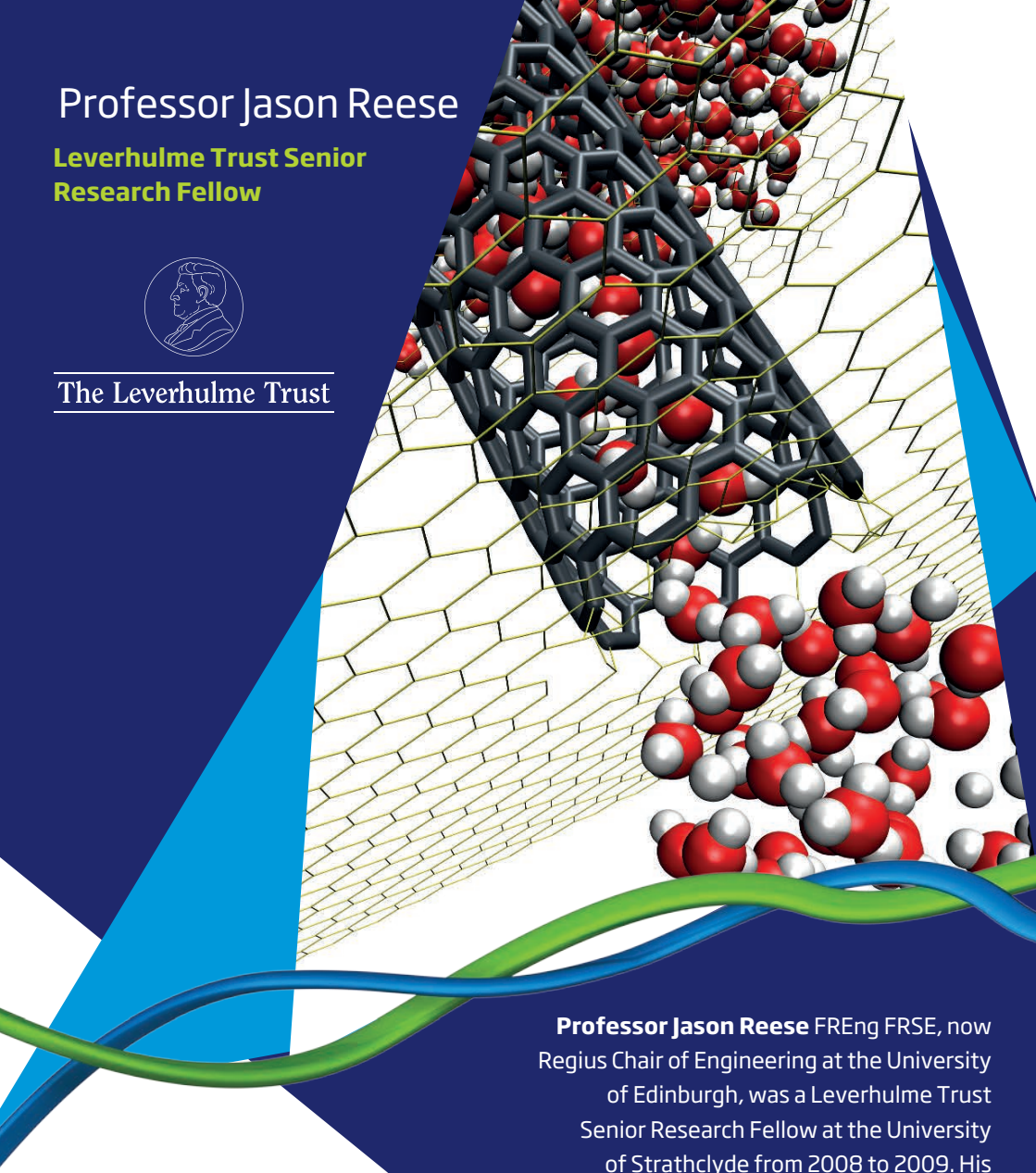
Professor Jason Reese

Leverhulme Trust Senior Research Fellow

The Leverhulme Trust



Professor Jason Reese FREng FRSE, now Regius Chair of Engineering at the University of Edinburgh, was a Leverhulme Trust Senior Research Fellow at the University of Strathclyde from 2008 to 2009. His Fellowship enabled him to expand the breadth and depth of his work on simulating flows at the nanoscale, which could be used in future desalination technologies.

ROYAL ACADEMY OF **ENGINEERING**

"I was really able to make an impact for UK engineering, giving invited talks around the world – in conferences, universities and industrial companies – on our latest developments."

RESEARCH

Professor Reese's Fellowship gave him more time to tackle the problem of modelling fluid flow in nanoscale systems, where the distances involved are just a few billionths of a metre. He combined aspects of both molecular and fluid dynamic calculations to optimise accuracy and speed in simulations. Detailed molecular models were used to generate information at the smallest scales that was then passed to a faster, conventional flow model of the full system. The blend gave the best of both worlds.

"Over the last few years the research has really taken off, both in the UK and overseas", Professor Reese explains. "The Fellowship acted as a springboard for the next five years of development." He and his colleagues are keen to create the technology that can enable future engineering applications, and are now implementing their approach on cases including microscale bearings and coatings to make surfaces slippery. Although simulating these systems is regarded as a difficult problem, the Fellowship provided Professor Reese with the time to develop the right tools to tackle it.

IMPACT

The work has huge potential for industrial applications – in desalination and filtration systems, for example. Generally, desalination requires substantial pressures in order to force seawater through polymer membranes. Making the membranes out of nanotubes could reduce these pressures, without compromising their ability to filter out unwanted substances. Understanding the behaviour of fluids through the nanotubes is key to developing the most energy-efficient membranes.

Professor Reese is now partnering with researchers at the Universities of Bath and Warwick, and Daresbury Laboratory, to develop practical applications of his nanotube research. He runs computational simulations to identify which systems provide useful technological capabilities, which can then be prioritised for physical testing. Although industrial-scale use of nanoscale flow devices may be some years off, they could revolutionise engineering when they arrive. Nanotube membranes, for example, could reduce the energy costs of filtration by 75%.

PROFESSIONAL DEVELOPMENT

Professor Reese took the opportunity of the Fellowship to promote his work internationally to universities and industrial companies. Since returning to teaching duties, he has used examples from his Fellowship research in his lectures, engaging new engineers with the latest technological opportunities in fluid dynamics. There were benefits for other researchers, too – the academic who stepped in to fill Professor Reese's teaching duties was his former postdoc, who gained the experience needed to get a permanent job as a lecturer as a result.

LEVERHULME TRUST SENIOR RESEARCH FELLOWSHIPS

RAEng/Leverhulme Trust Senior Research Fellowships allow academics to concentrate on full-time research by covering the salary costs of a replacement academic who takes over the awardee's teaching and administration duties for up to one year.

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