DENSITAXIS OF SWIMMING MICROORGANISMS

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ABSTRACT

Organisms often move through inhomogeneous environments like the gradients in heat, light, nutrients, fluid viscosity or density. They respond to these inhomogeneities by reorienting and changing speed, often exhibiting directed motion termed *taxis*. For instance, *E. coli* reorients to swim up nutrient gradients but swims down light or viscosity gradients. Here we present theoretical evidence of taxis in density gradients, which we call *densitaxis*. This taxis is sensitive to whether the organisms generate thrust in-front (so-called pullers) or back (pushers). Pullers, like *Chlamydomonas reinhardtii* for instance, reorient to swim up or down the gradients depending on their initial orientation. But pushers like *E. coli* rotate to swim normal to the gradients. This taxis could help explain the motion of marine organisms in the ocean where density gradients are prevalent or be leveraged to sort or organize a suspension of organisms.