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The effect of shear and flow separation on out of plane growth in biological films DEREK RINDERKNECHT, MORY GHARIB, California Institute of Technology — Shear stress and flow separation are important physical cues initiating biofouling in many biological systems examples are the formation of plaques in the cardiovascular system and the accumulation of algae or other contaminants on the hulls of ships. To examine the effect of unsteady flow on the local shear profile and flow separation location and their relationship to the growth of thin biofilms, an experiment was constructed consisting of an open ended box with two opposing cylindrical half rounds located along the midline of the top and bottom faces. This chamber when mounted on a traverse is capable of creating steady, oscillatory and pulsatile flow profiles. A parametric study consisting of LIF dye experiments and PIV was conducted to examine the affect of unsteady flow amplitude and frequency on flow separation. Empirical velocity fields were analyzed using Lagrangian Coherent Structures to determine the impact of the unsteady flow profile on boundaries to transport within the flow. Results show the existence of three distinct flow regimes where the size and number of recirculations present depend on the frequency and amplitude of the oscillation. The flow was also seeded with algae and the apparent effects of flow separation and time periodic shear on out-of-plane biological growth will be discussed.

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