PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A
MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES

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Dedication

Dr Timothy Bruce Nickels (1966–2010)

On Saturday 2nd October, at around 16.00 h, the fluid mechanics community lost one of its most valued members: Tim Nickels. Tim published widely in the fields of vortex dynamics and turbulence, but it is for his beautiful experiments that he will be best remembered. He was, without doubt, one of the foremost experimentalists in turbulent flows of his generation.

Brought up in rural Australia, Tim had a strong practical bent from the outset. He gained his honours degree in engineering from the University of Melbourne in 1987, and it was in Melbourne that he embarked on a research career in fluid mechanics. By the time Tim was awarded his PhD in 1993, he was already making a name for himself as an ingenious and careful experimentalist. His thesis work on colliding vortex rings was published in *Nature* in 1992, and it remains a key reference today. While Tim continued his interests in vortex dynamics and vortex rings, it was in the field of turbulence that he made his most important contributions. He acquired his enthusiasm for turbulence from Tony Perry, who had established a very active research group in Melbourne that

One contribution of 9 to a Theme Issue ‘Dynamical barriers and interfaces in turbulent flows’.

acquired a distinctive style combining careful experiments with deep physical insight. From 1994 to 1998, Tim held a research fellowship at Melbourne, which allowed him to work closely with Tony Perry and Min Chong, and a string of important papers on turbulent jets and boundary layers followed. A recurring theme was the attempt (usually successful) to interpret statistical measurements and scaling laws in terms of the behaviour of coherent structures within the turbulence—a strategy greatly favoured by Alan Townsend and Tony Perry.

In 1998, Tim moved to Cambridge, where he joined the engineering department and became a fellow of Emmanuel College. The manner of his appointment was typical of Tim. The lectureship he applied for was highly competitive, being the first opening in the fluids group for quite some time. Many highly qualified candidates applied, and those lucky enough to be short-listed gathered early one morning in a dusty old lecture theatre to give short presentations on their work. The room was crowded and the atmosphere tense as a sequence of near-perfect lectures were given by the candidates, any one of which seemed appointable. Tim was up last and his talk was on colliding vortex rings. The presentation started off monochrome and low key as Tim explained how, in theory, two carefully aligned vortex rings of identical strength made to collide head-on would perform a very intricate motion, rather like an elaborate dance. As the talk proceeded, the pictures gradually became more colourful and the audience were drawn in. But could such a perfect alignment of vortex rings ever be realized in the laboratory? The talk concluded with a breath-taking video showing red and blue vortices colliding and then executing the extraordinary dance predicted by theory. The film was on a loop, and, with the audience on the edge of their seats, Tim wondered slowly over to the video recorder and asked quietly if sound was available. It was, and a moment later the strident cords of one of Strauss' waltzes blasted the audience. Tim had choreographed the dancing vortices beautifully to the music. There was spontaneous applause and at that moment everyone in the room realized who would be awarded the lectureship.

At Cambridge Tim's work on turbulent boundary layers continued while his interests spread to other areas, such as the small scales in quasi-isotropic turbulence. He established an active and loyal research group and built a number of key turbulence research facilities. He always followed Tony Perry's advice to 'build it big and slow', which allows one to reach large Reynolds numbers while retaining good resolution in the measurements. The 'big washing machine', a vast $2 \times 2 \times 2\,\mathrm{m}$ stirred water tank, is a tribute to this strategy, offering a unique opportunity to probe the fine-scale structure of turbulence, as discussed in Tim's contribution to this Theme Issue. Much of his recent research focused on the development of complete three-dimensional and time-resolved measurement techniques to explore the physical structure of turbulence. He was excited that such approaches might finally allow us to see the fine-scale structure of turbulence in the laboratory. But Tim's legacy is not restricted to the construction of novel experiments, ingenious experimental techniques and new physical insights; there is also the long list of highly motivated researchers who were lucky enough to have him as their thesis advisor.

Tim was a first-class scientist and engineer, but he will also be remembered for his quiet, unassuming manner. In a profession known for its strong personalities and not infrequent feuds, he was always measured and thoughtful, kind to students and patient with his academic colleagues. He was the least pompous of academics and a pleasure to work with. This Theme Issue is dedicated to his memory.

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