Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Flows around Oscillating Bodies at Low Reynolds Numbers[1]
CHARLOTTE W. KOTAS, PETER H. ROGERS, MINAMI YODA, Georgia Institute of Technology — Understanding the acoustically induced fluid flows inside the fish ear, specifically near the otolith, may give insights on how fish localize underwater sound sources and lead to compact, directionally sensitive underwater acoustic sensors. To explore such acoustically induced flow fields, spheres, as well as prolate and oblate spheroids of various aspect ratios, were oscillated at Reynolds numbers based upon the oscillation frequency and body half-dimension ranging from 6 to 120 and normalized oscillation amplitudes of 0.05–0.2. Spheroids oscillated with different orientations (measured with respect to their principal axes) were also investigated to determine how these flow patterns are affected by the direction of the incident sound. Both oscillatory flow within a single period and steady streaming flow were studied using flow visualization and particle-image velocimetry (PIV). The effect of various parameters on the inner flow region (of primary interest in sensing applications) is explored at these intermediate Reynolds numbers. The experimental results are compared with asymptotic perturbation analyses and numerical results.

[1]Supported by ONR

Minami Yoda
Georgia Institute of Technology

Date submitted: 02 Aug 2005 Electronic form version 1.4