PHYSICAL MATHEMATICS SEMINAR

On the stability, sound and forced motion of a flag

AVSHALOM MANELA

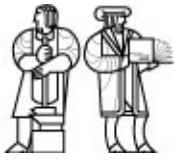
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

ABSTRACT:

The prevailing view of the dynamics of flapping flags is that the onset of motion is caused by linear instability of the initial planar state. This view is reexamined by considering the forced motion of a flag immersed in a high-Reynolds number flow and subject to vortex shedding from its cylindrical pole. Vortex shedding is represented by a `street' of discrete line vortices released periodically from the pole and convected in the mean wind over the surfaces of the flag. It is found that forced motion is possible when the flag is still temporally stable, which suggests that the present mechanism should be taken into account in future high-Reynolds experimental investigations. A linear theory is then proposed for describing the sound production of the flag in nominally uniform high Reynolds number flow. Acoustic radiation of dipole type is calculated and discussed in the limit where the flag is acoustically compact. It is found that the acoustic pressure is dominated by the contribution from the trailing-edge wake and that light flags are noisier than heavy.

TUESDAY, OCTOBER 14, 2008
2:30 PM
Building 2, Room 105

Refreshments at 3:30 PM in Building 2, Room 349
(Applied Math Common Room)



Massachusetts Institute of Technology
Department of Mathematics
Cambridge, MA 02139