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Steady streaming in a simple reciprocal swimmer¹ NICHOLAS DERR, CHRISTOPHER RYCROFT, Harvard University, DAPHNE KLOTSAS, University of North Carolina at Chapel Hill — While biolocomotion at high and low Re has been well-studied, swimming at intermediate $Re \sim 1-1000$ —where both viscous and inertial forces are important—is less understood. Most previous investigations at intermediate Re have centered on individual species, implicitly focusing on a single example of the many ways such organisms self-propel. As a result, few underlying generic mechanisms that unify the many disparate intermediate- Re swimming methods have been identified. One possible such mechanism is steady streaming—the generation, due to inertial effects, of lower-order steady flow by periodic large-scale motion. In this talk, we examine the role of steady streaming in the locomotion of a simple reciprocal swimmer at intermediate Re . After asymptotically expanding the Navier–Stokes equations, we solve for time-periodic solutions to the resulting set of unsteady Stokes equations. We present the swimming speed and efficiency over a range of intermediate Re and comment on similarities to motility mechanisms at low Re .

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