The Basics of Writing a Report

To help you get started with your report we made a LaTeX template you can download from the course page. You are, of course, allowed to use whatever software you like. (But why would you really use anything other than LaTeX?)

You can also find a couple of example reports on the course page. If you are unsure on how to write the report, use this guide along with the examples as a starting point for your report.

I. THE BASICS OF THE BASICS

If you're struggling with the idea of writing a report, I often find it very enlightening to review the purpose of reports: *to report on a finding with scientific relevance.* A scientific report is essentially a modern and polished way of saying "hey, I saw this thing the other day, here's how you can see it too". Essential to a report is *something to report on* such as an experiment, a simulation, or really anything reproducible.

Apart from the fundamental purpose of reports, a report may also serve a purpose to the author such as to disprove a theoretical prediction, describe the latest findings of an investigation, or just to show your audience what you have been working on.

II. THE COMPONENTS OF A REPORT

The fundamental components of a scientific report, listed in order, are:

1. Title, author, date, etc.
2. Abstract
3. Introduction
4. Theory (optional)
5. Method
6. Results
7. Discussion
8. Conclusion
9. Acknowledgements (optional)
10. References

While it may seem tedious to include each and every component listed above, it is actually *very important* as each component serves a unique purpose that is deeply rooted in the scientific method.

A. Title, author, date, etc.

This is probably the most obvious component of a report. The title should be straight-to-the-point and give the reader some understanding of what he or she is about to read. I'm assuming you're able to handle the author and date parts yourself.

B. Abstract

The abstract is short introductory text directly following the title that outlines the scope as well as the findings of your report, the text should not exceed 400-500 words. After reading an abstract the reader should be aware of what you are reporting on, the general aspects of your methods, the important details of your results and whether you encountered any complications with your methods or the results.**NOTE: A very common mistake is to not report on results in the abstract: remember the abstract should also report your most important results!**

Personally, I often tend to write the abstract last.

C. Introduction

The introduction should first and foremost introduce the reader to whatever you are reporting on. Second of all, the introduction should explain why your report is relevant to the reader. By *"relevant to the reader"* I obviously do not mean personally relevant to the reader, I mean explain the background of your report such that the reader can understand why you wrote the report in the first place.

The introduction should also state your thesis, your desired result, or the like. Ex: *"the goal of the experiment is to prove"*, *"the aim of the investigation is to discover the relationship between"*, etc.

After having read the introduction, the reader should be completely aware of your intentions and what you wish to accomplish.

D. Theory (optional)

One of the pinnacles of science is its unique ability to use the results of those who came before. The theory section is where you make sure the reader is on the same page as you. Whatever you choose to place in the theory section should not be controversial, unless the point of the report is to study the outcome of a controversial statement (in which case it is perhaps more fitting to place/mention it in the introduction). After reading the

theory section, the reader should be completely prepared to tackle your explaining in the methods section.

Finding the balance between whether something is *"too basic"* or *"should be included in the theory section"* can sometimes be quite difficult. Unless otherwise specified, I usually aim the text at an audience who doesn't know anything about what I'm writing about, but one who has the same general understanding of physics and mathematics as I.

E. Method

The method section is probably the most important section in a scientific report. This is because your results are irreproducible if you do not properly explain *how* you came to these results. Apart from a few exceptions, an irreproducible result in science is effectively meaningless. The method section should explain the principles behind your calculations, the setup of your experiment, etc. For lab experiments, it is particulary important that you note down the equipement you use.

After finishing the method section, a reader should (in theory) be able to reproduce your findings. Obviously this is not perfectly true for any report, especially with rare physical events such as passing comets, volcano eruptions, etc. At the very least, a reader should have been able to reproduce your findings if he or she was brought back in your footsteps when you initially performed your experiment, the simulation, etc.

In addition to reproducing your findings, a reader should also know what type of results you have produced. E.g.: Say you wish to report on a game of heads or tails. In the method section you would have to describe your measurement process, namely flipping a coin and noting down whether it was a head or tail. After completing the method section, the reader obviously doesn't know the final heads vs. tails count. He or she does know however that the results come in the form of a heads vs. tails count. The method section should describe the measurement process and your data analysis such that the shape of the results (i.e., a graph, number, frequency table, etc.) is at best immediately obvious and at worst unexpected, but understandable.

F. Results

The results section often tends to be much shorter than expected, this is because you should *not* explain anything in the results. Many students struggle with the relationship between the method and results sections. It's important to remember that the results is basically a bullet point list with the final answers.

Consider the following example: *"We divided the measured number of heads and tails by the their sum to arrive at the experimental probability of measuring a head or tail. We found an experimental probability of 0.49 of measuring a head and 0.51 of measuring a tail."* Note that the first sentence is a description of your analysis of the experimental data and thus belongs in the method section. **The results section should only include the final answer:** *"We found an experimental probability of 0.49 of measuring a head and 0.51 of measuring a tail."*

G. Discussion

The discussion section is where you self-critique your methods and discuss your methods' bearing on the results. Can you draw any reasonable conclusions from your results? Does your findings support your thesis, or are they perhaps inadequate to properly address it? What does your results mean for future studies? Are your findings in conflict with earlier findings?

H. Conclusion

The conclusion is a short summary of all the important details of your findings. It is important not to confuse the conclusion with a "second abstract": the conclusion should highlight the questions you asked in the introductory section and defend your findings' relevance to these questions. The conclusion should also justify why your report is significant to the reader and the scientific field as a whole. Suggestions of future experiments/studies are also welcome.

I. Acknowledgements (optional)

This section is included when you want to acknowledge the help from someone who has contributed to your work, but not to the extent that it deserves authorship.

J. References

It is important to properly reference your work, otherwise it is by definition plagiarism. There are a lot of ideas you don't need to reference, simply because of their fundamental importance in the field or because it is viewed as basic (e.g., Newton's Second Law of Motion). However, don't make the mistake of assuming something is utterly obvious, it's usually not. Keep in mind that it's never a sin to reference one too many.

Because your AST2000 paper will not be published, it is "okey" to make mistakes here. Nonetheless, try to keep a consistent format with your references. Remember that the point of a reference is to a) acknowledge someone else's work and b) allow the reader to find the referenced work.