Capsule deformation and orientation in general linear flows ALEX
SZATMARY, CHARLES EGGLETON, University of Maryland, Baltimore County
— We considered the response of spherical and non-spherical capsules to general
flows. (A capsule is an elastic membrane enclosing a fluid, immersed in fluid.)
First, we established that nonspherical capsules align with the imposed irrotational
linear flow; this means that initial orientation does not affect steady-state capsule
deformation, so this steady-state deformation can be determined entirely by the
capillary number and the type of flow. The type of flow is characterized by r: $r = 0$
for axisymmetric flows, and $r = 1$ for planar flows; intermediate values of r are
combinations of planar and axisymmetric flow. By varying the capillary number
and r, all irrotational linear Stokes flows can be generated. For the same capillary
number, planar flows lead to more deformation than uniaxial or biaxial extensional
flows. Deformation varies monotonically with r, so one can determine bounds on
capsule deformation in general flow by only looking at uniaxial, biaxial, and planar
flow. These results are applicable to spheres in all linear flows and to ellipsoids in
irrotational linear flow.

Alex Szatmary
University of Maryland, Baltimore County