

Plenty to Smile About in **IRELAND**



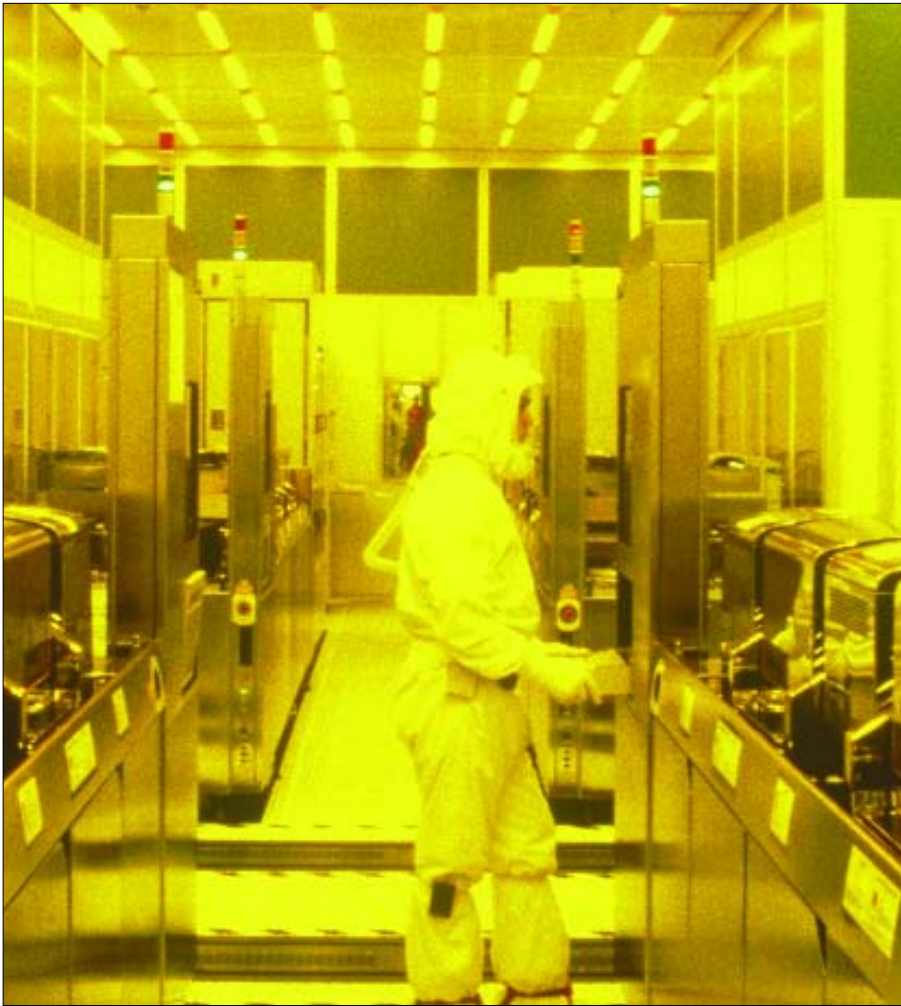
A major government commitment to biotechnology and information technology is drawing top optics researchers to Ireland.

Kim Douglass

When Eoin O'Reilly graduated from Ireland's Trinity College with a physics degree in 1974, the word was, if you wanted to continue scientific research, you should leave the country. The money just wasn't there.

"There was strong encouragement from the university to go," O'Reilly said. So he left. Of the six physics scholars in his class, four went to universities in the United States and United Kingdom. O'Reilly was at the University of Surrey in the U.K. for 17 years.

He might have spent his career there. But late in 1999, he returned to his home country to teach a seminar, and he heard a rumor. "Those were some of the first



An Intel technician working in a manufacturing clean room in Leixlip, Ireland. Intel's largest plant outside the U.S. is in Ireland. (Facing page) Eoin O'Reilly returned to Ireland when his home country did "an about-face in how it approaches science."

indications that there was going to be a significant commitment to research in Ireland," he said.

Ireland is investing 2.54 billion euros in a national development plan that includes 646 million euros for Science Foundation Ireland (SFI). The organization has been charged with encouraging academic-industrial partnerships to help good ideas make it into the marketplace. It is recruiting accomplished researchers—including about two dozen senior-level optics researchers—to generate knowledge and technologies that will advance two burgeoning fields: biotechnology and information/communications technology.

"Our goal was to make Ireland, in some areas, number one in the world," said Alastair Glass, SFI's director of information and communications technology, who also happens to be an optical scientist.

For a country that two decades ago was one of Europe's poorest, the impact of this commitment has been significant.

"Back in the 1960s and 1970s, we were thought of economically as poor; politically, as divided; but culturally, as rich. Scientifically, we didn't even figure," said Mary Harney, Ireland's minister for enterprise, trade and employment. "If anything has happened over the last 30 years ... and especially the last 10,

"Back in the 1960s and 1970s, we were thought of economically as poor; politically, as divided; but culturally, as rich. Scientifically, we didn't even figure. If anything has happened over the last 30 years... and especially the last 10, we have begun... to see the interconnections between all these aspects of our society. We've found a way to reward enterprise and jobs. ... We are creating vital synergies between government, universities and entrepreneurs."

— Mary Harney
Ireland's minister
for enterprise, trade
and employment

“We have to be able to say we have people on the leading edge working here.”

— *Alastair Glass*
SFI's director of information and communications technology

we have begun ... to see the interconnections between all these aspects of our society. We've found a way to reward enterprise and jobs. ... We are creating vital synergies between government, universities and entrepreneurs.”

In recent years, Ireland has been the world's largest exporter of software products (nearly \$3.3 billion in 1998), according to the Organization for Economic Cooperation and Development (OECD) Information Technology Outlook 2000 survey. The Irish unemployment rate reached a high of 17 percent in the 1980s; today it is about 5 percent.



(Left) Alastair Glass meets with Chris Dainty, a SFI Fellow at the National University of Ireland, Galway.

And Ireland has become an attractive home base for people such as O'Reilly.

“We realized it wasn't just a matter of bringing in better companies,” Glass said. “We have to be able to say we have people on the leading edge working here.”

In the summer of 2000, SFI announced its first research grants. O'Reilly applied for a grant and won. A year later he was back in Ireland at University College Cork as the SFI research chair in the National

Microelectronics Research Centre, studying semiconductor laser applications.

“[Ireland] has done an about-face in how it approaches science,” O'Reilly said. “The thing that attracted me was that it was significant funding not just for my own group, but for science generally.”

A long road

Ireland has spent nearly half a century trying to make its way economically, according to economist Frances Ruane of Trinity College Dublin. In the years immediately following World War II, large numbers of Irish fled the country because of limited investment opportunities. “The country was very inward-looking. Tariffs imposed during an economic war with the U.K. in the 1930s were still in place. Foreign direct investments were banned,” Ruane said.

The nation slowly loosened its trade policies, implemented corporate tax relief plans, and by 1973, it had joined the European Union. Large international companies were encouraged to invest there, especially those producing high-tech products. Intel opened its largest manufacturing facility outside of the United States in Leixlip in 1990, for example.

“There was a growing recognition that if we were to continue to have growth in these high-tech sectors, we needed to have a stronger underbelly,” Ruane said. “If you really want to get cutting-edge firms, you need doctorates and post-doctorates doing research in cutting-edge areas.”

A series of reports in the late 1990s reinforced this need, Technology Minister Harney said. “There was an acceptance in government that the future competitiveness of the Irish economy will be based increasingly on the quality of the intellectual capital.” It wasn't hard, therefore, to find consensus when it came to this latest major financial commitment, Harney said.

“I met with [Harney] twice my first week here,” Glass said. “The commitment from government is particularly strong here. I consider that a very important sign.”

Ireland's national science foundation

As a research manager for Bell Laboratories in the 1980s and 1990s, Glass oversaw the development of compound semiconductor devices, optical fiber technology, optical fiber devices, waveguide devices and optical networks. He was vice president of photonics research at Bell Labs and became chief technical officer of the optical networking group at Lucent Technologies before retiring in 2000.

The offer to help run SFI appealed to him because of the organization's potential. Ireland's growing economic success has been based largely on its manufacturing industry, he said. "[Companies] can leave as fast as they came. We needed to create intellectual property here."

SFI is structured in many ways like the United States' National Science Foundation (NSF). It must meet international quality standards in terms of the peer review process for grant proposals. But, grantees of SFI—unlike those of NSF—must be able to explain how their projects will help Ireland.

A key part of the SFI commitment has been the establishment of Centers for Science, Engineering and Technology, partnerships between university researchers and industrial organizations. Three are up and running.

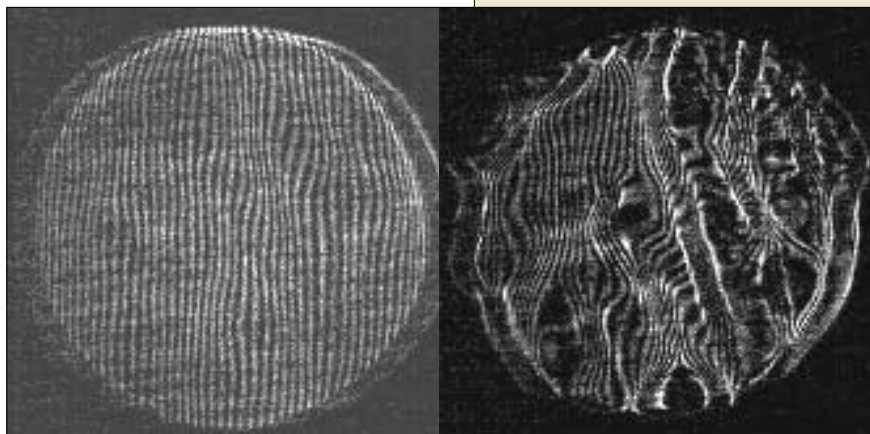
So far, 130 senior-level scientists have been recruited to Irish universities and institutes of technology through SFI grants, some of which provide 1 million euros a year for five years. Chris Dainty, the recipient of this year's OSA C.E.K. Mees Medal and the president of the European Optical Society, has received more than 6 million euros for work at the National University of Ireland, Galway, on advanced techniques of optical imaging and their applications in biomedicine and information technology. Dainty has been Pilkington Professor of Applied Optics at Imperial College London since 1984. He is currently on leave from Imperial.

"For many years I have collaborated with physicists from NUI [National University of Ireland] Galway," Dainty said. "Apart from the obvious appeal of having guaranteed funding for a long

period of time, the main appeal is to be an agent for change in the university system in Ireland. Because of decades of neglect and under-funding, universities in Ireland desperately lack the infrastructure for sustaining research. Accelerating the pace of change is indeed a challenge."

David Cotter, Andrew Ellis, Robert Manning, Paul Townsend, Rod Webb and Fatima Garcia are part of a group at University College Cork that has received more than 11 million euros to research photonic systems. O'Reilly's group has received more than 7 million euros to study the physics of next generation photonic devices. It is using the money to understand the complex physics behind systems such as quantum dots and dilute nitride alloys, to predict and optimize their performances, O'Reilly said.

In recent years, more startup companies devoted to optics and photonics have sprung up in Ireland as well, and that trend may be facilitated by this infusion of talent.



Alfredo Dubra

In Cork, the company Firecomms is developing sources and subsystems for plastic optical fiber applications. Optical Metrology Innovations, also in Cork, is developing test equipment for the electronics, photonics and microsystems industries. Eblana Photonics in Dublin is producing low-cost single frequency diode lasers.

"Ireland has always had top-class scientists and engineers," O'Reilly said. "I find it very exciting that the tools are now there to use that human resource."

Kim Douglass (kdougl@osa.org) is assistant managing editor of *Optics & Photonics News*.

"Apart from the obvious appeal of having guaranteed funding for a long period of time, the main appeal is to be an agent for change in the university system in Ireland."

— Chris Dainty
Science Foundation
Ireland Fellow, National
University of Ireland, Galway

Dainty is using adaptive optics to produce very high resolution images of the retina in vivo. (Left) An interferogram of a normal tear film just after blinking. The straight line fringes indicate that the tear film has good optical quality which does not impair vision. (Right) An interferogram five seconds later, just before the subject blinks again. The broken-up nature of the fringes means that the tear film is of poor optical quality and will affect vision.