New method for measuring fluid flow in algae could herald revolution for fluid mechanics

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In the words of Todd Squires, of the University of California, Santa Barbara "Nature has long inspired researchers in fluid mechanics to explore the mechanical strategies used by living creatures. Where better to look for innovative solutions to a technological challenge than to organisms that have had millions of years to devise strategies for related challenges?"

Now two research groups from the University of Cambridge, led by Professor Ray Goldstein of the Department of Applied Mathematics and Theoretical Physics, and Professor Lynn Gladden of the Department of Chemical Engineering and Biotechnology, have done just that.

Their findings are published in volume 642 of *Journal of* Fluid Mechanics, published by Cambridge University Press.

They have studied the giant cells of the Characean algae - cells that can measure up to 10cm in length and 1mm in diameter. This exceptional size makes the standard methods of distributing material within cells impossible, so Characean algae have long been known to employ 'conveyor belts' along their cellular walls to move food and waste around. It is the spatial distribution of the velocity of this movement that has been measured for the first time using state-of-the art magnetic resonance imaging techniques.

The impact of their discoveries and research techniques will be far-reaching. Professor Squires comments: “[The methods used] are incredibly powerful and have the potential to revolutionise our understanding of a wide range of environmentally and industrially relevant fluid flows. The technique is completely non-invasive, requires no flow tracers and can be performed in non-transparent materials."

Looking to the future, Professor Squires stated that this study ‘should serve as a potent reminder that the immense variety of organisms on Earth contains a wealth of expertise that may be mined for biomimetic [i.e. nature-imitating] solutions.’

More information: 'Measurement of cytoplasmic streaming in single plant cells by magnetic resonance velocimetry', Jan-Willem Van De Meent, Andy J. Sederman, Lynn F. Gladden and Raymond E. Goldstein: *Journal of Fluid Mechanics,* Volume 642. January 2010. pp 5-14. doi:10.1017/S0022112009992187

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