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Guided Motion of Individual and Collective Swimmers in Funnel Arrays CYNTHIA OLSON REICHHARDT, Los Alamos National Laboratory, THUC MAI, Syracuse University, CHARLES REICHHARDT, Los Alamos National Laboratory — We generalize a model of swimming bacteria in asymmetric arrays of obstacles [1] to include different rules of motion, including various rules for collective behaviors. For individual noninteracting swimmers, we observe guided motion and rectification by the asymmetric barriers when the particles align with the walls they contact, but we find no rectification if the particles are reflected by the walls or bounce off the walls. For collectively interacting swimmers, it is possible for the particles to form large swimming clumps that can move against the normal rectification direction of the asymmetric barrier array. In general, the rectification by the barriers is lost when the length scale of the swarms of collectively moving particles is significantly larger than the length scale of the funnel shaped barriers. A particle swarm can become trapped inside a funnel; however, individual strings of particles that follow each other can escape from the trap and move against the funnel direction.

[1] M.B. Wan, C.J. Olson Reichhardt, Z. Nussinov, and C. Reichhardt, Phys. Rev. Lett. 101, 018102 (2008).

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