

Abstract Submitted  
for the DFD08 Meeting of  
The American Physical Society

**Motion of beads in an oscillatory rotating fluid: micro-bead-beating** ALI NADIM, Claremont Graduate University and Keck Graduate Institute, JAMES STERLING, Keck Graduate Institute, ROBERT DOEBLER, Keck Graduate Institute and Claremont BioSolutions — One method for mechanical lysis of biological cells and spores is to mix them with a suspension of beads and vigorously “shake” the mixture. The precise mechanisms of lysis are not understood but lysis is thought to result from collisions between the beads and the cells and the associated stresses exerted on the cells. For instance, in the micro-bead-beater<sup>TM</sup> instrument from Claremont BioSolutions LLC (Upland, CA), the “shaking” occurs when a small cartridge filled with a mixture of cells/spores and 100-micron beads is driven at high frequencies in a small arc trajectory. In this presentation, we describe our initial modeling effort aimed at understanding this system via analysis of the trajectories of beads within such an instrument. The equations governing the motion of non-neutrally-buoyant spherical beads in an oscillatory rotating flow are derived and analyzed numerically. The resulting trajectories are found to be quite complex and very different from those in a steadily rotating fluid. A catalog of possible trajectories at various values of the governing dimensionless parameters is presented.

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Date submitted: 04 Aug 2008

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