Update

Where we are in understanding momentum transfer and where we still need to go

Where we have been

- A first lab to rekindle physical thinking
- Reynolds numbers (to understand the three kinds of flow regimes [laminar, “wavy” or periodic & turbulent] that can result when momentum produces shear and tensile stresses on water)
- Boundary layers that form over all objects in flows (lecture last week plus today’s lab)

Where we are going in the "momentum unit"

- See how momentum, shear and pressure interact to produce net forces and affect designs of organisms
- Focus on body shapes, locations in boundary layers and production of flow microenvironments

Today's lab

- A look at the vertical structure of a smooth-turbulent boundary layer (three flow regimes should be evident as a function of height above the bed)
- A look at flow behavior around a cylinder that extends above the viscous sublayer but not all the way through the boundary layer (1D + 2D = 3D)

Purpose

- Clear application to flows around animals and their tubes at the seabed (Any bluff body attached to a boundary has similar effects, *e.g.*, your house for purposes of siting a windmill.)
- Anticipate how Bernoulli's law works
- Have more than enough information to appreciate Stokes' law
- Prepare to look at realistic, asymmetric organisms or models next week

Reminder

- After today's lab and lecture, you should be able to understand Vogel through Ch. 8. Please read through Ch. 8.
- Actually, after today, you should be able to understand any of Vogel that you read in sequence. Feel free to read beyond Ch. 8.

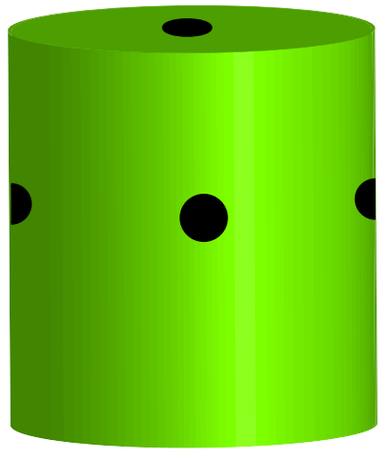
Use of Vogel

- For the first unit (momentum transfer), it is an independent, parallel introduction to the same topics we cover in lab and lecture.
- For the other two units, I will use it as a selective reference book, but don't let that stop you from reading it.

Flume reminder

- When done, leave the inflow to the head tank closed, and the inflow and outflow valves from the flume wide open

Today's lab device



If the holes are small enough (and they are in our case), the principal driver of dye will be a pressure difference between two open holes. You may want to block one or more holes at a time to see particular pressure differences. Hydro***static*** pressure differences will not drive flow (because there are no hydrostatic imbalances), but other pressure differences will.