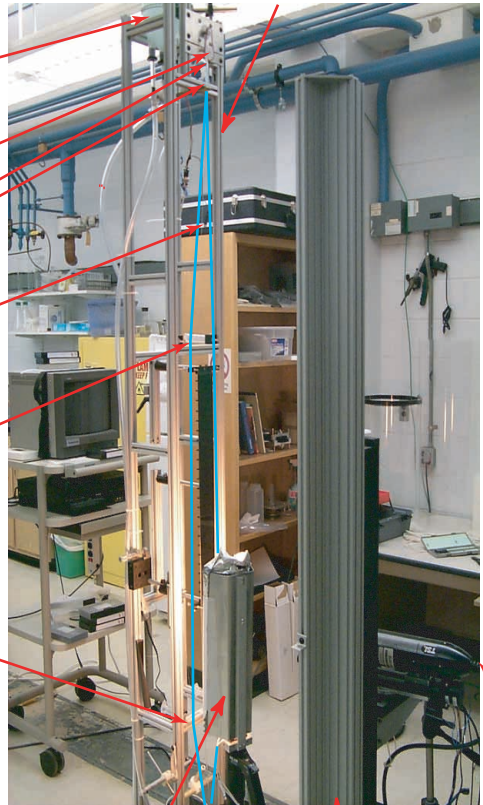
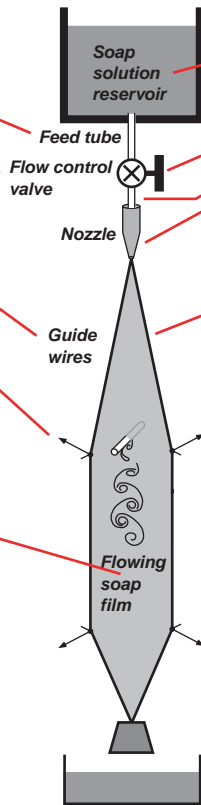
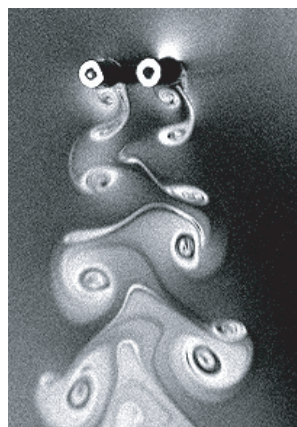


This film is viewed from the base of the apparatus. The visible portion is ~8 cm wide, ~100 cm tall, and ~3 μm thick.



Sodium lamp for monochromatic illumination LDV positioning system



Two cylindrical metal tubes (~1mm in diameter), thrust through the flowing film section denoted above.

The two interacting 2D vortex streets are visible because of slight differences (<10%) in film thickness. Monochromatic light (from a sodium lamp) interferes either constructively (bright) or destructively (dark). Thickness variations relax slowly (order minutes) compared to the vortex shedding time (~10 milliseconds) and act as a passive flow tracer.

Flowing soap films can be a very useful medium for studying 2D fluid dynamics for low (10) to moderate Reynolds numbers (~10⁴). The aspect ratio of fluid thickness to later extend is ~10,000 for a 1cm vortex, and quite convincingly quasi two dimensional.

The center figure above outlines the basic experiment. Soap solution flows from a reservoir through a feed tube and flow control valve into a nozzle. Two nylon wires emerge from this nozzle and guide the solution downward. Initially the guide wires are held together by the tensioning weight. Once the wires are wetted with solution, lateral tension is applied from four pull points. A flowing soap film now fills the void between the two guide wires.

The film moves at a constant speed through the parallel section of the channel, where gravity and air drag balance. The terminal velocity depends on the film thickness which can be controlled with the valve at the top of the channel.

Though the exact viscous properties of the film (we do know it is Newtonian) and its interaction with the surrounding air are still being studied, it is clear that the flowing film is a powerful medium for studying quasi-2D flows in the laboratory.

All Photos taken by Maarten Rutgers and Brent Daniel.

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10 meter tall, 1.5 meter wide version shown at the APS Centennial meeting, 1999.