Professor Patrick Doyle Eyes Life's Natural Wonders Big and Small

It has been pointed out that all science begins with a wonder about nature. Through observation, investigation, and experimentation, science then branches into attempts to understand and explain how our universe functions. The greatest scientists are those that maintain their wonder from root to branch, and Patrick Doyle, a full professor at MIT who spends large amounts of his time pulling on single strands of DNA at the BioSym IRG at SMART, is an example of one such scientist. "What we're doing is pulling strands of DNA to understand the fundamental mechanics of these buildings blocks of life," he enthusiastically explained. "Our goal is to publish our work in a peer-reviewed journal, but in the long run the greatest satisfaction would be when our work winds up in textbooks on DNA. We really are investigating fundamentals."

It turns out that pulling on a single strand of DNA requires a complex contraption smaller than a strand of human hair that uses micron-sized magnets to manipulate the organic matter. "We build devices that replicate the biophysical structure of cells that allow us to mimic biological scenarios to discover how DNA behaves. In the real world, DNA is very compacted, kind of like a tensed spring, so by using these devices we can run experiments to see how it interacts with other potential elements in the natural world such as protein molecules, or we can stretch DNA out to design assays at the molecular level, in an environment that is very similar to the natural one."

Enterprising Start

In order to do perform such research, Prof Doyle had to more or less start his laboratory in Singapore from scratch. "I've been coming to Singapore on MIT faculty exchange programmes for the past five years, and in last two years I have helped to build the BioSym laboratories at SMART. It's a little like creating a start-up company," he explains, "from research design to physical laboratories to securing funding and personnel, my role goes far beyond research and takes on that of project manager."

And importantly, SMART is one of the few places in the world where Prof Doyle can realise such a project. One reason is that compared to his experiences elsewhere, securing funding for his research is less difficult in Singapore. "Generally speaking, the funding agencies here are more willing to take a calculated risk than they are elsewhere. So long as we have a viable hypothesis, we can propose fairly high risk projects and they tend to give us the benefit of the doubt—especially if the long-term gain potentially balances short-term risk."

Another aspect that makes SMART fruitful is an environment that facilitates face-to-face interaction: "What is especially critical for the kind of research that we're doing is to have a physical centre that can act as a shell to hold the faculty and post-docs who form the nucleus of my research team." At SMART, Prof Doyle is able to focus almost completely on his research while maintaining a cohesive team of post-doctoral research assistants.

"Unlike in Boston, here I am able to meet with my post-docs on a daily basis. In fact, we usually have lunch or coffee together, and this time together can easily turn into editorial meetings to discuss our strategies for writing our research papers." In addition to his post-doc students at SMART, Prof Doyle notes that finding qualified research staff in Singapore is easier than ever before. "More than

five years ago it became clear that the government wanted the country to become a hub for bioscience. Now they've attracted an abundant pool of talent, especially in biotech and biomechanics, so it's becoming much easier to find collaborators who are the best in their fields for our research."

People Connect

It's not only the research potentials that Prof Doyle finds attractive in Singapore. When he comes here for research, he brings his family. "The overall lifestyle is much easier and less hectic for us here than it is back home. My wife is able to pursue a freelance career and I'm able to go swimming with my kids almost every day. Back home we're both too busy for this sort of thing."

The wonder that brought Prof Doyle to investigate the biomechanics of DNA has also lead him to explore the larger world, and the ability to get to so many places so easily from Singapore is another attraction to living and working here. "My wife and I like to travel for leisure in the region, and we have been to the Maldives and Bali." Asian hospitality is also something that he remembers fondly. "For many of my Asian students, I seem to be a professor for life. In fact, recently I travelled to both Taiwan and Korea and stayed with former post-docs, both of whom have since, I'm happy to report, become quite successful in their own right!"

The unexpected wonders of local places also keep Prof Doyle coming back for more. "Our first trip to Little India at night was unforgettable. It was like sensory overload! The sights and sounds, the temples, the food, the whole atmosphere: it really made us realise how Singapore is still so culturally diverse. We travel such a short distance from our home near the river in a modern building for dinner in Little India and it's like we're traveling thousands of miles!"

Wonder can be found not in places but also in time. Most days Prof Doyle takes taxis home from campus, and usually, he says, the taxi drivers will offer mini historical tours of the island. "As they drive around they'll share their memories of what used to be in certain spots and how things have changed. This gives me a real sense of transformation of Singapore and in a way makes it feel more like home."

Professor Patrick Doyle is a recipient of the 2008 Pioneers of Miniaturisation prize, 2009 Rothschild-Yvette Mayent-Institute Curie Award, and the 2009 John Simon Guggenheim Fellowship. Prof Doyle held the Joliot-Chair of École supérieure de physique et de chimie industrielles (ESPCI), in 2009.

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