11 Professor Sylvia Draper

Professor of Molecular Materials (2018)

→ “More and more, I’m looking at my research through a sustainability lens. As chemists we should be thinking carefully about how and why we do chemical reactions. We need to get under the hood of the processes that chemical industry has followed for years, and start asking the tough questions.”

“How we’re using the world’s resources, what are the potentially harmful side-effects of the materials we’re using, how are we dealing with waste? In a research lab we might synthesise 20mg of a material – but what’s the environmental cost of making it? And how might that multiply on an industrial, 200 tonne, scale?

“As an Inorganic chemist I work with heavy metals – these can be toxic to the environment and some are rare and scarce. I work a lot with Iridium which is a high-performing metal but it’s in short supply so we shouldn’t be pinning our hopes on it. We need to look at substitution, building new technologies around and from naturally abundant elements.”

Professor Sylvia Draper, Chair of Molecular Materials in the School of Chemistry, is the project sponsor for E3, the new Engineering, Environment and Emerging Technologies initiative. Its mission is to find ‘balanced [e.g. sustainable] solutions for a better world’. The E3 Learning Foundry (to co-educate engineers, natural scientists, and computer scientists and statisticians) will open in 2023, with the E3 Research Institute to follow on the new tech campus at Grand Canal Dock. Driving the E3 agenda has refocused her interest in sustainability in the context of her own research.

“With my research team, I work on materials that absorb and emit light. These find applications in biological media, in solar cells or as emitting layers in OLEDs. We create materials that can absorb near infra-red light and turn it into a high-energy source with which can kill a cancer cell or generate electricity. Solar panels are part of delivering on the sustainable agenda, but I’m realising that at every step of the process we can add an environmental challenge – for instance, can we look at making these materials in a way that is less energy intensive, creates less waste, uses less solvents? I’m excited about asking these questions because, as a scientist, I start out on a journey in which the destinations are unknown.”

Her science journey began in school in Bromley in south-east London where she took Maths, Physics, Chemistry and English for her A Levels – “I would have done Biology but it was a girls’ school and you couldn’t do all three sciences and Maths”. She loved “experimenting with the Bunsen burner” and remembers, at the age of 12, being introduced to the idea of atoms and thinking “how do you get a smooth surface if it is secretly made up of individual particles?” – but she also loved “literature, language, poetry and communication”. She was interviewed for a place to study English in Oxford but then “I suddenly had a complete change of mind. None of my family had been to university so they weren’t in a position to advise me, but at a late stage I reapplied everywhere to do Chemistry.”

She attended the University of Exeter and followed her primary degree with a PhD in the University of Cambridge. There she 'looked at why metal atoms cluster into particular shapes' under the supervision of Catherine Housecroft, one of only two women on the staff. At Cambridge she met her future husband, a law student. When he returned to Dublin to go to the King's Inns, she visited him and "one day I walked into Trinity off the street and got talking to Professor David Cardin. He offered me a postdoc for a year and from there I got a contract position and became an assistant professor in 1993."

"There are", she says, "three sides to being an academic: teaching, research and administration", and in her now 30-year career in Trinity, "I've singled out one of these for particular attention at different times". As a teacher, she is highly aware that "people are different and have different ways of learning – some are highly visual, some prefer a structured approach, others want the opposite". Her success in catering for difference is evidenced by her winning a Provost's Teaching Award in 2008 . She is now bringing her experience to bear on the teaching and learning approach of the E3 Learning Foundry.

Her impetus to get involved in strategic leadership was initially "to help give Chemistry a voice. Applications from students were falling off and I felt this is so wrong, they don't know how exciting it is, so I took to the media – I did a lot with RTE, Brainstorm and with Newstalk, Sean O'Rourke and Pat Kenny. Eventually, with support from others in the School, I got a Chemistry Education Officer appointed, who works with 450 secondary schools and does a lot advocacy. Chemistry as an open science should be open to all." She is now Dean of the Faculty of Science, Technology, Engineering and Mathematics, a demanding role, particularly in the past year, while managing the human and material consequences of the pandemic.

Her time off is family-oriented: "I have four children and I like to cook from scratch – with various degrees of success! – and to spend as much time as I can outdoors, gardening or walking".

Her goals for the next few years are "to elevate STEM-led research and to redefine its teaching across disciplines". Within E3, this involves designing curricula flexible enough to enable students to create "a personalised and tailored programme of study, pulling out different elements that interest them". In her own research, she wants to explore "a really neat material that allows us to form polymers, like polystyrene, using visible light. Polymers degrade but I have a feeling that this material has the potential to catalyse their repair using sunlight. I want to test this hypothesis. Making products that are compostable is one thing, but if they were self-repairing, perhaps we wouldn't need to make so many."