

## CENTREFOLD

### Shaun Cameron Hendy



Shaun Hendy was educated at Massey University, Palmerston North, where he graduated with a BSc in Mathematics in 1992, and a BSc (Hons) First Class in Mathematical Physics in 1993. He completed his PhD in Physics (Cosmic Strings in Black Hole Spacetimes) at the University of Alberta in 1998. He returned to the Applied Maths team at IRL in 1998 as a FRST NZ Science and Technology Post-Doctoral Fellow, and became a permanent IRL employee in 2000. In 2002 he became a Principal Investigator at the MacDiarmid Institute for Advanced Materials and Nanotechnology, a Centre of Research Excellence headed by the late Sir Paul Callaghan. Shaun's most significant scientific discoveries have occurred in the last decade, when he pioneered, established, and continued the development of theoretical and computational nanotechnology in New Zealand. During these studies, he identified a new type of phase transition at the nanoscale, and found a regime where the coexistence of liquid and solid phases is metastable at the nanoscale, in contrast to the macroscale. He has shown how a transition occurs in moving from the nano- to the macro-scale when the two phases change from not coexisting, to coexisting. This is particularly important because unconstrained nanoparticle impacts are typically violent enough to produce partial melting, so that phase behaviour is important in many nanoscale experiments. Some of Shaun's mathematical discoveries have relied on new numerical methods, called hybrid kinetic Monte Carlo methods, developed in conjunction with Tim Schulze (U. Tennessee), which allow both a fine computational grid where significant atomic redistribution is occurring, and a coarse grid where atomic distributions are largely static.

Shaun has also made significant discoveries on the behaviour of fluids at the nanoscale, especially near solid interfaces. This work is important because of its potentially wide applicability to medical applications. Shaun completed fundamental research on the slip boundary conditions between liquids and solids at the nanoscale, and has derived the effective slip for a wide range of surfaces. Shaun's work has contributed to overturning the conclusion in the 20th century that fluid slip does not occur at solid boundaries. He has made fundamental advances in how to manipulate small fluid bodies using nano-tubes through the use of their corresponding capillary pressures. Shaun has also shown how non-wetting fluids can enter capillary tubes, a phenomenon previously thought by many to be impossible. Shaun's discovery was made serendipitously through numerical simulation, and subsequently confirmed by mathematical analysis, and then by experiment.

More recently, Shaun has used the international patent databases and Google Earth to show how patent innovation develops in space and time. He has shown that invention is a collaborative process, which generates scale-free networks that are similar those produced by a Yule process. He has developed methods which allow regional rates

of innovation to be benchmarked internationally on measures of novelty, diversity and the chances of success. In 2011, IRL appointed Shaun their inaugural Industrial and Outreach Fellow, and provided additional resources for his research into innovation.

As a CRI scientist, Shaun has had to compete for research funding, and to date has won over \$20M in research grants, including two Marsden grants. He has supervised over 20 postgraduate students, organised over 6 conferences, given many invited talks, and continues ongoing collaborations with Stanford, Tennessee, MIT, Flinders, Sydney, Dresden, Lyon, Adelaide and Imperial College.

Shaun's scientific achievements have been recognised by his Chair in Computational Physics at VUW in 2010, and his Chair in Physics at the University of Auckland in 2013. He was awarded the Massey University Distinguished Young Alumni Award in 2010, the New Zealand Association of Scientists Research Medal in 2010, the Prime Minister's Science Media Communication Prize in 2012, The Royal Society of NZ's Callaghan Medal in 2012, a Fellowship of the Royal Society of New Zealand in 2012, and the ANZIAM's EO Tuck Medal in 2013. He has been President of the NZ Branch of ANZIAM, President of the NZ Association of Scientists, and Secretary of the NZ Mathematical Society.

Shaun is perhaps best known in NZ as a science communicator. He communicates through radio, public talks, print media and blogging. His blog at Sciblogs.co.nz, "A Measure of Science", was launched in 2009. It is widely read by policy makers in the innovation sector in New Zealand, and has become a leading forum for discussion of the links between science, innovation and economic growth, attracting a monthly audience of more than 1,000 readers. He has written over 80 posts, attracting more than 50,000 page views. Some of his posts attract much wider audiences, e.g. his post on the Fukushima nuclear disaster was syndicated by the NZ Herald ("How to shut down a nuclear reactor", 17/3/11) and attracted a large international audience. Shaun has also had a regular slot as physics correspondent on Radio New Zealand's Nights with Bryan Crump. Shaun is a regular media commentator on issues to do with science and innovation, and the importance of both for economic growth. He is frequently interviewed by Radio NZ National, Radio Live, Newstalk ZB, the NZ Herald, the Dominion Post and both major TV channels. He is one of the few researchers to analyse the impact of the formation of the CRIs, the introduction of the PBRF system, and the formation of the COREs, within NZ's innovation system. Shaun has recently completed a joint book ("Get off the grass") with the late Sir Paul Callaghan, in which he has attempted to bridge the gap between academia and the general public. Shaun enjoys the outdoors, especially tramping in the Canadian Rockies. We wish him a long and successful research and outreach career.

*Graham Weir*