

Profile Jean-Pierre Colinge

"If you did a Google search on junctionless transistors you would have had one hit in January this year, and three months later 200,000," says Jean-Pierre Colinge, a Belgian-born research professor at the Tyndall Institute at University College Cork UCC.

He uses this to illustrate the rapid impact his breakthrough has had on the world of semiconductor research. When he published in March in the specialist journal *Nature Nanotechnology*, it was followed up in the influential *Scientific American* magazine. Intel, the world's largest computer chip manufacturer, took note and stepped in with a €1.5m grant.

Today, under a European Union "Framework 7" programme, he is collaborating with Imec at Leuven in Belgium, Europe's leading nanoelectronic research centre. "And what's important, we are leading this research. We're not just a little follower," says Prof Colinge.

Transistors are the vital building blocks of all electrical devices, from computers to mobile phones. But as consumers demand more and more features, the size of the transistors and the semiconductors on which they are printed has progressively reduced, with several billion crowding on to a single chip.

At such nanoscales, the traditional architecture becomes difficult to control, particularly the junction that governs the flow of current and determines whether a semiconductor is on or off.

"Normally a transistor is a sandwich: two slices of bread with ham in the

middle. But nowadays, the slice of ham is so thin, it's transparent. Sometimes it leaks bread between the two slices. So we took out the ham and just use bread – one piece," says Prof Colinge.

Having no junctions, he says, makes it much easier to fabricate, especially in very small dimensions. In addition, "it turns out to be a

much better transistor than what is currently used in all electronic circuits."

Prof Frank Gannon, director-general of Science Foundation Ireland, the state agency funding the research, says: "Like all these things that are early stage, it could be massive. It could be a game changer. That's what we hear from Intel."

It is a big boost for SFI at a time when its funding has been under pressure – although an increase next year will restore it to 2009 levels.

Ireland, a country with no big defence budget to fire up its basic research effort and a university tradition more geared to literature and the humanities, is trying to create a science capability virtually from scratch.

A decade since the programme was launched – at the height of the Celtic Tiger boom – SFI can boast some remarkable progress.

Ireland is now the world's third most important research centre for immunology, and eighth in the material science league table. "Ten years ago, Ireland simply wasn't at the races," says Prof Gannon.

Prof Colinge is unusual in settling permanently. His first four-year grant ran out

last month and he has just applied for another. He and his wife Cindy – also a microelectronics professor – are committed to stay, notwithstanding the fact that their salaries, as public sector employees, were slashed in last December's austerity budget.

"The original principle was we should not be worse off here than we were in California. And that was the case. The salary was good. But now with the cuts, we've lost 25 per cent of our income. That's bad enough but we also bought a house at the peak," he says.

So is Ireland still an attractive place to do research? "It still is," he says with a broad smile. "But it's 25 per cent less attractive than it was."

John Murray Brown

