

# Fluid-Structure Interaction in Vibrating Cantilevers

Faculty: Suresh V. Garimella

Student: Tolga Açıkalin

## OBJECTIVE

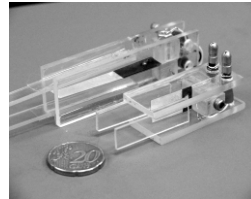
Develop analytical and numerical models to predict fluid-structure interaction of vibrating cantilevers.

## APPROACH

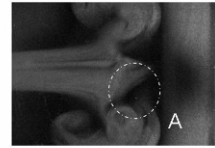
Develop analytical and numerical models to predict fluid-structure interaction of vibrating cantilevers.

## IMPACT

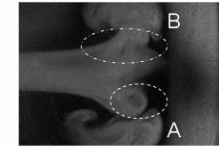
This research will help place piezoelectric fans in the thermal management toolkit by providing insight into the fluid flow induced by these devices.



Piezoelectric fans



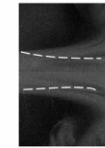
(a)  $t = 1/30$  sec



(b)  $t = 2/30$  sec



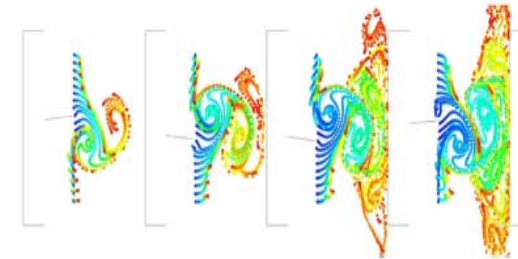
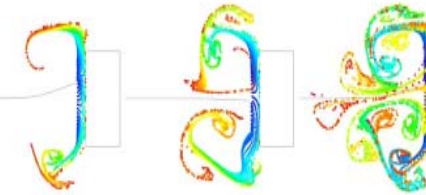
(c)  $t = 3/30$  sec



(d)  $t = 4/30$  sec

Experimental flow visualization

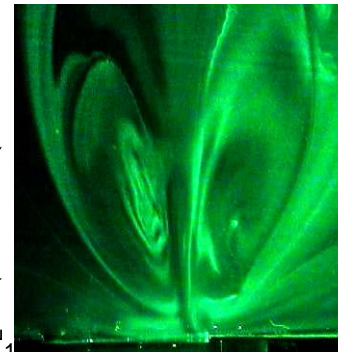
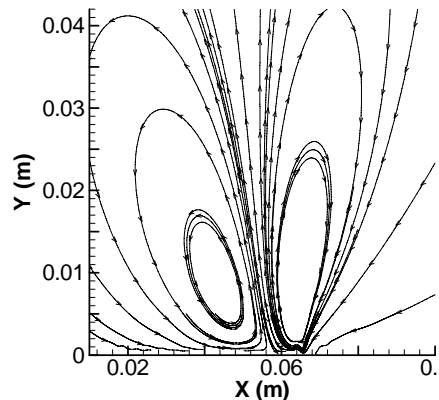
## Numerical CFD models



## SELECTED PUBLICATIONS

- T. Açıkalin, S.V. Garimella, A. Raman and J. Petroski, *Int. J. Heat and Fluid Flow* (in press).
- T. Açıkalin, A. Raman and S. V. Garimella, *J. Acoust. Soc. Am.*, 114 (4): 1785-1795, 2003.
- T. Açıkalin, S.M. Wait, S.V. Garimella and A. Raman, *Heat Trans. Eng.* 25(1): 4-14, 2004.

## Streaming flow models



2-D streaming model for a baffled piezoelectric fan agrees well with experimental flow visualization