Abstract Submitted
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Simulation of model swimmers near ciliated surfaces HENRY SHUM, ANURAG TRIPATHI, Department of Chemical & Petroleum Engineering, University of Pittsburgh, JULIA YEOMANS, Rudolf Peierls Centre for Theoretical Physics, University of Oxford, ANNA BALAZS, Department of Chemical & Petroleum Engineering, University of Pittsburgh — Biofouling by micro-organisms is problematic on scales from microfluidic devices to the largest ships in the ocean. One solution found in nature for clearing undesired material from surfaces is to employ active cilia, for example, in the respiratory tract. It is feasible to fabricate surfaces covered with artificial cilia actuated by an externally imposed field. Using numerical simulation, we investigate the interactions between these artificial cilia and self-propelled model swimmers. One of the key aims is to explore the possibility of steering swimmers to influence their trajectories through the flow field produced by the cilia. In our simulations, the fluid dynamics is solved using the lattice Boltzmann method while the cilia and model swimmers are governed by elastic internal mechanics. We implement an immersed boundary approach to couple the solid and fluid dynamics.

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