

Abstract Submitted
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Flow against the grain: a Newtonian microfluidic diode JOSÉ ALVARADO, JEAN COMTET, ANETTE PEKO HOSOI, MIT — Many biological structures are coated with a dense layer of fine hairs immersed in fluid, such as ciliary beds and microvilli brushes. These elastically deformable hairs are mechanically coupled to the fluid and can thus transduce mechanical forces. When hairs are slanted (forming a sub-normal angle to the surface) they deform differentially depending on whether fluid flows with or against the grain. Using theory and experiment, we show that a channel coated with slanted hairs leads to an anisotropic pressure drop. Surprisingly, this anisotropy holds for Newtonian fluids at arbitrarily low Reynolds numbers. We suggest that beds of slanted hairs could be used to build a Newtonian microfluidic diode.

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