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Taylor-Aris Dispersion of Elongated Rods[1] AJAY HARISHANKAR KUMAR, THOMAS POWERS, DANIEL HARRIS, Brown University — Particles transported in fluid flows, such as cells or nanorods, are rarely spherical in nature. In this study, we numerically and theoretically investigate the dispersion of an initial concentration of elongated rods in 2D pressure-driven shear flow. The rods translate due to diffusion and advection, and rotate due to rotational diffusion as well as their classical Jeffery's orbit in shear flow. When rotational diffusion dominates, we approach the classical Taylor Dispersion result for the longitudinal spreading rate by using an orientationally averaged translational diffusivity for the rods. However, in the high shear limit, the rods tend to align with the flow and ultimately spread faster as a direct consequence of their anisotropic diffusivities. The relative importance of the shear-induced orbit and rotational diffusivity can be represented by a rotational Peclet number, and allows us to bridge these two regimes.

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