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The signatures of microstructure in swimming properties of microorganisms in heterogeneous media MEHDI JABBARZADEH, HENRY FU, University of Nevada, Reno — Many swimming microorganisms move through complex bioenvironments. Some of these environments, such as mucuses, contain a network of filaments with features at lengthscales comparable to the swimmers. In order to understand the effects of these heterogeneous microstructures on the swimming velocity of microorganism, we use Higdon's Slender Body Theory to study the hydrodynamic interaction between a Golestanian three-sphere swimmer and filaments. We find that in spatially varying background flows, there is an optimal length for the filament segments in Higdon's Slender Body Theory, and that the effect on swimming velocity is well-approximated by the Stokeslet contribution to the flow. We consider the effect of media composed of many such filaments. For isotropic media, the average change of the swimming velocity is determined by the density of the medium, while the variance of the swimming velocity depends on the filament structure through its density-density correlation function. The dependence of the variance on the medium can be understood by relating lengthscales of the medium microstructure to lengthscales of the swimmer's velocity field.

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