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Dynamic Equilibrium of Microswimmers MEHDI MIRZAKHANLOO, MIR ABBAS JALALI, M.-REZA ALAM, University of California, Berkeley — Here we show that two propelling microswimmers may fall into an equilibrium state at which they both remain stagnant indefinitely. This so-called "Dynamic Equilibrium" is a result of hydrodynamic interactions between the two swimmers, and is obtained through the formation of a nested saddle-shaped flow field near swimmers. We use, as a benchmark, a newly proposed artificial microswimmer named Quadroar which consists of two axles (with rotating disks at each end) connected by a reciprocating linear actuator. Quadroar induces an oscillatory flow field which closely resembles that of Chlamydomonas Reinhardtii (a single-cell green alga). Dynamic equilibrium has not been observed at large Reynolds number regimes, and therefore this finding may have unique and important implications in the collective behavior at low Reynolds numbers. Specifically, if our finding can be generalized to many microswimmers, that is, if a dynamic equilibrium can be found between multiple microswimmers, then it means that a flock of microswimmers may come to an absolute halt in which they will be trapped forever.

Mehdi Mirzakhanloo
University of California, Berkeley

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