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How to be invisible as a microscopic swimmer NAVISH WADHWA, THOMAS KIØRBOE, ANDERS ANDERSEN, Technical University of Denmark —
Microscopic plankton live a difficult life in open waters, having to continuously scan large amounts of water for food and mates, and hide from predators at the same time. In the absence of vision at these small scales, all interactions are dominated by chemical and hydromechanical cues. Thus, there is an evolutionary pressure to minimize the hydromechanical disturbance generated during processes such as feeding and locomotion. We report experimental observations that breast stroke swimming plankton generate a fluid disturbance that decays faster with distance than what is predicted from the commonly used stresslet model of a self-propelled organism. We rationalize these observations by using a three-Stokeslet model of a breast stroke swimmer, and show that it is possible for a swimmer to dramatically reduce its fluid disturbance by appropriately positioning the propulsive apparatus. A generalization of this concept may be used in understanding the large diversity of shapes and swimming modes found in the plankton world.

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