Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Dynamics of a compound vesicle: numerical simulations[1] SHRAVAN VEERAPANENI, New York University, YUAN-NAN YOUNG, New Jersey Institute of Technology, PETIA VLAHOVSKA, Brown University, JERZY BLAWZDZIEWICZ, Texas Tech University — Vesicles (self-enclosing lipid membranes) in simple linear flows are known to exhibit rich dynamics such as tank-treading, tumbling, trembling (swinging), and vacillating breathing. Recently, vesicles have been used as a multi-functional platform for drug-delivery. In this work, the dynamics of simplified models for such compound vesicles is investigated numerically using a state-of-the-art boundary-integral code that has been validated with high accuracy and efficiency. Results show that for a vesicle enclosing a rigid particle in a simple shear flow, transition from tank-treading to tumbling is possible even in the absence of viscosity mismatch in the interior and exterior fluids. We will discuss the shape transformations, multiple particle interactions and the flow properties. Comparison with results from analytical modeling gives insights to the underlying physics for such novel dynamics.

[1]YNY acknowledges support from NSF/CBET-0853673 and DMS-0420590

Yuan-Nan Young
New Jersey Institute of Technology

Date submitted: 06 Aug 2010 Electronic form version 1.4