Lecture 3

• Course website update/announcement

• G. I. Taylor’s lecture
Low Reynolds Number Flows
Stokes Flow

Re $\ll 1$

Fluid inertia $\ll$ Viscous Force

Pressure force balances the Viscous Force

STATICS
Low Reynolds number flow

- History independent
- Time reversible
G. I. Taylor’s Lecture

curious phenomena at low Reynolds numbers

• http://web.mit.edu/hml/ncfmf.html
Low Reynolds number Flows
Stokes flow

• **History independent:** flow velocity is determined by the forces and the boundary velocity at the same instance

• **Time reversible:** if we play a film of the Stokes flow, we won’t be able to tell whether it is played forward or backward. time does not come in explicitly.

• **Stokes Drag on a Sphere:**
  linear in velocity, the density, and the size of the sphere

• **Approximated Drag on a Slender body:**
  roughly, the normal force is twice the tangential force