

Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Jump if you can't take the heat: three escape gaits of Paramecium swimming CHARLES N. BAROUD, AMANDINE HAMEL, LadHyX, Ecole Polytechnique, CATHY FISCH, Universite d Evry, LAURENT COMBETTES, Universite Paris 11, INSERM, PASCALE DUPUYS-WILLIAMS, Universite d Evry, ESPCI — Paramecium is able to swim at velocities reaching several times its body size per second, by beating its thousands of cilia in an organized fashion. Here we show that Paramecium has in fact three distinct swimming gaits to escape from an aggression in the form of localized heating, depending on the magnitude of the aggression: For a weak aggression, normal swimming is sufficient and produces a steady swimming velocity through cilia beating. As the heating amplitude is increased, a higher acceleration and faster swimming are achieved through synchronized beating of the cilia, which later give way to the usual metachronal waves. The synchronized beating yields high initial accelerations but requires the cell to coast through the synchronized recovery. Finally, escape from a life-threatening aggression is achieved by a “jumping” gait which does not rely on the cilia but is achieved from the explosive release of a rod-like organelles in the direction of the hot spot. Measurements through high-speed video explain the role of these rods in defending Paramecium. They also show that the zero-Reynolds number assumption is unverified in most cases.

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Date submitted: 04 Aug 2010

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