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Dynamics of Purcell's three-link microswimmer with a passive elastic tail EMILIYA PASSOV, YIZHAR OR, Faculty of Mechanical Engineering, Technion, Israel — One of the few possible mechanisms for self-propulsion at low Reynolds number is undulations of an elastic tail, as proposed in the classical work of [Purcell, 1977]. This effect is studied here by investigating a variant of Purcell's three link swimmer model where the front joint angle is periodically actuated while the rear joint is driven by a passive torsional spring. The dynamic equations of motion are formulated and explicit expressions for the leading-order solution are derived by using perturbation expansion. The dependence of the motion on the actuation amplitude and frequency is analyzed, and leading-order expressions are formulated for the travel-per-stroke, mechanical work per travel distance, and average Lighthill's efficiency. Finally, optimization with respect to the actuation frequency and the swimmer's geometry is conducted.

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