

FIG. 1.

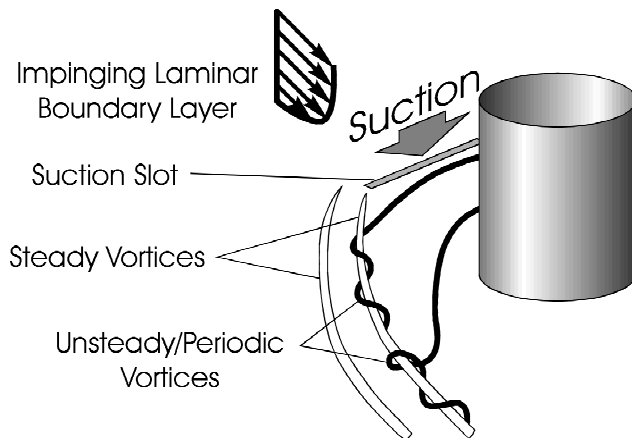


FIG. 2.

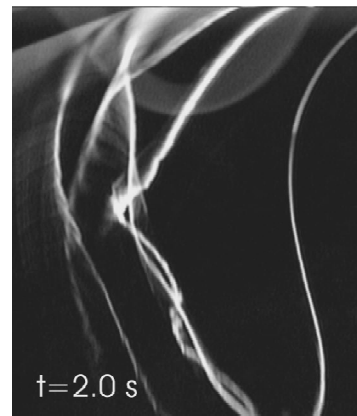
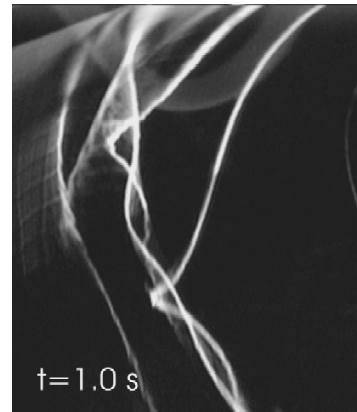


FIG. 3.

## INTERTWINING LAMINAR NECKLACE VORTICES

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Figure 1 is a hydrogen bubble visualization of the intertwining laminar necklace vortices formed in the junction of a cylinder and flat plate subjected to spatially limited, constant rate suction through a rectangular surface slot. Figure 2 is a schematic illustrating the vortices and their intertwinement as well as the suction slot placement. The suction slot was 64 mm $\times$ 2 mm and was located 88.5 mm from the cylinder,

which was 8.9 cm in diameter. For a particular combination of Reynolds numbers and suction rates, the flow is characterized by the formation of a number of steady vortices at the outboard edges of the suction slot. Downstream of the slot, an unsteady necklace (or horseshoe) vortex periodically forms, which undergoes a three-dimensional intertwinement with a steady vortex. Figure 3 is a short time sequence illustrating the three-dimensional periodicity of the system. Selected video sequences can be viewed at <http://www.lehigh.edu/~inmem/fluids/junction/intertwine1.html>.