

SPOTLIGHT ON IRELAND

Scientific renaissance

To make its mark on the global research landscape, Ireland is forging partnerships between academia, industry and the charitable sector.

“When you are in a deep economic crisis, excellence alone does not get you where you want to be.”

Mark Ferguson,
Science Foundation Ireland

IN 2007, when engineer Conchúr Ó Brádaigh spoke with representatives of Science Foundation Ireland (SFI), one of the country’s main research funding agencies, “it became clear that the research they were supporting was primarily of a fundamental nature.” He was then working in the materials industry, but, in 2010 decided to return to his position as a senior lecturer in mechanical engineering at the National University of Ireland, Galway (NUI Galway). Ó Brádaigh was pleasantly surprised by the changes taking place in Ireland’s academic research funding system, under which SFI would soon be funding more applied science and creating links between academia and industry. Now a professor at University College Cork (UCC) and Director of the SFI’s Marine Renewable Energy Ireland (MaREI) Research Centre, Ó Brádaigh has become a key player in Ireland’s scientific renaissance.

Ó Brádaigh’s experience is part of a much larger transformation of the Irish research scene. “Before 2000, there was no significant funding of science by the Irish government,” says Mark Ferguson, SFI’s director general. Academic researchers would only have had access to small, one-time grants from individual ministries, charities or industry, in addition to funding

through European or international schemes. The country’s international citation rankings from that time, says Ferguson, reflected this lack of state financial support and collaboration.

But a strong industrial presence since Ireland’s last period of economic prosperity between 1995 and 2000 has meant that big corporations settled there. Low corporation tax rates, membership in the European Union and a native-English speaking workforce attracted multinationals like Google, Facebook and Intel, who set up their European headquarters in Ireland.

These large companies would have come to Ireland for its potential as a low cost manufacturing base in the late 1990s, rather than for research and development (R&D), explains Willie Donnelly, the vice president of research and innovation at the Waterford Institute of Technology.

“At the end of the day, getting companies to work with academics is not straightforward,” says Mary Shire, vice president of research at the University of Limerick (UL). Due to their different institutional cultures and timescales, these two sectors require impetus in the form of state funding to foster collaboration, she says. The best research comes out of “an environment that sustains a whole myriad of activity, from basic to applied, to commercialization,” adds Donnelly. And this is exactly



Professor Conchúr Ó Brádaigh,
University College Cork.

PROF. CONCHÚR Ó BRÁDAIGH

the kind of environment Ireland’s funding agencies are now creating.

Building excellence and impact

When SFI was formally established in 2003, its main goal was to fund excellent research and gain international prominence, says Ferguson. Since the establishment of national-level funding by SFI and other agencies in 1998, such as the Irish Research Council (IRC), the long running State agency supporting indigenous companies, Enterprise Ireland (EI) the country has now climbed to 16th in the overall international citation ranking, according to Thomson Reuters InCites ranking.

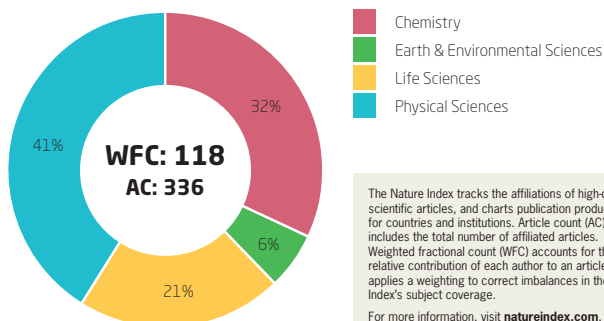
With the Irish economic

IRELAND BY NUMBERS

DATA: NATUREINDEX.COM

Ireland’s research output by subject area (2014 WFC)

High-quality research articles from Ireland indicate current strengths in the physical sciences and chemistry.



The Nature Index tracks the affiliations of high-quality scientific articles, and charts publication productivity for countries and institutions. Article count (AC) includes the total number of affiliated articles. Weighted fractional count (WFC) accounts for the relative contribution of each author to an article and applies a weighting to correct imbalances in the Index’s subject coverage.

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Top ten institutions

Ireland’s research output is driven by relatively few institutions, several of which are clustered in Dublin.

2014 INSTITUTION	WFC 2014	AC 2014
1 The University of Dublin	37.20	105.00
2 University College Dublin (UCD)	23.60	190.00
3 University College Cork (UCC)	19.55	52.00
4 Dublin Institute for Advanced Studies (DIAS)	7.67	60.00
5 National University of Ireland Galway (NUI Galway)	6.58	39.00
6 Dublin City University (DCU)	7.08	26.00
7 University of Limerick (UL)	5.65	17.00
8 National University of Ireland Maynooth (NUI Maynooth)	3.16	16.00
9 Royal College of Surgeons in Ireland (RCSI)	2.69	12.00
10 Waterford Institute of Technology (WIT)	1.00	1.00

downturn, which started in 2008, the government had to re-evaluate its funding schemes. In 2012, SFI reoriented these into 14 key priority areas that combined economic opportunity and expertise within Ireland. “When you are in a deep economic crisis, excellence alone does not get you where you want to be,” says Ferguson. “You also have to demonstrate the impact of research in terms of job creation.”

This evolution, from emphasising excellence to maximizing impact, is best exemplified by the SFI research centres, which are required to obtain 30% of their funding from industry. SFI funded seven of these centres in 2013, and a further five in 2014. It expects to create an additional three centres in the coming years along with another tranche of PhD, postdoc and faculty positions.

At the AMBER Research Centre, Jonathan Coleman, a professor of chemical physics at Trinity College Dublin (TCD), developed a way

to make graphene reproducible on industrial scales. In addition to publishing his work in 2014 (*Nature Materials*, 13, 624-630, 2014), Coleman worked with industrial partners at Thomas Swan, a multinational materials manufacturer, to develop the product commercially.

Coleman’s project was also funded by the European Commission’s Graphene Flagship, one of the EU’s largest research initiatives. By combining national, EU and industry funding, the initiative exemplified the research funding ideology Ireland strives for, says Ferguson. “SFI is very keen on people diversifying their funding sources, and using the state’s money catalytically.” And according to Eurostat, Ireland currently ranks as the most R&D efficient country in Europe, meaning its researchers produce the biggest bang for the government’s buck when it comes to innovation output, adds Ferguson.

A blossoming relationship

As the famous Alexander Graham Bell once said: “when one door closes, another opens.” But sometimes doors don’t have to close for others to open. Maria Luisa Guerriero, a former post-doc in systems biology at University College Dublin, secured an Science Foundation Ireland’s (SFI) Industry Fellowship in computational modelling, allowing her to keep two doors open at the same time – one to academia and another to industry. “Having worked in academia all my life, moving to industry had always felt like a risky jump,” says Guerriero. “I was not sure what to expect, how it would differ from academia, and if I would like it.” But the fellowship gave her the perfect chance to test the industrial waters for a year in the R&D department of pharmaceutical company AstraZeneca.

Guerriero’s experience may inspire others to apply to the fellowship, research insiders believe. A seasoned academic with industry experience, UCC’s Professor of Energy Engineering, Conchúr Ó Brádaigh, welcomes this SFI initiative. “We’ve got more researchers than you can shake a stick at and most of them don’t have enough industry experience,” he says. But “it’s not only that researchers aren’t familiar with industry, but also industry isn’t familiar with what our researchers can do.” To bridge this gap, the fellowship provides early-career researchers with a salary, and travel and subsistence costs needed to spend up to one year working in a company on a collaborative research project anywhere in the world.

After gaining experience in industry, some researchers may decide to stay in R&D and some may choose to return to academia. But for Damien English, the minister of skills, research and innovation for Ireland and SFI’s head, Mark Ferguson, it is a win-win situation. Because of the fellowship, Ireland now has more academics with industry experience and more PhD graduates with jobs. Guerriero, for example, obtained a full-time position with AstraZeneca as a result of the fellowship. Overall, “it’s about marrying the two worlds with a common language and common goals,” says Mary Shire, vice president of research at the University of Limerick. And that starts with cultivating talented individuals who can move between both the academic and industrial cultures and timescales – much like Guerriero.



Maria Luisa Guerriero, AstraZeneca.



A view across University College Dublin’s Upper Lake on Belfield Campus.

But researchers working in and outside SFI’s research centres, and in all stages of their careers, are supported by national funding schemes in Ireland. Support ranges from grants directed at up-and-coming scientists to grants for established professors who relocate to Ireland.

But SFI goes beyond career-development grants aimed at researchers staying within academia. Along with the centres, which create the environment for academia-industry links to flourish, SFI also has grants that provide young researchers with the opportunity to spend up to a year working at any company – anywhere in the world (see **A blossoming relationship**). The IRC also continues to fund excellent researchers at all career stages and across all scientific disciplines.

A future full of talent

This autumn Ireland’s government will be launching its new strategy for science, technology and innovation, says Damien English, the Minister of Skills, Research and Innovation for Ireland. To develop this, English sought the opinion of all major stakeholders in Ireland’s research ecosystem, including academics, industrial partners and government officials. All agreed that cultivating talented individuals must be at the forefront of the new policy, he says. That is, researchers who understand and value the impact of both academia and industry.

But what does this mean for the future of research funding in Ireland? As the fastest growing economy in Europe, English believes Ireland now has the “critical mass” needed to both continue funding research that maximises impact, and to address gaps in the previous funding policy. While all agree funding applied science is vital, some are concerned that research with no

short-term economic benefits, like mathematics, has been neglected. “Failing to support mathematics research undermines the calibre of the mathematics higher education staff,” argues Orla Feely, vice president for research, innovation and impact at University College Dublin. “The whole landscape of higher education and research is like a complex tapestry and if you start pulling threads in one part, you can get holes appearing in unexpected places.”

English agrees. “A company will find it easier to invest in applied research, but we want to convince them to invest some of their money in basic research as well because you cannot have one without the other,” he says. “To me, high-quality science is high-quality science,” adds Lokesh Joshi, vice president of research at the NUI Galway. Joshi says one of his main goals is to help make Galway as entrepreneurial as it is creative.

In fact, the Blackstone Charitable Foundation will set up LaunchPads, which provide a physical space where students and faculty alike can discuss and materialise their ideas, at three Irish universities this October – NUI Galway, UCC and TCD – its first initiatives outside of the United States. Exchanges through the programme have the potential to create up to 3,700 new jobs and 1,500 new enterprises in Ireland over five years. But “it’s not that everybody has to start a company and become a millionaire,” says Joshi. “It’s about instilling an entrepreneurial mindset.” And with that mindset will come further collaboration among academics, industry and the government, he adds. As the Irish proverb says, “Trí na chéile a thógtar na cáisléain,” – literally, “In our togetherness, castles are built.”

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