INVENTIONS & INNOVATIONS

THE POSITIVE IMPACT OF IDEAS FROM RESEARCH ON IRISH INDUSTRY AND SOCIETY
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FOREWORD

A key part of the Government’s plan for jobs and growth is ensuring that we create more products, services and ultimately jobs from Ireland’s high quality scientific research system. The quality of our R&D plays a major part in the success of our multinational and indigenous companies – but we must do more.

This publication is a clear demonstration of the success of Ireland’s national technology transfer system, featuring research teams from all over Ireland. It is a testament to the valuable ongoing work by Enterprise Ireland and the Technology Transfer Offices. It also demonstrates the type of commercial possibilities that exist in the laboratories and research facilities of our Universities and Institutes of Technology.

The Department of Jobs, Enterprise & Innovation is committed to facilitating the transfer of ideas and knowledge from the great minds in our Higher Education Institutions into Irish industry, for the benefit of our economy and society.

With the Minister for Research and Innovation Sean Sherlock TD, I recently announced new structures to make it easier to commercialise - and ultimately create jobs - from ideas developed through publicly-funded research, which currently receives total funding of over €800 million per year.


It will improve the partnership between industry and publicly-funded research by making it easier to commercialise the results of publicly-funded research.

It will create a new world-class system that will make it easier and faster for entrepreneurs and companies to negotiate a commercial arrangement with researchers. It will provide a significant improvement to Ireland’s international offering and encourage more companies to locate here. It will encourage more multinationals and indigenous companies to use the intellectual property generated by Irish research to create products and services and ultimately, create more jobs.

The new policies set out in the protocol will also support the building of relationships between industry and the public research sector that will support a sustainable flow of commercialisation activities and build networks of long term knowledge sharing. It is our ambition that these measures will increase the quality and quantity of commercially valuable intellectual property emerging from publicly-funded research.

I would like to commend Enterprise Ireland and the Technology Transfer Offices for their efforts in bringing the technologies featured in this publication to the market. I look forward to seeing an increase in the level and quality of technology transfer as the measures introduced in the Intellectual Property Protocol outlined above come into practice.

Richard Bruton TD
Minister for Jobs, Enterprise & Innovation

July 2012
This publication provides a glimpse of the exciting new products, services and technologies emerging from research teams in Irish Higher Education Institutions.

Enterprise Ireland works in partnership with Technology Transfer Offices in Higher Education Institutions (HEIs) to translate research from the lab to the marketplace.

To illustrate the economic and social impact of Ireland’s national technology transfer system, Enterprise Ireland and the Technology Transfer Offices have published these stories about research projects being developed into valuable innovations for industry.

They include technologies which will help us create a greener environment, new products to improve food production and to help people get more out of tourism, sports and leisure and clever new ways to deliver healthcare to improve the quality of our lives. These stories will give you a glimpse of the range of innovations which are coming out of research groups in Ireland’s Higher Education Institutions and illustrate how Enterprise Ireland is working hard to get the economic return from the Government’s investment in research.

Where has this come from?
Enterprise Ireland has provided €30M to develop Ireland’s national technology transfer system between 2007 and 2012. This funding is under the Technology Transfer Strengthening Initiative (TTSI) which involves ten Technology Transfer Offices around Ireland.

The aim of the TTSI was to increase the level and quality of Intellectual Property (IP) from research, and help create effective systems to transfer this valuable knowledge into companies in Ireland. This transfer of technology to companies results in the creation of new products, processes and services which can be scaled-up for export.

Every Higher Education Institution in Ireland has been supported through the initiative, with significant support given to the ten Technology Transfer Offices physically located in Dublin City University, Dublin Institute of Technology, NUI Galway, NUI Maynooth, University College Cork, University College Dublin, Royal College of Surgeons Ireland, Trinity College Dublin, University of Limerick and Waterford Institute of Technology.

How has it progressed?
A 2009 Technology Transfer system report found that “…the system that has been developed and supported through Enterprise Ireland has made enormous progress in a short period of time and there is now in place a system staffed with an impressive set of skills.”

The most relevant indicators of commercialisation performance in the system are the rate of spin-out company formation and the number of technologies licensed to industry. Since the inception of Enterprise Ireland’s supports in 2007 there has been an almost four-fold increase in the number of spinouts generated. Technologies licensed to industry have increased tenfold, from 12 in 2005, before Enterprise Ireland support existed, to 121 in 2011.

Other metrics, such as invention disclosures and patents, are measures of the production of “raw” technology and help to provide some insight into the pipeline productivity of the overall system.
In 2011, 86 per cent of the technology licences went to companies based in Ireland, continuing a trend set in previous years.

Comparisons with international statistics for technology transfer show that Ireland is currently generating 20 per cent more licences and 2-4 times as many spinouts for the amount of expenditure on research when compared with more mature technology transfer systems worldwide.

**How do we ensure this continues?**

To ensure a pipeline of new ideas from research, Enterprise Ireland’s Commercialisation Fund supports academic researchers to scope out and develop the commercial feasibility and market opportunity for their research while it is still at an early stage.

The programme funds the development of technologies at all stages of the commercial pipeline to a point where the technology is ready to be commercialised.

Since 2010, Enterprise Ireland has invested €25M in 126 technology development projects through the Commercialisation Fund. These projects, many of which are featured in this publication, are developing new technologies for tomorrow’s world.

Enterprise Ireland’s dedicated team of commercialisation specialists work closely with research groups to develop proposals.

Enterprise Ireland has been supporting the Technology Transfer Offices across the colleges in recent years to bring about a radical change in the professionalism with which the system manages its intellectual property. As the first phase is due to conclude at the end of 2012, Enterprise Ireland launched a call for proposals to the new programme at the end of 2011.

Building on the investment to date, the overall objectives of phase 2 of the Technology Transfer Strengthening Initiative are: to develop the Irish technology transfer system such that it will respond quickly and flexibly to industry, where the licensing of technology will bring direct economic benefits, and to radically enhance the culture of commercialisation among researchers in the Irish HEI sector.

Enterprise Ireland’s partnership with the Higher Education Institutions is going to continue and develop. Building on the high quality resources that are now in place, we are creating consortia of colleges to make better use of the expertise available and greater value for money. This work represents a key part of the process of unlocking the creative potential of our researchers to support innovation in industry, leading to jobs and economic growth.

The stories in this publication give a sense of the enormous impact of the Technology Transfer Strengthening Initiative on the quality and impact of Irish research. While the numbers of spinouts and licence deals are valuable and must be measured, the aim of this publication is to highlight other, in some cases, more meaningful outcomes such as improvements to our health and quality of life.
CREATING CLEVER COMPANIES FROM GROUND-BREAKING RESEARCH

Since Enterprise Ireland initiated the €30 million Technology Transfer Strengthening Initiative in 2007 to better resource the Technology Transfer Offices, there has been a four-fold increase in the number of spin-out companies created from intellectual property produced on campus.

The list that follows identifies the 117 companies that emerged from Higher Education Institutions in Ireland from 2007 to year end 2011.

Each of the 117 spin-outs is at a different stage of development, but it is possible to group them into 3 broad categories;

**Category 1:** Incorporated entity, built on intellectual property from a Higher Education Institution.

**Category 2:** Licence concluded, working with Enterprise Ireland and / or Business Partner to expand. Typically employing 2-3 people.

**Category 3:** Has won investment/sales, and is an Enterprise Ireland high-potential start up client. Typically employing 5-10 people.

Currently, there are 64 companies in category 1, 20 in category 2, and 33 in category 3.

Although only established for a short time – a few months in some cases – the 33 companies in category 3, or ‘high potential start up companies’ which have their origins in publicly-funded research currently employ more than 135 people in Ireland between them. It is expected that this figure will grow as the companies mature.

Building on this success to date, Enterprise Ireland is aiming to deliver 30 spin-out companies from research in 2012. Under the Government’s Action Plan for Jobs 2012, a target of converting 14 of these into high potential start-up clients of Enterprise Ireland this year, and 15 in 2013 has been set.

Delivering on these targets will not only produce new companies with substantial employment prospects, but will bring innovative solutions for societal challenges to the fore.
# Spinouts from Publicly-Funded Research

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### SPINOUTS FROM PUBLICLY-FUNDED RESEARCH

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## Spinouts From Publicly-Funded Research

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**Total 117 spinouts**
INTRODUCING IRISH INDUSTRY TO NEW INVENTIONS FROM RESEARCH

There has been a ten-fold increase in the number of technologies licensed to industry from Higher Education Institutions since Enterprise Ireland provided €30M under the Technology Transfer Strengthening Initiative in 2007.

121 licence deals were concluded in 2011, bringing innovative new ideas from researchers to the marketplace to the benefit of the companies involved.

Examples of how these licence deals impacted on the performance of the companies that licensed the technologies follow in this publication.

In addition, Enterprise Ireland provided funding for a range of other programmes which link industry in Ireland with research teams and allow for mutually-beneficial collaboration to take place.

In 2011 alone, 1,965 companies in Ireland benefited from these collaborative programmes. The table identifies the main programmes and how many companies benefited from each.

### NUMBER OF COMPANIES RECEIVING INNOVATION SUPPORT FROM ENTERPRISE IRELAND IN 2011

<table>
<thead>
<tr>
<th>Support provided by Enterprise Ireland</th>
<th>No. of Companies benefited</th>
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<tr>
<td>Technology Centres and Applied Research centres</td>
<td>399</td>
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<td>Innovation Vouchers &amp; Innovation Partnerships</td>
<td>852</td>
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<td>R&amp;D Fund and non-financial support</td>
<td>236</td>
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<tr>
<td>Access to international R&amp;D programmes</td>
<td>76</td>
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<tr>
<td>Start-ups located in Enterprise Ireland funded campus incubators</td>
<td>327</td>
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<tr>
<td>Companies facilitated to receive company to company licences</td>
<td>20</td>
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<tr>
<td>Companies facilitated to received licences from third level research</td>
<td>55</td>
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<td><strong>Total</strong></td>
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When Dublin’s senior GAA footballers secured victory in the All-Ireland final in 2011, the ‘Blues’ celebrated for weeks.

But there was at least one Corkman who was happy with the result too.

“I was probably one of the few Corkmen cheering for Dublin in Croke Park in the final that day,” recalls James Carroll, CEO of Scientia Sports. Why? Because the team had been using ProVue, an e-diary being developed by Scientia Sports that lets athletes and coaches record and analyse information about training and performance.

The Dublin team put the system through its paces in the run up to the final, says Carroll, who describes how the online diary works.

“Athletes go online and fill out information about how they are doing after training. That means that Dublin manager Pat Gilroy can pull up the relevant player information on the squad immediately instead of having to make 60 phone calls every morning.”

Gilroy says the e-diary is invaluable as a tool to monitor players’ multi-commitments and can be used as a central platform to share video and dietary information. “In today’s world it is a highly efficient way to manage fatigue and health issues,” he says.

The system also allows athletes to see how they are doing, explains Carroll.

“They can look at their sprint and exercise times, and it works as a type of motivation tool - they can see how they are doing against their peers.”

The technology behind ProVue comes from Dublin City University, where it was developed by experts in health and human performance led by Prof Niall Moyna and Dr Mark Roantree. It has been licensed to Scientia Sports through the Enterprise Ireland-supported Invent Centre at DCU.

“We found the people at Invent very practical and go-ahead in terms of trying to work with entrepreneurs to commercialise what they had in the black box,” says Carroll.

Scientia Sports has been introducing the system to sports organisations and teams in Europe and Australia. Meanwhile rugby coach Matt Williams, who is director of sport in the company, has been using ProVue...
13technology transfer
case studies
with this teams in France.
And Carroll sees more value being added to the software in the future: such as linking in sensors that can monitor physical metrics of performance like aerobic capacity and lactate in the blood, and offering a sport service behind the system.

The area of connected health holds even more promise for the platform, he describes. "That is where it could create a lot of jobs - for diabetes in particular, where people could use the e-diary after they have been diagnosed and physicians could monitor their symptoms and management."

Another approach to gathering useful data about sports performance came when inspiration struck two engineer cyclists, or cycling engineers. The muse visited as they rode out with their club in South Dublin.

They started thinking about a device called a ‘power meter’ that attaches to a bike to measure performance. "Someone had a power meter on their bike but we didn’t like the way it was designed;" recalls Dr Barry Redmond, a lecturer at Dublin Institute of Technology.

“We started talking about how we could design a better one, sitting on the bikes at the back of the bunch on a Sunday morning and our ideas evolved a little.”

What if you could put the power meter onto your shoe rather than the bike - but in practice it took some crafty research, development and engineering.

The fledgling company, called Brim Brothers, went through the Dublin Institute of Technology Hothouse Venture Programme, an Enterprise Ireland-supported initiative that offers training and space to start-ups.

“I’ve been involved in companies before, so initially thought I didn’t need Hothouse, but I was persuaded and I’m extremely glad I went through it,” says Redmond, who is now CEO of Brim Brothers.

“You are with a bunch of other people who are going through similar problems and challenges, even thought their businesses are in different areas. You get to talk to people in an open way and everyone has their own perspective.”

Getting the shoe-based power meter ready for the market has encountered a few bumps along the way: Redmond explains that they had to come up with new solutions around making the sensors small and affordable - but he argues that it has strengthened their hardware and software technology.

And, no strangers to bouts of adverse weather and less-than-pristine terrains on the bike, Brim Brothers also had to make sure the power meters could withstand the ride in this new, lowdown position.

“When something is on your shoe when you are cycling, it has to put up with dirt, being immersed in water, and being walloped around in many ways,” explains Dr Redmond. “The robustness is a challenge, and we have to keep the costs down.”

Cyclists are now lining up to trial and pre-order the power meters, which will be assembled and calibrated by engineers and technicians in Dublin, according to Dr Redmond.

And because Brim Brothers has already put the legwork into design and development, professional and amateur cyclists alike should find it a convenient addition to their sport.

“The whole idea of this is that somebody will just put it on and use it, there’s no special treatment, that takes a lot of engineering and design,” says Redmond.

“The easier we want to make it for an end user to use, the harder it is for us to develop. We do the hard work, not them.”
A CLOSER LOOK AT DISEASE

Getting a better view of cancer

When you put cells from the body under a microscope and take a close look, you can tell a lot about them. Including, in some cases, whether or not they are cancerous. Such microscope-based tests are a mainstay for screening cervical smear samples from patients.

Cervical cancer - or cancer at the neck of the womb - is the second most common female cancer in Europe, but it tends to develop slowly. Many countries, including Ireland, run screening programmes where women give cervical samples to be checked for signs of cells changing.

At the moment, the samples are typically stained with special dyes and analysed down the microscope by cytologists or pathologists, who look at the shapes and other characteristics of the cells to judge whether there might be a problem.

But while human expertise is crucial to diagnosis, technology can lend a hand too.

One approach being developed at Dublin Institute of Technology is looking to screen high volumes of cervical smear samples in a new way.

The DIT technology, called Cervassist, wants to automate the reading of the samples under the microscope by shining a laser on them and measuring a particular type of light called ‘Raman scatter’ that is reflected back.

This reading provides information about the molecular structures in the cell, offering a biochemical fingerprint that software can then analyse for warning signals of cancer, explains researcher Dr Fiona Lyng, who manages the DIT Centre for Radiation and Environmental Science.

“We have been showing that Raman spectroscopy is very good at discriminating between normal and abnormal cells purely based on a cell’s biochemical content,” she says.

“We are also working on a cell recognition algorithm, which is a way of automatically finding the cells in a sample and then automatically recording their Raman spectra.”

The Cervassist team has been working closely with Hothouse at DIT to commercialise the system, and have licensed technology to partner company Raman Diagnostics.

The potential benefits of the Raman approach include better sensitivity of screening, explains Dr Lyng, who received the Enterprise Ireland ‘One to Watch’ award in 2011.

“In current practice, in a very good lab the sensitivity of screening cervical smears would be about 70 per cent,” she says. “But in our initial tests using Raman spectroscopy, the accuracy was greater than 98 percent.”

The Cervassist team is continuing to develop technology with funding from Enterprise Ireland and through a collaboration with The Coombe Hospital in Dublin, and they have already started to develop Raman spectroscopy for analysing human papilloma virus (HPV) infection in cervical cells, which is linked to an increased risk of cervical cancer.

Dr Lyng explains that the automated approach could be used to assist screening programmes by identifying the normal smears, and flagging the samples that need the expert eyes of cytologists.
or pathologists to examine more closely for potential problems.

Irish company OncoMark is also using smart technology to capture information about cancers from patient tissue samples. Their high-throughput image-analysis system can automatically recognise the features of tumour cells and can quantify levels of important biomarkers (molecules of clinical interest) in many different types of cancer.

“We look at biomarker expression in tumour tissue,” explains Prof William Gallagher, co-founder and CSO of OncoMark Ltd, which is a spin-out from University College Dublin. “We want to be able to predict disease outcome of cancer patients. Of particular interest to us is prediction of response to therapies. This importantly supports cancer drug development.”

OncoMark’s IHC-Mark software can ‘learn’ how to automatically recognise tumour cells in a tissue sample that contain biomarkers of interest, explains Prof Gallagher. He started to develop the approach as a solution to a problem that was cropping up in his research at UCD.

“We were doing a lot of work with tissues, and we would have hundreds of specimens on a single slide,” he recalls. “There was a huge bottleneck when it came to getting data and interpreting those samples.”

Prof Gallagher worked on the basic science underpinning the high-throughput analysis technology in his lab at UCD, and Enterprise Ireland took up the baton and funded further development and validation.

“We validated the technology with tissue from more than 1,000 breast cancer patients and 3,000 prostate cancer patients,” he recalls. “That really increased the value of this core platform technology.”

OncoMark has now in-licensed IHC-Mark and Prof Gallagher describes that combining the high-throughput approach of recognising tumour cell characteristics with the ability to quantify biomarkers in the cells would be of interest in cancer drug development.

“As part of our Biomarker Interpretation Workflow, IHC-Mark is now becoming part of the cancer drug development process carried out by pharmaceutical companies to identify patients who will benefit from such drugs, help recover drugs that have previously failed in the development process and simply inform whether such drugs are hitting their intended targets.”

The company is itself using IHC-Mark to look for new biomarkers in cancer and, in the longer term, the hope is that the approach will also help to inform doctors so they can tailor therapies for individual patients based on the characteristics of their tumour tissue.

OncoMark, which is now growing its workforce at NovaUCD, has generated €3.5 million in EU funding covering the next three to four years, and is looking to build up its product pipeline, as Prof Gallagher describes: “We are looking at a variety of technologies coming from Irish universities and internationally with a view to licensing in. OncoMark is well positioned to be the go-to portal for cancer biomarker commercialisation.”

The Technology Transfer Case Studies page contains case studies of companies using technology to capture information about cancers from patient tissue samples. The text discusses the challenges faced by researchers in processing large amounts of tissue samples and how smart technology is being used to automate the process. OncoMark, an Irish company, is using its high-throughput image-analysis system to automatically recognise the features of tumour cells and quantify levels of important biomarkers in many different types of cancer. The text highlights the importance of being able to predict disease outcome and response to therapies, which supports cancer drug development. The company is using its IHC-Mark technology to identify patients who will benefit from such drugs, help recover drugs that have previously failed in development, and provide information on whether the drugs are hitting their intended targets. OncoMark is growing its workforce and product pipeline with the support of €3.5 million in EU funding.
Cutting costs in drug discovery by keeping cells happy

If you are in the business of drug discovery, finding that specific molecule which can hit the target is the key to success.

One way to do it is to screen millions of individual cells, watching what candidate molecules do to each one. But it’s an expensive and time-consuming process. So how can we make it easier?

Irish company BioCroi has hit on a way to lighten the load in those heavy-duty screening stages.

The typical approach taken in industry is to grow the cells in small holes, or wells, on a plastic plate, then robotic systems can analyse them and gather the data for analysis.

“These cell-based assays are performed under high speed using automated microscopes,” explains Peadar MacGabhann, Managing Director of BioCroi. “But there’s a lot of noise associated with the results - so they have to do lots of experiments to get over that problem.”

What if you could reduce that noise, by protecting the cells in the wells from the outside environment a little better?

That’s the idea developed by inventor Dr Anthony Davies, who directs the Irish National Centre for High Content Screening and Analysis at Trinity. He came up with a gel-based buffering system which surrounds the wells of each individual culture.

“It insulates the cells against changes in temperature and also creates a vapour cloud over the well which prevents evaporation,” says MacGabhann.

With that more stable environment comes less noise and better readings. The approach also means that the volumes of the cell cultures could be made orders of magnitude smaller and still give accurate results.

“Where assays are currently done using 100 microlitres we are doing a well of 100 nanolitres,” explains MacGabhann. “This cuts down vastly on the amount of materials you have to use, so it cuts down on cost.”

While the idea of buffering the wells to keep the cells happy and the noise down sounds simple, it wasn’t that straightforward in practice, explains MacGabhann, who partnered with the group just before the company spun out in 2009.

“A lot of these assays are very sophisticated and they are developed in labs over a period of years,” he says. “It hasn’t been that easy.”

But the company has been going from strength to strength with the technology and MacGabhann credits the Trinity College Dublin Tech Transfer Office for facilitating the initial partnership and spin-out.

“People like James Callaghan and Gordon Elliott came into Trinity and they transformed that whole process of spinning out companies,” he says.

“In order to get IP out previously you had enormous administrative structures to go through, but they cut through a lot of the red tape.”

In 2011 BioCroi received €800,000 in seed investment from the MedTech Accelerator Fund managed by Kernel Capital, including €300,000 from Enterprise Ireland and private investors.

And as the company now expands and moves into developing plates and beta testing, MacGabhann reckons the fact that industry is now using ‘smarter’ robots means their system should be well accommodated.

“The robots have gotten clever, they can work with lots of different formats, and that is good for us,” he says.
A new window on brain activity

As you read this, biochemical reactions are taking place in your brain that allow you to register and understand it. And as you live your life day and night, when parts of your brain become active, they start to need more glucose and oxygen to fuel their work.

Getting a handle on the important chemical changes that happen in the brain is a challenge, and at the moment technologies tend to be quite impractical, particularly if you want to get information in real time and over the longer term.

Functional MRI can track how blood flow changes in the brain, which suggests underlying changes in chemistry, but it is an expensive, cumbersome approach and the brain has to be still, there’s no moving around.

There are also ways to measure how levels of chemicals themselves change, but they tend to be invasive because they extract fluid samples. Also they provide a snapshot of information for just one point in time.

But new technology developed in Ireland is opening a new window for research into brain chemistry. The approach, which implants tiny sensors into the brain, gathers data in situ in real time, and means that researchers can monitor brain chemistry and behaviour over the course of months in animals that are awake and moving.

“Researchers want to know how the chemistry of the brain is changing as a result of interaction with the outside world or with potential drug compounds - it couldn’t be done before and now it can be with these sensors,” explains Rory Geoghegan, CEO and co-founder of Blue Box Sensors.

The implantable sensors, which were developed by Prof John Lowry and his group at NUI Maynooth, are in effect tiny wires with some clever chemistry on the tips.

They can be implanted surgically into specific regions of the brain and left there, where each sensor can measure changes in various ‘analytes’, including oxygen, glucose and nitric oxide as well as signalling chemicals that tell brain cells to fire.

The scope for such technology in life sciences research and industry is substantial: ultimately the sensors would be of particular interest for drug discovery and testing, particularly in the field of central nervous system diseases, where better animal models are needed to progress promising therapeutic compounds from preclinical studies to clinical trials in humans.

Blue Box, which spun out of NUI Maynooth in 2009 has licensed sensor technology from the university, and is currently introducing the tethered sensor solution into large research labs and pharmaceutical companies.

The company is also developing a wireless version of the sensors and it is looking to record changes about multiple chemicals in real time. “We believe that the implantable sensor technology will allow quicker results with fewer animals,” says Geoghegan.

Enterprise Ireland invested almost €1 million in the research that was carried out before Blue Box licensed the technology, and Geoghegan commends the practical and efficient way in which the Commercialisation Office at NUI Maynooth managed the company’s spin-out.
The bug stops here

It’s a cruel irony, but hospitals and clinics - which are there to help people recover from illness and injury - can also be a source of new infection.

The agents of those ‘healthcare-acquired infections’ or HCAIs can be viruses, bacteria or fungi which might be harmless to healthy people but can cause problems for people with compromised immune systems. And some bacteria have even developed ways to survive conventional treatments such as frontline antibiotics, so they can be especially dangerous.

In Europe alone, it’s estimated that more than 4 million people contract a HCAI each year, and around 140,000 people die as a direct result. And quite apart from the human suffering of individuals and their loved ones, HCAIs are also costly to healthcare providers because they can result in extended hospital stays due to complications. It is estimated that the annual cost of HCAI’s to European health services is over €30 billion.

The push is on to develop technologies
that can stop those pathogens in their tracks. And it could be as simple as clinical staff washing their hands effectively.

Irish company Glanta is weighing in with a mobile training system that gets staff up to speed with hand-washing techniques that remove or kill pathogens and reduce the risk of cross-infecting patients.

Their SureWash training system allows individuals to practice their hand-washing skills, in their own time and without the need for a trainer being present. The system can identify errors in technique and offer solutions.

"Hand washing is a physical activity, and people are best trained in physical activity through repetition," explains Sean Bay, CEO of Glanta, which spun out of Trinity College Dublin in 2010.

“Our system facilitates 'on the ward' training, staff can train in short bursts when they have a couple of minutes here and there. They can be responsible for their own training.”

The mobile SureWash system can be brought to a ward and users can practice hand washing while software image-analysis tracks their efforts. They can practice anonymously or else put in their ID and build up a record of their skills.

“It's like tying your shoelace - if you train enough then you can do it with your eyes closed,” says Bay. "This is what we want with hand hygiene - everyone will wash their hands or use gel correctly without thinking about it."

The idea for the innovative technology came when inventor Dr Gerard Lacey was in his car, listening to a report on the radio about SARS and how washing hands can help reduce the spread of the virus. His own work on visual graphics in Trinity was looking at how video technology can recognise hand movements.

He put two and two together and came up with the SureWash technology, explains entrepreneur Bay, who paired with the team, and they spun out Glanta.

Getting the video-recognition software to ‘understand’ the whole picture of hand washing required development and expertise, says Bay.

“It’s not just viewing what you see, it’s understanding what you don’t see as well,” he explains. "So when the hands interact, what is happening between the ten digits and the palm space and the arm."

The training technology, which is patented in Europe and the US, has undergone trials in hospitals in the UK and Ireland, which saw hand-washing compliance rates increase by more than 200 per cent.

The system is now in use in hospitals in Ireland and Switzerland, and it has been welcomed with open hands - as the experience in Dublin's Mater Private Hospital demonstrates.

“We brought the SureWash Training into the hospital on a Friday evening and the nurse in charge positioned it on the cardiology ward, turned it on and told the staff here's a new device.” recalls Bay. "When she came in on Monday morning, 61 staff had already gone through the training process."

Glanta has now secured private investment - which was made smoother by the good working relationships with Enterprise Ireland and Trinity College Dublin, according to Bay - and is now rolling out the product in Europe and Australia. Meanwhile, operations in Ireland are set to grow in development, manufacturing and support.

"We have specialised software engineers and are looking to develop our customer service and support areas,” says Bay. “We can effectively run the international support from here and use Ireland as a hub for global activity - we are well placed for time zones."

And as well as giving individual hospitals feedback on hand-washing effectiveness, more widely the training technology could help economies save tens of millions of Euro each year by reducing HCAI levels, according to Bay. “The money saved could be fed back into the health service - and that’s all without losing a single job.”

Ultimately, reducing levels of HCAIs will result in better patient outcomes, quicker recovery and saved lives. “Patients are the beneficiary of this technology,” he says.

And it’s not just hands, potentially disease-causing microbes can also hitch a ride on textiles to move around a healthcare setting.

While staff can wash their hands between patients, cleaning uniforms happens less frequently - so how can you help keep bugs from living on clothes?
A European project led by the University of Limerick has come up with Nanoplast, which is a way to incorporate nanoparticles onto the outer surface of textiles that, when activated by light, can kill off bacteria. So by simply exposing the material to light - indoors or better yet going for a quick walk in sunlight - hitchhiking bugs can be killed.

The technology puts these very small particles called nanoparticles into textile material,” explains Dr Tofail Syed from the Materials and Surface Sciences Institute at UL, who was a leader on the EU-funded BioElectricSurface consortium. “Then when they react with part of the sunlight they become antimicrobial.”

The approach faced a few challenges, particularly because the textiles and nanoparticles were so different from each other.

“The main difficulty there was that these particles are hard like sand, while the textile is very compliant and soft - so how do you mix something that is so hard into something that is so soft,” recalls Dr Syed.

The consortium came up with a finishing process that would apply the nanoparticles to the synthetic textile at the end of the production line. It uses the properties of the material itself, rather than needing chemical binders.

Next step was to see how well they stuck, so into the laundry the textiles went. “We had washing machines going days and nights to test them,” says Dr Syed. “We tested them for up to 40 washes in a condition that would be similar to industrial scale washing.”

Tests showed that the nanoparticles stuck well to the textiles; but did they kill off the bugs when they were in situ? Yes, according to the tests, which were carried out with colleagues in Wroclaw University of Technology and Wroclaw Medical University, Poland.

Light-activated titanium nanoparticles on the textiles were active against MRSA, while silver-doped titanium nanoparticles applied by the technology could see off E. coli when exposed to light.

Dr Syed credits Enterprise Ireland’s support and expertise in UL’s initial successful involvement with the European project, and the extensive help provided to the project by Seamus Browne of UL’s Technology Transfer Office, both in surveying the market and in offering hands-on support.

Enterprise Ireland is continuing to support Nanoplast through a Commercialisation Fund Technology Development award.

And while the approach is still being developed and tested, Dr Syed is confident it will work on other synthetic textiles and synthetic blends.

“Clothes are a potential source of contamination, but because our technology is making the textile photo-sterilisable, it means if you go for a walk in the sun you will be cleansing them.”
Using the immune system to fight cancer

Cancer is one of the world’s major killers: in 2008, it accounted for about 13 per cent of all deaths worldwide, according to the World Health Organisation. Figures for Europe alone suggest that nearly 1.3 million people will die from the disease through 2012.

Medical treatment for cancer is advancing, but what about recruiting the body’s own weapons against tumour cells?

Irish company TriMod Therapeutics Ltd is developing a way to help harness a person’s immune system in the fight against cancer.

It has long been known that the immune system can target cancer in the body, but ramping up a person’s immune defences isn’t as easy as it sounds, explains Dr Jeremy Skillington, CEO and co-founder of TriMod.

“The immune system has many mechanisms to put the brakes on itself,” he says. “If you ramp up the immune system it’s very good at shutting itself back down.”

But what if you could take those brakes off?

Science Foundation Ireland-funded research by TriMod co-founder Prof Kingston Mills at Trinity College Dublin has found a route to inhibit the biochemical pathways that apply the brakes - with the net effects of boosting important immune cells.

TriMod has secured seed funding of €750,000 from Enterprise Ireland, Opsona Therapeutics and Oyster Technology Investments Ltd to help bring the technology out of the lab and towards the clinic.

Enterprise Ireland was particularly helpful in the critical assessment of TriMod’s business plan, and were able to respond rapidly to the company’s needs, according to Dr Skillington: “They saw the value TriMod could provide to both medicine and Ireland and they did a terrific job to help secure the financing,” he says.

So what is next for the company? The immune-boosting approach has worked well in preclinical models of cancer, and TriMod is now linking with biotech and pharma companies to develop further approaches that expose tumours to an amped up immune system and move towards clinical trials.

“We want to open a window for the immune system to recognise the tumour, then the immune system can start its work,” says Dr Skillington.

“On paper the cancer is very smart at evading the immune system. But if you can find an Achilles’ heel to expose it again, the immune system is powerful enough to win that battle.”
A novel ‘no-flush’ niacin for better cholesterol control

Niacin, or vitamin B3, is well established as a highly effective agent for treating cholesterol problems. It can improve the profile of lipids in the blood such as high LDL (“bad cholesterol”) and low HDL (“good cholesterol”). But more than one in two patients stop taking niacin due to the side-effect of skin flushing.

Thanks to some clever chemistry, a new niacin prodrug could help overcome that problem; by engineering the compound to release aspirin in the bloodstream, where it inhibits the chemicals that cause flushing, and then releasing niacin with a distribution profile that results in greater efficacy.

The new chemical entity, which was engineered by Dr John Gilmer at Trinity College Dublin, is now being developed by pharmaceutical company Solvotrin Therapeutics Ltd, which spun out in 2009.

CEO and co-founder Pat O’Flynn became involved when he met the Trinity team through the Enterprise Ireland Business Partners Programme.

Cork-headquartered Solvotrin secured initial funding of €1.2 million from the founders and Enterprise Ireland, and is now developing the new, chemically modified niacin compound.

The compound has already shown a positive effect on blood lipids in preclinical proof-of-concept studies. This is on top of its benefits demonstrated as a “no flush” niacin, explains O’Flynn.

“Having Ireland recognised internationally for developing a new chemical entity would be a great thing,” he says.

Solvotrin won the 2010-2011 Enterprise Ireland Life-science & Food Commercialisation Award.
Food production is one of the most critical sectors for human survival: a global population of more than seven billion means enormous investment - and opportunities - in technology to improve farming.

Happy, healthy animals tend to be more productive, and Irish company Reprodoc has developed technology to monitor the reproductive wellbeing of beef and dairy cattle.

Now an Enterprise Ireland-supported project with Dublin City University is looking to go global with the approach.

“We provide reproductive management services to the dairy and beef industry throughout Ireland and our objective is to improve the whole wellbeing of animals,” explains Dan Ryan, founder of Reprodoc.

To monitor the cattle, he uses ultra-sonography to capture information about each cow’s reproductive system at various points in the production cycle.

“If the animal is happy in the environment she is in, the reproductive tract of the animal will show us images which are concurrent with an animal that is happy,” he explains. “But if the animal is in an adverse environment, where the housing or nutrition is not concurrent with her proper welfare, the reproductive images will show that the uterine environment is hostile so she will not go back in calf.”

Ryan is no stranger to the highways and byways of Ireland, visiting around 3,000 farms each year.

But while the technology can give the answers, the difficult bit has been to physically process the information from the ultrasound equipment.

Thanks to an Enterprise Ireland Innovation Partnership grant, the company has been working with image analysis experts at the Centre for Image Processing & Analysis in DCU to come up with a solution.

The technology they are developing would mean that a technician could monitor the animal, then the information gets relayed to the company for automatic analysis on the herd.

“By being able to automate the technology we can provide services worldwide,” says Ryan. “This will allow us scale up from our markets to a global network.”
A helping hand for food producers

Beef and dairy might be familiar staples on Irish menus, but globally there’s also an enormous appetite for sea urchin roe, and Irish company GourmetMarine has developed a new, efficient way to farm the animals.

Its patented UrchinPlatter™ system uses specially designed modular cages and tanks that allow the sea urchins to grow happily. And the company is starting to tap into the global market for sea urchin farming, which is worth about €800m per year, according to founder Dr Gerry Mouzakitis.

GourmetMarine spun out from University College Cork in 2008. With funding from Enterprise Ireland and private investors it has completed successful academic and industry validation of the sea urchin farming system, including major trials in Chile, which is one of the world’s major producers. “It works very well with the Chilean sea urchin, which is important as it accounts for about 45 per cent of world production,” says Dr Mouzakitis. “We can show we can make high quality roe using a feed of only seaweed - you are not giving it any artificial flavours or colours, you are giving it what it eats in the wild.”

GourmetMarine is now expanding global sales and offers equipment, training and consultancy to seafood producers. But Mouzakitis is adamant that while the focus is worldwide, production and design of the product will remain in Ireland.

“That is really important for me,” he says. “I can go on a day trip from Cork to Galway and sit with the designer. If the design was outside of Ireland that would be very difficult.”
Hot water that doesn’t cost the Earth

Hot water is something we probably take for granted - whether we are at home doing the dishes or having a shower, or in industry for cleaning and hand hygiene.

But heating water can be an expensive business, particularly during the day when electricity tariffs tend to be higher. Not to mention the wider environmental impact of using electricity to heat the tank.

Dr Mick McKeever at Dublin Institute of Technology has come up with a neat solution to help keep hot water on tap during the day without incurring extra cost.

His invention, the Warmer Wedge, sits at the outer side of the tank and stores energy from the heat. Then it releases the energy slowly back to the water in the tank over time.

That means savvy consumers can heat water during the night when electricity is cheap, and get the benefits during the day when they need hot water.

Dr McKeever, a lecturer in engineering, got the idea while working on solutions for hot-water cylinder tanks that involve phase-change materials, which melt as they absorb energy and then give the energy back as they solidify.

Putting phase-change material inside the tank was one option, but it would mean building a new tank from scratch, and even then the costs would be prohibitively high for home consumers.

Dr McKeever devised a more practical solution: modular ‘wedges’ containing the phase-change material that can be clipped to the outside of an existing tank instead.

In practice, that means when the tank gets hot it heats the phase-change material in the wedges, then they release the energy back to the tank later.

“It is a modular system so you can buy up to 10 of them depending on the size of your tank,” he explains.

“If you heat the water at night time, when the cost of electricity is cheaper, the Warmer Wedge will allow you to have more capacity so you can get through the next day, rather than needing to heat the tank again to wash the dishes. So there are cost savings.”

When he was working on the now-patented technology, he called DIT’s technology transfer staff about the commercial potential and got a “more than helpful” response.

They advised him about funding options and brought him through the procedures to secure commercialisation funding from Enterprise Ireland.

That funding is allowing Dr McKeever to develop prototypes and address issues such as packaging, and he is now looking at routes to bringing the Warmer Wedge to market and talking to interested companies and retail outlets.
Environmental testing - the smart way

The quality of water is critical for life and health. Pollution can mean that plants and animals die, or that entire regions need to boil their drinking water.

But a technology being developed in Ireland aims to enable automatic monitoring of water in the field, so problems can be detected early and without the need for people to visit remote sites often.

Carlow-based company T.E. Laboratories has been linking in with Dublin City University to realise this goal.

“We have a vision that certain amounts of environmental testing can be done in the field rather than the laboratory,” explains Mark Bowkett, CEO of T.E. Laboratories.

One way of detecting pollution remotely is to deploy sensors in the field and monitor them over time. To look into the approach, TE Laboratories went to DCU for expertise - the researchers met through an organisation called QUESTOR, which links companies with academic experts for environmental innovation.

Since then, through an Enterprise Ireland Innovation Partnership Award grant, T.E. Laboratories has been collaborating with Prof Dermot Diamond’s lab at the National Centre for Sensor Research in DCU.

Their emerging sensor technology uses microfluidic hardware and customised chemicals to detect changes in water quality, then the information is relayed to an online monitoring system.

“It’s an early warning pollution device,” explains Bowkett. “We can put this into a river and if there’s a material change in the river that can indicate pollution, this device will issue a warning and a sample of the water is captured for analysis.”

Aside from the environmental and societal benefits of being able to detect pollution early, the hope is that manufacturing and monitoring the sensors will also support further employment in Ireland.
Exploring more efficient wastewater treatment

A technology called OxyMem is being developed at University College Dublin, to make wastewater treatment more efficient.

“Currently wastewater treatment plants use air-sparging to supply bacteria with oxygen for breaking down pollutants,” explains Dr Eoin Casey, a senior lecturer at UCD.

But current processes are wasteful - around 70 per cent of oxygen bubbled into wastewater goes unused by the bacteria, and this contributes to enormous electricity bills chalked up by wastewater plants.

Dr Casey’s team has been working on a different way of introducing oxygen, and it doesn’t use bubbles. “Instead of using bubbles we are using tubular membranes - air or oxygen flows on the inside and the oxygen diffuses - without bubbles - through the membrane into the liquid,” explains Dr Casey. “The only oxygen you provide is the oxygen that the organisms need so there’s no waste.”

The OxyMem system allows microbes to grow in biofilms on the membranes that are densely packed, which improves the productivity of the wastewater treatment plant.

But it can also monitor when biofilms are becoming a problem and are likely to cause clogging. “Our invention allows us to monitor quite easily what is going on and to know when to apply a control strategy that unblocks the system,” explains Dr Casey.

“The idea is that the whole process could be retrofitted into existing wastewater treatment plants and run automatically with minimal intervention.”

An Enterprise Ireland commercialisation grant has allowed the group at UCD to build a large-scale pilot system in the lab, where it can be closely evaluated by the development team.

And one of the highlights of bringing the research towards commercialisation has been the involvement of an industrial advisory board, according to Dr Casey. “Several companies are providing us with really good feedback,” he says.

Ultimately, the technology could offer the environmental double-whammy of purifying water while reducing energy consumption, explains Dr Casey.

“If someone who is operating a wastewater treatment plant could implement this OxyMem technology, they could save dramatically on energy usage, whilst achieving increased discharge standards.”
The Irish medical device revolution

A device that trains the brain to mute the imaginary sounds of tinnitus. An implantable scaffold to help bones to heal after injury. A monitor that helps people with asthma learn to use their inhalers properly.

Those are just some of the Enterprise Ireland-supported medical technologies that are emerging from research in Ireland.

Medical technology or ‘medtech’ is one of the great success stories in Ireland in recent years. The sector employs around 25,000 people directly in Ireland and had exports in excess of €7.2bn in 2010 – up 14 percent on 2008 levels.

This means Ireland has become the second largest exporter of medtech products in Europe, behind only Germany.

Historically, large multi-national medtech companies have invested in Ireland, and today most of the world’s top names in the industry have a presence here.

But indigenous medtech has been thriving too, and Enterprise Ireland strongly supports Irish companies in developing innovative new devices and technologies to help clinicians deliver care and to improve the quality of patients’ lives.
Silencing tinnitus

Imagine if you could hear ringing, whistling, buzzing or hissing in your ears, even though there was no external source of the noise. Now imagine that noise wouldn’t go away, you just had to live with it. Welcome to tinnitus.

Around 40 million people worldwide are thought to have the condition, which in severe cases can impair the quality of life.

MuteButton, a medical device company that spun out of the Hamilton Institute at NUI Maynooth in 2010, is working on a new way to help silence that illusory noise.

The technology, which was developed at NUI Maynooth by Dr Ross O’Neill, Dr Paul O’Grady and Prof Barak Pearlmutter, aims to train the brain to identify the phantom noise and know what to tune out.

To do this, the MuteButton device plays music to stimulate the sense of hearing, and at the same time stimulates the sense of touch by delivering the information to sensors placed on the tongue.

In this way the approach targets parts of the nervous system that integrate sound and touch. Then by comparing the inputs, the person’s brain can learn to distinguish the real sound, which matches with the tactile input from the tongue, from the illusory sound that’s heard in tinnitus.

In 2010 Dr O’Neill won Enterprise Ireland’s ‘One to Watch’ award, which was a catalyst for investment into the company. “It got MuteButton the perfect level of media exposure,” he says. “We got a number of investors who approached us and one of them invested.”

Enterprise Ireland has also invested in MuteButton as it trials the technology clinically and moves to seek regulatory approval to market it for use in the treatment of tinnitus.

And Dr O’Neill has plans to go much further: MuteButton is also looking to develop other applications that allow brain activity to be modulated non-invasively.

He explains that procedures which currently use neuromodulation, such as the physical deep-brain stimulation that can help alleviate the symptoms of Parkinson’s disease, often involve brain surgery, which is an expensive and invasive approach.

So MuteButton is now exploring less invasive options that stimulate peripheral nerves in other parts of the body, effectively using them as channels into the brain to affect activities that are linked to symptoms of disease. And for the patient, it could involve little more than a device being placed on their skin.

“What I want from MuteButton is to build on the first generation of success that has been achieved by others with invasive neuromodulation devices,” says Dr O’Neill. “We want to build a second generation of non-invasive devices that achieve the same result through non-surgical means.”
Inhaler devices like the hand-held ‘puffers’ used by people with asthma offer a direct route for getting medicines into the airways quickly - but do patients always use them properly?

Learning the correct technique and sticking to it are key to getting the benefits of an inhaler, and monitoring technology developed at Trinity College Dublin offers a way to keep track of how a patient is using the device.

“Compliance is the biggest problem with inhalers,” says Frank Keane, general manager of Vitalograph Ireland, an Ennis-based company that specialises in respiratory technology.

When a patient doesn’t use an inhaler correctly, the result can be that the treatment is less effective and medications are wasted, he explains. But if the patient can master inhaler technique, drugs can be delivered more accurately and the person may need fewer trips to the doctor.

The Inhaler Compliance Monitor uses technology developed by respiratory consultant Prof Richard Costello at Beaumont Hospital and Prof Richard Reilly at Trinity College Dublin in a project supported by Enterprise Ireland through its Commercialisation Fund.

“The system helps physicians or clinicians or healthcare professionals to make sure that a patient is using an inhaler as prescribed, and that they are using it correctly,” says Keane.

So how does it work? A small device clips on to the dry powder or metered dose inhaler and its sensor technology records acoustic details about the breath and when and how the inhaler is being used.

Different types of inhalers require people to use different techniques to deliver the appropriate dosage, and the system can pick up whether a person is using their inhaler the right way. “It can check they inhale for the correct amount of time and that they hold their breath for the correct amount of time and then exhale,” explains Keane.

The information can be uploaded to a web-based system in a clinic or pharmacy, where a healthcare professional can look at the person’s patterns of use and technique. Algorithms can also automatically highlight potential problems with patterns.

Vitalograph is currently using the system with partners in clinical trials, where device manufacturers are developing an inhaler and want to track its use, explains Keane.

But eventually he sees the technology moving into doctor’s clinics for the benefit of patients and budgets alike: “I think down the road for the primary and secondary care market this technology will mean big savings for healthcare.”
Lending natural support to bones

It’s easy to think of the bones in our skeletons as being static, just there for support. But bone is a living, dynamic tissue, and when it gets damaged there’s often scope to fix it.

If bone is badly damaged or diseased, a surgeon might opt to use a graft, where a piece of the patient’s own bone from elsewhere in the body, a piece of donated or bovine bone or else a synthetic scaffold gets implanted to help fill the gap.

“Bone grafting is the second-most numerous surgical procedure performed, second only to blood transfusion,” says Dan Philpott, CEO of Irish company SurgaColl.

There’s a growing market for synthetic bone graft substitutes, and SurgaColl’s first offering from its portfolio of technologies is aimed at meeting that need. Its HydroxyColl product contains two substances naturally found in the body - hydroxyapatite and collagen - rendered in a way that encourages bone tissue to regrow.

The technology grew from Science Foundation Ireland-funded research by Prof Fergal O’Brien’s group at the Royal College of Surgeons in Ireland.

Since 2007 Enterprise Ireland has provided proof-of-concept and commercialisation funding to help SurgaColl get off the ground, and today Enterprise Ireland continues to support the company as a High Potential Start-Up.

Pre-clinical trials show that HydroxyColl can speed up healing in damaged bone tissue, and the technology is being brought towards clinical trials and market approval, explains Philpott: “Ultimately we expect an overall recovery experience in patients that is faster and better.”
INFORMATION ON THE MOVE

Making the move to mobile

Next time you are in a public place have a quick look around: how many people are using a smartphone or tablet device? They might be searching for information, checking their bank balance or even doing up a presentation for work. Mobile apps are now a part of everyday life, and technologies developed in Ireland are seeking to make it easier for users and businesses alike to harness the power of information on the move.
Search goes mobile, and social

One of the great advantages of the Internet is being able to search for relevant information, whether for work or play.

Now Irish company HeyStaks, is opening up new forms of mobile ‘social searching’ using technology that combines two powerful drivers of Internet use: search and the social web.

Their approach allows friends to form search communities as a way to collaborate and share as they search.

“We want to help people search more effectively online,” explains HeyStaks co-founder and chief scientist Prof Barry Smyth.

“When people search they are often looking for things that their friends or their colleagues are interested in, so people they trust may have already found information. Wouldn’t it be great if we could connect that up?”

The technology grew from scientific research at the Science Foundation Ireland-funded CLARITY Centre for Sensor Web Technologies, a partnership between University College Dublin, Dublin City University and Tyndall National Institute that Prof Smyth directs.

“In one sense the hard science was the easy bit, now it’s about how you marry that with a great user experience and really transform it into a brilliant product,” he says.

The Heystaks approach was initially developed for use with a web-browser, and now the move to a mobile app is opening up new opportunities for the technology, including presenting results in a magazine-like layout.

“When we started looking at it, especially in the mobile phone and tablet area, we realised that people hadn’t started to think about optimising search for touch and tablet,” says Prof Smyth, who is professor of computer science at UCD.

“We took a fresh look at search and started figuring out if there is a better way to deliver search results no matter what device you were searching on. And because we have an app and we are not restricted to working within the browser, we can do much more interesting things.”

Ultimately by making search more effective, HeyStaks hopes to boost productivity in the workplace and to bring economic benefit to Ireland in the form of jobs.

The spin-out, which is based in San Francisco and at NovaUCD, raised its first round of seed funding in 2010 - securing investment of €1 million in equity funding from the Ulster Bank Diageo Venture Fund, managed by NCB Ventures - and the company is now looking to raise its next round.

“All of that is going to help to support the growth of the company and that ultimately means more jobs - we are estimating creating in the region of creating 40 new jobs over coming years,” says Prof Smyth.

And, poised at the intersections between search, social networking and mobile apps, he sees plenty of potential for the Staks model.

“The thing to remember is that Google has proven that if you can attract people to your search engine you can make money,” he says. “And wouldn’t it be great if an Irish company could disrupt Google?”
Developing and managing mobile apps made easy

Mobile apps make life a little easier for users. Rather than being tied to an office or a computer at home, apps let people access and create content on devices like smartphones or tablets.

But who makes it easier for the companies that are looking to bring those apps to their customers? Waterford-based company FeedHenry does - its technology takes a lot of the hard work and unknowns out of building and managing an app in the cloud.

“We have what we call a cloud-based mobile application platform,” explains CEO Cathal McGloin. “It essentially allows anybody, a developer, a business, a small business, to build mobile app solutions in the cloud that will run on all smartphones and tablet devices from a single build.”

In practice, someone using FeedHenry’s platform can build the app using web technology rather than deep code, then the platform allows them to handle the requests and connections and to integrate the apps securely into their existing business systems, all through the cloud.

The approach has attracted some of industry’s top names, and FeedHenry now has partnerships with VMware, security company RSA and Telefónica among others, and several more large companies either trialling or looking to partner with FeedHenry, according to McGloin.

Why are they interested?
“There are many tools out there to help develop apps that will run on all phones,” he says. “But there are fewer tools out there that will do that as well as providing the backend-as-a-service to integrate with business systems. There’s no other platform in the marketplace today that enables the complete cycle of building apps, integrating them with the backend, managing them with deployment to different clouds. That is where we are different.”

The technology was initially developed at the Telecommunications Software & Systems Group at Waterford Institute of Technology - but where did the name FeedHenry come from?

One of the initial developers who was working on the technology for use with feeds came from Kilkenny, which is an arch-rival of Waterford in hurling, explains McGloin. “So he named it after Henry Shefflin, captain of the Kilkenny hurling team.”

McGloin himself came to know of FeedHenry through contacts at Enterprise Ireland. He saw the potential to use it to allow businesses to develop and host apps in the cloud.

“We took the technology and repositioned it to solve a more compelling problem: the issue of mobile apps in enterprise.”

Angel and seed capital funding, including a contribution from Enterprise Ireland, allowed the company to spin out from TSSG and get off the ground.

“We had enough initial capital to take in 13 staff from WIT, to take over the IP and to hire another 10 staff,” says McGloin.

“And Enterprise Ireland is now working with us to put other programmes and grants and investments in place to grow that up to about 40 to 45 staff by the end of this year.”

The company is now ideally positioned by the intersection of two disruptive trends: mobile apps and cloud technology, explains McGloin.

“Mobile apps have completely changed the software industry,” he says. “They have solved one of the problems for small Irish software companies, which is how do you get your product to the marketplace. Mobile apps have solved that by allowing distribution through app stores - any small developer in Mayo or Cork or Kerry can build software and reach international markets quickly through the app stores.”

Meanwhile, Ireland is building a name for itself as a hub in cloud technology for Europe, he adds.

“FeedHenry sits at the intersection - we enable mobile apps to be serviced from the cloud. So we can potentially help Ireland become a leading centre of cloud and we can also provide small developers and software companies in Ireland with the opportunity to build world class products.”
Making light work for industry

Sometimes innovation can lie in a seemingly simple change. For a team in Tyndall National Institute at University College Cork, that change was altering the shape of a light-emitting diode, or LED.

We are familiar with LEDs as the long-lasting light sources in indicator lights or bicycle lamps, which can send out bright light for long periods without draining the battery.

But changing the shape of the semiconductor material that emits light in the LED can make a huge difference and lead to more innovative uses for the technology.

In a project supported by Enterprise Ireland, the Tyndall team turned the normally flat semiconductor into a bowl-shaped parabola to make miniature ‘microLEDs’ that can focus or redirect the emitted light without the need for additional optics.

And because of their small size, they can be arranged into arrays or matrices, opening up new possibilities for use.

“The technology is a smaller and more efficient type of LED,” explains Joe O’Keeffe, CEO of infiniLED, a company that spun out of Tyndall and has licensed the microLED technology.

Entrepreneur O’Keeffe initially evaluated the microLED technology for commercial potential through the Enterprise Ireland Business Partner Programme, and then co-founded infiniLED with Dr Bill Henry from Tyndall.

The microLED technology now stands to support a range of manufacturers across many sectors, including medical devices and electronics.

“LEDs are used in various applications and the same would apply to ours,” says O’Keeffe.

He cites examples where the ability to miniaturise, save energy and focus the light could help bring down costs and in some cases enable less invasive technologies.

“In one case the microLED technology is being applied to develop a blood-monitoring sensor for a very common ailment. This sensor would eliminate the need for patients to prick their fingers several times a day to monitor their blood,” he says.

“Another application is in a new way of manufacturing printed circuit boards that significantly simplifies the process and lowers the cost of the equipment needed.”

The microLED technology stands to deliver cheaper products for consumers, and for a company it can mean greater flexibility for manufacturing, he adds. And for Ireland, infiniLED plans to enrich the economy through manufacturing at home and mainly exporting products globally.

“The main benefit to Ireland is that infiniLED is a high-technology exporting company,” says O’Keeffe. “And exports are likely to be the engine of the recovery.”

InfiniLED, recently secured an investment of €1.6 million from IL Investment Group from Quebec, Canada and Enterprise Ireland. It will immediately result in the formation of eight new high-tech positions at InfiniLED with up to 16 staff targeted before the end of 2013.
A sound way to ‘see’ faults

When you are manufacturing something as valuable as a silicon wafer containing thousands of dollars worth of computer chips, it pays to avoid defects cropping up that could render the entire wafer useless.

But how can you ‘see’ such defects? A clever technology developed at Dublin City University shines pulses of light on the material and measures the acoustic signal that comes back.

Detecting this with a high-technology microphone allows faults in the material’s surface or sub-surface layers to be picked up and classified as critical or tolerable. The method by which the light is delivered and the acoustics monitored and analysed is protected IP.

The technology arose from breakthrough research at the Nanomaterials Processing Laboratory headed by Prof Patrick McNally in DCU, and it is now being developed for industry by spin-out Sonex Metrology Ltd.

The approach could be used in a failure analysis or yield improvement setting to understand how defects arise in materials and how to avoid them, explains Mike Cunningham, CEO and co-founder of Sonex.

And because the technology is non-invasive, it could also be used to monitor materials as they are being processed for manufacturing. This would give real-time information about potential problems and so help to improve overall yield.

Sonex recently secured funding through Enterprise Ireland, private VC banking institutions and angel investors, and the capital will allow the company to work with industry and develop more sophisticated prototypes.

“It’s an exciting time where we will look to validate in an objective way that our science works in real live examples,” says Cunningham, noting that eventually, the technology could also be applied to manufacturers across various sectors.

“What we are designing here is a piece of state-of-the-art metrology, and like any metrology whether it’s a microscope or a simple 12-inch ruler, it can be applied in many fields. The potential opportunities for its application are vast,” he says.

“The beauty of this science is that you are able to look at defects on or below a surface, even through optically opaque layers. We are doing the first round of products based on silicon applications but it could be used in other fields: pharmaceuticals, foods, anywhere that you need a quality control measure to be financially competitive, reliable, non-destructive and above all very manufacturing compatible. There are many applications for it in the future.”

The environment in Ireland has been favourable for the technology to develop, according to Cunningham.

“In every good chemical equation you need different ingredients and you need the climate to be right for things to happen. We have a body of world-class scientists working in the labs in universities in this country, and we could never have done this had Prof McNally and his DCU team not been working on this for the past eight years. That is a critical ingredient,” he says.

“We have some of the best and brightest of technical talent in the world here in Ireland across a broad range of technologies. Many of the world’s great and innovative companies are also located here and they are all well integrated with this creative gene pool created by our schools and universities.”

The policies in Ireland that favour business and innovation have also set the scene, according to Cunningham.

“The access that the universities and Irish entrepreneurs have to Enterprise Ireland for example is a key asset we have and needs to be supported and nurtured even more so in these difficult financial times,” he says.

“Product innovation, technical leadership and export oriented business will play a critical role in our future as a nation. This requires a close working partnership between our education facilities, private business, financial institutions and Government enterprise bodies such Enterprise Ireland/SFI and IDA. We are very lucky that this partnership exists and keeping this strong and healthy is key to our future.”
A guide in the palm of your hand

For entrepreneur Trevor Winckworth, a chance conversation on a flight sparked an idea that has led to a business with global appeal.

A fellow passenger showed him a basic audio device that played personal motivation messages, and Winckworth’s background in healthcare set him thinking: could this approach be spruced up technically and used to help patients to stick to long-term treatment regimens, or to promote healthy behaviours?

Winckworth contacted the Nimbus/Technologies for Embedded Computing (TEC) Centre at CIT, and thanks to an Innovation Voucher of €5,000 from Enterprise Ireland, they set about building a cost-efficient and small MP3 player that can be pre-loaded for customers with the relevant audio content.

And growing from that collaboration, Cork-based In Hand Guides, of which Winckworth is founder and managing director, now supplies the players with audio content and branding artwork to clients around the world.

Applications include healthcare, where the players are used in diabetes education and anti-smoking programmes, and public advocacy as a means to inform people of their rights.

Then there’s tourism, where the small player can replace unwieldy rental audio units, which can be expensive to install and maintain.

In Hand Guides currently supplies tourist attractions in Ireland and internationally, where rather than renting a unit the visitor simply buys the small player and listens to the audio content to get more from their visit.

The customised artwork on the device means it is an attractive souvenir of the trip that they can take home with them too.

With the support of another Enterprise Ireland Innovation Voucher, the company has recently worked with the Nimbus/TEC Centre to add even more value by incorporating a ticket into the MP3 player.

In practice, this means that a visitor to an attraction or site - like the Book of Kells in Trinity College Dublin, where the ticket-enabled devices have been field trialled - has the option to buy the device as their entrance pass, then they have the relevant audio content at their fingertips.

InHand Guides is now set to take the technology to the next level: working with an Irish company they are developing a ‘smart’ version that plays audio on the basis of location. “You could walk around a city or a group of attractions and the audio will trigger automatically,” explains Winckworth.

In Hand Guides expects to expand its workforce in Ireland to 10 by 2013 and intends to collaborate further on development of the product with CIT, and Winckworth credits the success of the technology to the good working relationship he has with the experts at the Nimbus/TEC Centre and to the support of Enterprise Ireland.

“It wouldn’t have been possible without starting with the Innovation Vouchers and building it up,” he says. “Our turnover in 2011 was just under €300,000 and for 2012 we are setting a target of €1m - that is all based on €10,000-worth of Innovation Vouchers.”
You Are Here - adding to a user’s experience of their environment

Picture it: you are visiting a city and taking in one of its attractions, maybe a zoo or an art gallery. As you walk around, an application on your smartphone automatically delivers appropriate media: whether it’s the sound of roaring lions as you walk into the African section, or harpsichord music as you approach a portrait of Henry VIII.

Or perhaps you have just arrived at a trade show and you are trying to find your way around. What if an app could be your guide to help you find what you need from wherever you are in the cavernous hall?

MobiSurround, an interactive HD media engine for location-based services, is being developed at Dublin Institute of Technology to deliver relevant information to users.

“We are looking at how to use the engine to deliver extensive rich media that targets users and environments,” explains Dr Charlie Cullen from the Multimodal Interaction Group at DIT. “There’s a lot of opportunity for things like blended learning, particularly in museums and exhibition spaces - delivering effective information to the user is a complex task.”

The MobiSurround audio interface engine moves beyond merely pinpointing where a user is and brings their experience of that location more to life.

“It’s a bit like when you see a map and it has a little red dot on it saying ‘you are here’ - it’s amazing the amount of times you still don’t know where you are and where you want to go,” says Dr Cullen. “Instead it’s the model of information around the place that is interesting to the user.”

The team behind MobiSurround, which receives support through Enterprise Ireland’s Commercialisation Fund, works closely with technology transfer experts in HotHouse at DIT.

“We liaise with HotHouse a lot,” says Dr Cullen. “They are helping us to position the MobiSurround technology, to look at it in different ways and to see new value propositions.”

BRINGING INFORMATION TO LIFE

You Are Here - adding to a user’s experience of their environment
Next time you are boarding an Aer Lingus plane for a European flight, have a look over at the engine. It’s quite likely that it contains parts made by ÉireComposites Teo in Galway.

And the indigenous company’s success is set to climb even higher as they work on the next generation of rocket launchers.

The company, which is a spin-out from NUI Galway and is supported by Údarás na Gaeltachta, manufactures and develops composite materials for aircraft and wind turbines - it supplies well-known aerospace customers such as Bombardier and Airbus and also manufactures around 2,000 blades each year for micro turbines to harvest wind energy.

As well as manufacturing and providing testing services for composite materials, ÉireComposites is also developing new technology to make materials for planes and launchers that are strong but light.

The aerospace industry wants this because it can reap savings on fuel usage, explains R&D Director at ÉireComposites Dr Conchúr Ó Brádaigh.

And since 2003, the Galway operation has been working with the European Space Agency on technology for building rocket launchers.

Dr Ó Brádaigh credits Tony McDonald and Bryan Rodgers based at Enterprise Ireland for their work in helping Irish companies to bid for ESA contracts: so far, ÉireComposites has won ESA contracts to the tune of almost €2 million, particularly on the Ariane launcher project.

The overall goal is to replace the aluminium fuel tank of the launcher with a material that doesn’t weigh so heavily on the pocket, explains Dr Ó Brádaigh, who is also a senior lecturer in mechanical and biomedical engineering at NUI Galway.

“In the space industry, the push is on reducing the weight of launchers - if they reduce one kilo of a structure’s weight they can earn back about 30,000 dollars,” he says. “So they are looking at replacing the metal structure with cost-competitive composites.”

But whether you are making an aircraft or a spacecraft, processing composite materials for such large structures can be costly, notes Dr Ó Brádaigh.

“A lot of the composites we see flying on new aircraft are processed in big pressure cookers called autoclaves, and it’s quite expensive to do that when you get up to bigger structures of five or six metres,” he says. “So what we have been working on since 2003 is a method of producing these types of structures without an autoclave: we are aiming towards a mobile heat source which moves up and down the structure and lays the material on.”

The space-related technology being developed through ESA contracts could also eventually be of benefit for civilian aircraft and wind energy, and ÉireComposites has parallel technology development programmes to explore these applications.

“Not only does it provide direct employment,” says Dr Ó Brádaigh. “It positions the company to enter into not only the space market but also develop its interest and offerings into aerospace and wind energy.”
READY FOR YOUR CLOSE UP?

Taking an extremely close-up look at wrinkles, blemishes and scars can help aesthetic doctors, dermatologists and plastic surgeons to assess a person’s skin and track how treatments work over time.

A handheld optical device, the Antera3D, developed by Trinity College Dublin spin-out Miravex bounces visible light from LEDs onto the skin and then collects visual and spectroscopic data.

This produces both two- and three-dimensional images and measures levels of pigmentation and other features.

The non-invasive technology was developed by Prof Igor Shvets, Dr Roman Kantor and Dr Guido Mariotto with support from Enterprise Ireland’s Commercialisation Fund.

In 2009 the trio co-founded Miravex, which has established the device in clinic and research centres in Europe and is now entering markets globally.

“It’s a very compact and portable device - you can easily carry it in a small briefcase,” explains Dr Mariotto. “You can use it to look at skin problems everywhere on the face or body, which makes it easy for doctors to assess conditions such as wrinkles, birthmarks, thread veins, stretch marks and cellulite.”

GUITAR ZERO TO HERO

If you fancy yourself as the next Eric Clapton or Eddie van Halen, but you still need a bit of practice, then software developed by Dublin-based SonicLadder could be just what you need.

Their Riffstation software takes music from your MP3 player and shows you what the guitar chords are in real time. It also lets you change things around to suit yourself: you can slow down that solo by Slash to learn it, you can silence the guitar on a track for a spot of your own ‘guitar-eoke’ and you can even create a loop for a jam by ‘telling’ Metallica what to play.

The technology is the brainchild of guitar players Dan Barry, Martin Gallagher and Mikel Gainza, who also happen to be experts in digital signal processing.

In 2010 they spun Sonic Ladder out of Dublin Institute of Technology, where they had been researching and developing audio technology that attracted clients such as Sony.

SonicLadder and Riffstation allowed them to explore even more interests.

“It was an area we could tackle as a labour of love and at the same time address market opportunity,” says Barry.

Riffstation is now available for customers to download.

“It’s an exciting time for us,” says Barry. “There’s a great satisfaction when you know that people are using your technology every day.”
Pre-eclampsia is a potentially life-threatening complication of pregnancy that can restrict blood flow to the womb and put both mothers and babies at risk. It’s thought to be responsible for around 70,000 maternal deaths and half a million infant deaths worldwide each year.

“It’s one of the leading causes of maternal death,” says Prof Louise Kenny, Professor of Obstetrics at University College Cork and a Consultant Obstetrician and Gynaecologist at Cork University Maternity Hospital. “There are some preventative strategies but you have to start them early.”

But there is currently no way to easily predict in early pregnancy the risk of a woman developing pre-eclampsia later on.

However, a promising new finding involving Prof Kenny’s team at University College Cork could change that.

As part of the international SCOPE (Screening for Pregnancy Endpoints) study, more than 3,000 women gave blood samples 15 weeks into their pregnancies. The study tracked who went on to develop pre-eclampsia and used the data to pinpoint a suite of metabolites in the blood in early pregnancy that could predict risk. The benefit would be to screen and identify women who are in need of closer monitoring or preventive treatment for the condition.

Trust, the Health Research Board and Science Foundation Ireland, and now a Commercialisation Plus award from Enterprise Ireland is allowing the findings to be validated and moved towards clinical use.

UCC spin-out Metabolomic Diagnostics is now looking to commercialise the technology.
The variety of technologies, the diversity of their origins and the ingenious uses to which they have been employed, illustrates that the transfer of technology is by no means a standard process.

Enterprise Ireland, in partnership with the Technology Transfer Offices, ensures that each technology is evaluated on its own merits and a tailored path to the marketplace is developed in consultation with the inventors.

We look forward to reviewing the impact of the second phase of the Technology Transfer Strengthening initiative in the coming years.

For information on Ireland’s Technology Transfer system and links to the Technology Transfer Offices in Irish Higher Education Institutions visit www.enterprise-ireland.com/technologytransfer

ACKNOWLEDGMENTS

Enterprise Ireland would like to thank everyone who contributed to this publication. In particular, those interviewed in the case studies and the staff in the Technology Transfer Offices who nominated them for inclusion in the first instance.