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Active stress driven convection in a suspension of chemotactic bacteria[1] KASYAP T.V., DONALD KOCH, School of Chemical and Biomolecular Engineering, Cornell University — We examine the linear stability of a suspension of swimming bacteria producing dipolar hydrodynamic disturbances confined in a channel subjected to a linear chemo-attractant gradient across the channel. At the continuum level swimming bacteria exert an "active" stress on the fluid which is a function of the bacterial concentration and orientation fields. In the base-state without any fluid flow, the fluxes from the chemotactic and diffusive motion of the bacteria balance to yield exponential number density and active stress profiles across the channel. We show that such a base-state is unstable to perturbations in the number density parallel to the channel walls if the bacterial concentration exceeds a critical value determined by a Peclet number measuring the strength of chemotaxis relative to diffusion. Active stress gradients resulting from the perturbation in the number density drive convective fluid flow, which transports bacteria into the regions of highest perturbed bacteria concentration reinforcing the original perturbation.

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Donald Koch
School of Chemical and Biomolecular Engineering, Cornell University

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