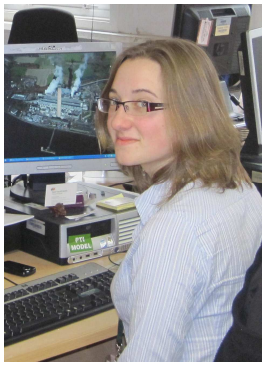
April 2011

mech + bio

Mechanical Engineering and **Biomedical Engineering** at NUI Galway

Mechanical Engineer Sorcha Schnittger putting carbon away

I studied mechanical engineering in NUI Galway because the course could give me an understanding of all the engineering disciplines, as well as developing a logical approach to problem solving which is a real asset for the project management aspect of many jobs.



In my final year of the degree I did a short project on Carbon Capture and Storage (CCS); this is a process to separate carbon dioxide from power plant emissions and store it in underground formations to help combat climate change. The subject really interested me so I applied to do a one-year Masters course in Edinburgh. I was awarded a place having written about the many varied projects I had completed at NUIG, and the experience I had gained on work placement and through various clubs and societies.

Following the Masters I got a job consulting for ScottishPower as a CCS Development Engineer at Longannet Power Station. Part of my job is to assess carbon capture technologies. This involves touring the suppliers' demonstration plants, reviewing their designs and software models, and asking a lot of questions! A sound basis in core engineering subjects such as thermodynamics, fluid mechanics, and design is vital for me to understand and report on these novel processes. I also write and review technical reports on current technologies and academic research which we are sponsoring. A consistent format of report is really important, so it's great that I had experience of writing these in NUIG.

Final year mechanical engineering student Daragh Feeney

Since I had a major interest in cars and anything that moved from a very young age, Mechanical Engineering was the perfect career choice for me. In secondary school I chose physics and technical drawing as I knew these would help with my engineering skills. In first year of the university course, these were both covered anyway, but the experience helped me along. As a final year student, the Mechanical Engineering course in NUI Galway has exceeded expectations by covering a wide variety of subjects that will set you up for the engineering world ahead.

For placement between third and fourth year, I got a job with Sídheán in Spiddal, Co. Galway, who manufacture and refurbish fire engines. It was a major bonus to get involved in the type of industry that I aimed for. While there, I applied my design skills to develop new components and performed inspections on new vehicles to check standards were met. I also learnt how to manage multiple projects at once and also gained tasks that required great responsibility. It's a great experience and makes you realise the studying, labs and projects all come into place for the working environment. After college, I plan to get a job that will further develop my engineering skills, ideally in the area of computer-aided engineering and modelling. My ambition is to work in motorsport engineering.

Ultra-efficient cars

Prizes were recently awarded in the Progressive Automotive X Prize, a competition to build highly fuel-efficient cars that are also practical – they must have reasonable luggage space and comply with US road safety standards, for example. One of the prizes was taken by Edison2, a 4-seater rating over 102 miles per gallon equivalent (2.3 litres per 100 km). Although many competitors opted for electric or hybrid power, the Edison2 team opted for a small ethanol-burning engine, after finding that the extra weight of an electric motor and battery was too much. The machine's performance was achieved with lightweight construction and very low aerodynamic drag. Drag is so low that the car will coast for 1½ miles if power is removed at 70 mph. For more information, see www.progressiveautoxprize.org.

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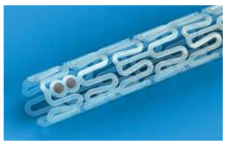
Robotic surgery

Surgical robots are being designed by engineers to perform surgical procedures that sometimes require three surgeons, an anesthesiologist and several nurses. This robot can be controlled by a doctor sitting at a computer console, either in the operating room, or outside in telesurgery. The engineers design everything from the surgical tools to the mechanical robot arms, the software and the computer console. Engineers program the robots to compensate for hand tremors, so if the doctor's hand shakes the computer ignores it and keeps the mechanical arm steady. The robot can operate in a smaller space, operating on the heart by making incisions of only 1 cm, whereas a surgeon needs a 30 cm long incision to do the same job. The patient experiences less pain, trauma and bleeding, which means a faster recovery. These robots might eventually allow doctors to perform delicate surgery even when they are miles away from the patient. For more, see Intuitive Surgical (whose robots are already in use in Ireland) at http://short.ie/zt0yo7 and the UCSC Bionics Lab at http://short.ie/40nbdp.

Biomedical engineer
Mark Gilligan
Helping to produce life-saving medical implants



My biomedical engineering degree has given me the opportunity to work with one of the world's leading medical device companies, Abbott Vascular. Abbott Vascular is focused on transforming the treatment of blood vessel diseases and improving patient care. It has developed multiple products to achieve this, such as protection devices that catch blood clots to prevent strokes and heart attacks, guide wires for a surgeon to navigate to the site within the body where the problem is occurring, and products to close blood vessels during an operation.

I'm currently working on a scaffold which is made of an absorbable frame. This performs like to a stent, a small metal frame, to open up a blood vessel that has been partially blocked by cholesterol. The scaffold or stent is inserted into the blocked vessel and expanded in order to allow better and easier blood flow. However, approximately two years after the operation, the scaffold is absorbed fully into the body. This is the next generation product to deal with blocked blood vessels.

As a Quality Engineer, my day consists of reviewing documents such as instructions and changes to ensure that they are complete and accurate, dealing with issues during production of the scaffold , and participating in validation projects. Validation is where we test the scaffold to ensure it performs as it's meant to. Every day, there are new and exciting challenges and developments within this job, and the medical device sector as a whole.

This was all possible with the education I received at NUI Galway. The course provided me with solid theoretical engineering knowledge and the tools required to be an effective member of the engineering team. I liked the small class size as it gave me the chance to get to know my fellow students quickly, as well as the various lecturers. This made me more comfortable in having one-to-one contact with the lecturers when I needed help. I especially enjoyed the computer design aspects of the course, where we could see 3-D views of our designs. We could also simulate different forces on these designs and see what the outcomes would be like, which was awesome. As well as the formal education, there were the numerous societies and clubs that NUI, Galway had to offer. I made loads of life long friends in these.

Heart surgery
New technology in Galway

Apica Cardiovascular is developing an innovative system that allows surgeons to access the inside of a beating heart and insert devices such as artifical heart valves and ventricular assist devices. In conventional cardiac surgery, the heart must be bypassed, stopped and opened in a difficult, risky process. In the new transapical process, surgeons can work through a small incision at the apex of the heart while it is still beating. Apica involves a partnership between American university Georgia Tech and NUI Galway, and is located on campus in Galway. For an animation of another transapical heart valve implantation, see the Edwards Ascendra procedure at http://short.ie/hzu405. The process requires very compact, strong devices that will function smoothly and precisely inside the body – a classic example of biomedical engineering design.