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**Dynamics and phase diagrams for highly non-spherical vesicles in shear flow computed with Loop subdivision surfaces**[1] ANDREW SPANN, HONG ZHAO, ERIC SHAQFEH, Stanford University — Vesicles, particularly those with a low volume to surface area ratio, are challenging to simulate due to the presence of a surface incompressibility constraint and a bending energy that requires a highly accurate estimate of curvature. A boundary integral method based on Loop subdivision surfaces on an unstructured mesh is used to compute phase diagrams and stress dynamics for highly non-spherical vesicles in shear flow. In addition to the most commonly studied prolate family of vesicles, we also investigate the biconcave and stomatocyte shapes. We chronicle the decrease in the viscosity ratio threshold needed to trigger transition between the regimes of tank treading, trembling, tumbling, and kayaking as the reduced volume ratio of a prolate vesicle decreases. For biconcave shapes, we observe three regimes: conversion to prolate, tank treading, and tumbling. We find that biconcave tumbling near the critical viscosity ratio is not merely a rotation motion and includes noteworthy stretching in the vorticity direction.

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Andrew Spann
Stanford University

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