

Centre in Dublin delivers on expectations...

Dr John Colreavy has been involved with surface coatings for over 25 years with a career spanning ICI Paints Research, British Steel Technical and Courtaulds International and Enterprise Ireland. He wrote the technical study that led to the EU Deco Paints Directive 2004/42/EC governing the solvent level of all decorative paints in the EU member states.

Since the 80s, industrial R&D reduced considerably, government laboratories privatised and the vision reduced to more immediate market responsive timescales. Multinationals responded to the EU Framework programmes to deliver their R&D needs and relied on relationships with higher level education institutions. Sustained EU, national and increasingly trans-national funding became crucial for the EU market to respond to the rapidly advancing challenges from emerging markets. The coatings industry was responding to pressures to address environmental challenges such as lowering solvent content levels, eliminating chromates from aerospace primers and tributyltin from antifouling self-polishing copolymers.

The industry now solves environmental problems, enables better quality-of-life in addition to continuing to deliver the protection of important assets. We now expect cars to have anti-perforation corrosion warranties of at least 10 years, expect telecomm and IT components to withstand the abuses of a busy life and to have medical devices that extend our lives, which rely on biocompatible and novel drug-release coatings. The CREST Centre in the Dublin Institute of Technology (DIT), supported by Enterprise Ireland's Applied Research Enhancement

(ARE) Programme, aims to deliver these expectations.

The CREST Centre is the only dedicated coatings laboratory on the Island of Ireland. It exists to serve the Irish economy by means of translating technology. The CREST model relies on a coatings consultancy service that draws the industry base to the centre.

Companies committed to developing innovative technical capability recognise the capabilities in the centre and in time view the centre as an extension of their own R&D capability, drawing on the centre's combined 60 years of commercial surface coating experience and state-of-the-art equipment.

The immediate need for companies is to bring new products to market with a unique-selling-point (USP) within market-responsive timescales. What is vital – a quick response from centres such as CREST, a rapid approval process from the funding agency involved, industrial financial support and an ability on the part of the product development team to respond to ever-changing market needs within the lifetime of the project. This requires a management skill set that can deliver to the timescales involved and can communicate within the industrial commercialisation culture, while exploiting the creative academic environment. CREST operates as a certified ISO 9001 Quality Management System Centre to guarantee consistent and reliable project delivery.

The CREST Centre was initiated in 2004 with three staff and funding of €180k. Since then the centre has secured €5.6m in competitive funding with 26% direct funding from industry. It has transferred eight commercial licence agreements, is launching its first spinout business

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(Radical) in September 2010 and increased its staff numbers to 14.

Publications stand at 41 with three patents published and one nationalised on three continents. All of the licences are for export products allowing SME and medium companies manufacturing in Ireland to compete in world markets with highly advanced competitive products, moving them beyond commodity to, higher value added functionality products.

Dr Colreavy believes that the unique model in CREST – utilising industrially experienced chemists, developing research scientists to address market-informed problems and the closeness of the industry-funding agency relationships – has delivered a culture of rapid innovation and delivery.

CREST's research agenda has aligned itself to addressing the environmental challenges facing transport systems, water supplies and indoor air quality, thereby improving hygienic conditions. As transportation solutions move towards lightweight vehicles, a greater reliance on metals such as aluminium and magnesium occurs.

Being highly reactive metals, their reliance on carcinogenic hexavalent chromium (Cr6+) for corrosion prevention will have to diminish. Dr Brendan Duffy of CREST has developed and licensed novel corrosion tetrazine inhibitors that act by self-healing, and incorporated them into organic/inorganic hybrid films.

Remediation of water remains a challenge not just for the emerging economies but increasingly for those already developed. Dr Suresh Pillai of CREST has developed photocatalytic titanium dioxide (TiO₂) materials that absorb visible light to degrade organic contaminants. Dr Colreavy has developed and licensed hygienic surface coatings, validated through



beta-site trials, that reduce or eliminate bacteria that contribute to hospital acquired infections (MRSA, etc.), in addition to developing decorative paints that contribute to better indoor air quality.

All of the work involved in the centre is defined through industry partnerships, co-funded with Enterprise Ireland, Science Foundation Ireland (SFI) and the EU Framework programmes. The centre's two senior research managers Dr Duffy and Dr Pillai have secured international recognition and funding with one FP7 award in 2010 for Dr Duffy through invitation by EADS. Dr Pillai secured international support through the US IRL Nano programme involving SFI, Invest Northern Ireland and the National Science Foundation (NSF) in the US.

Ireland is the European hub for pharmaceutical, medical device and silicon chip manufacturing. Its economy transformed utterly since Dr Colreavy emigrated from there in 1986 – transforming to a vibrant and confident knowledge economy on his return in 1998.

The early efforts of the Industrial Development Agency (IDA) to attract the global blue-chip multinationals to select Ireland as a base have bred a highly skilled workforce that are best in corporate class to deliver hi-tech products such Intel's latest chips (Intel® Core™ i7 processor), Boston

Scientific's medical devices (TAXUS™ Element™ Paclitaxel-Eluting Coronary Stent System) and Creganna's hypo-tubes (PoleVault™).

Dr Colreavy has seen the Irish scientific landscape transform from that of the mid 1980s to that of the current level that has two Irish universities in the QS Times Top 100 and the DIT ranking 326th in the same poll. Indigenous companies have increased their investment in R&D such that an estimated €520m expenditure on R&D by Irish owned companies in 2008 (BERD) represents a 57% increase in five years and an increase of one-third in three years.

In the 1990s, the quality of Irish publications, as measured by the internationally accepted parameter of citations per paper was lower than that of Bangladesh and just slightly ahead of the Philippines. Today, by this parameter, they have moved into the Top 20¹.

The Irish people's investment in R&D continues unabated. The Dublin Institute of Technology recently competitively secured a €13m investment to develop the first all-island Environmental Health Science Institute (EHSI), partnering the institute with the national health provision agency, the Health Services Executive (HSE), the Institute of Public Health, Dublin City Council and Ulster University.

A key component of the institute's successful bid was its track record in technology translation to indigenous industry. DIT staff and students own their IP and are free to publish without commercial intent and free to pursue commercialisation in their own right. Since establishment of its Technology Transfer Office (HotHouse) by Tom Flanagan in 2007, DIT's rate of exploitation of research has outperformed (by up to nine fold) the commercialisation levels of European universities.

Since 2001, more than 200 new, knowledge intensive companies have been launched through DIT, creating more than 1,000 highly skilled jobs in the Dublin area.

Considering its population of four million people, Ireland is not just renowned for literary contributions, with four Nobel Prize winners; it is also no stranger to scientific endeavour. William Parsons (1800-1867) developed a telescope that could see further into space than any other instrument of the time. George Boole (1815-1864), the Father of Computer Science, developed his system of Boolean Algebra while in Cork. Ernest Walton (1903-1995), Ireland's only science Nobel Laureate, built the first successful particle accelerator at Cambridge, which 'split the atom' in 1931. Kathleen Lonsdale (1903-1971) is recognised for her exceptional work in X-ray crystallography, including a demonstration that the benzene ring is flat.

The spirit of the Irish people transcends recession – as adversity and emigration are familiar travel companions in our evolution. This is manifest in Ireland's rapid response to arguably the harshest recession in our lifetimes and suffering the severest impact in the developed economies, having made exactly the same mistakes as all developed economies that have come before us. Our resilience, creativity, curiosity and ability to dust ourselves off after every fall will lead us to a return to a wiser prosperity.

¹ Prof. Frank Gannon, Director General SFI



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