> "...writing means joining a conversation of persons who are, in important ways, *fundamentally disagreeing with each other,* or, to make the matter less agnostic, *jointly seeking answers to shared questions that puzzle them*."
>
> — John C. Bean, Engaging Ideas

3 Writing an Introduction

3.1 General Requirements

The **introduction** convinces the reader that this paper will be interesting to read. It also **provides the necessary background to understand the project.** A general discussion of any techniques or theories used should be included. Summarize the relevant theory and equations. You may want to look up and cite some other references that provide you with added theoretical grounding for the project. Any information presented that is not your original idea must be cited.

The introduction also includes a statement of what the purpose of your report is, with a clear connection to all prior introduction material, and how you accomplish this goal. The reader should be able to clearly distinguish between what was already known and what you show them in this paper.

For more on introductions, please see the excerpt from *A Short Guide to Writing About Science* by David Porusch.

3.2 Finding the Proper "Pitch"

It is very easy to take too broad of an approach to your introduction: "From the very moment the universe was born..." It is also very easy to take too narrow of an approach to your introduction: "Guanine nucleotide binding proteins participate in eukaryotic signal transduction." To find the proper "pitch" for your introduction, you must consider your audience, and orient them to your project. Your audience is another Phys 211 student; they know they are about to read a physics paper, but they want to know the context of your specific project.

3.3 What sort of problem are you working on?

There are 4 general kinds of problems in science based on what a researcher wants to accomplish:

- *Define or measure a specific fact or gather facts about a specific phenomenon.* Example: What is the average speed of a bunny fleeing a predator?
- *Match facts and theory.* Example: Does the center of mass of a dancer follow a parabola?
- *Evaluate and compare two theories, models, or hypotheses.* Example: Does a pumpkin dropped out of a third floor window follow free-fall motion, or is air resistance significant?
- *Prove that a certain method yields better data than other methods.* Example: Marking the center-of-mass of a tossed baseball bat ahead of time will lead to more accurate y-position vs. time compared to using a point-series method in Logger Pro.

1. What is the problem statement for your group's project? How would you categorize this problem statement using the four kinds of problems above?

3.4 Relate the Problem to Theory

After providing enough context and introducing your problem, you'll then need to provide the relevant theoretical background information that you used to solve the problem. This includes an explanation of the concepts/theories/models that you used, which for Phys 211, may include: Newton's First, Second, or Third Laws, Kinematics, Center of Mass, or more.

Then, put your problem in context with these laws. For example, you'll likely want to include a free-body diagram of your objects during various parts of the motion you are studying. The relevant equations should be expressed in general variable form; you won't be inserting your specific numbers until you get to your Methods or Results sections. If you use an equation in your Methods or Results sections, they need to appear here in their general form.

2. What are the general concepts, theories, and equations that are important to your project?

You should also look up and cite some other references that provide you with added theoretical grounding for the project. These are specific to the motion you want to study, whether that is the physics behind a certain sport, car crashes, or air resistance.

3. Have you looked up relevant references for your project? What were the main things you learned that are relevant for the introduction?