

The living, breathing heart of learning

The didactic approach to teaching has become a thing of the past for the staff and students of NUIG's engineering faculty – the university's remarkable new building is 'alive' and in continuous communication with its inhabitants, writes **John Holden**

IT GOES WITHOUT saying that no other discipline is better suited than engineering to be housed in a living, breathing building. This salient point is certainly not lost on the entire NUI Galway engineering faculty. Every lecturer, researcher and student interviewed for this piece was effusive with excitement at the prospects of their new home.

The level of intricacy that went into the building's design is previously unseen in this country. So naturally its residents' sense good things for the future. "Everything about the building is exciting," says Dr Jamie Goggins, Programme Director for the NUIG BSc in Project and Construction Management. "It's alive and in constant communication. We will be using the building itself as a teaching tool. It is designed to actively engage with the student and help him to understand engineering on a more personal level."

From exposed structural elements on view to built-in sensors (measuring light, temperature, carbon dioxide) throughout, all aspects of engineering come alive. Such features will no doubt make the discipline far easier to engage with for new learners.

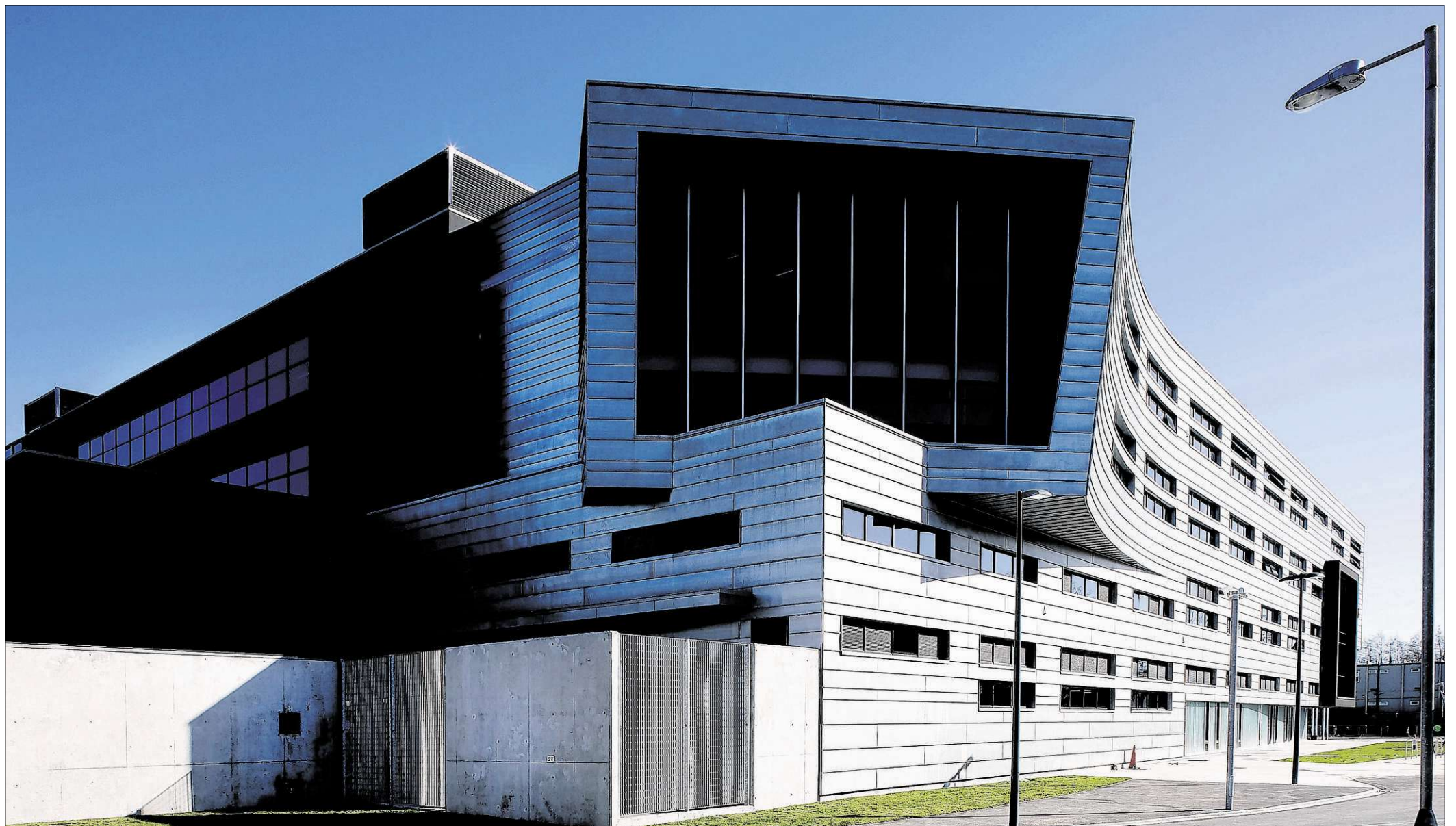
Third year student Michael Fleming (19) is particularly impressed: "I'm only in the building a few days and so far it has blown me away," he says. "As you walk through the corridors, you see sections of different elements exposed – such as the reinforcement bars in the concrete walls, the base of a concrete column and electrical wires. Such elements would usually be hidden in any other building. Here they are left open to sight so students can see for themselves how they are installed. This is much more beneficial than looking at pictures in a lecture."

Inside the front door in the atrium are "collision spaces" where students converge. Located here is the brain of the building, where a large display panel shows all the various activity going on at any given time – like how much water and electricity have been used that day.

"The external environment is also tracked by a weather station on the roof," says Goggins. "We have a built-in power station and combined heating and power, a biomass boiler which uses locally sourced pellets, solar panels, ground source heat pumps, low-heat glazing, heat exchangers and rain water harvesting facilities. There is a whole menu of green technologies in the building, not all of which are necessary but are used as teaching tools."

The second aspect exciting engineers at NUIG are the new lab spaces. "A very large part of the building's design stage was dedicated to figuring out how to maximise and improve our laboratory spaces," says Prof Gerry Lyons, NUIG's Dean of Engineering and Informatics. "Because of the improved lab resources, our teaching methods will now take a more project-led approach. We have the facilities to physically demonstrate the fundamentals of engineering rather than just explaining them."

At 14,500 sq m, this is the largest university engineering building of its kind in Ireland and can hold more students than any other. But NUIG was in serious need of a central space for engineering. "When the discipline was first offered here in 1849, there were 69



students," explains Lyons. "Today, we have more than 1,200 coming through 12 different entry route programmes."

"Engineering was previously spread across 14 different locations on campus," Lyons adds. "We are now bringing the various facets together which gives us, for the first time, the chance to teach in an integrated way. In the past, we saw all the different disciplines in science and engineering as separate entities. The reality in the workplace, however, is quite different where the skill sets of all are regularly brought together."

"The current challenges facing Irish society and the economy are in areas such as product development for IT, medical devices, gaming, renewable energy etc. NUIG now has the expertise, facilities and resources in all of these areas together under one roof."

The new 'one-stop' engineering structure will also conveniently fit into the county's existing infrastructure. "Given Galway's location, the prospects have never been better," says Lyons. "The building provides the potential and facility to make even more

Right: Dr Jamie Goggins, Programme Director for the NUIG BSc in Project and Construction Management



direct contact with all the national and multinational players located nearby. We can now become an even bigger support to them and to the Industrial Development Authority."

The international flavour of NUIG Engineering has not only been attractive to multinationals looking to tap into the local expertise. Other international universities are recommending their students pursue further education in the west. PhD student Václav Belák (27), from the Czech Republic, was advised by his masters supervisor to come to NUIG to continue his research interests. "I am fascinated by the possibilities the web has to offer the large-scale organisation of people," he says. "I learnt from one of my lecturers that NUIG does world-class research in web science – an emerging research area. Hence my research interest fit really well into the existing activities here."

"Besides research, I am also interested in the practical application of new technologies," Belák adds. "Ireland has a reputation as a business-friendly country, where it is easier to

turn an idea into a company than in other parts of Europe. As I enter the second year of my studies at NUIG, I still find this option a very attractive prospect."

With international students and multinationals to be found all around NUIG, one would think integration was not much of an issue. Yet even the design of the new building's corridors, staircases and walkways facilitates greater interaction between students, researchers, teachers and industry. "Rather than having meeting rooms, we have what's known as 'breakout spaces'," explains Dr Nathan Quinlan of the Department of Mechanical and Biomedical Engineering. "These are pockets of space along the corridors with comfortable chairs where students and teachers alike can sit and chat, or work on their laptops. The flow of human traffic is also designed so that people will encounter each other on staircases and in the atrium of the building."

Students at every level are eager to gain access to the new world-class facilities. "I am most looking forward to using the new biomedical laboratories," says Mechanical and Biomedical Engineering PhD student Riona Ni Ghriallaigh (25). "This is a considerable development for research involving tissue engineering and cell culture experiments which will enable research groups within the biomedical clusters to work together efficiently sharing experimental techniques and knowledge."

"As a PhD student, I assist with computer laboratory teaching for final-year engineering undergraduates. The new building is equipped with an 80-seater computer lab complete with advanced computing facilities that allows each student to have their own computer for these tutorials. All computer laboratories are managed by the building management system and powered by green and sustainable energy sources."

Dr Nathan Quinlan did his undergraduate in engineering at NUIG in 1992. Having seen major developments since then, the new building is the consolidation of much work. "There have been big changes in the quality of facilities since I was here," he says. "But the new building is the biggest development for NUIG engineering in a very long time."

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Congratulations to NUI GALWAY
by the Design Team who delivered the **New Engineering Building**

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PROFILE GEAROID Ó LAIGHINI

‘We can develop smart systems that empower individuals’

Gearoid Ó Laighin, Professor of Electronic Engineering

"Since my entry to academia, I have followed a research career in Biomedical Engineering with a strong interest in Rehabilitation Engineering and in the application of Neuromuscular Electrical Stimulation (NMES) to medical problems, particularly vascular disease and stroke rehabilitation. I completed my PhD on the application of NMES to stroke-related drop-foot."

"We started working in NMES four years ago with the aim of applying electronic engineering expertise to medical problems. This is not just for unhealthy or overweight people, but across the life course. The issue of physical activity concerns all age groups. Rather than just stigmatising the sick or elderly, we look at all ages."

"One of the reasons we focus on exercise is that it plays a key role in health and wellness. It has been shown many times that exercise has several benefits for the individual – controlling weight, combating a variety of disease conditions such as stroke, types of diabetes, depression, cancer and arthritis. So it has physical and mental benefits for the individual."

"Exercise has also been shown to stimulate various brain



chemicals, making one more relaxed and improving self-esteem.

"Obesity is an increasing problem in Ireland. In 1990, eight per cent of males were obese. That figure jumped to 20 per cent in 2000 and we can be sure that the figure has gone up again in the last 10 years. This will have major health implications in the future. So if we can develop smart systems that empower individuals, we can have a huge impact on society."

"In recent years my interest in

Rehabilitation Engineering has evolved into Connected Health, which is the use of ICT in the management of health and wellness in the home and community. I played a major part in the setting up of smart Ambient Assisted Living (SAAL), a research partnership between NUI Galway, the University of Limerick and Georgia Institute of Technology.

"We want to get to a point where a device like a smart phone is used across the life course and

would adapt to the needs of the person as they grow older. So in the development of phone apps, we're looking at increasing adherence to monitor physical activity in the home, to try and see how we increase adherence to physical activity."

"You can have apps that track your activity – running, cycling, etc – using GPS to track movements and an accelerometer to measure acceleration. That information can then be transferred onto Facebook, where

you can share your progress with exercise buddies. It's important to have a social dimension to encourage adherence."

"There is also a growing trend to have associated hardware to go with an app. So you could have a blood-pressure monitor which attaches to an iPhone socket. You put on the blood-pressure device and the app takes the measurements, which can then be stored and sent wherever you want it to go – your GP for example. My GP colleagues tell me that if you get an individual to manage their own health, you get better health results."

"Aside from academic experience, I have also had a range of industrial experience, including periods when I worked in the United States in the semiconductor industry from 1985-1990 in the design and manufacture of integrated circuits."

"In addition to my positions in NUI Galway, I am a Fellow of Engineers Ireland, a Fellow of the Institution of Engineering and Technology (FIET) and Senior Member of the Institute of Electrical and Electronics Engineers (SMIEEE). I am also a Fulbright Scholar and a member of the Editorial Board of Medical Engineering and Physics."

John Holden