Swimming microorganisms stir things up

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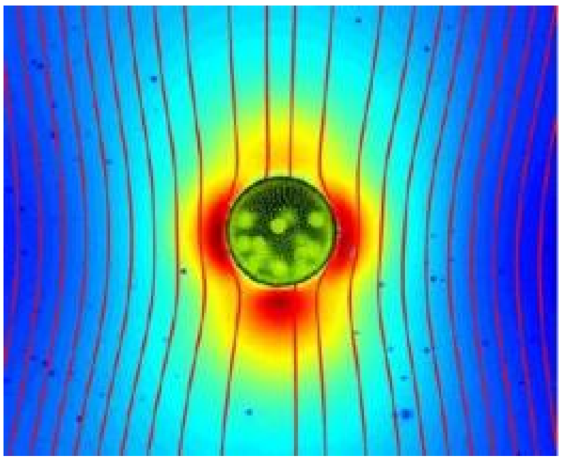

Researchers have mapped the flow field around a swimming *Volvox carteri* microbe by tracking the movements of tiny tracer particles. The spherical Volvox is swimming towards the top of the image. Streamlines appear as red curves, and the color map corresponds to the fluid velocity. Credit: K. Drescher, R. E. Goldstein, N. Michel, M. Polin, and I. Tuval, University of Cambridge

Two separate research groups are reporting groundbreaking measurements of the fluid flow that surrounds freely swimming microorganisms. Experiments involving two common types of microbes reveal the ways that one creature's motion can affect its neighbors, which in turn can lead to collective motions of microorganism swarms. In addition, the research is helping to clarify how the motions of microscopic swimmers produces large scale stirring that distributes nutrients, oxygen and chemicals in lakes and oceans.

A pair of papers describing the experiments will appear in the October 11 issue of the APS journal Physical Review Letters.

In order to observe the flow that microorganisms produce, researchers at the University of Cambridge tracked the motion of tiny tracer beads suspended in the fluid surrounding the tiny swimmers. They used the technique to study the fluid around two very different types of creatures: a small, blue-green form of algae called *Chlamydomonas reinhardtii* that swims by paddling with a pair of whip-like flagella, and the larger, spherical alga Volvox carterii that propels itself with thousands of flagella covering its surface.

The tracer beads showed that the two types of organisms generate distinctly different flow patterns, both of which are much more complex than previously assumed. In a related study performed at Haverford College in Pennsylvania, researchers used a high speed camera to track the flow of tracer particles around Chlamydomonas in a thin, two-dimension film of fluid over the course of a single stroke of its flagella.

The studies should help scientists develop new models to predict the fluid motions associated with aquatic microorganisms. The models will provide clearer pictures of the ways microbes mix bodies of water, and potentially offer insights into the role plankton plays in the carbon cycle as it stirs the world's oceans.

David Saintillan (University of Illinois at Urbana Champagne) gives an overview of the microorganism swimming research in a Viewpoint article in the October 11 edition of *APS Physics*.

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