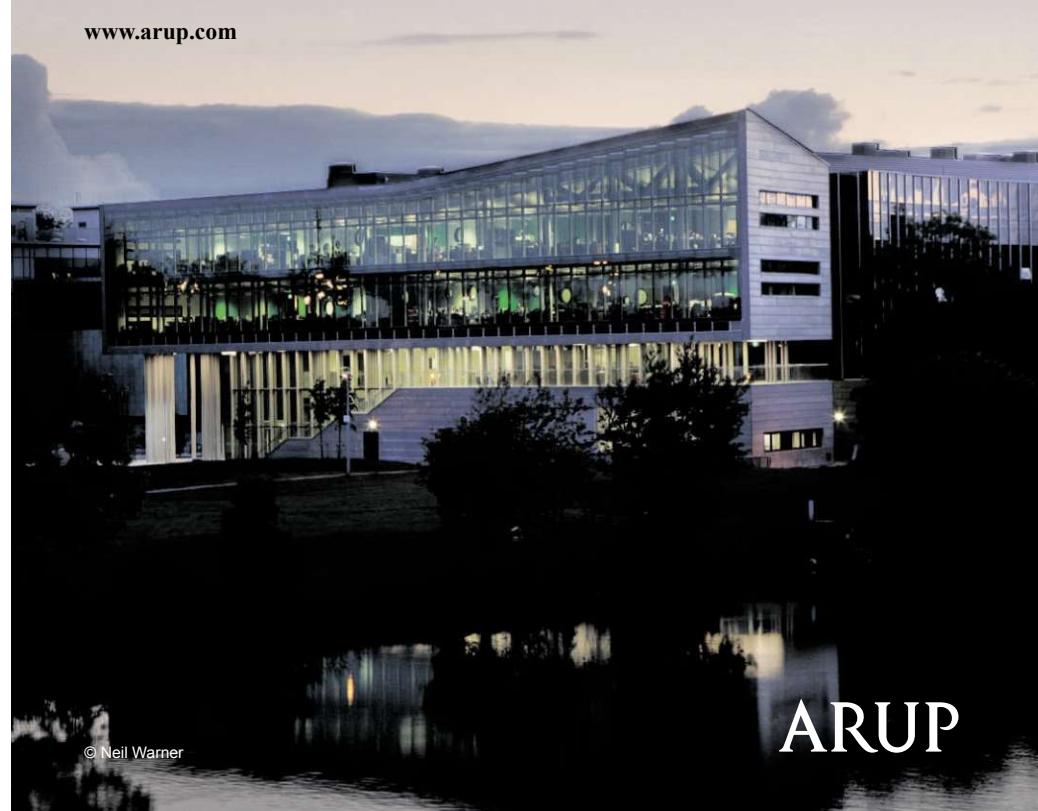
He says the composites research that began in NUIG and the University of Limerick in the nineties led directly to the company's formation.

"We have graduate engineers working with us, the majority of which are graduates from Galway and Limerick. If it was not for the university, EireComposites would not be there."

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PROFILE JOHN BRESLIN

'I am trying to bridge the worlds of electronics and the web'

Dr John Breslin of the department of electrical and electronic engineering

"I've been working full-time at NUI Galway for 11 years now, in a variety of areas ranging from power electronics to web standards. After lecturing in electronics for four years, I moved from hardware to software when I joined the Digital Enterprise Research Institute (DERI) in 2004 to work in the areas of semantic web and social media. I have always had an interest in online communities, as I had been involved in creating the online bulletin site, boards.ie some years earlier. So the whole emerging area of social networks has always been fascinating to me."

"I work as an academic lecturer in the School of Engineering and Informatics at NUI Galway, and I'm now a lead researcher with DERI, which is the world's largest Semantic Web research institute. I am course director for the Engineering Innovation –

electronic undergraduate course. I am also co-author of the book *The Social Semantic Web*. This year, I've taken on the role of General Chair for the International Conference on Weblogs and Social Media (ICWSM), the premier social media research conference which will be held in June 2012."

"ICWSM brings together computer scientists and social scientists from academia and industry, and the top researchers in social media will be descending on Ireland next summer. It's a great opportunity for us to show the world what we are doing in this space."

"I'm the creator of the SIOC framework which aims to link online communities with semantics, used in Yahoo! SearchMonkey, Drupal 7 and on the *Newsweek* website."

"Social media is one of my main research areas, and I work closely with Stefan Decker, director of DERI, and Alex Passant, leader of the social software unit. For



example, one of my masters students worked on the IRCSET-funded project researchers.ie, which aims to build an alumni network for researchers in Ireland.

"I returned to lecturing in electronics a few years ago, and I'm still an active researcher with DERI, so I see myself as trying to bridge the worlds of electronics and the web, particularly in relation to social media applications."

"There's lots of exciting things happening in electronics and computing at the moment. I started teaching our students about the Arduino in 2010. The Arduino is basically a cheap and open computing device, costing around €20, that you can programme to create anything ranging from interactive clothes to an earthquake detector. In November, we're expecting to see an even more powerful computing device, the Raspberry Pi, which will cost about €25 and is equivalent in power to an Xbox."

They showed a demo of a 3D game called Quake 3 running on this €25 computer and it is pretty amazing to think about the applications people will create when this is released."

"In 1998, I set up an internet forum to discuss video games which evolved into boards.ie, one of Ireland's largest indigenous websites with over 35 million monthly page views and 2.25 million monthly visitors in 2011."

"I am also co-founder of its spin-off company Adverts Marketplace. I've received a number of awards for my web work, including a Golden Spider award and two IIA Net Visionary awards."

"I am founder of *New Tech Post*, an online technology publication, based at NUI Galway. This year, I co-founded StreamGlider, a visual real-time dashboard for tracking interests across various types of devices, along with Nova Spivack and Bill McDaniel."

John Holden