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Instability of a chemotactic thin-film bacterial suspension NISHANTH MURUGAN, ANUBHAB ROY, Indian Institute of Technology Madras — We formulate a thin-film flow driven by active stresses arising from the anisotropic orientation distribution of swimmers present in a chemotactic suspension. The film is found to be unstable to perturbations in the long-wave ($k << 1$) regime and we identify two mechanisms associated with the instability. The hydrodynamic field of a pusher type swimmer works to reinforce perturbations to the density field and generates a mode of instability which has previously been predicted by Kasyap and Koch [2014]. In addition to this mode of instability, we find that the active stress allows for a jump in the viscous stress across the interface that is reminiscent of marangoni stresses in films, which drives a flow enhancing the interface perturbation. The perturbation of solely the interface or the density field is shown to be unconditionally stable for a suspension of pullers, while in the case of pushers, there exists a critical activity (β) for the film to destabilize. However, the coupled system exhibits an instability for a suspension of pullers, wherein the marangoni like stresses at the interface work to reinforce the density perturbation. The stability characteristics of the system are further probed in the finite wave number regime.

Nishanth Murugan
Indian Institute of Technology Madras

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