Guiding young researchers to a more equitable future - Dr Fatima Gunning enables young researchers to be confident and industry ready

World leading photonics researcher Dr Fatima Gunning has won the inaugural Science Foundation Ireland (SFI) Mentorship Award which recognises outstanding mentorship provided by a researcher funded by SFI. Gunning is a principal investigator at the Irish Photonic Integration Centre (IPIC) at the Tyndall National Institute where she also serves as head of graduate studies.

Her research work looks at novel photonics technologies for the internet of the future and she brings the same approach to her mentorship activities. She believes that all students are different, driven by different motivations and develop their research in different ways. As a result, she trials novel
mentoring methods to encourage self or group learning designed to meet the differing needs of individual students.

The citation for the award described Gunning as “a leader and crucial player in guiding the young researchers of today towards a more equitable Science, Technology, Engineering and Maths (Stem) industry of the future. Her students graduate with a high level of technical skills, self-confidence, a love for working in a team, connected to a large network and are able to communicate their ideas clearly.”

Her work spans a wide range of areas. “I work on the whole area of photonics, the optical connections and infrastructure that powers the internet”, she explains. “We wouldn’t have the internet without the fibre-optic cables under the ground. Even mobile phone antennas are connected through fibre-optic cables. All of these things have to be managed.”

They also have to be made faster with devices like autonomous cars and flood sensors requiring near instantaneous responses to signals.

“In future everything will be connected through fibre-optics,” she says. “We are working on increasing the capacity of the existing infrastructure. We are looking at new technologies at the physical layer for the management of the network as well as looking at the devices using it. If you had all the money in the world you would look at what is the best infrastructure for the future which could be the same fibre or a completely different technology.”

That may not be possible, but her research is taking her into new areas. “We are looking at novel fibre structures. At the moment the fibre is solid glass and we are looking at hollow tubes which enables more data to be carried. A lot of new technology has to be developed to light up that pipe and we are working with people to develop that.”

While this may be exciting, she says that it is still extremely important to see what can be done with the existing infrastructure. “Rural broadband has to be delivered”, she points out. This will open up new businesses opportunities and new ways of doing business for the regions.”

Gunning is no stranger to this approach having been one of the early pioneers of the wave division multiplexing technology which greatly expanded the capacity of fibre-optic cables. “The light in the fibre was always one colour and we then split it into several different colours,” she explains. “We keep bringing the colours closer and closer together. In future they could be mixed and then separated out again and we are borrowing technology from wireless and other areas to do that.”

Realisation and support

She works very closely with researchers in Tyndall both supervising and mentoring them. “I try to enable young researchers to be industry ready and have the confidence to know what they want in their careers” she says.

“The have to be able to communicate well, to be creative, innovative, collaborative and entrepreneurial if they want to go straight into industry. As a mentor, I help them realise what they want to do and support them in their journey.”

This involves taking them out of their comfort zones through public speaking engagements. “This gives them the confidence to speak to anyone about what they do. We need to give back to society and engage with the public and ensure they understand the importance of science and how it affects their lives. People think they don’t know about photonics - but you carry it in your hand in the LED screen on your phone.”
The results of mentoring can be quite powerful.

“You can see them transform as people over the four years of a PhD project” she says. “They emerge as completely independent researchers with the confidence to go anywhere in the world and talk about what they do. I try to encourage and allow students to develop themselves. That’s what I aspire to do.”

Her role as head of graduate studies at Tyndall means she is now looking after a much larger pool of students and helping other supervisors to become more effective mentors. “That’s very important,” she says. “Even 10 years ago we didn’t communicate in the same way as we do today. The iPhone is only a little over 10 years old. It’s impossible to say we can do things the same way as we did 30 years ago, we can’t. Our students have no experience of a world without the internet. I help people with that.”

In conversation with journalist Claire O’Connell, published in the Irish Times.