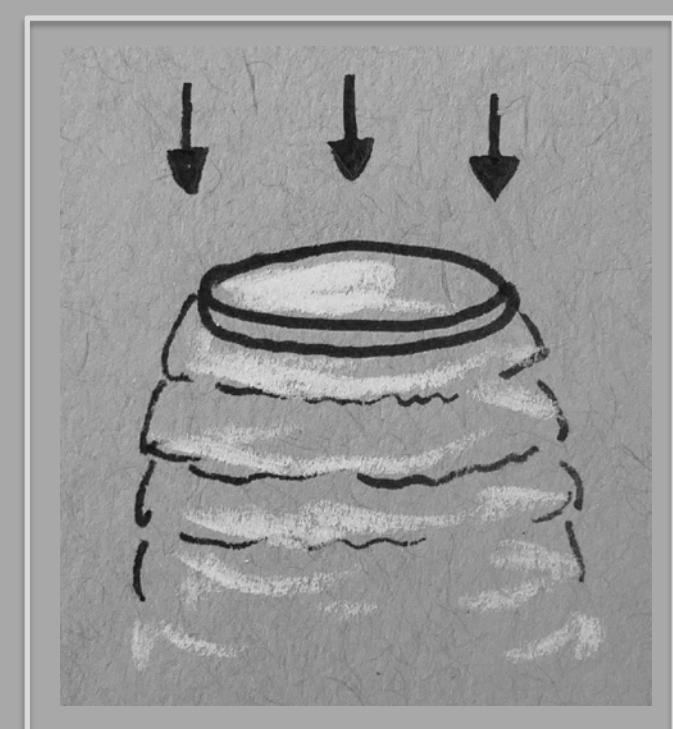


Portrait of a Flow in Three Colors

Natalie Agre, Stephen Childress,
Jun Zhang, Leif Ristroph

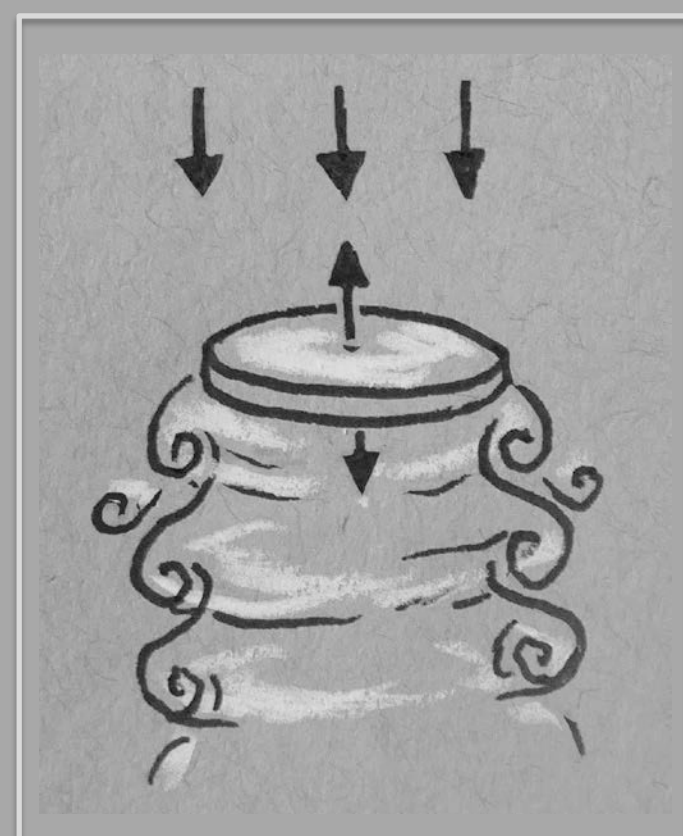
Applied Math Lab
Courant Institute, NYU

While visualization techniques reveal the otherwise hidden character of a flow, each method also strongly affects our perception. One method can emphasize what another might mask. These differences are illustrated in the context of high Reynolds number laminar flows past stationary and oscillating disks, as shown in the insets.



The left column of images captures streaklines using ink released near the front stagnation point and entrained into the flow as it separates off the disk edge. For steady flow the ink envelops the wake in a translucent drape that includes thin thread-like vortex rings, while the oscillating body emits a train of large and intense rings. The right column also represents streaklines, here revealed by concentrated fluorescein dye which gives an other-worldly quality to the photographs. The middle column shows time-exposed photographs of microparticles illuminated by a laser sheet, and the length and direction of these pathlines indicate local velocity.

Pathlines reveal features of the outer flow not seen with streaklines. For example, the lower pathline photograph captures a moment in which an off-body stagnation point is induced by the forward stroke.



Revealed by streaklines but not pathlines, however, is a closely coupled pair of counter-rotating vortex rings.

