Gyrotactic cells subject to imposed 3D flows NICHOLAS HILL, SCOTT RICHARDSON, ANDREW BAGGALEY, University of Glasgow — We examine the effect of imposed 3-dimensional test flows, specifically a Taylor–Green Vortex flow and an ABC flow, on the patterns and mixing of suspensions of gyrotactic swimming cells. Numerically solving the deterministic swimming trajectory equations for individual cells with random starting positions, we explore how the surrounding flow and the cell shape determine the long-time patterns. For certain parameter ranges these patterns often take the form of braided "plume-lie" structures, even when using the chaotic ABC flow. For various pattern configurations, analysis of the governing equations of motion reveals why they are formed, as analytical solutions of the equations for the swimming cell trajectories can be obtained. These patterns persist when small random perturbations (noise) are added to individual trajectories.

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