Lab 2, Part 1: How can information about forces be derived from a video?

Introduction to Video Capture &

Analysis of Directed Motion and Resistive Forces.

This is the first week of a two-week lab sequence designed to introduce you to video capture and analysis of directed motion and resistive forces. In this first week, you will collect video data using ImageJ for two separate investigations. Next week you will analyze your data and try to determine how the resistive forces scale with respect to the varied quantities. In the first investigation (hour 1), you will be asked to analyze the directed motion of either coffee filters falling through the air or different spheres falling through fluid (one concentration of glycerol). (You are investigating how resistive forces and terminal velocity scale with the mass of the falling object.) In the second investigation (hour 2), all students will analyze the directed motion of one sphere falling through different fluids (different concentrations of glycerol). (You are investigating how resistive forces and terminal velocity scale with the viscosity of the fluid.) The lab handout will give explicit instructions on video capture, but no guidance on the performance of the experiments or attainment of the physics skill goals.

Why do we care about resistive forces and directed motion? The resistive effect of air (on macroscopic organisms) and fluids (on both macroscopic and microscopic organisms) cannot always be ignored. For example, the fluid resistance on a bacterium (or on a cell) requires that the bacterium exert a force to overcome this resistance and change its motion. These resistive forces can be affected by the size and mass of an object and by the characteristics of the medium creating the resistive force. You will learn more about this in the upcoming lectures, readings, and recitation. Pay attention, as you will need these theoretical ideas to do your data analysis next week.

Today you will practice and master the skills necessary to capture your own videos for analysis in ImageJ. After today, you will ALL be expected to be experts at these skills so take turns and help each other learn. Take notes for the future if you are worried that you will forget.

At the end of the lab next week, **your group will submit one lab report**. This will be reviewed by the TA according to the Scientific Community Lab rubric. Though the report is not due today, it is a good idea to begin writing as much of the report as you can this week—it will ensure that you don't forget what you have done and will give you a good head-start on writing the report for next week. Good attention to detail now will save you time later! Remember, your TA is here to help you with equipment and ImageJ, but the physics is up to you and your group!

Approximate Timing: (~2 hours)

- Introduction: 15 minutes
- Data Collection (1st investigation): 40 minutes
- Data Collection (2nd investigation): 40 minutes
- Class Discussion/Summation: 10 minutes
- Data Entry/Data Table: 5 minutes