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Designing self-propelling micro-swimmer that navigates in microfluidic channels BEN BINGHAM, HASSAN MASOUD, ALEXANDER ALEXEEV, Georgia Institute of Technology — Using a fully-coupled computational approach that integrates the lattice Boltzmann model for the hydrodynamics and the lattice spring model for the micromechanics of deformable solids, we design a synthetic micro-swimmer that not only self-propels but also successfully navigates in a low Reynolds number environment of a microfluidic channel. The swimmer body consists of a responsive polymer gel that undergoes periodical swelling and shrinking. Two thin elastic flappers are attached to the opposite sides of the swimmer body. The flappers wiggle driven by swimmer body oscillations and, in this fashion, propel the micro-swimmer through its highly viscous fluid environment. Third, light sensitive flapper is attached in the front of the swimmer and serves to steer its trajectory in microchannel. When exposed to light, the steering flap bends towards the light source. We show that this swimmer can either move straight or turn in the required direction following light signals. Thus, guided by light, the micro-swimmer can successfully navigate towards the target in a microfluidic channel.

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