The first lab was a combination of exercises with a mini-experiment (mapping measured eyepiece field of view to the eyepiece focal length) embedded within. Future labs will be weighted more toward the experiment side, but inevitably there will still be exercises that illuminate general principles. This document provides some guidance on the expectation and style for lab write-ups.

Astr3130 is supposed to introduce you to telescope and instrumentation techniques while also preparing your for scientific communication, ultimately preparing you for participation in the writing of scientific journal papers. As such you should make yourself aware of the format of astronomical journal papers. Fully formatted papers can be found on the journal home pages (these papers are generally only accessible from a UVa IP address – we pay for the subscription...). For example

- Nature – [http://www.nature.com](http://www.nature.com)

The “ApJ Letters” are nice and concise, being limited to 4 pages and may prove the best examples. Alternatively the astronomy preprint server arXiv.org/astro-ph ([http://arxiv.org/list/astro-ph/new](http://arxiv.org/list/astro-ph/new)) contains postings of most recently submitted papers and has free access. The paper formatting on astro-ph is variable, however, with some reflecting the journal formats while some are much more spartan (for example all of the figures are piled up at the end of the paper making it much harder to follow).

Styles vary between journals with Nature papers being very different from the Astrophysical Journal. You should take a look and see. Despite the difference in style you should be seeking and emulating the clarity in presentation that is the hallmark of scientific publication. Typical journal papers are formulaic. They lay out the problem, beginning with the historical/fundamental context and concisely provide the motivation for the experiment at hand. They then detail the procedures/observations resulting from the experiment, how and when they were obtained and other supporting details of the observation. Next they interpret the observations and discuss the implications of the observations and potential shortcomings. Finally they return to the big picture summarizing the conclusions of the experiment and possibly motivating future work.

For the experimental part of the first lab things are much simpler, but in general you should try to emulate the scientific writing style found in the journals. Most importantly, expectations for the quality and craftsmanship of your write-ups are quite high. Scrawling down a few notes and making a couple of marginally legible plots is not acceptable even if the answers to all of the laboratory questions are demonstrably there and even if that style in the past garnered you nearly full credit for problem sets. Lab write-ups are not problem sets. Simply put, lab write-ups should be beautiful. Clarity and flow is key. Someone completely unfamiliar with the course, and to some extent with the physics/material should be able to pick up your writeup, have an enjoyable read, and understand with great clarity what you did, why and how you did it, and why it is important. Although a number may suffice to answer one of our questions an essay, an illustrated one at that, is expected. This concept holds particularly for the individual general questions on the lab that are outside the bounds of the main “experiment”. We're looking for tutorial prose. Be sure to keep it relevant, though, and don't
“ramble.”

For the “experiment” follow the traditional structure: 1) Illuminate the motivations (this approach may get a bit contrived for something as simple as mapping field of view to magnification, but humor us). 2) Detail the procedure and observations. Sufficient information should be there so that someone can reconstruct the experiment without having the lab instructions and can reconstruct your analysis from the data you provide. Please include dates and times of observation (we will use MJD format for this course) and weather conditions. 3) Discuss and analyze your results deriving the conclusions germane to the lab instructions. Construct graphics and plots (computer generated, not hand drawn) so that they streamline the discussions (a picture/plot can indeed be worth a thousand words, but it can also be a distraction. Choose wisely.). Clearly label plots and don't forget the units. Put uncertainties on data points where appropriate. 4) Summarize everything in a succinct conclusions section. Highlight what went right. If it happens, speculate on why things didn't quite work out the way you expected. Document lessons learned for future generations. Include as an appendix scans of your hand-written notebook pages taken during the experiment.

Scientific writing is as much about quality prose as it is about experimental narrative. Writing should be clean and concise. Think Hemingway rather than Dickens. Employ Strunk and White's most precise advice... “Omit needless words.” Write-ups should be readable and ideally a pleasure to read. Seek the active voice (without using first person) where possible.

“The rotation of the Earth displaced the stars the sidereal rate providing a means of determining the eyepiece field-of-view via transit timing.” (active and preferable)

“The field-of-view was measured by timing the transit of a star across the eyepiece at the sidereal rate.” (passive, was measured by....)

“We measured the field-of-view by timing the transit of a star across the eyepiece at the sidereal rate.” (cop out activation of a sentence – might as well be passive. Being old-school I (Mike) find this phrasing borderline reprehensible in scientific writing, but it is rapidly becoming the norm. You are welcome to use it without (conscious) penalty).

Complete your first pass at writing your lab report and then review and rewrite it with presentation, phrasing, and concise choice of word and phrase in mind. Find clever ways to “activate” sentences.

Finally note that although data acquisition/observation happens in groups, lab write-ups are an individual effort. You may consult on data reduction, statistics, and consistency of final results, but your writing, plots, and conclusions should be your own.